



version 7.5 for Windows (January 1995)

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If you do not know it yet, you will be glad to find out that SuperMemo will let you learn at a speed that will surpass your wildest imagination.

Using this help, you will be able to start your speed-learning with SuperMemo in minutes. All you need to do is:

- 1, create a set of questions and answers that will represent the knowledge you want to learn (alternatively, you can just use a ready-made collection called a SuperMemo database)
- 2, repeat the collected knowledge systematically under the supervision of SuperMemo.

Additionally, it is also recommended that you follow the rules needed to ensure the safety of computer files storing your knowledge. The rest is optional.

As of now, you can **learn fast and forget about forgetting!**

## Creating a SuperMemo database

Follow the steps listed below to create a set of questions and answers used in learning (such a set is called a database):

1. Create an new database by choosing **New** on the **File** menu
2. Use option **Append new items** on the **Edit** menu to add pairs of questions and answers (such pairs are called items)

## Learning with SuperMemo

In order to memorize and repeat the learned items, do the following:

1. Choose **Learn all** on the **Learn** menu (e.g. press Ctrl+L).
2. Mentally or verbally, answer the question appearing in the Question field of the Learn window
3. Display the answer by pressing Enter, choosing **Action : Show answer** or clicking the mouse on the answer field
4. Depending on the accuracy of your response, provide a grade on a 0 to 5 grade point scale (5=bright, 4=good, 3=pass, 2=fail, 1=bad, 0=null). To provide the grade press the corresponding number key, click the grade button or choose the correct grade on the **Grade** menu
5. Display the next item to learn by pressing Enter, clicking the mouse below the question-answer fields, or by choosing **Action : Next** on the Learn window menu
6. If a new item appears in the Question field, go to Step 2 (to continue repeating items)

If a message Final drill appears on the screen, press Enter, and repeat items displayed by SuperMemo. These items are those which scored a grade less than four in the learning procedure described in Steps 1 through 6.

**Warning: On a given day, the learning process is complete only when the Outstanding parameter displays 0+0.**

Having had a look at the foregoing repetition procedure, you are perhaps now inclined to believe that SuperMemo is too simple to be really effective. The truth is: it is both simple and effective! See the section on [theoretical foundations](#) of the method to learn how SuperMemo figures out when and which pieces of knowledge should be repeated in order to achieve a staggering memory result.

## Database safety principles

Here is a list of safety principles to follow to ensure that your SuperMemo databases are safe and sound:

1. exit SuperMemo before turning off the computer or before starting an application that might cause an unrecoverable system lock-up
2. keep 2-3 back-up copies of your database files (particularly, after adding a larger number of new items). Do not back up files of an open database!
3. in case of abandoning the program in a prohibited way, e.g. in power failure, use **Tools : Recover** to check your databases for integrity, or use your database back-up copy
4. never try to modify the content of database files by means of tools other than those supplied by SuperMemo World
5. run **Tools : Garbage** once every few months (set the **Compact** check box on, if possible), and **Tools : Recover** at least once a year
6. keep accurate date and time setting
7. if Database integrity error message appears, (1) create a back-up copy of the database (do not override earlier back-ups), (2) run **Tools : Recover** and (3) run **Tools : Garbage** (set the **Compact** check box on, if possible)

## Optional topics related to SuperMemo

Here is a list of optional topics that you might wish to study to deepen your understanding of SuperMemo:

[list of options of the SuperMemo program](#)

[list of most important windows of the SuperMemo program](#)

[optimization procedure used by SuperMemo](#)

[parameters displayed on-screen](#)

[troubleshooting](#)

[hits and tips for a successful learner](#)

[files installed by SuperMemo on the user's hard disk](#)

[SuperMemo database files](#)

[SuperMemo Database Bank](#)

[SuperMemo World](#)

## Grades used in learning

After each repetition, SuperMemo requests the learner to produce a grade that is supposed to reflect the accuracy of the just provided response.

The grade point scale is defined as follows:

**Null (0)**, complete blackout; you do not even recall ever knowing the answer

**Bad (1)**, wrong response; the correct answer seems to be familiar

**Fail (2)**, wrong response that makes you angrily say "I knew it!"

**Pass (3)**, answer recalled with difficulty; perhaps, slightly incorrect

**Good (4)**, correct response provided after some hesitation

**Bright (5)**, excellent response

Note, that in SuperMemo you are unlikely to need grades Null (0) or Bad (1).

Having responded to the question, you can specify a grade by choosing one of the three actions:

- \* click the corresponding grade button below the item field in the Learn window
- \* choose **Grade** from the Learn window's menu, and pick the relevant grade
- \* press the corresponding numeric key

You have to input a grade before you proceed with repetition. If, upon displaying the answer of an item, you choose any action different from the aforementioned, your request will be ignored and you will hear a beep (the only valid alternative is to quit the Learn window).

## Appending new items to SuperMemo databases

To add a series of new items to a SuperMemo database follow the steps listed below:

1. choose **Edit : Append new items** (e.g. by pressing Ctrl+A)
2. type in the question of the new item
3. move to the Answer field of the Append window (e.g. click it with the mouse, press PgDn or Tab, or choose **Edit : Answer**)
4. type in the answer
5. add the item to the database by pressing Esc or choosing **Action : Add and next**
6. go to Step 2 (to enter consecutive questions and answers)

## Options available on the main menu

Here are the main menu options of the SuperMemo program and their uses:

**File** - database file procedures

**New** - create a new database

**Open** - open a new database for use

**Save/Close** - close the currently used database

**Copy** - copy a database to a new location

**Move** - move a database to a new location

**Rename** - rename a database

**Delete** - delete a database

**Exit** - exit SuperMemo

**\SM7\DB\AUDIOVIS**, etc. - open a database from a list of the 5 most recently opened databases

**Edit** - edit and expand a database

**Edit recent item** - edit the recently used item; browse the database

**Append new items** - add new items to the database

**Search** - search for items containing a given substring

**Find first** - search for the first item containing the substring

**Find all** - search for all items containing the substring

**Fuzzy search** - search for items that contain substrings similar to the defined search string

**Learn** - memorizing new items and repeating previously learned items

**Learn all** - repeat outstanding items, memorize new items, and work the final drill in the optimum order

**Repeat outstanding items** - repeat outstanding items scheduled for a given day

**Memorize new items** - memorize new items

**Final drill** - repeat items that scored less than four in other stages of learning (e.g. in memorize new items)

**Cut drills** - delete repetitions scheduled for the final drill (this operation deletes the file [database name].DRL)

**Browse** - browse the database

**All** - browse the entire database

**Searched** - browse the items last found in **Find all**

**Intact** - browse the intact items

**Memorizing** - browse the memorized item

**Outstanding** - browse all outstanding items from the given day

**Leeches** - browse the most difficult items (defined by the combination of E-factor, interval and lapses range)

**Audio items** - browse items that contain audio records

**Visual items** - browse items that contain visual records

**Analysis** - statistical procedures

**Burden** - inspect the number and content of items to be repeated on particular days

**Monthly burden** - inspect the number of items scheduled for repetition in particular months and

years

**Factor distribution** - inspect the distribution of E-factors, which determine the difficulty of particular items

**Interval distribution** - inspect the distribution of intervals in a database

**Forgetting curve** - inspect the approximation of forgetting curves collected in the process of learning (initially, the curve for E-factor=2.5 and repetition-number=1 is displayed; other curves may be inspected by pressing arrow keys)

**Advanced statistical options**

**Advanced : Retention factors** - inspect the matrix of R-factors used by the SuperMemo optimization algorithm and the associated forgetting curves

**Advanced : Optimal factors** - inspect the matrix of O-factors used by the SuperMemo optimization algorithm and the associated forgetting curves

**Advanced : Optimal intervals** - inspect the matrix of optimum intervals used by the SuperMemo optimization algorithm and the associated forgetting curves

**Advanced : Retention** - inspect the values of retention at repetitions for particular E-factors and repetition numbers

**Advanced : Cases** - inspect the matrix of repetition cases used in evaluating the credibility of particular entries of OF and RF matrices and the associated forgetting curves

**Advanced : Retention factors 3D** - inspect 3-dimensional representation of the matrix of R-factors

**Advanced : Optimal factors 3D** - inspect 3-dimensional representation of the matrix of O-factors

**Advanced : Retention 3D** - inspect 3-dimensional representation of retention at repetition for particular E-factors and repetition numbers

**Advanced : Cases 3D** - inspect 3-dimensional representation of the matrix of repetition cases used in evaluating the credibility of particular entries of OF and RF matrices

**Tools** - a collection of procedures that can be used in processing databases:

**Garbage** - perform smart garbage collection, i.e. delete temporary files and/or compact the database by removing superfluous data

**Recover** - recover from database integrity errors

**Replace strings** - globally replace string in the database (see TOOLKIT.TXT for the description of REPSTR.EXE and TO\_TEXT.EXE, and for the definition of CNV and FLT files)

**Reset** - reset the database (i.e. make it ready for use by another person), or reset a selected elements of the optimization process

**Transfer items** - transfer groups of items between databases

**Export text** - export items as text

**Import text** - import items from a text file (the file should be formatted as the files generated by **Export text** or TO\_TEXT.EXE)

**Import audiovisual files** - import bitmap or sound files from a selected directory (the files should be named 1.BMP, 2.BMP, 3.BMP, etc. or 1.WAV, 2.WAV, 3.WAV, etc. for items 1, 2, 3, and so on)

**Export to SuperMemo 6** - export a database to SuperMemo 6 format (mainly in order to remedy the problem of word-wrapping appearing in SuperMemo 7). KBD and FNT files (if necessary) must be provided independently by the user

**Sort database** - sort a database for difficulty of items

**Swap items** - swap questions with answers in the entire database

**Cross-section** - perform a cross-section analysis of a number of database (see TOOLKIT.TXT for

details about CRS files used by CROSS.EXE)

**Setup** - install new databases or additional components of SuperMemo

**Miscellaneous** - miscellaneous procedures helpful in the learning process and in database management:

**Date** - change the date setting

**Random tests** - display items from the database at random (the presentation can be limited to a set of memorized items, intact items, intractable items, items found with **Find all**, audio items, etc.)

**Approximate** - compute the best-fit theoretical values of the OF matrix according to the current status of the RF matrix used by the SuperMemo optimization technique

**Mercy** - spread outstanding items over a defined period of time

**Wipe** - delay repetition of the most intractable items; remove the most intractable items from the learning process

**Lexicon** - open the lexicon associated with a database. The lexicon may be provided with a commercially available database, or built with **Miscellaneous : Build lexicon** using a user-defined filter

**Audio lexicon** - open the audio lexicon associated with a database. SuperMemo does not provide tools for building audio lexicons. They are provided ready-made with databases distributed on CD-ROM

**Build lexicon** - build a lexicon using the vocabulary of the currently used database. A user-defined filters can be employed in the build

**Font** - change the font and color used in items in a given database (to change the font in answers only, click the answer field and press Ctrl+F)

**Options** - set parameters which define the configuration of the SuperMemo program

**Users** - define new users, their working directories and, optionally, database access passwords

**View text files** - inspect the periodically updated text files which accompany SuperMemo software. For example: DBANK.TXT - listing of SuperMemo databases available, Q&A.TXT - most commonly asked questions about SuperMemo, DEVELOP.TXT - list of improvements in SuperMemo software, etc.)

**Help** - running help

**Front page** - introduction to SuperMemo

**Index** - index page of help

**Common questions** - run the help starting from the listing of over 100 most often asked questions about SuperMemo

**Hints and tips** - notes on the effective use of SuperMemo

**User** - data of the user, dealer or distributor who has purchased the given copy of SuperMemo directly from SuperMemo World

**Note** - note on intellectual property rights pertaining to the SuperMemo method and software

**About** - note about the version and release date of SuperMemo

## Most important windows of SuperMemo

The most important working windows of SuperMemo are:

- \* process window, which displays the parameters of the learning process
- \* editing windows: **Edit**, **Learn**, **Search** and **Random test** windows, which display individual items in particular options of SuperMemo
- \* append windows which are similar to editing windows and are used to add new items to the database
- \* browser window, which can be used to browse all items, intact items, memorized items, leeches, etc.
- \* statistical windows displaying optimal factors, optimal intervals, retention factors, etc.

## Editing windows

Editing windows, apart from the Question and Answer fields, provide a menu with the following options:

### Action

**Next** - move to the next item (i.e. item which follows the displayed one, in **Edit**; next item with the same substring, in **Search**; item to be repeated next, in **Learn**; another randomly picked item, in **Random tests**, etc.)

**Switch to Append** - switch the editing window to the Append mode

**Print** - print the current item (the actual printing takes place only after completing a page; to print only a few items, follow the printing with **Form Feed**)

**Form feed** - send the form feed command to the printer (printing items stored in the printer buffer)

**Exit** - close the editing window

**Edit** - edit the current item

**Question** - edit the question

**Answer** - edit the answer

**Switch** - switch the cursor between the question and the answer

**Swap** - swap the question with the answer (i.e. the question becomes the answer and vice versa)

**Replace** - replace a substring with another string

**Item** - database operations on the current item

**Delete** - delete the item

**Select** - select another item by its number

**Reset** - reset the item, i.e. change its status from memorized to intact (the item will be scheduled for memorization at the end of the queue of intact items)

**Memorize** - memorize the item, i.e. change its status from intact to memorized (the item will be scheduled for repetition using the default interval or the interval provided by the learner)

**Copy** - duplicate the current item and edit the copy

**Transfer** - transfer the current item to another database

**Position** - move to other items by using operations such as **Next**, **Previous**, **First**, **Last**, **PgUp** or **PgDn**.

**Image** - create and edit bitmaps associated with the current item (suboptions are: **New** - create a new image, **Edit** - edit the existing image, **Delete** - delete the existing image, **Import** - import a bitmap file in BMP format)

**Audio** - create and edit sound files associated with the current item (suboptions are: **New** - create a new sound file, **Edit** - edit the existing sound file, **Delete** - delete the existing sound file, **Import** - import a sound file in WAV format, **Play** - play the sound file, e.g. at the moment of displaying the question in **Learn**)

The bottom part of the editing windows displays item parameters and repetition parameters.

The size of the item edit controls can be changed by moving the sizing border that surrounds the question and answer area.

## Append windows

Append windows are used to add new items to the database. The following options are available on the Append menu:

### Action

**Continue** - move to the next step (from question to answer, or from answer to the next item)

**Add and next** - add the current item to the database and edit a new item

**Add copy** - add a copy of the current item to the database and continue editing the current item

**Switch to edit** - switch to the editing mode (e.g. in order to review a couple of recently added items)

**Exit** - destroy the Append window

**Edit** - edit the current item

**Question** - edit the question

**Answer** - edit the answer

**Swap** - swap the question with the answer

**Switch** - switch between editing fields

**Delete line** - delete the line by the cursor

**Clear** - clear the editing fields

**Image** - create and edit bitmaps associated with the current item (submenu options are: **New** - create a new image, **Edit** - edit the existing image, **Delete** - delete the existing image, **Import** - import a bitmap file in BMP format)

**Audio** - create and edit sound files associated with the current item (submenu options are: **New** - create a new sound file, **Edit** - edit the existing sound file, **Delete** - delete the existing sound file, **Import** - import a sound file in WAV format, **Play** - play the sound file, e.g. at the moment of displaying the question in **Learn**)

## Browser

Browser windows allow you to view a number of items together with their item parameters. The browser menu provides the following options:

- Position** - change the item displayed at the top of the browser
  - Next page** - move to the next page of items
  - Previous page** - move to the previous page
  - First** - move to the first item
  - Last** - move to the last item
  - Back** - move back to the recently used browser position (back can use up to 20 undo levels)
- Edit** - edit the item highlighted by the selection bar
  - Fixed view** - open a synchronous editing window that remains open as you browse through the items in the browser
  - Edit** - open an editing window to access editing operations for the current item
  - Open** - open question and answer fields of a current item
  - Question** - open question and answer fields, and edit the question
  - Answer** - open question and answer fields, and edit the answer
  - Close** - close question and answer field (if open)
  - Delete** - delete the current item
  - Memorize** - memorize the current item (if intact)
  - Reset** - reset the selected item (if memorized), i.e. remove it from the learning process, and place it in the intact queue (queue of items waiting for memorization)
- Search** - search for items containing a defined substring (only within the scope of the browser)
  - Find first** - search for the first item with the defined string
  - Find next** - repeat the last search operation
  - Question** - search for the first question containing the defined string
  - Answer** - search for the first answer containing the defined string
- Move** - move items within the browser (this menu is active only for the general database browser and for the intact queue browser)
  - Top** - move the current item to the beginning of the browsed sequence
  - End** - move the current item to the end of the browsed sequence
  - Shift** - move the current item to a new position by (1) shifting it by a defined number of items, (2) moving it to a position defined by the item number, or (3) moving it to a position defined by percentage of the browser sequence
- Browser** - perform global item operations on the browser: **Delete all**, **Reset all**, **Memorize all** and **Print all**
- Subset** - perform set operations on collections of items
  - Open** - load a collection of items from a previously saved file with extension SET and place them in a browser
  - Save as** - save the content of the currently used browser in a SET file
  - Add** - add the content of a selected collection of items from a SET file to the present content of the currently used browser
  - Subtract** - remove from the currently used browser all items that are present in a selected file with a collection of items (extension SET)
  - Intersect** - remove from the currently used browser all items that are **not** present in a selected

file with a collection of items (extension SET)

**Child** - create a child browser with a subset of items selected from the parent browser

**Intact** - create a child browser with all intact items included in the parent

**Memorized** - create a child browser with all intact items included in the parent

**Leeches** - create a child browser with all leech items included in the parent

**Search** - search for all items in the browser that contain a given string and create a child browser with all found items

**Audio** - create a child browser with all items of the parent that are provided with a sound track

**Tools** - use database tools on the contents of the browser

**Transfer items** - transfer all items kept in the current browser to another database

**Export items** - export the contents of the current browser as text

**Replace strings** - replace texts in the current browser according to specifications provided in a filter file (extension FLT)(see TOOLKIT.TXT for the definition of filter files)

**Swap items** - swap questions with answers in the browser

**Audio**

**Play** - play the sound track associated with the current item

**Edit** - edit the wave file associated with the current item

To change the item parameter displayed in the right part of the screen, click one of the items, and choose the desired parameter from the item parameter list box.

## Theoretical foundations of SuperMemo

The optimization technique used in SuperMemo is based on the work of a Polish biologist, Piotr A. Wozniak, who has developed a mathematical model of the decline of memory traces. The model makes it possible to determine the optimum spacing of repetitions for any desired level of knowledge retention.

SuperMemo uses the Wozniak model, and can be programmed to allow knowledge retention in the 90-99% range.

Although the details of the optimization technique are covered by SuperMemo World's trade secret, the general outline of the used algorithm is presented below (patent pending).

All forms of learning produce molecular changes in neuronal synapses which form connections between nerve cells in the nervous system. These changes are gradually obliterated in the process of forgetting, which plays an important evolutionary role in optimizing the organism's responses to the outside environment.

Forgetting affects all synapses that are able to learn, and can be prevented only by means of repetition. Every attentive learner knows, that forgetting can ruin the delicate fabric of knowledge that may take months or years to build. Latin saying *Repetitio mater studiorum est* is as old as the art of learning.

However, not everybody knows that **it is not possible to learn something once and to remember it forever without repetition!**

Even a person's own name could be forgotten if not used, or in other words, repeated as often as it is. The problem with repetitions is that they consume one of the most valuable assets in the modern lifestyle, time. Therefore, the key to effective learning is to find ways to reduce the number of repetitions needed.

SuperMemo allows learning to approach the maximum natural capacity of the human brain to form memories. This is done by the optimization of repetition scheduling, i.e., finding out when and which portions of knowledge should be repeated. Given a piece of knowledge, two criteria are used to determine the length of optimal intervals which should separate repetitions: (1) minimization of the number of repetitions, and (2) maximization of overall knowledge retention.

In other words:

- \* intervals between repetitions should be as long as possible to reduce time spent on repetitions and to produce maximum memory effect
- \* intervals should be short enough to ensure that the repeated knowledge is not forgotten

Because forgetting has a stochastic nature, i.e., it cannot easily be predicted when a given piece of knowledge will be forgotten, a statistical approach to the process of learning has to be applied. By statistical analysis, we can determine when a given proportion of memorized knowledge will be forgotten; hence, the following definition of optimal intervals: optimal intervals are intervals that result in a small, previously determined fraction of knowledge being forgotten. This fraction, called the forgetting index, may be chosen by the learner, and usually falls in the range 5 to 15 percent. By using optimal intervals in the process of learning, SuperMemo produces an incredible increase in the rate of knowledge acquisition without affecting knowledge retention. Optimal intervals will vary for different sorts of knowledge and different learners. The former problem is dealt with in SuperMemo by splitting the learned knowledge into the smallest possible pieces called items.

The optimization procedure, i.e., computation of optimal intervals, is then applied to each of the pieces separately, producing a unique repetition spacing in each of the cases. The principle of applying items of maximum simplicity is called the minimum information principle.

The problem of differences between learners is solved in SuperMemo by application of self-modifying algorithms that adjust repetition spacing to individual needs.

SuperMemo procedures can detect what sort of learning and what sort of learner are subject to optimization.

The net result is that a determined level of knowledge retention may be maintained in the process of learning to approach the maximum natural speed at which the learner's brain can form memories.

See also [Outline of the SuperMemo optimization algorithm](#)

## Optimization algorithm used in SuperMemo

Below is an outline of how SuperMemo makes it possible to learn at your maximum capacity:

- \* learned knowledge is split into the smallest possible pieces called items
- \* items are formulated in question-answer form; they can also include graphics, sound, and programmed elements such as specific repetition procedures, video, and even virtual reality (only in programmed databases)
- \* items are memorized in a self-paced manner by means of a drop-out technique, i.e., by responding to the asked questions as long as it takes to provide all correct answers
- \* after memorizing an item, the first repetition is schedule after an interval that is the same for all items (it is randomly shortened or lengthened for the sake of speeding up the optimization), and which statistically produces FI lapses of memory (FI stands for the forgetting index and equals 10% by default)
- \* the first interval is computed for an average learner, but as soon as the value of FI deviates from the requested level, the length of the first interval is modified
- \* after each repetition, the learner produces a grade, which determines the accuracy and easiness of reproducing the correct answer
- \* on the basis of response ratings, items are classified into difficulty categories. Difficulty is reestimated in each successive repetition
- \* different optimal intervals are applied to items of different difficulty
- \* different intervals are applied to items that have been repeated a different number of times
- \* the function of optimal intervals is constantly modified in order to produce the desired level of knowledge retention (i.e. the level determined by the selected forgetting index)
- \* the function of optimal intervals is represented as the matrix of optimal factors (OF-matrix), defined as follows:

$$I(1,EF)=OF(1,EF)$$

$$I(n,EF)=I(n-1,EF)*OF(n,EF)$$

where:

$I(n,EF)$  - n-th interval for item difficulty  $EF$

$OF(n,EF)$  - optimal factor for the n-th repetition and difficulty  $EF$

The matrix of optimal factors may be inspected by means of the option **Analysis : Advanced : Optimal factors** or graphically by means of **Analysis : Advanced : Optimal factors 3D**

- \* difficulty of items is expressed by means of E-factors (see  $EF$  in the formulas from the previous paragraph). Historically, E-factors were used to determine how many times intervals should increase in successive repetitions of items of given difficulty. At present, E-factors are only used to index the matrices of optimal factors and retention factors, and may bear little relevance to the actual interval increase. Initially, all items have their E-factors set to 2.5. In the course of repetitions, E-factors are increased or decreased depending on the grades given by the learner. Good grades (i.e. grades above four) gradually increase E-factors, while bad grades decrease E-factors.
- \* matrix of optimal factors is produced by smoothing the matrix of retention factors (RF-matrix); (matrix of retention factors may be inspected by means of the option **Analysis : Advanced : Retention** or graphically by means of **Analysis : Advanced : Retention factors 3D**)
- \* each entry of the RF matrix equals the current estimation of the optimal factor  $OF$  that is expected to produce FI lapses of memory (i.e.  $RF(n,EF)=OF(n,EF)$ )
- \* entries of the RF-matrix, the so-called retention factors (R-factors), are computed from forgetting

curves whose shape is sketched on the basis of repetition history

- \* each difficulty category and repetition number has its own record of repetitions used to sketch a separate forgetting curve (forgetting curves may be inspected by clicking the mouse over one of the matrix entries displayed with following options on the **Analysis : Advanced** menu: **Retention factors, Optimal factors, Optimal intervals, Retention** or **Cases**)
- \* intervals used in learning, including the first interval, are slightly dispersed around their optimal values in order to increase the accuracy of forgetting curve sketching and make the distribution of repetitions in time more uniform

See also [Theoretical foundations of SuperMemo](#)

## Troubleshooting; error messages reported by SuperMemo

Error messages are displayed each time SuperMemo can detect any abnormality in the status of the learning process, structure of the database, environment conditions or user's actions.

The three major classes of error messages are:

- \* warnings - inform the user of the detected irregularity. They can usually be successfully responded to by pressing an appropriate key or changing a program's or system's parameter
- \* database integrity error messages - inform the user of the integrity problems detected in the database. Very often, integrity errors can be remedied by using **Tools : Recover** or RESCUE.EXE without any loss of data. However, if not properly responded to, integrity errors can propagate, or result in a fatal error, and consequently produce a significant damage to the database
- \* fatal error messages - indicate that SuperMemo or Windows encountered a problem it was not able to cope with. Fatal errors usually result from serious database integrity problems, software or hardware problems (often independent of SuperMemo)

## Warnings

**Warning! Last repetitions <date>** - this message appears if the current system date is much later than the earliest day on which there are repetitions scheduled in a database which is about to be opened. Either you have not been making your repetitions for over 1 month, or your system date is wrongly set. Press Enter if you want to continue or change the system date if it is wrong.

**Invalid date! Last repetitions <date>** - this message appears if the current system date is earlier than the earliest day on which there are repetitions scheduled in a database which is about to be opened. Either you have mistakenly made your repetitions scheduled for the future, or your system date is incorrect. Change the system date, use your back-up databases or wait until the day for which repetitions are scheduled.

**Cannot open <database name>** - this message appears if, for any reason, SuperMemo is unable to open a database. Check the following: **(1)** if all four database files are present in the database directory (note that the DOS's COPY command fails to copy zero-sized files). If not, copy the files from the back-up disk. If you do not have a back-up and only the DAT file is missing, create an empty DAT file and run **Tools : Recover** or RESCUE.EXE on the incomplete database, **(2)** if the database files have correct filename extensions (INF, ITI, ITM and DAT). If not, rename them, **(3)** if there is free space on the database disk. If not, delete some of the files, or use another disk **(4)** if the door handle of the used disk is closed. If not, close it. If you still cannot open the database, use **Tools : Recover** or RESCUE.EXE to remedy the problem.

**Not enough disk space** - this message appears when SuperMemo has problems with writing to the disk. Check the following: **(1)** if the database path is correctly specified, **(2)** if there is enough disk space on the database disk (usually SuperMemo will prompt you on how much space is needed for a given operation), **(3)** if the specified drive is ready for operation

**Changes introduced by Mercy/Wipe are irreversible** - this warning makes sure that you don't use the **Mercy/Wipe** option without consideration. You can pass it by pressing Y.

**Disk error** - this message is presented in most cases when SuperMemo is unable to read or write to a file. You can usually remedy the problem with ease, e.g. by closing the disk drive's door handle, and pressing Enter to repeat the recent disk operation.

## Database integrity errors

Upon receiving a database integrity error message, you should immediately stop the learning session, back-up your databases and perform a database recovery by means of **Tools : Recover** or RESCUE.EXE. Afterwards, compacting the database with **Tools : Garbage** is recommended.

Each time a database integrity error message appears, you will be asked to press Esc to make sure that you don't miss the message.

Database integrity error messages include:

**Database already in use** - displayed each time you attempt to open a database which is currently in use with another instance of SuperMemo, or which has not been closed recently, e.g. because of power failure, or which has been closed by termination procedures used to handle fatal errors. In the latter case, you need no more than to choose No to open the database; however, you should run **Tools : Recover** or RESCUE.EXE to check for integrity errors.

**Wrong ITM record** - displayed if the pointer to the location of the item text points beyond the end of the ITM file

**Wrong ITM pointer** - displayed if the pointer to the location of the item text points beyond the end of the item record in the ITM file

**Wrong assignment pointer** - displayed if the repetition schedule contains a pointer to an item which does not exist

**Wrong interval** - displayed if a memorized item uses a zero interval

**Wrong repetition date** - displayed if the last repetition date indicates that the repetition took place in the future

**Wrong E-factor** - displayed if an E-factor reaches beyond the range

**Wrong U-factor** - displayed if a U-factor reaches beyond the range

**Wrong intact pointer** - displayed if the intact queue contains a pointer to an item which does not exist

**Wrong intact queue** - displayed if the first item of the intact queue cannot be located

**Wrong optimal factor** - displayed if an O-factor reaches beyond the range

**Removing unscheduled item** - displayed if **Delete**, **Reset**, **Mercy** or **Wipe** attempt to remove from the repetition schedule an item which is not scheduled

**Circular intact queue** - displayed if the intact queue is circular

## Files installed on the user's hard disk

### Integral files of SuperMemo

- SM7.EXE - SuperMemo 7 for Windows program
- BWCC.DLL - custom control DLL needed to run SuperMemo 7
- SM7.CI\_ - compatibility index file needed to run SuperMemo 7
- 0.BMP - default bitmap template
- 0.WAV - default sound file template

### Accessory files

- SM7.HLP - SuperMemo 7 for Windows help
- SM7.INI - SuperMemo initialization file

### Text files

- README.TXT - most recent listing of files on the distribution disk
- MINGUID7.TXT - Minimum User's Guide for SuperMemo 7
- DBANK.TXT - info about SuperMemo World's Database Bank
- INQUIRY.TXT - SuperMemo World's inquiry form
- DEVELOP.TXT - the history of SuperMemo software development
- Q&A.TXT - most common questions and answers about SuperMemo
- OPINIONS.TXT - opinions of users, scientists and journalists about SuperMemo

### SuperMemo Toolkit

- SETUP.EXE - SuperMemo component installation program
- RESCUE.EXE - program for recovering from database damage (analogous to **Tools : Recover**)
- RESET.EXE - program for transforming databases to the intact form (analogous to **Tools : Reset : Database**)
- TRANSFER.EXE - program for transferring items between databases; also used in merging and splitting databases (analogous to Tools : Transfer items)
- REPSTR.EXE - program for replacing fonts and substrings in a database (analogous to Tools : Replace strings)
- TO\_TEXT.EXE - program for converting SuperMemo files to ASCII format with extension TXT (analogous to Tools : Replace strings)
- CROSS.EXE - program for compiling a cross-section statistical analysis of SuperMemo databases (analogous to Tools : Cross-section)
- SWAP.EXE - program for swapping questions with answers in SuperMemo databases (e.g. to transform an active recall vocabulary word-pair database to a passive recognition word-pair database)(analogous to Tools : Swap)
- CLEAN.EXE - program for resetting optimization matrices in SuperMemo databases (analogous to **Tools : Reset : Optimal factor matrix** and **Tools : Reset : Retention factor matrix**)

### Obligatory database files

- \*.INF/ITM/ITI/DAT - files of commercial, exemplary, sample or shareware databases

\*.AAA/AAB/AAC,etc. - bitmap files in a SuperMemo database

\*.YAA/YAB/YAC,etc. - wave files in a SuperMemo database

\*.DLL - files of programmed databases

### **Accessory files**

\*.TTF - True Type font file of a database (stored in the Windows directory)

\*.FOT - True Type header file of a database (stored in the Windows directory)

\*.DRL - files used to store the sequence of items scheduled for the final drill

\*.INI - database configuration files

\*.FND - files to store the sequence of items used in the search browser

\*.REC - database recovery report

\*.TXT - text files, also used to keep items in ASCII format

\*.STB - sortable database text files

\*.SRT - sorted database text files

\*.CNV - conversion files used by REPSTR.EXE and Tools : Replace strings

\*.FLT - filter files used by TO\_TEXT.EXE, Tools : Export text, and Tools : Replace strings

\*.CRP - database cross-section analysis results

## Parameters of the learning process

The parameters of the learning process are displayed in the right part of the main screen. These are:

**database** - name of the database in use

**dates** - date on which the currently opened database was created, and the present date (dates are displayed in the UK or US format depending on the setting in **Miscellaneous : Options : Date-format**)

**day** - number of days that have passed since creating the database in use

**memorized** - number of items that have already been memorized

**intact** - number of items that have not yet been memorized

**total** - total number of items in the database (**total = memorized + intact**)

**outstanding** - (1) number of items that are scheduled for repetition on the current day, and (2) the number of items that have scored grades below 4 in the current session (the latter items will take part in the final drill)

**burden +/-** - change of the **burden** parameter in the current session (see below)

**burden** - average number of repetitions per day

**mean time** - average repetition time in seconds

**workload** - average time spent on repetitions per day (**workload = burden \* mean-time**)

**interval +/-** - change of the **interval** parameter in the current session (see below)

**interval** - average current interval between repetitions for items in the database

**factor** - average **E-factor** for items in the database

**repetition** - (1) average number of repetitions, and (2) the average number of memory lapses for items in the database

**lapses +/-** - change of the **lapses** parameter in the current session (see below)

**lapses (FI)** - proportion of items that are not remembered at repetitions (the value FI stands for the requested forgetting index)

**retention** - estimated proportion of memorized items which the learner is likely to recall

**grade** - average grade provided at repetitions

**time** - total learning time in the current session

(see also [Item parameters](#) and [Repetition parameters](#))

## Item parameters

Item parameters are displayed in the bottom-left quarter of all editing windows (**Edit, Learn, Search,** etc.).

These are:

**number** - number of the item

**repetition** - number of repetitions and the number of memory lapses

**interval** - current interval

**dates** - date of the last repetition and the date of the next repetition (the difference between the two is **interval**)

**E-factor** - E-factor of the item (the greater the E-factor, the easier the item)

**future reps** - estimated number of repetitions of the given item in the next 30 years (computed from the matrix of O-factors)

**U-factor** - U-factor of the item (current interval divided by the previous interval)

(see also Repetition parameters and Learning parameters)

## Repetition parameters

Repetition parameters are displayed in the bottom-right quarter of all editing windows (**Edit, Learn, Search**, etc.).

These are:

**grade** - grade provided in the most recent repetition

**opt interval** - optimal interval which should precede the next repetition (computed from the OF matrix:  $\text{old\_interval} * \text{O-factor}$ )

**new interval** - interval which will precede the next repetition (this value is obtained by randomly modifying **opt interval**)

**next rep** - date of the next repetition (current date + **new interval**)

**new e-factor** - new E-factor for the recently repeated item (grades above 4 increase E-factors; grades below 4 decrease E-factors)

**cases** - number of repetition cases that have been used to compute the values of the relevant R-factor and O-factor

**R-factor** - value of the relevant R-factor (1) before and (2) after the recently made repetition

**O-factor** - value of the relevant O-factor (1) before and (2) after the recently made repetition

(see also Learning parameters and Item parameters)

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## Keyboard shortcuts

The following keys can be used to access some most frequently used options and operations of SuperMemo:

F1 - Help index

F2 - File : Save - close the database in use

F3 - File : Open - open a new database for use

F4 - Search : Find all - search for items containing a given string of characters

F5 - Browse : All

F9 - Audio : Edit (active only in editing windows)

F10 - Audio : Play - play the sound file associated with a given item (active only in editing windows and in the browser)

F12 - Tools : Recover - recover from database integrity problems

Ctrl+A - Edit : Append new items - add new items to the database

Ctrl+B - Burden - inspect the number of items to be repeated on particular days of the process

Ctrl+D - Miscellaneous : Date - change the current date

Ctrl+F - Miscellaneous : Font - change the current font and color of items

Ctrl+E - Edit : Edit recent item - edit the recently used item

Ctrl+G - Tools : Garbage - garbage collection

Ctrl+M - Miscellaneous : Mercy - distribute outstanding items over a defined period

Ctrl+N - File : New - create a new database

Ctrl+O - Miscellaneous : Options - change the parameters of the SuperMemo program

Ctrl+R - Edit : Replace (active only in editing windows)

Ctrl+W - Miscellaneous : Wipe - postpone or eliminate the repetitions of the most intractable items

## **File**

File menu provides the following options for operations on SuperMemo database files:

**New** - creates a new, empty database.

**Open** - opens a database for use with SuperMemo.

**Save/Close** - saves and closes the database in use.

**Copy** - copies a database to a new location

**Move** - moves a database to a new location

**Rename** - renames a database

**Delete** - deletes all files of a database

**Exit** - exits SuperMemo

**\SM7\DB\AUDIOVIS**, etc. - selects one of five the most recently used databases

## Open

This option allows you to open a database for use. Apart from choosing **Open** on the **File** menu, it may also be chosen by pressing *F3*. Upon calling **Open**, a standard file dialog box appears on the screen.

The dialog box contains fields which allow you to select the drive, path, and filename of the database that is to be open. You can move between the fields by means of the mouse or by pressing Tab or Shift+Tab. The **File name** combo box displays the currently available files determined by the file selection template and the current directory specified at **Directories**. To pick a file to open double-click its name. To quit **Open** without choosing any file press *Esc* or click the **Cancel** button. When changing the filename template, remember that you should not change the INF extension (unless you just want to use **Open** to see the files available in the database directory). By trying to open a non-database file you can damage its content!

As an example of a useful modification to the filename template imagine that, in your database directory, you have a number of databases on mathematics and physics such as A\_MATH, B\_MATH, C\_MATH, ... , A\_PHYS, B\_PHYS, C\_PHYS, etc., In such a situation, you might wish to work with MATH databases first. To do so you could successively (1) define the template ?\_MATH.INF, (2) click the list box **File name** (not its edit control), (3) select a given MATH database by pressing A, B, C, etc. and (3) choosing **OK**. If SuperMemo displays a message Cannot open <filename> then probably one of the database files is missing. Upon choosing a database, it is open for use, and all its learning parameters are displayed in the movable learning parameters window.

After completing your work with SuperMemo, you should always close the database in use, otherwise its content may become inconsistent. You can close the database in one of the following way:

- \* choosing **Files : Save** (or pressing *F2*),
- \* opening another database (e.g. by pressing *F3*),
- \* quitting SuperMemo (e.g. by pressing *Alt+F4* or double-clicking the control-menu box).

SuperMemo does not close databases when you switch to another Windows application; therefore, it is recommended that you press *F2* before you press *Alt+Esc* or *Ctrl+Esc* (unless you want to simultaneously use more than one database using a few instances of SuperMemo).

## **New**

This option can be used to create a new, empty database. The newly created database will be stored in the database directory specified by the option Miscellaneous : Options : Database Path. New creates four files that make up a SuperMemo database, and sets up initial values for all learning parameters.

To create a new database do the following:

1. Choose File : New (or press Ctrl+N).
2. Provide an 8-letter name for the database.
3. Click OK or press Enter.

In case the provided name is not unique, i.e., a database of the same name already exists, SuperMemo will ask you to confirm your decision. To override the old database, choose Yes in a query dialog box..

## Save

This option can be used to close the database in use. Apart from the menu selection, it may be activated by pressing F2. Save is automatically performed in the following circumstances:

- \* opening a new database,
- \* quitting SuperMemo,
- \* initializing a new database with **New**.

If any of the working windows is open, the message will be displayed: *Close working windows?*

Save is also responsible for creating a database configuration file (extension INI) in which such parameters are stored as: size and placement of working windows, font, color, last used search string, case sensitive search indicator, etc.

## Garbage

**Garbage** can be used to perform a database garbage collection. This procedure removes all superfluous data from the database and allows to reduce its size. It is recommended that you perform garbage collection from time to time. The recommended frequency varies from once a year, for small databases that are not often modified, to once a month, for fast growing, large or intensely edited databases. As Garbage provides some database integrity check-ups, it can also be used in cases you suspect a database damage (the check box Compact must be set).

**Delete files** group allows you to choose optional files to delete. There are: **(1)** temporary toolkit files (SRT, STB, REP, REC, CRP, etc.), **(2)** temporary database files (FND - used by Browse : Searched, DRL - used by Learn : Final drill, PRN - used by Action : Print in editing windows, etc.), **(3)** source databases in the ASCII format (extension TXT), **(4)** range files used by the toolkit (extension RNG) **(5)** database documentation files (DOC), **(6)** filter files (FLT), **(7)** conversion files used by Tools : Replace strings and REPSTR.EXE, **(8)** cross-section database lists used by Tools : Cross-section (CRS), **(9)** image files (only in the standard mode of audiovisual file access), and **(10)** sound files (only in the standard mode of audiovisual file access).

The **Compact** check box makes it possible to compact the database by removing superfluous records from ITM and ITI files. Note that you cannot compact databases that use audiovisual file access mode different from the standard mode.

The **Renumber** check box makes it possible to renumber the items at compacting, i.e. give the successive items numbers 1, 2, 3, etc. Renumbering may be useful in cases where a large number of items have been deleted from a database.

## Recover

**Recover** can be used to perform general database integrity check-up, or to repair a database damaged by one of the following factors:

- \* media failure (bad sectors, drive problems, cross-linked files, etc.)
- \* action of viruses
- \* version mismatch (using different file versions of the same database)
- \* system lockup (inconsistent data written to the database by SuperMemo)
- \* date errors (e.g. using the database with an incorrectly set date), etc.

To recover a database, you need all the files with extensions INF, ITM, ITI and DAT. In case you lost the DAT file, you can create an empty DAT file for the recovery, but the entire learning process will irreversibly be lost.

To recover a database with integrity problems do the following:

1. open the database
2. choose **Tools : Recover** (e.g. by pressing F12)
3. click the **Start** button

All corrections done to the inconsistent database are presented on the screen and the recovery report is stored in a text file with the extension REC.

You can also repair your databases at the level of DOS by using RESCUE.EXE.

## Edit recently used item

Upon choosing Edit SuperMemo opens an Edit window and enters the editing mode. You can open up to four numbered Edit windows. In the editing mode the following operations are available:

### Action

**Next** - moving to the next item (i.e. item which follows the displayed one, in **Edit**, next item with the same substring, in **Search**, item which is to be repeated next, in **Learn**, or another randomly picked item, in **Random tests**)

**Switch to Append** - switching the editing window to the Append mode

**Print** - printing the current item (the actual printing takes place only after completing a page; if you want to print only a few items, follow the printing with **Form Feed**)

**Form feed** - sending the form feed command to the printer (printing items stored in the printer buffer)

**Exit** - closing the editing window

**Edit** - editing the current item

**Question** - editing the question

**Answer** - editing the answer

**Switch** - switching between the question and the answer

**Swap** - swapping the question with the answer

**Replace** - replacing a substring with another string

**Item** - database operations on the current item

**Delete** - deleting the item

**Select** - selecting another item given its number

**Reset** - resetting the item, i.e. changing its status from memorized to intact (the item will be scheduled for memorization at the end of the queue of intact items)

**Memorize** - memorizing the item, i.e. changing its status from intact to memorized (the item will be scheduled for repetition using the default interval or the interval provided by the learner)

**Copy** - duplicating the current item and editing the copy

**Transfer** - transferring the current item to another database

**Position** - moving to other items by using operations such as **Next**, **Previous**, **First**, **Last**, **PgUp** or **PgDn**.

**Image**, - creating and editing bitmaps associated with the currently presented item (the suboptions are: **New** - creating a new image, **Edit** - editing the existing image, **Delete** - deleting the existing image, **Import** - importing a bitmap file in the BMP format)

**Audio**, creating and editing sound files associated with the currently presented item (the suboptions are: **New** - creating a new sound file, **Edit** - editing the existing sound file, **Delete** - deleting the existing sound file, **Import** - importing a sound file in the WAV format, **Play** - playing the sound file, e.g. at the moment of displaying the question at **Learn**)

The bottom part of editing windows is used to display item parameters and repetition parameters.

Apart from menu choices, you will often use the following keys in the Edit window:

->,<- - to move one item forward or backward.

PgUp/PgDn - to move a couple of items forward or backward.

Home/End - to move to the first or last item in the database.

Enter - to move to the next item.

Esc - (1) to exit the editing mode, and close the Edit window (if no edit control has the focus), or (2) exit the edited item field and set the input focus on the Edit window (if the question or answer field are being edited).

You can also start editing the currently displayed item by clicking its Question or Answer fields. The editor commands are standard for Windows programs. For example:

->,<- - Move the cursor (only within the current edit control).

Ctrl -> - Move one word right.

Ctrl <- - Move one word left.

Backspace - Delete the symbol preceding the cursor, and paste lines if the cursor is located in the first column.

Del - Delete the symbol at the cursor's position, and paste lines if the cursor is located at the end of the line.

Enter - Split the current line and move to the beginning of the next line.

Home/End - Go to the beginning or end of the current line.

Shift+(arrow keys) - Mark block.

Ctrl+Ins - Copy block to the clipboard.

Ctrl+Del - Cut block.

Shift+Del - Move block to the clipboard.

Shift+Ins - Paste block from the clipboard.

Esc - Move to the Answer field (if in the Question field), or exit the editor (if in the Answer field).

You can also perform standard editing operations by means of the mouse. For example, to copy part of an item to the clipboard:

- \* Move to the beginning of the text that you would like to copy, and click the mouse.

- \* Move to the end of the text that you want to copy and double-click.

- \* Press Shift+Del.

To change the font and color of items in the database choose **Miscellaneous : Font** or press Ctrl+F. To change the font in answers only, click the answer field and then press Ctrl+F.

If you want SuperMemo to use word-wrapping during item editing, check the option **Word-wrapping** in the **Options** dialog box (you can open **Options** by pressing Ctrl+O). Remember, however, that once you turn word-wrapping on, your database will no longer be compatible with SuperMemo 6 for DOS.

## Append new items

This option allows to add new items to the database, and is invoked with Ctrl+A. You can add a lot of new items without ever memorizing them. However, if you wish to remember them, you have to commit them to memory by means of Learn, and repeat them regularly. You can freely alternate the process of appending items to your database and learning.

You can add a new item to the database by pressing Ctrl+A and proceeding along the following steps:

1. Input the question (use standard Windows editing commands).
2. Press Esc, Tab, PgDn, or click the Answer field to start editing the answer.
3. Input the answer.
4. Press Esc once to input more items (alternatively, choose Add and next), or press Esc twice to quit Append (alternatively, choose Add and next and follow it with Exit or Alt+F4).

The following options are available in the Append window:

### Action

**Continue** - moving to the next step (from question to answer, or from answer to the next item)

**Add and next** - adding the current item to the database and editing a new item

**Add copy** - adding a copy of the current item to the database and continuation of editing the current item

**Switch to edit** - switching to the editing mode (e.g. in order to review a couple of recently added items)

**Exit** - destroying the Append window

**Edit** - editing the currently processed item

**Question** - editing the question

**Answer** - editing the answer

**Swap** - swapping the question with the answer

**Switch** - switching between editing fields

**Delete line** - deleting the line with the cursor

**Clear** - clearing the editing fields

**Image**, - creating and editing bitmaps associated with the currently processed item (the submenu options are: **New** - creating a new image, **Edit** - editing the existing image, **Delete** - deleting the existing image, **Import** - importing a bitmap file in the BMP format)

**Audio**, creating and editing sound files associated with the currently processed item (the submenu options are: **New** - creating a new sound file, **Edit** - editing the existing sound file, **Delete** - deleting the existing sound file, **Import** - importing a sound file in the WAV format, **Play** - playing the sound file, e.g. at the moment of displaying the question at **Learn**)

## Learn : Learn all

**Learn all** allows you to memorize new items and repeat items that have already been memorized. **Learn all** is called by pressing Ctrl+L. You can memorize new items on whatever day you choose, and in quantities of your choice. However, as soon as an item has been committed to your memory, SuperMemo will determine the dates of subsequent repetitions, and you will have little or no influence on repetition timing. Optimally, you should go through **Learn all** once a day. If, for any reason, it is not possible to repeat items every day, try to pass **Learn all** as regularly as your weekly schedule permits. You should remember that working with SuperMemo once a week will reduce the effectiveness manifold, and working once a month can hardly produce results better than traditional forms of learning with a non-optimized repetition schedule.

**Learn all** proceeds in three stages:

1. Repeating items scheduled for the current day. **Outstanding repetition** or **Repetition** appears in the title bar of the Learn window (this stage may be passed independently by choosing **Learn : Repeat outstanding items**).
2. Memorizing new items. **Memorize** appears in the title bar (this stage may be passed independently by choosing **Learn : Memorize new items**).
3. Repeating items that caused recall problems in stages 1-2. **Final drill** appears in the title bar (this stage may be passed independently by choosing **Learn : Final drill**).

Items repeated in the first stage are determined by the repetition scheduling algorithm. Optimally, all items scheduled on the current day should be repeated. In the second stage, items are memorized in the sequence in which they have been introduced to the database by means of **Append**. This sequence can be modified by means of the Intact browser as well as with **Reset** and **Memorize** (options available in all editing windows). You can freely choose the number of new items you want to memorize depending on availability of time, tiredness, etc. You can skip the second stage in case there are no more new items in the database, or if you do not wish to increase the repetition burden. In the third stage, you will repeat items that scored below four in the response quality assessment in the first and second stages of **Learn all**. If you have a great number of outstanding items, e.g., because of vacation, illness, etc., you can resign from the third stage of repetitions. To do this, you can choose the **Cut drills** option on the Learn menu.

Each repetition in each of the three stages proceeds along the following steps, called the repetition cycle:

1. The question of the repeated item is displayed, and you should provide a verbal response, or you should answer the question in your mind. Upon producing the response, click the answer field of the Learn window or press Enter.
2. The answer of the repeated item is displayed, and you should compare it with the response you provided in Step 1.
3. The grade, or response quality, should now be specified to tell SuperMemo how difficult it was to answer the question. To input the quality click one of the five grade buttons under the Answer field, or click **Grade** on the menu and select the relevant grade.

Press Enter to continue repetitions, or select any of the options of the editing mode, e.g. **Delete** (Del), **Reset** (R), **Memorize** (M), **Print** (Ctrl+Shift+P), **Copy** (C), etc.

The response quality grade scale is as follows:

- 5 - Bright - Excellent response, correct answer given without hesitation.
- 4 - Good - Correct answer given after some consideration.
- 3 - Pass - Answer recalled with difficulty, perhaps slightly incorrect (e.g., 5 billion in response to a question on the size of the human population which was 5.4 billion in 1991).
- 2 - Fail- Wrong answer that makes you say: I knew it!
- 1 - Bad - Wrong answer in case when the correct one seems to be familiar.
- 0 - Null - Complete blackout; you even do not recall ever knowing the answer.

In case you have memorized an item that seems less important or too difficult, and you think that you would rather wish to memorize it later, reset it (in the Learn window, press R or choose **Item : Reset**). Resetting will place the item at the end of the list of items waiting for memorization (this list is called the intact queue). Note, that **Reset** will have no effect on intact items; therefore, if you want to move intact items to the end of the intact queue, press M or choose **Item: Memorize** before you choose **Reset**.

If you want to put an important item to the learning process before its turn comes in the sequence determined by **Edit : Append new items**, you can choose **Memorize** in any of the editing windows (e.g. by pressing M).

Here is the best algorithm for using SuperMemo (tried successfully by thousands of users in several dozen countries of the world):

1. Choose the daily working time from 5 to 45 minutes. Unless you are an experienced SuperMemo user, do not choose the working time longer than 45 minutes!
2. In the course of your ordinary daily activities collect items that you want to remember (facts, figures, rules, vocabulary, names, phones, etc.). For working examples, see sample databases placed on your hard disk by the installation program.
3. Open the database
4. If Outstanding in your database(s) is different from zero, repeat outstanding items until Outstanding equals 0+0 (use **Learn : Learn all**).
5. If you have got some time left for work with SuperMemo (compare Step 1), and if Intact in your database(s) is different from zero, memorize new items until Intact equals zero or until your time is out (whichever comes first).
6. If you have got some time left for work with SuperMemo, add new items collected in Step 2 (use **Edit : Append new items**). If your time is limited, select only the most important items. Keep unused items for later use. Continue appending new items until your time is out.
7. If you have got some extra time and would like to work beyond the time limit set in Step 1, append more items. Do not memorize new items after time! Do not repeat items using **Random tests!**
8. After work, take a one day break and go back to Step 3.

**Warning!** If you are ever tempted to give dummy grades to provisionally unload the backlog of outstanding repetitions, remember that dummy grades may result in an irreversible damage to the learning process by distorting optimization matrices RF and OF. **Mercy** and **Wipe** should be used in such circumstances, and only as a last resort!

## Learn : Cut drills

This option can be used to eliminate the final drill queue. All items that score below four in a given session are scheduled for repetition on the same day. If a great number of outstanding items accumulates, and there is a risk of missing a day of repetitions, final drill may be skipped by choosing **Cut drills**. **Cut drills** works by deleting the file <database name>.DRL, which stores the record of items scheduled for final drill.

## Search : Find first

This option allows to search the database for items whose content is partially known. This is possible by specifying any substring that is contained in the item. For example, if you want to search for items that concern viral aspects of AIDS you could choose to search for strings like HIV, vir, virus, AIDS, etc. In order to search for items by means of Search do the following:

1. Choose **Search : Find first**.
2. Input the string to search for.
3. Depending on if you wish the search to be case-sensitive or not, set the case-sensitive check-box appropriately.
4. Depending on if you wish to look for whole words or for any substring, set the match words check-box appropriately.
5. Press Enter or click OK.

Upon finding an item that contains the specified string, SuperMemo displays it and enters the editing mode with its **Delete**, **Select**, **Print**, **Reset**, **Memorize**, **Copy**, and **Replace** options at hand. Note, that Next in the search window invokes searching for the next item containing the defined string. **Exit** stops searching.

For large databases, it can be seen that the search proceeds in two stages: (1) searching the ITM file for items containing the substring, and (2) searching the ITI file for item information pertaining to the found item. By pressing Enter you can skip the second stage of search. This allows you to accelerate browsing large databases, and resuming search, in case the found item does not require editing, deleting, etc.

In case you experience problems while using Search, choose **Tools : Recover** and follow it with **Tools : Garbage** (remember to set **Compact** to true in the latter case). Your problems are likely to result from damage to the ITM file, which stores the text of the items.

In case you have a great deal of items containing the search string, you may avail of the fact that SuperMemo allows you to change the search string during search. To change the string press Ctrl+S upon finding one of the items containing the old string, and input the new word or phrase.

## **Search : Find all**

**Search : Find all** searches for all items containing a given substring and displays them using the Search browser. The collection of items found with **Search : Find all** is not lost when you quit the Search browser. It is preserved in a disk file with the extension FND between SuperMemo sessions. You can review the sequence of found items by choosing **Browse : Searched** any time before choosing **Search : Find all** again, and before you run **Tools : Garbage**.

The file with the extension FND can always be deleted without a detriment to the database integrity.

## Browse menu

**Browse** makes it possible to view a group of items in a uniform full-screen item **browser**. The following groups can be browsed: all items, intact items, leech items, memorized items, outstanding items and items collected by means of **find all**. **Browser** windows allow you to view the items with their item parameters. The browser menu provides the following options at hand:

**Position** - change the item displayed at the top of the browser

**Next page** - move to the next page of items

**Previous page** - move to the previous page

**First** - move to the first item

**Last** - move to the last item

**Back** - move back to the recently used browser position (back can use up to 20 undo levels)

**Edit** - edit the item highlighted by the selection bar

**Fixed view** - open a synchronous editing window that remains open as you browse through the items in the browser

**Edit** - open an editing window to access editing operations for the current item

**Open** - open question and answer fields of a current item

**Question** - open question and answer fields, and edit the question

**Answer** - open question and answer fields, and edit the answer

**Close** - close question and answer field (if open)

**Delete** - delete the current item

**Memorize** - memorize the current item (if intact)

**Reset** - reset the selected item (if memorized), i.e. remove it from the learning process, and place it in the intact queue (queue of items waiting for memorization)

**Search** - search for items containing a defined substring (only within the scope of the browser)

**Find first** - search for the first item with the defined string

**Find next** - repeat the last search operation

**Question** - search for the first question containing the defined string

**Answer** - search for the first answer containing the defined string

**Child** - create a child browser with a subset of items selected from the parent browser

**Intact** - create a child browser with all intact items included in the parent

**Memorized** - create a child browser with all intact items included in the parent

**Leeches** - create a child browser with all leech items included in the parent

**Search** - search for all items in the browser that contain a given string and create a child browser with all found items

**Audio** - create a child browser with all items of the parent that are provided with a sound track

**Move** - move items within the browser (this menu is active only for the general database browser and for the intact queue browser)

**Top** - move the current item to the beginning of the browsed sequence

**End** - move the current item to the end of the browsed sequence

**Shift** - move the current item to a new position by (1) shifting it by a defined number of items, (2) moving it to a position defined by the item number, or (3) moving it to a position defined by percentage of the browser sequence

**Audio**

**Play** - play the sound track associated with the current item

**Edit** - edit the wave file associated with the current item

To change the item parameter displayed in the right part of the screen click one of the items, and choose the desired parameter from item parameter list box.

## Analysis

This option provides a set of procedures used in statistical analysis of the learning process. The general application of particular suboptions is:

**Burden** - inspecting the number items scheduled for repetition on particular days and which these items are.

**Monthly burden** - inspecting the number of items scheduled for repetition in particular months and years.

**Factor distribution**- inspecting the number of items falling into particular difficulty categories.

**Interval distribution** - inspecting the number of items falling into particular current interval categories.

**Forgetting curve** - inspecting the current approximation of forgetting curves for particular entries of OF/RF-matrices (use arrow keys to move between particular curves).

**Advanced : Retention factors** - inspecting the matrix of retention factors as well as the corresponding forgetting curves.

**Advanced : Optimal factors** - inspecting the tabular form of the function of optimal intervals (matrix of optimal factors).

**Advanced : Optimal intervals** - inspecting the average values of intervals used in repetitions of items of varying difficulty.

**Advanced : Retention** - inspecting the values of retention at repetitions for particular E-factor and repetition number categories.

**Advanced : Cases** - inspecting the number of repetition cases that have been used to compute particular entries of the OF matrix displayed by the option Optimal factors.

**Advanced : Retention factors 3D** - inspecting the matrix of retention factors in three dimensions.

**Advanced : Optimal factors 3D**- inspecting the function of optimal intervals (matrix of optimal factors) in three dimensions.

**Advanced : Retention 3D** - inspecting 3-dimensional representation of retention at repetitions for particular E-factor and repetition number categories.

**Advanced : Cases 3D** - inspecting 3-dimensional representation of repetition cases that have been used to compute particular entries of the OF matrix displayed by the option Optimal factors.

## Burden

This option, activated by Ctrl+B, can be used to see how many items are scheduled for particular days and which these items are.

In the displayed columns, the following entries can be seen in particular rows:

Day - Number of the day in the process (no 1 corresponds to the day of creating the database by means of **New**).

Date - Date corresponding to the given day. Its display format is determined by the Date format radio buttons on the **Options** dialog.

Items - Number of items scheduled for the given day.

The whole maximized Burden screen may be scrolled by a screenful of days forward or backward using PgUp and PgDn. Use the PanelUp, PanelDn, YearUp, YearDn, FirstDay and LastDay options on the Position menu to change the range of days presented in the window. The bar selector is initially placed on the current day. It may be moved up, down, left or right by means of arrow keys. By pressing *Enter*, *Space*, or double-clicking a day, you can inspect the items scheduled for the selected day.

## **Monthly burden**

This option can be used to see how many items are scheduled for particular years, months, days, and which these items are.

In the displayed columns, successive months are displayed with the number of items scheduled for each month.

The menu or cursor keys can be used to display several years of the schedule ahead.

By clicking a selected month, the distribution of repetitions in particular days of that month can be inspected.

Retention

Optimal factors

Optimal intervals

Cases

Factor distribution

Interval distribution

Curve

## Toolkit dialog

The Database Toolkit dialog makes it possible to perform the following operations on the database:

**replace strings** - substituting selected strings in the database with a chosen set of replacement string. This option may be useful to change diacritical characters in foreign language databases from one coding standard to another.

**transfer items** - transferring a subset of items, or all items from one database to another.

**sort database** - sorting the database with respect to the difficulty of particular items. The sorting is done according to the data collected in the learning process that is used to determine the difficulty of particular items. In sorted databases, easy items come first, while difficult items are placed at the end of the item sequence.

**export text** - exporting a text file with the content of a database

**import text** - importing a text file to a database. The imported text items are converted to items in the SuperMemo format and appended to the end of the destination database.

**import audiovis** - importing bitmaps or sound files into a database. The bitmap files should be named 1.bmp, 2.bmp, 3.bmp, etc. while sound files should be named 1.wav, 2.wav, 3.wav, etc. where the numbers 1,2,3,... denote the number of items with which particular bitmap or sound files should be associated

**export SM6** - exporting the source database in the format acceptable by SuperMemo 6 for DOS. SuperMemo 6 for DOS cannot display bitmaps nor can it produce sounds. The conversion concerns mostly the formatting of the text in database items. In SuperMemo 7 for Windows, with the option word-wrapping turned on, items may exceed the limit of maximum 48 characters per line imposed by SuperMemo 6. This problem is eliminated by the option **export SM6**.

See instructions at the bottom of the Toolkit dialog for the summary of actions needed to complete the currently selected Toolkit operation.

The following are the parameters accepted by the procedures of the Toolkit.

**Source** - path and filename of the source database (or text file). This parameter can be specified by typing in its value into the relevant edit control or by using the associated Browse button.

**Destination** - path and filename of the destination database or text file (if any).

**Filter file** - path and filename of the filter file used in replacing, transferring, sorting or exporting items. Filter files are text files with the extension FLT that define replacement strings, ordinal numbers, items to be excluded from output, etc. See TOOLKIT.TXT for detail of the FLT file syntax. Optionally, CNV files used with REPSTR.EXE in earlier versions of SuperMemo may be used in place of filter files.

**Reset** - this parameter will reset items in the destination database (e.g. in transferring or sorting items).

**Sort** - this parameter will sort items in the destination database. Easy items are placed first on the output.

**Slim** - this parameter will result in generating slim database text files, i.e. files that contain only the text of questions and items. The output will not include item parameters, bitmap filenames, sound filenames, ordinal numbers, etc.

**Ignore WAV** - this parameter speeds up processing databases that do not include sound.

**Ignore BMP** - this parameter speeds up processing databases that do not include bitmaps.

**Size** - this parameter determines the maximum size of the newly created destination database (e.g. when sorting a large database). If the number of items processed is greater than the maximum size of the destination database, new destination databases will be created with 6-letter names concatenated with 00, 01, 02, etc. For example, database ENGLISH might generate databases

ENGLIS00, ENGLIS01, etc.

**Range** - this parameter determines the range of items taken from the source database.

**Keep files** - this parameter determines which intermediate text files created by Toolkit operations should not be deleted. For example, transferring items from one database to another always goes through a buffering text file, which is deleted upon completing the process. By checking Keep files : TXT text file, you can inspect the text file after the transfer. STB files are sortable files used by the sorting procedure. SRT files are also used in sorting, and are sorted equivalents of STB files. REP files are report files that keep the record of the Toolkit operations.

## Reset

**Reset** can be used to reset selected elements of the learning process in a given database. To use **Reset**, tick appropriate check-boxes in the **Reset** dialog box, and choose **OK**.

The checkbox **Database** can be used if the entire learning process should be reset in the currently opened database. A reset database can be used by another student, i.e. its parameters are like in a newly created database (e.g. Memorized=0, Burden=0, optimization matrices are reset, etc.).

The checkbox **Forgetting index** can be used to reset the measurement of the forgetting index. This option may be useful after changing the requested forgetting index (using **Miscellaneous : Options : Lapses**).

The checkbox **Forgetting index counter** can be used to reset the counter of repetitions used in measuring the forgetting index. This option will usually be used in association with **Forgetting index** check-box in the **Reset** dialog box.

The checkbox **Optimal factor matrix** can be used to reset the matrix of optimal factors to the shape from before the learning process. This option may be useful in cases of irregular learning, where the matrix of optimal factors assumes a highly irregular shape.

The checkbox **Retention factor matrix** (and **Cases**) can be used to reset the matrix of retention factors and well as the matrix of repetition cases. This is equivalent to discarding the information pertaining to the properties of the learners memory and his or her perception of the material in the reset database. This option should be used only then when a substantial change has occurred in the learning process such like: (1) removing a large number of difficult items, (2) adding a large number of easy items, (3) improving the structure of existing items, (4) long break in learning, (5) substantial improvement in the regularity of repetitions (in a neglected database), etc.

The most typical applications of the option **Reset** are:

- \* **Reset : Database** - to pass ones own database to a colleague or to return again to a long unused database
- \* **Reset : Forgetting index** and **Reset : Forgetting index counter** - to resume the measurement of the forgetting index after changing the requested forgetting index (in **Miscellaneous : Options : Lapses**), or after a substantial change in the difficulty of the database, or after an increase in the regularity of repetitions (that might positively affect the forgetting index)
- \* **Reset : Optimal factor matrix** - to restart the process of computing the matrix of optimal factors when it becomes increasingly irregular (e.g. as a result of irregular repetitions)
- \* **Reset : Retention factor matrix** - to restart the process of computing all optimization matrices (RF matrix and OF matrix).

In general, the following is the typical order of using the suboptions of **Reset** with the increasing severity of change to the learning process (irregular repetitions, restructuring databases, changing **Lapses**, etc.): (1) reset the forgetting index, (2) reset the forgetting index counter, (3) reset the matrix of optimal factors, (4) reset the matrix of retention factors and, only in very drastic cases, (5) rest the database.

## Miscellaneous

The **Miscellaneous** menu provides the following options:

**Date** - changing the current date.

**Random tests** - randomly presenting items taken from a selected subset: all items, intact items, memorized items, leeches, etc. The suboption **Demo** is automatic allows you to randomly display items in the database without pressing a key or clicking the mouse.

**Approximate** - smoothing the matrix of optimal factors in consistence with the theoretically predicted function of optimal intervals. The smoothing is done on the basis of data stored in the RF matrix.

**Mercy** - evenly distributing the outstanding items in a selected period of time (e.g. after or before a break in learning, e.g. during a vacation period).

**Wipe** - delaying or eliminating outstanding repetitions of short-interval items.

**Options** - changing, reading or storing the parameter set of the SuperMemo program (Lapses, database path, configuration path, word-wrapping, date format, text editor, graphic editor, sound editor, audiovisual file access mode, etc.).

**Users** - adding, editing and deleting new users of the particular SuperMemo installation. Each user has its own default working directory, and, optionally, database access password

**Font** - changing the font and color used in SuperMemo items.

**View text files** - inspecting text files accompanying SuperMemo 7 for Windows.

Date

Random test

Demo

## Approximate

This option can be used for the following purposes:

- \* adapting the OF matrix to the new setting of the requested forgetting index (the Lapses parameter),
- \* smoothing the OF matrix in case it has become excessively irregular.

**WARNING! Unless you understand how Approximate works, you should not use it.** Misguided use of **Approximate** may slow down the learning process. What **Approximate** does is to find the closest compromise between the RF matrix (displayed by the **Process : Retention** option) and the theoretically predicted value of the OF matrix. In other words, it uses the retention factors as input data and tries to find parameters of the ideal function of optimal factors that provide the closest fit to the RF matrix.

As soon as the parameters of the function of optimal intervals are found, the function is translated into the OF matrix. For the repetition number equal 1, the function of optimal intervals has a close-to-linear nature and is approximated by a procedure akin to linear regression with the number of repetition instances considered in the computation. For the repetition number greater than 1, the approximation procedure is iterative in nature. In this case, the four parameters of the function of optimal intervals are initially set to average, expected values, and the algorithm proceeds toward minimizing the objective function called the deviation (sum of square differences between OFs and RFs). During iterations, all the parameters are displayed on-screen together with the measure of steps used in the hill-climbing algorithm (akin to the Rosenbrock method). The counter variable indicates the number of steps and iterations of the algorithm as it progresses. The progress parameters indicate the decrease of the objective function Deviation in particular steps and iterations, as well as the trailing average of the iteration progress. Iterations proceed until the trailing progress drops below 0.01 or Esc is pressed.

## Mercy

The option **Mercy** can be used for the following purposes:

- \* evenly spreading outstanding repetitions in a defined period with the view to minimizing the damage to the learning process (after a longer break in learning)
- \* evenly spreading repetitions scheduled for a given period of time (when the number of repetitions in particular days varies greatly)
- \* scheduling future repetitions at earlier dates (e.g. before leaving for vacation)

By running **Mercy**, the repetitions scheduled in a defined period of time may be distributed in even portions over a chosen period immediately following the current date. For example, if the **Outstanding** parameter indicates that 1000 items should be repeated on a given day, it is possible to distribute those items evenly over a 10 day period and thus have slightly more than 100 items scheduled for repetition in each of the days in that period.

You can open the Mercy dialog by choosing **Miscellaneous : Mercy** or by pressing Ctrl+M.

Here is how to use **Mercy**:

- \* If you had a break in learning, and you want to repeat the outstanding items in even portions over a selected period of time, do the following:
  1. Make sure that the **Future** check box is unchecked.
  2. Choose **Rescheduling period**
  3. Type in the number of days in the period in which you want to get over with your repetitions
  4. Choose **Mercy** button
- \* If you have an irregular number of repetitions scheduled in a number of days that follow the current date, and you want to have the same, selected number of repetitions every day, do the following:
  1. Make sure that the **Future** check box is unchecked.
  2. Choose **Items per day**
  3. Type in the number of items that you want to repeat per day
  4. Choose **Mercy** button
- \* If you think that you will not have an opportunity for doing your repetitions in a given period of time, and you would like to work ahead of schedule to have zero repetitions scheduled in the difficult period, do the following:
  1. Check the **Future** check box
  2. Choose **Rescheduling period**
  3. Type in the number of days before the first day of the no-repetitions period
  4. Choose **Gathering period**
  5. Type in the number of days until the last day of the no-repetition period
  6. Choose **Mercy** button

**Mercy** reschedules the items in such a way that the damage to long-term memories is minimum. After running **Mercy** you can view the expected drop in retention in the Mercy Report dialog box.

If you want to quit **Mercy** without changes to the repetition schedule choose **Cancel**.

The rescheduling proceeds in three stages:

1. collecting the outstanding items, and items scheduled for repetition in the gathering period,
2. sorting the collected items with the view to minimizing the damage to the learning process

3. scheduling the items anew in the rescheduling period

**Always back-up the database before running Mercy. You can also preventively choose Tools : Recover to avoid propagating possible integrity errors.**

## Wipe

The option **Wipe** can be used to deal with most intractable repetition at the moment of a large number of outstanding items in the learning process. Elimination of intractable items in a given session may proceed in two ways:

- \* postponing repetitions of items with the shortest intervals
- \* removing items with the shortest intervals from the learning process and adding them to the intact queue, i.e. to the queue of intact items waiting for memorization

In order to postpone least important repetitions, choose the maximum inter-repetition interval used by items that can be postponed, and optionally, define the interval increase factor.

The interval increase factor tells how many times the intervals of the postponed repetitions will increase. If the interval increase factor equals 1, all the postponed items will be moved to the next day.

Finally, choose the **Wipe** command button to remove the to-be-postponed items from the outstanding queue.

(2) In order to remove short-interval items from the learning process, choose the maximum inter-repetition interval used by items that can be reset (i.e. made intact), and choose the **Reset-Wipe** command button to remove the to-be-reset items from the outstanding queue.

[View text files](#)

Font

## Options

The Options dialog can be displayed by pressing Ctrl+O, and allows to define the following parameters:

- Lapses** - requested forgetting index, i.e., proportion of items that are allowed to be forgotten at repetitions (this value may vary from 3 to 20%).
- Directories** - used by SuperMemo (database, configuration, help and text files).
- Word-wrapping** - request for the item editor to wrap items within the displayed area. Note, that word-wrapped items are not compatible with SuperMemo 6 for DOS.
- Date format** - date format (UK: DD.MM.YY or US: MM.DD.YY).
- Text editor** - text editor used by **View text files** and in other contexts of SuperMemo (Windows Notepad by default).
- Graphic editor** - graphic editor used to edit images associated with items (Windows Paintbrush by default).
- Sound editor** - sound editor used to edit and record sound files associated with items (Windows Sound Recorder by default).
- Spell-Pad** - request for the spelling drills during repetitions (Spell-Pad is activated only if the Spell-Pad string is part of the item)
- Audiovisual file access mode** - location and names of wave and bitmap files. The following modes are available: (1) **Standard** - files have the same names as the database and are kept in the database directory, (2) **Linked** - files are taken from another database that uses Standard file access mode, (3) **CD-ROM** - files are taken from a CD-ROM directory tree, and (4) **CD-ROM Alias** - files are taken from locations specified by the PTR file of pointers to a CD-ROM directory tree).

**Options** also allows you to **Write** parameters to the disk, **Read** parameters from the disk, and to restore **Default** parameters of the program.

The Lapses parameter makes it possible to specify the requested value of the forgetting index, i.e., the proportion of items that are not to be remembered at repetitions. The permitted range of Lapses is from 3% to 20%. For Lapses equal 3%, the learning process will proceed 5-10 times slower than for Lapses equal 20% (esp in initial months). However, the knowledge retention will be as high as 99%! For Lapses equal 20%, learning may be quite fast, but retention may drop even below 90%. High values of Lapses should not be used for highly interdependent knowledge structures. Moreover, low retention can render some of the items extremely elusive, if not completely intractable. Such items must be deleted, or the learning process will grind to a halt (no visible reduction of the Burden parameter over a longer time, even if the Interval value increases substantially). The recommended value of Lapses is 5-10%. Upon using the Lapses option, the Approximate procedure should be used to adjust the OF matrix to the new RF matrix setting.

Note! The longer you use your database, the longer it takes for the measured forgetting index to approach the requested value.

The directories used by SuperMemo may be set by means of the **Options** dialog box:

- Database path** - path to a directory in which database files are kept (used by Open). The default value is the current or working directory.
- SM7.INI path** - path to a directory in which SM7.INI file is kept (used by Read and Write parameters). The default is the directory from which SM7.EXE has been run.
- Text file path** - path to a directory in which info files installed with SuperMemo are stored.
- Help path** - Path to a directory in which the help file is kept (used by Help). The default is the current or working directory.

The **Date format** option of the Options dialog allows you to change the format in which dates are displayed or input from the keyboard. The two formats are:

days - months - years (UK)

months - days - years (US)

If you want to make option settings permanent, choose **Write**. This command button in the **Options** dialog allows to store the parameter set on the disk. Options are stored in the SM7.INI file which is kept in the directory specified by **Miscellaneous : Options : SM7.INI path**. Note, that some parameters are related to the currently opened database. These parameters are stored in the database INI file.

**Options : Read** can be used to read the parameter set from the SM7.INI file. The initial parameter set is loaded from the SM7.INI file when you run SM7.EXE. This file is taken from the same directory from which SM7.EXE has been run.

User

Note

Help

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[Help](#) : [Index](#)

Help : Hints and tips

Help: Common questions

## Leech filter

Leech filter dialog box is used to define the criteria for classifying items as leeches (a leech is an intractable item that causes particular difficulties in learning). The following three criteria may be used:

- \* **maximum E-factor** (the lower the E-factor, the more difficult the item)
- \* **minimum number of lapses**, i.e. the minimum number of times the classified item has been forgotten in the process of learning (the greater the number of lapses, the more difficult the item)
- \* **maximum interval** (literal All can be used to ignore this criterion). Note, that it may be useful to exclude long-interval items from among the leeches, as the difficulties with remembering such items might have already been overcome.

Leech filter is used in collecting leeches for browsing (**Browse : Leeches**) or random test (**Miscellaneous : Random tests : Leeches**).

# Common questions about SuperMemo

## General questions

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[Using SuperMemo in a lab](#)  
[Using SuperMemo on other computers](#)  
[Hardware requirements](#)  
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[Why do E-factors equal 2.5 at the beginning?](#)  
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[Repetition vs. Cases](#)  
[Interval vs. Day](#)

### **Theoretical aspects of SuperMemo**

[Remembering forever](#)  
[Learning not so fast as claimed by SuperMemo World](#)

Maximum possible speed of learning

Buzan, Lozanov and MegaMemory

First repetition after 24 hours?

75% of knowledge lost in 24 hours?

Is permastore possible?

We cannot compare SuperMemo with MegaMemory

Minimum information principle and associativeness

Increasing the speed of learning 10-50 times

Traditional learning does not use equally spaced repetitions

Can I not achieve retention over 10% without SuperMemo?

Burning one's fingers is remembered for ever

Forgetting with SuperMemo

SuperMemo and intelligence

SuperMemo vs. artificial intelligence

**Q: Can a computer illiterate person use SuperMemo?**

A: Yes. The entire knowledge needed to start is encompassed in the page long Minimum User's Guide which is present at the beginning of the manual, as well as on the installation disk (MINGUID7.TXT). Five simple operations needed to use SuperMemo can be learned in less than 10 minutes! No specialized knowledge is required.

**Q: If I don't have a computer, can I use SuperMemo?**

A: Yes. A limited, paper-and-pencil variant of SuperMemo exists, and is shortly described in the file SMPAP.TXT. A more detailed description you will find in the file SMPAP.DOC (Microsoft Word format).

**Q: Can I use SuperMemo in a computer lab?**

A: Yes, on condition that the access to computers in the laboratory is regular. Once you start working with SuperMemo, you must systematically continue the process of repetitions. Otherwise, the acquired knowledge will gradually be forgotten (e.g. if you stop after having used SuperMemo for 5 years, you will forget about 60% of the learned material in the first year!). In SuperMemo 7.4, you may find option Miscellaneous : Users particularly useful if you do not want one of your colleagues to confuse his database with yours.

**Q: Do you have SuperMemo for Mac, Amiga, Atari, etc.**

A: SuperMemo is available for DOS, Windows, Macintosh and Amiga. To learn more about the Amiga version contact: **Twin Spark Soft**, Os. Kolorowe 9, 31-939 Krakow, Poland, tel: (48) 12 444368, fax: (48) 12 477299, e-mail: GELESNIA@LFS.CYF-KR.EDU.PL.

To learn more about the Mac version contact: **AS Project**, Bydgoszcz, Poland, tel/fax: (48) 52 392759

**Q: What are the minimum hardware requirements of SuperMemo?**

A: The minimum requirements are as follows:

SM2: IBM XT, DOS 3, 200 KB memory, no hard disk, any display

SM5: IBM XT, DOS 3, 300 KB memory, no hard disk, any display

SM6: IBM XT, DOS 5, 512 KB memory, no hard disk, EGA or better

SM7: IBM AT, Windows 3.1, 2 MB memory, 2-5 MB hard disk space, VGA or better

SM7 (for AudioVisual databases): 386, Windows 3.1, 2 MB memory, 10-50 MB hard disk space  
(depending on the size of databases)

SM for Amiga: Amiga, 1 MB memory, 2 MB hard disk space

SM for Mac: Apple MacIntosh, hard disk

**Q: What are the basic differences between SuperMemo 2, 5, 6 and 7?**

A: The full record of upgrades introduced to SuperMemo is listed in the file DEVELOP.TXT. In short, all versions of SuperMemo allow the learner to substantially increase the speed of learning. Figuratively, if traditional methods of learning are viewed as a pedestrian, SuperMemo 2 Public Domain may be compared to a bicycle, SuperMemo 5 Shareware to a Trabant, and SuperMemo 6 to a Mercedes. Learning with SuperMemo 7 is as fast as with SuperMemo 6, but introduction of audiovisual features adds some extra quality to learning. Each version includes some improvements to the user's interface, database management, fault tolerance, statistical analysis options, menu tree, keyboard shortcuts, parameter set, help, etc. Moreover, in SuperMemo versions above 5, the speed of learning may be regulated by the learner (in a trade-off with knowledge retention).

**Q: What is the size of SuperMemo 2, 5, 6 and 7 in KB and databases?**

A: The sizes are as follows: SM2 77 KB, SM5 108 KB, SM6 160 KB, and SM7 515 KB. The size of text databases is usually less than  $(5+0.1*\text{Total})$  KB, where Total is the number of items in the database. Additionally, graphic files may take 20 KB per picture, and sound files take 10-20 KB per word.

**Q: What are the basic differences between SuperMemo 7.0 thru 7.5?**

A: SuperMemo 7.1 allows you to associate graphics and sound with SuperMemo items. SuperMemo 7.2 includes about 20 minor new options such as selectable fonts, copying and moving databases, word-wrapping, etc. SuperMemo 7.3 introduces over 20 major improvements such as full-screen database browsers, search browser (Find All), possibility of changing the order of items in the database, and the order of items in the intact queue, possibility of browsing intractable items, etc. SuperMemo 7.4 includes: integrated toolkit, child browsers, multi-user management, Spell-Pad for spelling drills, different fonts in questions and in answers, Mercy into future, CD-ROM audiovisual database access, etc. Finally, SuperMemo 7.5 adds the ability to use programmed DLL database modules that extend the applications of SuperMemo to all fields in which a training procedure can be programmed with the computer (e.g. touch-typing, intelligence tests, problem solving, playing musical instruments, etc.).

**Q: Can I write my own SuperMemo database concerning topics of my interest?**

A: Yes.

**Q: If I prepare a database for SuperMemo, can I sell it to SuperMemo World?**

A: Yes. Particularly if it is a good database, on a popular topic, and preferably written in English.  
Otherwise, your database may be included in the Database Bank, and you will be paid royalties from each copy sold (standardly 10% of the end-user price).

**Q: What databases for SuperMemo 5 Shareware can I get from SuperMemo World?**

A: Because of low profitability, SuperMemo World does not collect databases for SuperMemo 5. Contact shareware houses for information about SuperMemo 2 Public Domain and SuperMemo 5 Shareware databases.

**Q: What databases are there in the SuperMemo World's Database Bank?**

A: See the DBANK.TXT file for the most recent list of databases available from the Database Bank (use **Miscellaneous : View text files**).

**Q: What is SuperMemo World e-mail?**

A: If you have an important problem, you might try one of the following:

JAM@BRAHMS.UDEL.EDU [English, Polish] (general info, available databases)

JAM@PLPUAM11.BITNET [English] (Research&Development: theoretical questions about SuperMemo, proposed improvements to software, developing new databases, biological aspects of memory)

GELESNIA@LFS.CYF-KR.EDU.PL [Polish, English] (Twin Spark Soft: SuperMemo for Amiga, available databases)

SUPRMEMO@FIREFLY.PRARIENET.ORG [English] (SuperMemo USA, Inc.: orders and distribution in the US)

All e-mail messages are read carefully. Please understand, however, that we are unable to answer all e-mail inquiries.

**Q: Why does SuperMemo ask only those items which are difficult?**

A: Just because they are difficult. You do not want to learn things you already know, do you? The purpose of SuperMemo optimization is to compute the best intervals between repetitions. Difficult items must be repeated more often; hence the impression that only the hardest items are considered in the process.

**Q: If I have an item in my database, and I want to memorize it after memorizing some of the items that follow it, what should I do?**

A: You can change the order of intact items by using **Browse : Intact** (see the **Move** menu). Alternatively you can press *M* (for **Memorize**) and *R* (for **Reset**) while inspecting the item. That will move the item in question to the end of the intact queue.

**Q: How can I change the order of items in a database?**

A: You can change the order of items by using **Browse : All** (see the **Move** menu). After moving a number of items to new positions, quit the browser (e.g. by pressing Esc). Respond with *Yes* to Do you want to rebuild the database?. Remember that the rebuilding process is quite time consuming and that it is quite error prone. Therefore, it is recommended that you run **Tools : Recover** before rebuilding a database, and that you make a back-up copy of the database files.

**Q: How can I quickly transfer a single item from one database to another without losing its learning parameters?**

A: Use **Item : Transfer** on the menu of editing windows, and choose the destination database to which the current item should be transferred.

**Q: I found some errors and misspellings in your databases. How can I correct them?**

A: When you see the wrong item on the screen, press *E* (for **Edit**) or click the mistaken field (question or answer). Edit the item using arrow keys, *Backspace*, etc.

**Q: I left for vacation, and my learning process is in mess. I want to start all over again. What should I do?**

A: Follow the steps:

1. Press *Ctrl-W* or choose **Miscellaneous : Wipe** to invoke the **Wipe** dialog box.
2. Set the maximum interval value to a period comparable to twice the length of your vacation.
3. Press *Alt-R* or choose the **Reset-Wipe** button.
4. Press *Ctrl-M* or choose **Miscellaneous : Mercy** to invoke the **Mercy** dialog box.
5. Set the **Rescheduling period** in which you want to catch up with outstanding repetitions (usually from 50% to 200% of the vacation period; depending on availability of time).

Though not without losses to what you have already learnt, your learning process shall become clear and regular. Remember, however, that despite the relief which **Mercy** and **Wipe** provide for irregular learners, the two options have also a potential to kill your progress. Use them only as a last resort!

In case you want to return to repetitions after a year or more, it may appear that it is more rational to start the learning process all over again. To start again, use **Tools : Reset : Database** to convert your database to the intact form.

**Q: The User's Guide often mentions that the user should periodically back up his or her databases. What does it mean and how to do it?**

A: To back up a file means to copy it to an archive diskette in case the original file was lost or damaged. The easiest way to back up your database is to use **File : Copy**. You can also back up your files by means of DOS commands such as COPY or XCOPY, as well as by means of tools such as Norton Commander, PC Tools or File Manager in Windows. Consider using archiving utilities like PKZIP, ARJ, LHARC, etc. This way you can save a great deal of disk space, esp if you use audiovisual databases.

**Q: Can SuperMemo work with databases compressed with DBLSPACE in DOS 6?**

A: Yes

**Q: How can I increase the frequency of repetitions before an exam?**

A: SuperMemo is not supposed to be used as a cramming tool. It is rather designed for those who want to keep knowledge in their memory for a longer period of time (from one year to lifetime). To maximize the frequency of repetitions set **Lapses** to 3 (option **Miscellaneous : Options**) and run **Approximate**. The day before the exam you might try **Random test** or **Demo**, but this will certainly introduce a lot of noise into your long-term learning process.

**Q: Are databases of SuperMemo 6 compatible with SuperMemo 7?**

A: Databases of SuperMemo 6 are compatible with SuperMemo 7; however, ASCII characters below 32 and above 128 may be defined differently in DOS and Windows environments. Moreover, spaces (char #32) in standard non-fixed Windows fonts have lower width, which may corrupt some mathematical or chemical formulas. You can easily remedy the above problems by means of **Tools : Replace strings** or REPSTR.EXE included in the SuperMemo Toolkit. The easiest way to remedy DOS and Windows incompatibilities is to use the font Terminal.

**Q: Why is it not possible to use databases of SuperMemo 7 with SuperMemo 6?**

A: SuperMemo 7 was not designed as backward compatible with SuperMemo 6. If to neglect the fact that SuperMemo 6 does not have audiovisual capability, the main problem remains that SuperMemo 7 allows of longer text lines in its items. A partial solution is to convert the SM7 database to the SM6 format with **Tools : Export to SuperMemo 6**

**Q: How can I run SuperMemo in a network?**

A: Install the program on the server, and let particular learners keep their databases in their home directories. Each learner will have his or her own learning parameters (stored in INF files) and database parameters (stored in INI files). Each learner will have his default working directory and, optionally, password (defined by means of **Miscellaneous : Users**). However, all the users will share some parameters stored in the SM7.INI file (e.g. text file directory, help directory, etc.).

**Q: I want to learn Russian. Can SuperMemo provide Cyrillic?**

A: Yes. To get Cyrillic in your items do the following: (1) install Cyrillic in Windows (choose a commercial or shareware font, or define the font using any font editor), and (2) choose Cyrillic font for your RUSSIAN database (option **Miscellaneous : Font**). To keep Latin alphabet in questions and Cyrillic in answers, click the answer field and press Ctrl+F to choose Cyrillic for the answer field only.

**Q: How can I learn mathematical formulas in SuperMemo?**

A: You can choose one of the following:

- \* use TEX syntax if you know it
- \* use the options of the Image menu and represent you formulas using graphics
- \* define your own font with mathematical symbols or use a commercially available font that would satisfy your needs

**Q: How can I improve the default sampling and resolution of recordings associated with SuperMemo items?**

A: Create an empty wave file with the desired parameters and copy it in place of 0.WAV in the BIN subdirectory. Alternatively, use **Audio : Import** if you want to change only the parameters of a sound file associated with a single item.

**Q: How can I change the default size and other parameters of bitmaps associated with SuperMemo items?**

A: Create an empty bitmap file with the desired parameters and copy it in place of 0.BMP in the BIN subdirectory. Alternatively, use **Image : Import** if you want to change only the parameters of a bitmap associated with a single item.

**Q: As I travel, I use SuperMemo 7 on a number of different computers. Do I always have to repeat the entire installation procedure?**

A: No. Prepare a floppy containing the following files SM7., SM7.CI\_, and BWCC.DLL (if you create new audiovisual items then add yet 0.BMP and 0.WAV). Copy all these files to a single directory and that shall suffice to run SuperMemo on an computer provided with Windows.

**Q: For some time now, the Grade parameter hardly changes in the main window of SuperMemo. Is something wrong going on?**

A: Parameters such as Grade, Lapses, Retention, and Mean time are, or are derived from, averages or trailing averages. Therefore, the longer you have been learning, the less they change. After a year or so, you will hardly see them change.

**Q: Why is time updated only at repetitions?**

A: The timer used in SuperMemo is used to estimate some parameters related to the learning process (Mean Time, Workload, etc.). Obviously, the time which the learner spends on editing the database, or even eating his/her lunch, is of little relevance to the method per se. The time spent for the entire learning session, if at all needed, can easily be computed by using an external timer, e.g. a separate Windows application.

**Q: Why did you not implement Undo in SuperMemo?**

A: A single-step undo in item controls is available in the Windows version by pressing *Ctrl-Z* or *Alt-Backspace*. Future versions will include multistep undo.

**Q: What should I use Copy in the Edit window for? What for do I need the same item twice in the same database?**

A: You can copy an item, if you want to add to the database another item which is only slightly different. This way you can spare some time by reediting the old item instead of typing the new one all over again.

**Q: Can I define KBD files in SuperMemo 7 as it was possible in SuperMemo 6?**

A: Yes. However, you can only make assignments to Alt-key combinations. To redefine the keyboard used when editing items do the following: (1) create a text file [database].KBD, (2) in the following lines of the KBD file put the key-character pairs separated by a space (e.g. a ä,u ü, etc.), (3) place the KBD file in your database directory. In the item editor, you will be able to use Alt-a to get ä.

**Q: Why do you use grades 0..5 with 5 standing for the best grade? This goes against standards used, for example, in the US?**

A: As of version 7.1, grades are associated with names like 'good', 'fail', 'pass', etc.

**Q: Why do you use grades like 'null' or 'bright'? Numbers from 0 to 5 were much more intuitive (earlier versions)?**

A: Depending on the country of origin, the learner may interpret the excellent grade as 5 or as 0. Short names make the grade scale more universal.

**Q: When I back up my databases, do I have to back up SM7.EXE as well?**

A: No.

**Q: How can I perform AND-search in SuperMemo?**

A: Run **Find : Search All** with the first argument of the AND-search, and follow it with **Search : Find all** in the browser with the second argument of the AND-search.

**Q: Upon undeleting a mistakenly deleted database, the search procedure started doing strange things. I could not remedy the problem with your recovery tools. What should I do?**

A: Run **Tools : Garbage**. Remember that **Tools : Recover** (or RESCUE.EXE) does not recover from damage to ITM files, which store the text of items. The only way to recover from ITM file damage is to run **Garbage** with the option **Compact**, and try to rescue particular items manually.

**Q: In my database I got a great deal of items with very-short intervals which seem to increase at an infinitely low pace. The E-distribution indicates that the database is rather well-structured. What do you advice?**

A: Consider increasing the forgetting index (see **Miscellaneous : Options : Lapses** and **Miscellaneous : Approximate**).

**Q: I learn to recognize opera passages, how can I hear the recording included with Audio : Import during repetitions before displaying the answer?**

A: Press *F10* or click the right mouse button in the Learn Window.

**Q: How can a whole family use SuperMemo on one computer?**

A: Install one copy of SuperMemo and duplicate these databases that are to be used by the members of the family. You can store databases under different names in the default database directory (e.g. databases MUM, DAD, CATE in the subdirectory C:\SM7\DB), or under the same name in different subdirectories (e.g. database ENGLISH in subdirectories C:\SM7\DB1, C:\SM7\DB2, C:\SM7\DB3, etc.). The first solution is somewhat better, as upon running SuperMemo you will automatically be positioned in the default database directory, and will have to specify the database name only at Open. Otherwise, the full path should be specified or located by browsing the directory tree. Optionally, you can also use Miscellaneous : Users to define user working directories and passwords for all members of the family.

**Q: Why is the Edit window in SuperMemo 7 called EDIT 1, not just EDIT?**

A: Because it is the first Edit window created. If you open more Edit windows, they will be marked by the number of similar windows created on your desktop (e.g. EDIT 2, EDIT 3, etc.).

**Q: I would like to keep the definition of backgammon in my SuperMemo database, but I cannot cut the Webster wording to suit the 250 character limit, and yet make the definition understandable: "a board game played with dice and counters in which each player tries to move his counters along the board and at the same time to block or capture his opponent's counters ..."**

A: If you do not know what backgammon is, you should not attempt to store the rules of the game in just one definition! You might choose one or two features that define backgammon unambiguously, and keep the rest of details in separate items, for example: "*What do players try to do with the opponent's counters in backgammon?*", "*What is the size of the board used in backgammon?*", "*How many counters does a player have in backgammon?*", etc. If you know what backgammon is, and you just want to make sure that you do not forget the name, you might just ask "*What is the name of the game I played with Robert in summer 1993?*". However, if you are just a learner of languages, it may appear sufficient to learn that backgammon is a kind of board game. In Advanced English, you will find the following item: Question: *backgammon*, Answer: *kind of game*.

**Q : My computer was hit by a virus. SuperMemo reports integrity errors and I cannot work. What should I do?**

A: Use **Tools : Recover** (or RESCUE.EXE) on the database in question and follow it with **Tools : Garbage : Compact**. Remember to back up your database beforehand.

**Q: I neglected my repetitions for too long. I want to start again with the same database. What should I do?**

A: Run **Tools : Reset : Database** on your database and start the learning process from scratch (remember to set the correct date in your computer).

**Q: How to convert databases between different standards of national diacritical character codes?**

A: Use Tools : Replace strings or REPSTR.EXE. Define your own FLT or CNV file or use FLT/CNV files supplied by SuperMemo World (if available). See the manual or TOOLKIT.TXT to learn how to define filter files (FLT).

**Q: I have created two databases and would rather use one. How can I merge databases?**

A: Use TRANSFER.EXE. For example to merge GEOG1 with GEOG2 run TRANSFER S=GEOG2  
D=GEOG1 ALL

**Q: I have created my own question and answer files in ASCII. I would like to convert them to SuperMemo databases. What is the easiest way?**

A: Manually or programmatically, convert the files to the TXT format acceptable by **Tools : Import text** (all question lines starting with 'Q:' and all answer lines starting with 'A:'). Run **Tools : Import text**.

**Q: Can SuperMemo work with other file formats, e.g., ASCII, DBase, Lotus, Word Perfect, Quattro Pro, ChiWriter, etc.?**

A: No. However, if the files contain data in the form of questions and answers (e.g. word pairs), they can easily be converted to SuperMemo format. The easiest way is to convert them to the TXT format accepted by **Tools : Import text**.

**Q: I create a database and use it together with my sister. How can we share files so that all correction introduced by me would automatically appear in her databases?**

A: Sharing files is not allowed between the databases of two different users. The only thing you can do is to periodically use **Tools : Transfer items** (or TRANSFER.EXE) to transfer newly introduced items to your sister's database. However, you will not be able to edit both databases at the same time. All editing will have to take place before the act of transfer.

**Q: I am creating a database for a group of students. How can we do the work simultaneously (creating the database and learning), without the need to type all the questions to each of the databases separately?**

A: Use TRANSFER.EXE each time you add a new portion of items to your database. A batch file of the following format might be a good hint:

Syntax: MOVE <first\_item> <last\_item>

Content:

TRANSFER S=TEACHER D=ROBERT %1-%2 RESET

TRANSFER S=TEACHER D=ANYA %1-%2 RESET

TRANSFER S=TEACHER D=MACIEJ %1-%2 RESET

TRANSFER S=TEACHER D=VERONICA %1-%2 RESET

Example: MOVE 2001 MAX

**Q: How to change the physical order of items in a database?**

A: Choose **Browse : All**, use options on the **Move** menu to change the order of items, quit the browser, and respond with *Yes* to the question *Rebuild database?*. Make sure that: (1) your database is backed up before the process, (2) you preventively run **Tools : Recover**, and (3) you are ready to wait several minutes for the rebuilding process to complete (the larger the database, the longer it takes to rebuild the entire database).

**Q: How to convert a SuperMemo database to text without losing its learning parameters and then to convert it back to a database?**

A: If the name of your database is HISTORY, do the following:

1. run **Tools : Export text** and uncheck the option **Slim**
2. specify the name of the destination file (e.g. HISTORY.TXT)
3. do all the editing you need on HISTORY.TXT
4. create a new database
5. run **Tools : Import text**
6. specify the name of the edited source file (e.g. HISTORY.TXT)

Alternatively:

1. run TRANSFER.EXE with the parameter TXT
2. in the file selection window choose HISTORY
3. press *Esc* when the program requests inputting the name of the range file
4. wait a while as items are transferred to a text file
5. press *Esc* when the program requests the name of the destination files (the text file will have the name HISTORY.TXT)
6. do all the editing you need on HISTORY.TXT
7. create an empty database HISTORY1
8. run TRANSFER.EXE again
9. instead of the source database choose HISTORY.TXT: in the file selection window (1) press *Tab* a few times until you get to the template window with the template \*.INF, (2) change \*.INF to \*.TXT, (3) press *Enter*, and (4) select HISTORY.TXT
10. choose HISTORY1.INF as the destination database.

Note that this way you can also edit item information such as E-factors, intervals, etc.

HISTORY1 will not inherit optimization matrices from HISTORY. Only item information will be transferred. To inherit the OF and RF matrices, create HISTORY1 right after closing HISTORY. To reset the optimization matrices use **Tools : Reset**.

**Q: How can I replace questions with answers in a word-pair database?**

A: Press *Ctrl+Tab* to swap questions with answers in a single item, or run **Tools : Swap** or SWAP.EXE to swap the whole database.

**Q: How can I print the content of a whole database?**

A: (1). Use **Tools : Export text** or TO\_TEXT.EXE with the option SLIM to convert a database to the text format, and (2) print the created text file. TO\_TEXT.EXE is included in SuperMemo Toolkit.

**Q: How can I manually install compressed databases?**

A: Use the DOS command EXPAND. Remember to change the file name extensions which end with underscore. For example:

```
EXPAND A:\DB\SWEDISH.ITM C:\SM7\DB\SWEDISH.ITM
```

```
EXPAND A:\DB\GERMAN.IF_ C:\SM7\DB\GERMAN.INF
```

**Q: Why are intervals in SuperMemo so long? In SuperMemo 2 they used to be much shorter.**

A: They are as long as it takes to produce the desired proportion of items to be forgotten at repetitions. If intervals are irritatingly long, reduce the **Lapses** parameter in the **Options** dialog box, and follow it with **Approximate**.

**Q: Why are some items repeated in intervals that increase just by one day between repetitions? I am certain that those intervals could be longer.**

A: The intervals are as long as it takes to produce the desired proportion of items to be forgotten at repetitions (forgetting index). If repetitions are irritatingly frequent, increase the forgetting index (**Miscellaneous : Options : Lapses**), and follow it with **Approximate**.

**Q: Why does not SuperMemo mix the order of items scheduled for repetitions? I have introduced some words in an alphabetical order and they are asked in the same order at repetitions. This is not optimal.**

A: True. Please note, however, that items will be mixed as soon as their E-factors and intervals become different. The major advantage of not reshuffling items is the fact that at repetitions, short interval items are asked first. The learner has a general feeling of how long intervals are assigned to items that are currently being asked. This makes it possible to sharpen the accuracy of grading for long-interval items whose inaccurate placement in the repetition schedule has more severe consequences for the learning process.

**Q: I think that lower grades, e.g. 3, should produce shorter intervals in comparison to higher grades, e.g. 5. It is not always so in SuperMemo.**

A: In SuperMemo, lower grades may produce longer intervals because of the two following reasons:

1. Grade 3 (Pass) may result in the enhancement of the so-called **spacing effect**, which may be less visible for Grade 5 (Bright). The **spacing effect** says that longer intervals, and consequently a greater recall effort, produce more stable memory engrams. SuperMemo does not arbitrarily set the function of optimal intervals. It computes intervals which are most likely to result in the forgetting index defined in **Miscellaneous : Options : Lapses**; hence; the possibility of longer intervals for lower grades.
2. Irregularities in computing optimal intervals may also result from the fact that some entries of the RF and OF matrices can be computed more accurately than others, depending on the number of repetition cases recorded in the process. The real-time smoothing of the OF matrix is used to counteract this problem. Moreover, highly irregular matrices, e.g. resulting from longer breaks in learning, can be smoothed by means of the option **Miscellaneous : Approximate**.

**Q: Why can I not see the correlation between intervals and the grades given in learning?**

A: Your impression of no correlation between grades and intervals is quite common among those who begin their work with SuperMemo. It results from the fact that at memorizing new items, first intervals are randomly dispersed around a fixed value. This value comes from the model of an average learner, and can be modified only after the repetitions have shed some light on if the value should be increased, decreased or kept at the same level. Consequently, it will often happen that a lower grade will produce a longer interval and vice versa. At memorizing new items, grades cannot be used to estimate item difficulty because the program has no way of knowing if good grades come from easiness of items or from the fact that a given group of items has just been input to the database (inputting items is a form of repetition). You will start noticing the correlation between grades and intervals in a week or two.

**Q: I used SuperMemo 2 Public Domain, and was accustomed to repeating forgotten items on the next day. It is very irritating that in SuperMemo 7 I do not have this possibility.**

A: SuperMemo 7 will schedule forgotten items in intervals which are determined by the requested forgetting index. The greatest increase in the speed of learning with SM6/SM7 as compared to SM2 resulted from substantially increasing the length of the first interval! The learner may be left with the feeling that he is likely to forget the item again if it is not repeated on the next day. Statistically, however, he will forget no more than the proportion defined by the forgetting index (specified in **Miscellaneous : Options : Lapses**). However, by reducing the forgetting index to less than 5%, you can make sure that the length of the first interval will drop to 1-2 days (this change may come to effect almost immediately if you choose **Miscellaneous : Approximate**).

**Q: Why is the first interval after which the first repetition takes place not equal in all cases?**

A: It is randomly modified to speed up computing its optimum value, as well as to produce smooth distribution of the number of repetitions scheduled over a period of a few days.

**Q: I set Lapses to 10 and used Approximate but I do not know if this generated optimal OF and RF matrices?**

A: You cannot do much damage with **Approximate**. Even if optimization slows down a bit, the program should recover fast by modifying the OF matrix to suit the optimum schedule. Moreover, note that Approximate does not affect the RF matrix.

**Q: Why can I not see the effect of different grades during memorizing new items, and during the final drill? Are grades used there, and how?**

A: At memorizing and at final drill, the interpretation of grades is limited to Pass (4 or more) and Fail (less than 4). None of the optimization parameters are affected. Here are the reasons:

- at memorizing new items, grades cannot be used to determine item difficulty, because the program has no way of knowing if a good grade resulted from easiness of the item or from the fact that the user has just input the given item to the database. Consequently, grades cannot affect optimization, and are only used to detect items that should be scheduled for final drill.
- Final drill is not used for optimization either. This is because of the fact that final drill relies on short-term memory, and is substantially more sensitive to inter-item interference as well as more dependent on the number of other items separating repetitions of the item in question. Final drill is used solely for the purpose of fixing the forgotten information in the user's brain. Grades are used only to eliminate from the final drill those items which score 4 or more.

**Q: Why do not grades affect E-factors in memorizing new items?**

A: At memorizing new items, grades cannot be used to estimate item difficulty because the program has no way of knowing if good grades come from easiness of items or from the fact that a given group of items has just been input to the database (inputting items is a form of repetition). E-factors can only be verifiably modified after the lapse of the first interval.

**Q: Why do E-factors always equal 2.5 at the beginning of repetitions?**

A: Historically, the value 2.5 comes from the development of SuperMemo; not from any specific property of memory. It could be 0.25 or 25 as soon as all the remaining optimization parameters were modified accordingly. You can look at E-factors as a very rough approximation of O-factors for the forgetting index equal to 15% and the repetition number greater than 2.

**Q: What is the interpretation of E-factors? Why do they range from 1.2 to 3.5, and not just from 1 to 20?**

A: Before SuperMemo 5, optimum intervals were computed using the formula:

$$OI(n) := OI(n-1) * EF$$

where:

OI(n) - optimum interval after the n-th repetition

EF - a factor expressing the difficulty of an item, now called the E-factor (E stands for easiness); the higher the E-factor, the easier the item

In SuperMemo 5, for simplicity, EFs became indices to the matrix of optimal factors. Obviously, E-factors might have values ranging from 1 to 20, but this would blur their intuitive interpretation as the approximate value by which subsequent intervals have to be multiplied. Moreover, the formulas for modifying E-factors were inherited almost literally from SuperMemo 2, which naturally suggests keeping their previous intuitive range.

**Q: How can Repetition indicate 7 while Cases 31. Which number is true?**

A: Repetition says how many times a given item has been repeated. Cases indicates how many repetition cases, of various items, have been used to compute entries of OF and RF matrices. In other words, Repetition (among item parameters) concerns a single item, while Cases (among repetition parameters) concerns many items with the same E-factor and Repetition values.

**Q: How can the average interval (Interval in the main window) be longer than the number of days I have spent on learning (Day in the main window)?**

A: It is possible. For example, imagine that you have just started learning and you have memorized only one item. If its New Interval is 4 days you will have the following in the main window:

Day 1

Interval 4.0

**Q: In your materials I found a contradiction. On one hand you claim that once learned knowledge is constantly maintained in the learner's memory, on the other you say that after ceasing repetitions, I will gradually forget what I have learnt. Which is true?**

A: Both facts are true. The term 'maintained' is understood as 'actively kept in memory by means of repetitions', not as 'remains in memory for ever'.

**Q: I have been using your program for one week. In my estimation, I can learn no more than 50-100% faster than without the program. Do you claim that my estimation is conservative?**

A: No. The power of SuperMemo can only fully be observed after a longer period of time. This comes from the close-to-constant knowledge acquisition rate in SuperMemo, while other forms of learning produce rapid decrease in the speed of learning in result of saturation of the learning schedule with randomly spaced repetitions. The estimation of the 50-fold increase in the speed of learning concerns the lifelong perspective. By using mnemonic techniques, you can easily beat SuperMemo in periods of up to one month. In other words, SuperMemo will not work for those who want to cram a great deal of data before an exam. On the other hand, it is of invaluable help for those who want to retain indispensable facts and figures for months and years.

**Q: Your claim that SuperMemo allows me to learn with the speed that closely approaches the maximum speed with which memories can be formed does not sound convincing. What evidence do you have to substantiate the claim?**

A: For a given collection of questions and answers SuperMemo computes a repetition schedule that cannot be much improved by algorithmic means. In this sense, it gives you almost the best possible repetition timing. Obviously, there is a great number of elements that can improve the learning process independently of SuperMemo. These are: (1) application of mnemonic techniques (the same item may be memorized in a number of ways, each of them providing different stability of memory traces), (2) repetition procedure and environment, (3) health and the status of the learner's mind, (4) pharmacological factors, etc. Moreover, the same knowledge may be represented in a different way (different order of items, different wording, etc.) which may greatly affect the speed of learning. As far as SuperMemo optimization algorithms are concerned, their accuracy cannot be greatly improved because of the environmental noise that interferes with the learning process. Each item may be more or less consciously repeated in common life situations; the process being beyond the control of SuperMemo. Shortly speaking, if you are healthy, in a good frame of mind, you use mnemonics, and you use well-structured databases under the supervision of SuperMemo, you may be quite sure that you are getting close to your maximum learning potential, and no natural method can help you speed up learning by a substantial factor.

**Q: (1) I want to spend my money on the MegaMemory program delivered on cassette tapes. How would you convince me that I should rather spend money on buying SuperMemo? (2) Is SuperMemo the same as SuperLearning developed by Dr Georgi Lozanov from Bulgaria? (3) Which techniques produce a greater increase in the speed of learning: SuperMemo or the mind maps proposed by Tony Buzan?**

A: The mnemonic techniques (Tony Buzan, MegaMemory, etc.), SuperLearning (Dr Georgi Lozanov) and SuperMemo are all complementary, and make up the three pillars of effective learning. All of them have to do with optimization:

- \* In SuperLearning the stress is on optimizing the cognitive environment which produces the best effects on the learning process.
- \* In mnemonic techniques, the representation of knowledge is optimized in order to produce the most durable memory engrams.
- \* In SuperMemo, the optimization concerns the spacing of repetitions.

To be a successful learner, you have to apply mnemonic techniques while using SuperMemo in a optimum cognitive environment. The important advantage of SuperMemo is that many capable learners develop quite good techniques as far as mnemonics is concerned. They can also reasonably master their own physiology to subject it to the learning effort. However, they have no way of optimizing the spacing of repetitions. Mostly due to the fact that the amount and complexity of computation needed to determine the spacing require the use of a computer, and the technology proprietary to SuperMemo World. You are advised to follow the teachings of Tony Buzan, Kevin Trudeau and Georgi Lozanov; however, if you are a capable learner, you can safely commit your foremost priority to learning how to optimize your learning schedule. As for now, SuperMemo is the world's best tool developed to assist you in this task.

**Q: Tony Buzan claims that the first review (second repetition) of an item should take place in 24 hours. This is not so in SuperMemo. Why?**

A: In SuperMemo, the length of the first interval is computed from the forgetting curve plotted in the course of repetitions to make sure that a defined proportion of items is remembered; usu 80-97% (this proportion is programmed by means of setting the forgetting index in the option **Lapses**). Depending on the forgetting index, the length of the first interval may range from 1 up to 20 days, and is not set arbitrarily. It is computed from the record of repetitions and determined by the requested forgetting index. (requested forgetting index is the proportion of items that are not remembered at repetitions)

**Q: Tony Buzan claims that 75% of information is lost if not reviewed in 24 hours. Does it not defeat the validity of SuperMemo in which the first interval is often longer than a week?**

A: No. In the context of self-paced drop-out learning technique used by SuperMemo, Buzan's claim is certainly invalid. In SuperMemo, if the learner chooses the retention of 95%, the typical value of the first interval falls in the range 2-6 days depending on the learner and the difficulty of the learned material. For retention 25%, the same interval might be as long as one month, though it cannot be verified experimentally with SuperMemo which limits the range of the forgetting index from 3-20%, and consequently the range of the overall retention in the range of 85-99%.

**Q: How do you respond to the accusation that the whole SuperMemo theory is contradicted by the claim stated in the MegaMemory program of the American Memory Institute, which says that forming indelible memories is possible if suitable representation of the learned knowledge is used?**

A: AMI is a commercial, not scientific institution. The claim that their program produces indelible memories can only be understood as part of the marketing strategy used to promote their otherwise very interesting program. The concept of permastore has been proposed in a limited number of publications in the field of psychology; however, the data collected in the research on molecular aspects of memory clearly refutes such a possibility. In SuperMemo, items whose optimal intervals reach beyond the biologically determined lifespan can be considered part of the permanent memory store. The easiest way to disprove the AMI's claim is to use their program to memorize a large body of intractable knowledge with and without help of SuperMemo (e.g. 1000 phone numbers would do). The knowledge retention after a 6-month-long period will stand at 85-98% with SuperMemo (depending on the forgetting index), and 5-15% without it (depending on individual capabilities)!

**Q: How can you claim superiority of SuperMemo by comparing its retention levels with those obtained in the MegaMemory program? After all, in MegaMemory you do not have to spend time on repetitions! (compare the previous question)**

A: The comparison was not supposed to show superiority of SuperMemo, it was only intended to falsify the claim of the existence of indelible memories. Mnemonic techniques and SuperMemo are complementary.

**Q: Do you not think that the minimum information principle stands in conflict with the ages old rule that the learned knowledge should be highly associative in nature?**

A: No. The minimum information principles concerns the representation of knowledge in SuperMemo databases, not in the learner's memory. The principle does not prevent great advantages coming from proper structuring of the learned material. In the optimum situation, the learner should first construct a cohesive model of the learned subject, and only then, apply SuperMemo to make sure that the learned knowledge is sustained in memory as a whole. The knowledge may be highly associative, but strictly targeted neural stimulation, achieved by means of granular representation of knowledge in SuperMemo, is necessary to effectively induce molecular processes responsible for memory formation.

**Q: On what basis do you ground your claim that SuperMemo increases the speed of learning from 10-50 times?**

A: For knowledge retention of 95%, it can be computed that the number of repetitions in an average learning lifetime (i.e. about 60 years) is 50 times greater for equally spaced repetitions than for progressive repetitions (as used in SuperMemo). For repetitions with no regular spacing scheme, this number may even be greater (e.g. traditional read-and-review textbook learning). Moreover, the greater the required knowledge retention, the greater the increase in the knowledge acquisition rate (classical forms of learning almost never reach knowledge retention above 10% in periods longer than a year!). In practise, users of SuperMemo claim that it increases their speed of learning from 50% to 2000%. These values are, however, highly subjective, as they do not account for so-called **intractable items**, which are practically unmemorizable without SuperMemo. In other words, learners tend to underestimate the fact that they can reach knowledge retention from 90 to 99%, which would hardly be possible by using any other method.

**Q: How can you assume that traditional learning involves equally spaced repetitions? What length of intervals do you use to compare equally-spaced and progressive schedules? (compare the previous question)**

A: The comparison did not imply that traditional learning is based on equally spaced repetitions. The term traditional learning is used throughout this book to denote learning with no regular pattern of repetition timing (e.g. 2-4 repetitions in a school year and no repetitions later on). As the level of knowledge retention decreases here gradually from 95-100% to 0-5%, there is no comparable retention figure. In other words, traditional learning cannot compete with SuperMemo in retention categories over 60%, because this retention is not possible without a system for repetition spacing. Therefore, equally-spaced learning was used as a substitute, in which a permanent retention of over 90% is feasible and comparable with SuperMemo. The length of the interval in an equally-spaced schedule is determined by the level of knowledge retention used in the comparison. Obviously, this will be exactly the same value as the length of the first interval used by SuperMemo for the same level of knowledge retention (e.g. 2-20 days for retention 95%, depending on the difficulty of the learning material).

**Q: How can you claim that retention of over 10% is hardly achievable by other means than scheduling repetitions? Do you mean then that as a highly skilled expert I know only 10% of what I have learned in my field?**

A: A greatly talented reader, fluent in mnemonic techniques, might be able to recall up to 100% of a recently read book. However, this level of knowledge retention cannot be maintained without repetitions for longer than 1-5 days. The 10% figure concerns the periods on the order of years and decades. As a highly skilled expert you certainly remember 100% of what you have learned, but rather not much more than 10% of what you have read and wanted to learn. Please recall the long line of hundreds of textbooks and dozens of courses you have passed before getting your present expert knowledge. Pick one of the books, open it at random and check how much you remember. If you could write your expert knowledge in the form SuperMemo items, you would be surprised to see that it contains only 5-30 thousand items, which you could have memorized in just a year. The books you have read and courses you have passed must have contained an equivalent of 500,000-10,000,000 items.

**Q: When an infant burns its fingers, it will not easily forget the experience. How does it relate to your claim that nothing learned once can be remembered for ever without repetition?**

A: Some low-level memories may differ in nature from memories typically involved in high-level learning. This results from the existence of specialized nervous circuitry involved in storing inborn memories, which may combine with newly acquired experience. This way, a number of reflexes does not have to be ever learned, and remains imprinted in memory for lifetime. However, in the above case, one should not overlook the fact that repetition of an unpleasant experience such as burning one's fingers, does not have to be based on repeating the experience itself. The mere fact of visual contact with flames, may invoke unpleasant memories and serve as a repetition. This way, each subsequent contact with fire, hot plate, etc. will effectively function as a repetition, without a need to experience the pain.

**Q: Can SuperMemo be used to forget things?**

A: Forgetting is a molecular process that cannot easily be induced by natural methods. The more so, there are no sensitive methods to induce selective forgetting, though lesion to some parts of the cerebral cortex may produce roughly localized amnesia. However, there is a component of forgetting that may be influenced. This component is interference. Whenever we learn new things, they always interfere with previously learned material. The interference may enhance some memories while obliterating others. This fact can be used to employ SuperMemo in forgetting, by formulating and memorizing a large number of contradictory items that strongly interfere with remembered facts that are to be forgotten. However, you should not expect the effectiveness of such a procedure to be anything but poor.

**Q: Can I use SuperMemo to improve intelligence?**

A: Yes. Let us define intelligence as the capability to process information. Your brain is like a computer: the better software it runs, the better it performs. You can identify the elements of knowledge that, for example, will make you perform better in intelligence tests. Those elements, if representable in audiovisual or textual form, can be used to learn, and consequently, improve your intelligence. Yet much greater scope for improvement comes with programmable SuperMemo in which, you can write your own DLL libraries of repetitions, or use libraries written by somebody else. With programmable SuperMemo you can learn everything that does not require specialized hardware (if the appropriate programmed database is available, or if you write it by yourself)!

**Q: Soon computers will surpass human beings in their intelligence. Is it not better to invest in artificial intelligence rather than to try to force the forgetful memory to accomplish things with ever-disappointing performance?**

A: Without disputing the time table for *the soon* it is worth noting that *the soon* may become sooner if we intelligently use the human intellectual resources which are indispensable for the progress in artificial intelligence.

## Hints and tips for the SuperMemo learner

To be truly satisfied with your SuperMemo repetitions, you should obey the following principles:

regular work

formulation of simple and univocal items

moderation

concentration

proper selection of material

multifaceted approach

application of mnemonic techniques

health

pleasure

knowledge of the above principles

## **Regular work**

Regular work is the basis of your work with SuperMemo. It is better to work 3 minutes every day, than to spend an hour on weekends. Regular work may go against human nature; it may be hard to bear for a great deal of individuals, but the mechanisms of memory are ruthless, and do not provide any way out of the demand for regular brain-racking. Moreover, the positive feedback between the pile-up of outstanding repetitions and the natural tendency to delay repetitions is the main source of SuperMemo drop-outs.

## **Simplicity and univocality of items**

One of the main ways to increase the speed of learning with SuperMemo is to consequently formulate items that contain minimum information and are unambiguous. Minimum information does not mean minimum number of items. An ill-structured item may often be replaced by a dozen of simple items, and the resulting redundancy is likely to greatly reduce the learning time! One should never learn convoluted formulas, lists containing more than 3-5 elements, sets containing more than 2-3 elements, long descriptions, etc. All of them should be replaced by a set of simpler items.

The notable exception are short epigrams; however, their use may be constrained by SuperMemo's limit on the size of items.

Most of SuperMemo beginners display the lack of sense of item simplicity. Despite all warnings, they formulate monster items that by no means can be reproduced at repetitions. Usually, the learner will have to learn the hard way that there are different knowledge representation strategies that may render the same piece of knowledge a pushover in one case, and a nightmare in another.

## **Moderation**

A dangerous snag awaits all inexperienced SuperMemo learners because of the two following facts:

1. it is easier to memorize items than to retain them in memory over a longer time
2. in the first year of work, the learning rate will gradually be reduced in result of accumulation of repetitions of previously learned items

In consequence, the learner, bedazzled with the initial progress, may overestimate his or her ability to sustain the intensive working regime.

Soon, he or she will be overwhelmed by the unbearable number of repetition, and the crisis may be amplified by the increasing difficulty to recall the ill-structured items. One of the first things a SuperMemo learner must do is to test his capability to work with SuperMemo over a longer period of time. The best daily dose for beginners is 5-10 min. Only after a month or so, it could gradually be increased to 30-40 minutes per day. It is worth noting that the decrease in the speed of learning becomes practically undetectable as soon as after the first year of the process.

## **Concentration**

It is important for the quality of knowledge obtained by means of SuperMemo, that repetitions are conscious and semantic, i.e. they do not just reproduce the answers automatically, without truly grasping their implications. Automatic repetitions not only reduce the value of the knowledge. They also make the work with SuperMemo monotonous, and are less engaging for memory. In consequence, the repeated items are more difficult to recall. A truly successful SuperMemo learner finds a challenge in each repetition.

## **Selection of material**

One of the most important prerequisites of a success with SuperMemo is the proper selection of the learned material. The art is not to know thousands of facts, but to know just those of them that can be directly applied in the day-to-day activities of the learner. Memorizing a phone number of a colleague may produce more profit than knowledge of a sophisticated mathematical formula. A simple rule for drug application may be of greater use than a hundred of drug dosages. The question: 'What do I want to learn and why?' should be a commonplace in the SuperMemo learner's daily schedule. SuperMemo allows to learn fast, and therefore may easily lead somebody to learn a lot of useless garbage without ever stopping to ask 'What for?' Applicability must be the primary criterion in choosing new items to learn. Applicable knowledge may be a source of hugely increased effectiveness and personal satisfaction for the learner. Garbage items only waste the learner's precious time.

## **Multifaceted approach**

It can easily be seen that a dose of smart redundancy can greatly reduce the learning workload and improve the quality of the acquired knowledge. Imagine that you want to learn the following piece of knowledge: 'The annual cost of smoking to the world's economy is \$100 billion, while the anti-smoking campaign fund is \$10 million worldwide'. The best way of learning the above facts is to produce a set of items, that ask for all the most important aspects and implications of the learned knowledge.

It may appear sufficient to ask two questions about (1) the losses produced by smoking and (2) the cost of the anti-smoking campaign; however, an important implication may soon be lost from the learner's memory: 'What is the mutual cost relationship between the disease and the remedy?' Answer: 10,000 !!! Not only implications may be lost. A learner able to tell what disease is caused by HIV, may not be able to answer the question what virus causes AIDS. Multifaceted questions increase the quality of knowledge and reduce the learning time!

## **Mnemonic techniques**

One of the principles of SuperMemo is to formulate simple and univocal items. However, even the simplest item may be quite hard to remember. Numbers are a notorious example of intractable pollutants of SuperMemo databases. The problem with numbers is that they are all similar to each other and can easily be confused. Here, the help comes from techniques which are as old as the art of learning itself, the mnemonic techniques.

Any good mathematician may demonstrate that remembering numbers is much less of a problem to him than to an average man in the street. Having had to learn hundreds of constants and formulas, a mathematician more or less consciously knows how to deal with them. The simplest technique is to learn a list of 10, 20 or 100 pictures associated with numbers. For example: 1 - harpoon, 2 - coin, 3 - tripod, 4 - dog, 5 - hand, etc. Knowing such associations, numbers may easily be represented as colorful pictures. For example: 4315 may be seen as a dog on a tripod harpooning somebody's hand.

Despite what may seem at first, time spent on forming the pictures is incomparable with gains produced by successful memorization. By virtue of the brain circuitry developed in the course of evolution, vivid pictures are by far easier to remember than dry numbers.

In SuperMemo, it is always better to invest heavily in formulation of items, in order to have only a couple of repetitions in the lifetime.

Ill-structured or intractable items may be repeated as many as 30 times in the course of a single year!!!

## Health

Health is an obvious prerequisite of success in any form of learning. Here, only the greatest natural allies of SuperMemo are listed:

**sleep** - nothing can ruin a SuperMemo session as effectively as drowsiness; sufficient amount of sleep is needed to activate memory consolidation mechanisms

**physical exercise** - jogging and swimming have salubrious neurotrophic effects when accompanied by mental effort

**oxygen** - without fresh air, a SuperMemo learner will experience signs of extreme exhaustion as soon as in the first 5 minutes of learning

**abstinence** from smoking and drinking.

## **Pleasure**

The most sure way of telling if all the principles of effective work with SuperMemo are satisfied is the user's pleasure experienced during repetitions. This is an infallible litmus test and should constantly be examined in order to detect the reasons for unsatisfactory progress. All problems mentioned earlier such as backlog of items, recall problems, monotonous repetitions, garbage knowledge, superficial items, tiredness, etc., are certain to take the gilt off the SuperMemo work and result in disillusionment.

## **Knowledge of principles**

Each of the ten principles of the effective work with SuperMemo is of a huge importance on its own. The problem is that there are ten of them, and none is less important than the others. Why not to make use of SuperMemo now, and learn the principles by formulating them as SuperMemo items. By obeying the principles, you may increase your effectiveness manifold. Perhaps, the gain may be as big as from applying SuperMemo in the first place. Be on your guard, the reserves are immense.

## SuperMemo World's Database Bank

SuperMemo World's Database Bank is a collection of SuperMemo databases developed by SuperMemo users, and by SuperMemo World database developers.

All users of SuperMemo software are invited to send in their SuperMemo databases. Upon no-cost evaluation, selected databases are added to the Database Bank and distributed with other SuperMemo World products.

All authors of selected databases receive royalties on terms agreed with SuperMemo World (standardly 10% of the end-user price).

Moreover, each submitted database is automatically entered in the **Annual Best Database Competition** with attractive prizes in cash and SuperMemo for winners by category (closing date is December 31 each year).

Chances of positive database evaluation increase greatly if the database can be sent in the native form, i.e., with the learning process included, so that such parameters as factor distribution, interval distribution, burden, etc., can be inspected. In selected cases, the learning process can also be used to sort databases with respect to difficulty of particular items.

Upon adding a database to the Database Bank, SuperMemo World ranks it on a scale from 0 to 10 to reflect the quality of the database in terms of knowledge structuring, factual consistence, linguistic correctness, item ordering, etc. The ranking is updated on the basis of opinions of users that purchased the database.

See [DBANK.TXT](#) for the periodically updated listing of databases in the Database Bank, as well as for the database registration form for database authors.

## **SuperMemo World**

SuperMemo World is the world's exclusive owner of all intellectual property rights to the SuperMemo method, software and publication.

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## SuperMemo database files

Each SuperMemo database contains four files with extensions .INF, .ITM, .ITI and .DAT. These files are created automatically by **Files : New** and are updated each time the database is modified. If one of these files is unavailable, opening the database is not possible; therefore, it is recommended that **regular backup copies of ALL database files be made**.

Content of the database files is as follows:

<name>.**INF** - information about the learning process. For example: Total, Memorized, Intact, Burden, E-factor distribution, Interval distribution, OF matrix, RFmatrix, forgetting curves, Lapses (requested and measured), etc.

<name>.**ITM** - text of items

<name>.**ITI** - information about items. For example: interval, e-factor, u-factor, repetition, lapses, last repetition, pointer to the item text in the ITM file, pointer to the next intact item, pointer to the next item scheduled on a given day, etc.

<name>.**DAT** - list of pointers to lists storing items scheduled for particular days

**Note:** Modifying the above files in any other way than by means of tools provided by SuperMemo World may result in destroying the integrity of the database,

A database may also optionally include the following files:

<name>.**AAA, AAB, AAC, AAD**, etc. - bitmap files associated with particular items

<name>.**YAA, YAB, YAC, YAD**, etc. - sound files associated with particular items

<name>.**TTF, FOT** - True Type font files (stored in the Windows directory)

<name>.**DRL** - sequence of items scheduled for the final drill (this file is erased by **Learn : Cut drills** and can always be deleted without detriment to database integrity)

<name>.**INI** - database configuration file (desktop, font, color, etc.)

<name>.**DOC** - text file with the description of the database (this file can always be deleted)

Other files having the same name as the database might include (see TOOLKIT.TXT for more details):

<name>.**TXT** - text file with the content of particular items and learning parameters (generated by Tools : Export text, TO\_TEXT.EXE or TRANSFER.EXE)

<name>.**STB** - sortable text file generated by database conversion options (**Tools** menu)

<name>.**SRT** - sorted text file generated by database conversion options on the **Tools** menu

<name>.**REC** - recovery report generated by **Tools : Recover** or RESCUE.EXE

<name>.**CNV** - string conversion file used by Tools : Replace strings or REPSTR.EXE

<name>.**FLT** - string conversion file used by Tools : Export text or TO\_TEXT.EXE

<name>.**CRS** - list of databases used by the database cross-section utility CROSS.EXE

<name>.**FND** - sequence of items used by search browser (**Browse : Searched**)

<name>.**AUD** - list of audio items (used to speed up the option **Browse : Audio items**)

<name>.**VIS** - list of visual items (used to speed up the option **Browse : Visual items**)

<name>.**\$\$\$**- temporary files that may appear in case of a system crash (they can all be deleted)

**acquisition rate** - speed of learning, usually expressed in **items** memorized per year per minute. For example, if 20 minutes a day yield 10,000 **items** a year, the **acquisition rate** is 500 items/year/min. In **SuperMemo**, the **acquisition rate** may vary from 100-1000 depending on the difficulty of the material, **forgetting index** and the stage of the process (**acquisition rate** may substantially decrease in the period of the first year; later it stabilizes asymptotically)

**action** - submenu on the menu in append windows and editing windows that provides actions such as **next**, **continue**, **exit**, etc.

**add and next** - option in **append** windows that is used to add the currently edited **item** to the **database** and move to editing a new item

**add copy** - option in **append** windows that is used to add a copy of the currently edited **item** to the **database**.

**Advanced English database** - the most popular SuperMemo database comprising 38,000 words and phrases of English. This database is standardly added to every package of SuperMemo 7 for Windows

**analysis** - option on the main menu that provides statistical procedures that allow of more effective supervision of the learning process

**annual burden** - number of **items** that have to repeated in particular years. **Annual burden** may be inspected by using the **monthly burden** option

**answer** - second part of the **SuperMemo** item

**answer field** - part of the **SuperMemo editing window** where the **answer** is displayed

**append new items** - suboption on the **edit** menu that is used to add new **items** to the **database**

**to append an item** - to add it to the **SuperMemo database** by means of **append new items**

**appending mode** - mode of editing windows in which new **items** can be **appended** to the **database**. This mode is entered by choosing **edit : append new items** or by using **switch to append** in **editing windows** (by pressing F8)

**append window** - window with **question** and **answer fields** used to edit items at the moment of introducing them to a **SuperMemo database**

**approximate** - option on the **miscellaneous** menu that is used to compute a new **matrix of optimal factors** on the base of the **matrix of retention factors**. It can also be used to re-evaluate the **OF matrix** to fit a new value of the **forgetting index**

**audio** - submenu on the editing windows menu which is used to record, edit, delete, import and play **sound files** associated with SuperMemo items

**average factor** - average of **E-factors** taken over the whole **database**. It is displayed in learning parameters as **factor**

**average grade - trailing average** of **response qualities** provided during repetitions. It is displayed in **learning parameters** as **grade**.

**average interval** - average of **current intervals** taken over the whole **database**. It is displayed in **learning parameters** as **interval**.

**average quality** - see **average grade**

**average repetition number** - average of **repetition nos** taken over the whole **database**. It is displayed in learning parameters as **repetition** (before the colon)

**average time** - see **mean time**

**Bank** - see **Database Bank**

**back** - option on the **browser** menu which is used to undo several recent positioning operations.

**bitmap** - graphic image stored in a bitmap file. Bitmap files associated with SuperMemo items have extensions AAA, AAB, AAC, AAD, etc.

**browse all** - option on the **browse** menu which is used to browse all **items** in the **database** by means of the **browser**

**browse intact** - option on the **browse** menu which is used to browse all **intact items** in the **database** by means of the **browser**

**browse leeches** - option on the **browse** menu which is used to browse all **leeches** in the **database** by means of the **browser**

**browse memorized** - option on the **browse** menu which is used to browse all **memorized items** in the **database** by means of the **browser**

**browse outstanding** - option on the **browse** menu which is used to browse all **outstanding items** in the **database** by means of the **browser**

**browse searched** - option on the **browse** menu which is used to browse all **items** found by **find all**

**browser** - module of SuperMemo which is used in browsing a selected subset of **items** in the **database**. The browser can be used to inspect all items, **intact items**, **leech items**, **memorized items**, **outstanding items**, and items found by means of **find all**. The **browser** can be activated by (1) choosing any of the options on the **browse** menu, (2) running **find all**, or (3) choosing **view : browse** in **analysis : burden**

**burden** - (1)(in learning parameters) number which estimates the average number of **items** that have to repeated daily:

$$\mathbf{burden} = 1/I(1)+1/I(2)+ \dots + 1/I(n)$$

where:

I(n) - **current interval** of the n-th **item**

The **burden** parameter is displayed in **learning parameters** as **burden**. (2) option on the **analysis** menu that is used to see how many and which **items** are scheduled for particular days of the process. The **burden** option is activated by pressing Ctrl+B. (3) see monthly burden and annual burden

**case sensitivity** - (in **search**) ability to distinguish between lower-case and upper-case characters. If the searched string is 'SuperMemo' then for 'SUPERMEMO' to be found, the case sensitive check-box must be unchecked in search

**cases** - (1) (in repetition **parameters**) number of repetition instances that have been used to compute values of the relevant **optimal** and **retention factors** (2) option on the **analysis** menu which displays the matrix of repetition cases used in computing relevant entries of **RF** and **OF matrices**

**clear** - option in **append** windows which is used to clear the content and **question** and **answer fields**

**close** - (1) option on the **file** menu which is used to close the currently used database (denoted as **save/close**), (2) option on the **browser** menu which is used to close the currently opened question-item fields in the browser

**configuration** - desktop arrangement, **font**, color, **word-wrapping**, **case sensitivity**, and other parameters associated with a given SuperMemo **database**. These parameters are stored in files with the extension INI

**copy** - (1) operation of the menu of **editing windows** that makes it possible to **copy** and edit the currently displayed **item**. It may be used to quickly **append items** that have similar wording. (2) option on the **file** menu which can be used to copy a **database** to a new location

**current interval** - number of days between the last **repetition**[1] of a given **item** and the date of the **next repetition**

**current interval categories - item** categories determined by **current intervals**. They comprise **items** whose **intervals** differ by no more than 100% in relation to each other (e.g. 17-32, 33-64, etc.)

**current items** - (1) (in the **learn** option) **items** that have been scheduled for repetition on the current day (2)  
stage of the **learn** option when the **current items**[1] are repeated

**cut drills** - option on the **learn** menu which is used to delete repetitions scheduled for the **final drill**

**daily burden** - see [burden](#)[2]

**database** - (1) collection of **items** (2) collection of files that store the **database**[1] and all information pertaining to the learning process. The **database**[2] cannot be opened if one of the files with the following extensions is missing: INF, ITM, ITI and DAT

**Database Bank - SuperMemo World's collection of **databases**[2] created by **SuperMemo** learners and by **SuperMemo World's** database developers**

**database file** - any of the 4-6 files that make up a **SuperMemo database**[2]

**date** - option on the **miscellaneous** menu that is used to change the current DOS date setting

**date format** - (1) way in which dates are displayed in **SuperMemo**. It may be DD-MM-YY (UK) or MM-DD-YY (US) (2) check-box in the **miscellaneous : options** dialog box that is used to change the **date format**

**delete** - (1) operation of the **editing mode** that removes the currently displayed **item** from the **database**, (2) option on the **file** menu which is used to delete all files of a **SuperMemo database**

**delete line**- option on the **append** menu which is used to delete a line in the **item editor**

**demo** - option on the **miscellaneous** menu which successively displays items randomly selected from the database

**difficulty of an item** - degree to which a given **item** is difficult to remember. Difficulty is expressed by means of **E-factors**

**difficulty categories - item** categories determined by **E-factors**. They comprise **items** whose **E-factors** differ by no more than 0.1 (e.g. from 2.4 to 2.5)

**dispersion of intervals** - random modification of **optimal intervals** used to speed up the **optimization** and to reduce the **lumpiness** of item-to-day assignments

**distribution of factors - see factor distribution**

**distribution of intervals - see interval distribution**

**e-distribution** - see **factor distribution**

**e-factor** - number associated with each **SuperMemo item**. It estimates the difficulty of the **item** and ranges from 1.3, for the most difficult **items**, to 3.5 and more, for the easiest **items**. Initially, all items have their E-factor set at 2.5. This value is later modified in the course of repetitions

**edit** - (1) option on the main menu which is used to open the **edit window** with the most recently used item (2) operation of the **editing mode** that is used to edit the currently displayed **item**

**editing mode** - state of the SuperMemo program in which **database** operations such as **edit, delete, copy, print**, etc. are available. It is entered automatically in **editing windows** when using options such as **learn, search, edit, random test**, etc.

**editing window** - window such as **edit, learn, search** or **random test window** in which such operations of the **editing mode** are available as: **edit, delete, select, print, copy, memorize, reset**, etc.

**edit window** - one of the **editing windows**, which is displayed upon choosing **edit recent item** on the **edit** menu (or using **switch to edit** in the **appending mode**)

**EF** - see **E-factor**

**end** - option on the **browser : move** menu that is used to move the current item to the end of the browsed sequence

**exit** - option used to destroy editing windows, and the **append** window, as well as to exit **SuperMemo**

**factor** - (1) (in **item parameters**) see **E-factor** (2) (in **learning parameters**) see **average factor**

**factor distribution** - option on the **analysis** menu that is used to see a graph representing the participation of **items** of various **difficulty categories** in the **database**

**factor used** - see **U-factor**

**file** - option on the main menu, which provides database file operations: **new, open, save, cut drills, rename,**  
and **delete**

**filter file** - file with extension FLT that is used to generate a filtered text file from a **database** by means of TO\_TEXT.EXE

**final drill** - third stage of the **learn all** option when repetitions pass again through **items** that scored a grade less than 4 in **response quality assessment** in the two previous stages of learning (i.e. **outstanding repetitions** and **memorizing new items**)

**find all** - option on the **search** menu that is used to find all item containing a particular substring. The items that have been found with **find all** are placed in the **browser** and may subsequently be inspected with **browse : searched**

**find first** - (1) option on the **search** menu that is used to find the first **item** containing a particular substring. The search begins from the current searching position (in the **search** window), (2) option on the **search** menu of the **browser** that is used to search the **browser** for **items** containing a given substring

**find next** - option on the **search** menu of the **browser** that is used to search the **browser** for **items** containing a given substring defined previously in **find first[2]**

**first** - option on the **browser : position** menu that is used to position the **browsers** at the beginning of the browsed sequence

**font** - option on the **miscellaneous** menu which makes it possible to select any Windows font for use with SuperMemo items. The color of the font may also be chosen

**forgetting curve** - (1) curve which represents changes of **knowledge retention** in time (when no **repetitions** are made) (2) option on the **analysis** menu that represents **forgetting curve**[1], (3) sub-option of the **retention**, **cases**, **optimal factors**, and **optimal intervals** options on the **analysis** menu (activated by clicking the mouse on one of the entries of the displayed matrices)

**forgetting index** - proportion of **items** that are not remembered at the moment of **repetition**[1]. In **SuperMemo 7**, its desired value may be programmed to vary between 3% and 20%, and is displayed in **learning parameters** as **lapses** (<number>). The measured value of the **forgetting index** is displayed to the right of the desired **forgetting index**.

**form feed** - option on the editing window menu that is used to issue a printer's form feed command (page eject). **Form feed** is useful when less than a pageful of **items** is to be printed, and should follow the **print** command for particular **items**. If **form feed** were not issued, the items pending in the printing queue would be kept in a text file with the extension PRN

**full view** - option on the **browser**'s menu that is used to open a **editing window** for the currently highlighted **item** in the **browser**

**function of optimal intervals** - function that relates the length of **optimal intervals** with the **repetition number** and **E-factor**. In **SuperMemo 7**, it is represented in a tabular form as a **matrix of optimal factors**:

$$OI(1,EF) = OF(1,EF)$$

$$OI(n,EF) = OI(n-1,EF)*OF(n,EF)$$

where:

$OI(n,EF)$  - n-th **optimal interval** for **E-factor** equal  $EF$

$OF(n,EF)$  - n-th **optimal factor** for **items** whose **E-factor** equals  $EF$

**future reps** - (in **item parameters**) the expected number of repetitions of a given item in the course of the nearest 30 years, and the expected total repetition time. The number is computed from the **matrix of optimal factors** assuming that the item will not be forgotten in the meantime (the probability of forgetting an item in each of the future repetitions equals the **forgetting index**)

**garbage (collection)** - option on the **tools** menu that is used to clean the **database** from superfluous data. It also performs a rough **database** integrity check-up. Note, that from the user's point of view, the database before and after **garbage** looks virtually the same. The major noticeable difference is the drop in size.

**grade** - (1) (also **response quality**) number in the range from 0 to 5 which is supposed to reflect the accuracy of the learner's response given in the recently made repetition (2) (in **repetition parameters**) the value of **grade[1]** displayed in **editing windows** after a **repetition** (3) (in **learning parameters**) see **average grade**

**help** - option on the main menu which is used to process the SM7.HLP **help file** by invoking the Windows' help engine

**help file** - SM7.HLP resource file that stores information displayed by the Windows' help engine

**help on help** - part of the **help** that provides information on how to use the **help** itself

**hints and tips** - part of the help that provides information on the learner-dependent aspects of effective application of **SuperMemo**

**image** - option in **editing windows** which is used to create, edit, delete and import bitmap files associated with items

**intact** - number of **intact items** in the database. It is displayed in **learning parameters**

**intact database** - a **database** that has not yet been used, i.e. Memorized=0, Intact=Total, Interval=0, etc. (see **native database**)

**intact item** - **item** that has not yet been **memorized** by means of option **learn** or **memorize**. **Intact items** do not take part in repetitions

**intact queue** - sequence of **intact items** that await **memorization**. This sequence is the same as the sequence in which **items** have been **appended** to the **database**.

**integrity error** - error caused by inconsistent information stored in the **database**. It is usually caused by physical damage to one of the **database files**. It may also be caused by a learner's mistake, e.g. setting the date below the last date used. In most cases, **SuperMemo** will automatically correct integrity errors. Some of them may be remedied by **garbage collection**. For most extensive damage the use of **recovery** tools may be necessary.

**interval** - (1) period between two successive **repetitions[1]** expressed in days (2) (in **item parameters**) see **current interval** (3) (in **learning parameters**) see **average interval**

**interval distribution** - option on the **analysis** menu that is used to see a graph representing participation of **items** of various **current interval categories** in the **database**

**intractable item - item** which is characterized by a low **E-factor** and a high value of **lapses**[1]

**item** - simple **question-answer** pair used to represent knowledge in **SuperMemo**

**item field** - part of a **editing window** or an **append window** where the **question** and the **answer** of the **current item** are presented

**item parameters** - collection of parameters that characterize the **item** currently displayed in one of the **editing windows**. These include **current interval, E-factor, U-factor, repetition number, last repetition, next repetition**, etc.

**keyboard shortcut** - keystroke combination that is used to quickly access remote options independent of the context of use (also **hotkey**). **Keyboard shortcuts** are displayed to the right of particular menu items

**knowledge acquisition rate** - see **acquisition rate**

**knowledge retention** - proportion of knowledge retained in memory in result of learning. In **SuperMemo**, depending on the **forgetting index** the **knowledge retention** may vary from 85% to 99% (compare **retention at repetitions**)

**lapse** - see memory lapse

**lapses** - (1) (in **item parameters**) number of times a given **item** has been forgotten (displayed at the **repetition[2]** entry after the colon) (2) (in **learning parameters**) recorded value of the **forgetting index**. It is displayed as **lapses**. The number in parentheses expresses the desired value of the **forgetting index** (3) (in **learning parameters**) desired value of the **forgetting index**. It is displayed in parentheses at the **lapses** entry (4) (in **learning parameters**) change of the **lapses[2]** parameter in a given repetition **session**. It is displayed as **lapses +/-** (5) scroll-bar in the **miscellaneous : options** dialog box that is used to change the desired value of the **forgetting index** (**lapses[3]**)

**last** - option on the **browser : position** menu that is used to position the **browsers** at the end of the browsed sequence

**learn all** - option on the Learn menu that is used to make repetitions of knowledge stored in a **database**. **Learn all** is performed in three stages:

- **outstanding repetitions** - repeating **items** scheduled on the current and all outstanding days
- **memorizing new items** - committing new **items** to memory
- **final drill** - repeating again **items** that scored **grades** below 4 points in the two previous stages

The remaining options of the Learn menu are used, among others, to pass the three stages of learning independently.

**learning parameters** - parameters that describe the learning process, displayed in the left part of the main window of **SuperMemo**. These include: **total, memorized, intact, burden, retention, lapses**, etc.

**learn window** - one of the **editing windows** which is used to present **items** during repetitions in option **learn**

**leech** - intractably difficult **item** that repeatedly causes problem in the learning process. **Leech** items can be defined by the user by specifying the three following criteria: (1) maximum **E-factor**, (2) maximum **interval**, and (3) the minimum number of **lapses**. In other words, **items** must seem difficult, be forgotten a number of times, and linger at low **intervals** to be classified as **leeches**

**lumpiness** - tendency of **items** memorized on the same day to stick together in the learning process. Lumpiness entails substantial variations in the number of **items** that are to be repeated on particular days. The problem of lumpiness was eliminated in **SuperMemo** versions above 3 by means of **dispersion of intervals**.

**maintenance of databases** - housekeeping operations on **SuperMemo database files** that ensure compliance with **database safety principles**. Frequent backing up is the most important part of **database maintenance**, and provides the most sure protection against all mishaps

**matrix of optimal factors** - tabular representation of the **function of optimal intervals**. It is defined in the same way as the **matrix of retention factors**, and is computed by smoothing the latter. The **matrix of optimal factors** may be displayed by means of the option **optimal factors**

**matrix of optimal intervals** - tabular representation of the **function of optimal intervals**. It is computed directly from the **matrix of optimal factors**, and may be inspected to review the values of **optimal intervals** (option **optimal intervals** on the **analysis** menu)

**matrix of repetition cases** - matrix which represents the number of repetition cases that have been used in computing **matrices of retention factors** and **optimal factors**

**matrix of retention factors** - tabular representation of the **function of optimal intervals**. Because the fact that the **matrix of retention factors** may be difficult to compute accurately, its smoothed form, the **matrix of optimal factors** is used in computing **optimal intervals**. The **matrix of retention factors** may be displayed by means of the option retention

**mean time** - (in learning parameters) **trailing average** of time spent on answering questions at repetitions. It is expressed in seconds per item

**memorization** - process in which items are **memorized**, i.e. committed to the learner's memory

**memorize** - operation of the **editing mode** which is used to put an **intact item** into the learning process

**to memorize an item** - to commit the **item** to memory by means of options **learn** or **memorize**

**memorized** - number of **items** in the **database** that have already been **memorized**

**memorized item** - item that has already been **memorized**

**memorizing new items** - option on the Learn menu corresponding to the second stage of the **learn all** option in which **intact items** are committed to memory

**memory lapse** - instance of forgetting an individual **item**

**mercy** - option on the **miscellaneous** menu which is used to spread **outstanding items** in a desired period of time

**minimum information principle** - principle of the **SuperMemo** method saying that an **item** should be as simple in form as possible

**miscellaneous** - option on the main menu which provides a set of accessory procedures like **date**, **mercy**, **wipe**, **options**, **font**, **users**, etc.

**mnemonics** - art of representing knowledge in a graphic, easy to remember way. It may greatly increase the learner's ability to memorize numbers, complicated names, symbols, formulas, etc.

**monthly burden** - option on the **analysis** menu that is used to see the number of **items** that are scheduled for **repetition**[1] in particular months and years

**move** - option on the **file** menu which is used to move a **database** to a new location

**multifaceted items** - **items** that ask question on the same piece of knowledge, each time from a different standpoint. The use of **multifaceted items** may reduce **workload** in **databases** representing knowledge of highly interdependent, and cohesive structure

**native database - database** with the learning process included, i.e. with all parameters pertaining to the learner who has been using it. A native database can be converted to an **intact database** by means of **Tools :**  
**Reset : Database.**

**new** - option on the **file** menu that is used to create a new, empty **database**

**new factor** - new value of the **E-factor** computed right after a **repetition**[1]. It is displayed among **repetition parameters** in the **learn** window

**new interval** - new value of the **current interval** computed right after a **repetition**[1].It is displayed among **repetition parameters** in the **learn** window

**next** - (1) option of **editing windows** that is used to move to the next **item** (next item is determined by the context) (2) option of the **append window** that is used to add the currently displayed item to the database and move to editing the next item

**next repetition** - date at which the next repetition of an **item** is to take place. It is displayed among **item parameters** in all **editing windows** (following the **last repetition**), as well as among **repetition parameters** right after a repetition

**O-factor** - see **optimal factor**

**OF** - see optimal factor

**OF matrix** - see **matrix of optimal factors**

**open** - (1) option on the **file** menu used to open a **database** for use, (2) option on the **browser** menu used to open the **question** and **answer fields** of the currently highlighted item

**optimal factor** - one entry of the **matrix of optimal factors**. For **repetition number** equal one, the optimal factor is equivalent to the first **optimal interval**. For repetition numbers greater than one, **optimal factors** represent the increase of the **optimal interval** after the relevant **repetition[1]**

**optimal factors** - option on the **analysis** menu, which is used to inspect the **matrix of optimal factors**

**optimal interval** - (1) **interval** that yields the **forgetting index** equal to the requested value, i.e. equal to **lapses[3]** (2) (in **repetition parameters**) newly computed value of the **optimal interval[1]**

**optimal intervals** - option on the **analysis** menu which is used to view the approximate values of **optimal intervals** used in repetitions. The intervals displayed by the **optimal intervals** option are derived from the **matrix of optimal factors** (compare **function of optimal intervals**)

**optimization** - (in **SuperMemo**) process by which the set of **E-factors** of individual **items**, as well as the **matrix of optimal factors** are modified in order to yield the desired **retention at repetitions** (see **lapses[3]**)

**optimization factors** - factors used in **optimization**:

- **E-factor** - characterizing the difficulty of **items**
- **O-factor** - determining the **function of optimal intervals**. The **matrix of O-factors** is produced by smoothing the **matrix of R-factors**
- **R-factor** - approximating the **function of optimal intervals** on the base of **forgetting curve** sketching
- **U-factor** - characterizing the increase of subsequent **intervals** used in the learning process

**optimum interval** - see optimal interval

**options dialog** - dialog box available on the **miscellaneous** menu, used to read, change and write the **parameter set**

**outstanding** - number of **items** that are scheduled for **repetition[1]** on the present and all the previous days on which repetitions have not been made. The **outstanding** parameter is displayed in **learning parameters**

**outstanding items - items** that are scheduled for **repetition**[1] on the present and all the previous days on which repetitions have not been made

**overall retention - see knowledge retention**

**parameter set** - collection of **SuperMemo** variables that can be stored on the disk by means of the **write parameters** option. These are for example: **lapses[3]**, **database path**, **parameter path**, **help path**, **word-wrapping**, **date format**, etc.

**paths** - set of path variables in the **options dialog** which determine where **SuperMemo** searches for files such as **database files, help file, parameter file**, etc.

**print** - operation of the **editing mode** which is used to print the currently displayed **item**. Note, that items will actually not be printed unless **form feed** is issued or the printing queue overflows the page. Before printing the page, to-be-printed items are stored in a text file with the extension PRN

**process parameters** - see **learning parameters**

**programmable SuperMemo** - SuperMemo that has the ability to use programmed DLL database modules to execute the repetition procedure. Programmed database may be used to learn touch-typing, playing musical instruments, problem solving, etc. The only limitation is the programmers imagination on the possible application of the database. All versions of SuperMemo for Windows starting with release 7.5 are programmable. A touch-typing drill database is available with programmable SuperMemo under the name TT.

**put** - option of the **append window** which is used to add the displayed item to the database

**quality** - see **grade**

**question** - (1) first part of a **SuperMemo item** (2) option on the menu of the **append** window, used to move to the **question field**

**question field** - part of a **editing window** in which the question part of **SuperMemo items** is displayed

**question-answer pair - see item**

**random tests** - submenu on the **miscellaneous** menu that provides options used to randomly pick up **items** from the **database** (e.g. to test a colleague's knowledge, to review the content of a newly acquired **database**, to randomly pick items from the intact queue, to test one's knowledge of items containing a substring, etc.)

**ranking** - number in the range from 0 to 10 that is used to characterize the quality of a **SuperMemo database** included in the **SuperMemo World's Database Bank**. The quality is based on the database's factual consistence, observance of item formulation principles, linguistic correctness, etc.

**read** - option in the **miscellaneous : options** dialog box that is used to read the **parameter set** from the disk. The **parameter set** is stored in the SM7.PAR file

**recover** - option on the **tools** menu which is used to check for and remedy **database integrity errors**. **Recover** should be used each time a **database** reports integrity problems. **Recover** does not check the content of the **items**; therefore it is recommended that **garbage** be run in case of damage to files storing the content of questions and answers. **Recover** is equivalent to the Toolkit utility **RESCUE.EXE**

**registration coupon** - form used by **SuperMemo users** to register in **SuperMemo World** in order to get software upgrades, information materials, database listings, etc.

**registration number** - unique number given to all legal users of **SuperMemo**. The number corresponds to the number of copy sold (except for promotional and gift copies that receive numbers less than 1000).

**rename** - option on the **file** menu which is used to rename a **database**

**repeat outstanding items** - option on the Learn menu which corresponds to the first stage of repetitions in **learn all**, in which **outstanding items** are repeated

**repetition** - (1) act of answering a question in the **learn** option (including **memorization** of new **items**) (2) (in **item parameters**) see **repetition number** (3) (in **learning parameters**) see **average repetition number**

**repetition number** - number of **repetitions**[1] the **item** in question has been subject to (including **memorization**). It is displayed among **item parameters** as **repetition** (before the colon).

**repetition parameters** - collection of parameters, displayed in the **learn window** (bottom-right) that statistically describes the recent repetition. These include: **new interval, new E-factor, new OF and RF entries, next repetition**, etc.

**repetition spacing - see spacing of repetitions**

**replace** - operation of the **editing mode** that is used to replace part of an item with a selected text

**REPSTR.EXE** - utility of the **SuperMemo Toolkit** used to globally replace collections of strings or fonts in a **database**

**RESCUE.EXE** - utility of the **SuperMemo Toolkit** used to recover from **database integrity problems**. It is equivalent to **Tools : Recover**

**RESET.EXE** - utility of the **SuperMemo Toolkit** used to reset a database to an **intact database**. **Intact database** may be useful for other users who would like to start the learning process from scratch.  
**RESET.EXE** is equivalent to **Tools : Reset : Database**

**reset item** - operation of the **editing mode** that is used to convert a **memorized item** into an **intact item**. All **item parameters** are modified accordingly. The **reset** operation should be used each time the text of a memorized **items** has substantially been modified

**reset-wipe** - see [wipe\[2\]](#)

**response** - recalled form of the correct **answer** that appeared in the learner's mind in the course of a **repetition[1]** (compare **answer**)

**response quality** - (also **grade**) number from the range 0-5, which is the learner's score for the accuracy of his response, and is supposed to reflect the degree to which the response matched the **answer**

**response quality assessment** - process in which the learner provides a **grade** supposed to reflect the accuracy of the **response** to the recently asked **question**

**retention** - (1) see **knowledge retention** (2) (in **learning parameters**) estimation of **knowledge retention** based on the value of the **forgetting index**, (3) option on the **analysis** menu that is used to inspect **retention at repetitions** for particular **E-factor** and **repetition number** categories

**retention at repetitions** - proportion of **memorized items** that are remembered at the moment of **repetition**[1].  
It equals 100% minus the value of the **forgetting index** (compare **knowledge retention**)

**retention factor** - number that estimates the corresponding value of the **optimal factor** on the base of the shape of the relevant **forgetting curve**. The **retention factor** for a given curve is determined by the value of the **optimal factor** such that the forgetting index equals the desired value

**retention factors** - option on the **analysis** menu that is used to inspect the **matrix of retention factors** as well as all corresponding **forgetting curves**

**retention matrix** - see **matrix of retention factors**

**retention vs acquisition rate trade-off** - mutual dependence of **knowledge retention** and **acquisition rate**.

High values of knowledge retention (i.e. above 90%) imply lower **acquisition rate**. However, very low retention levels (below 70%), which are disabled in **SuperMemo**, may also reduce **acquisition rate**. The greatest **acquisition rate** may be obtained for the **forgetting index** in the range 10-25%. This last value depends on the length of the learning period, and the longer the learning period, the lower the recommended value of the **forgetting index**. Increasing the **acquisition rate** by reducing the **retention** deprives the learner of the possibility to determine, which **items** should be remembered.

**review intact** - option on the **random tests** menu that is used to randomly review **intact items**

**review leeches** - option on the **random tests** menu that is used to randomly review **leech items**

**review memorized** - option on the **random tests** menu that is used to randomly review all **memorized items**

**review outstanding** - option on the **random tests** menu that is used to randomly review **outstanding items**

**review searched** - option on the **random tests** menu that is used to randomly review **items** collected by means of **find first**

**RF** - see retention factor

**R-factor** - see retention factor

**RF matrix** - see **matrix of retention factors**

**safety principles** - rules that should be obeyed by the learner in order to ensure that no loss of **database** information will take place in result of media damage, hardware faults, power failure, human error, etc.

**save** - option on the **file** menu that closes the **database** in use

**search** - option on the main menu that is used to search the **database** for **items** containing a specified string of characters. **Search** may proceed until the first item is found (**find first**) or until all items have been collected and can be displayed in the **browser** (**find all**)

**search window** - one of the **editing windows**, which is activated upon finding an **item** in **search**

**select** - operation of the **editing mode** that is used to display the **item** of a given number

**session** - single workout with a SuperMemo database which starts at the moment of using open and ends with closing the **database**

**SETUP.EXE** - program that can be used to install such components of SuperMemo as **SuperMemo Toolkit**, sample databases, commercial databases, etc.

**shift** - option on the **browser** menu which is used to shift items in the browsing sequence. This option makes sense only for **browse all** and **browse intact**; therefore it is inactive in other **browser** options. **Shift** may use relative or absolute shift values measured in percentage or in the number of items

**show answer** - option on the Learn menu that is used to present the correct **answer** during repetitions

**sound file** - file used to store sounds associated with a SuperMemo item. Sound files used in SuperMemo have the extensions YAA, YAB, YAC, YAD, etc.

**spacing of repetitions** - unique pattern in which inter-repetition **intervals** are chosen in learning. **Spacing of repetitions** may be massed, distributed, or, like in **SuperMemo**, progressive.

**SuperMemo** - (1) see **SuperMemo method** (2) computer program implementing the **SuperMemo method**  
(e.g. **SuperMemo 7 for Windows**)

**SuperMemo database** - see [database](#)

**SuperMemo item** - see **item**

**SuperMemo learner** - learner who applies the **SuperMemo method**

**SuperMemo method** - speed-learning method developed by a Polish biologist P.A.Wozniak and promoted world-wide by SuperMemo World. **SuperMemo** increases the **rate of knowledge acquisition** at a high level of **knowledge retention** by means of optimum **repetition spacing**

**SuperMemo session** - see [session](#)

**SuperMemo software** - see [SuperMemo](#)[2]

**SuperMemo World** - the exclusive owner of all intellectual property rights to the **SuperMemo method**

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**SWAP.EXE** - one of the programs of **SuperMemo Toolkit** that is used to swap questions and answers in a **database**

**switch** - option on the menu of **editing windows** that is used to switch the focus from the **question** to the **answer** and vice versa

**switch to append** - option on the menu of **editing windows** that is used to switch from the editing mode to appending mode. This option, activated by F8, is useful when the browsing of a **database** is done simultaneously with appending new **items**

**switch to edit** - option on the menu of **append windows** that is used to switch from the appending mode to editing mode. This option, activated by F8, is useful when the appending of new **items** is done simultaneously with browsing the **database**

**time** - (in learning parameters) time used for repetitions in a given **session** (in hours, minutes and seconds)

**Toolkit** - a collection of programs used to process SuperMemo databases (e.g. conversion to text, sorting, transferring, merging, splitting, replacing fonts, replacing substrings, statistical analysis, recovery, resetting to the intact form, etc.). All DOS toolkit programs are duplicated on the **Tools** menu and can be run in Windows. See the manual or TOOLKIT.TXT for details on using the Toolkit

**top** - option on the **browser : move** menu that is used to move the current item to the beginning of the browsed sequence

**total** - (in learning parameters) number of **items** stored in the **database** (**total = memorized + intact**)

**TO\_TEXT.EXE** - one of the programs in **SuperMemo Toolkit** that is used to convert SuperMemo **databases** to ASCII text files (extension TXT). These files may later be edited, sorted, and/or converted back to SuperMemo **databases** by means of **Tools : Import text**

**trailing average** - average of a sequence of numbers defined as follows:

$$a(n) = s(n)*f+a(n-1)*(1-f)$$

where:

$a(n)$  - **trailing average** for an n-long sequence of number

$s(n)$  - n-th number in the sequence

$f$  - a fraction such that  $0 < f < 1$

**TRANSFER.EXE** - one of the programs in **SuperMemo Toolkit** that is used to transfer items between databases, merge databases, split databases, etc.

**troubleshooting** - process by which all sorts of software or hardware problems appearing during **SuperMemo** workouts are located and eliminated

**U-factor** - quotient of two successive **intervals** used in repetitions:

for  $n > 1$ : U-factor =  $I(n)/I(n-1)$

for  $n = 1$ : U-factor =  $I(1)$

where:

$I(n)$  -  $n$ -th interval used in between repetitions

Note that **(1)** despite similar interpretation, **U-factor** differs from **R** and **O-factors** in this sense that it expresses the used ratio of intervals while **R** and **O-factors** are intended to approximate the desired ratio of intervals, **(2)** if the **new interval** differs from the **optimal interval** then the **factor used** will differ from the **optimal factor**. Even if the **new interval** equals the **optimal interval**, the **factor used** may be higher than the **optimal factor** in case the **repetition[1]** has been delayed

**UF** - see **U-Factor**

**unclosed database** - **database** that has been **opened** and that has not been **saved**. At opening, such a **database** will produce the 'Unclosed database' error message. The main reason of leaving **databases** unclosed are media, hardware and power failures.

**used factor** - see **U-factor**

**view text files** - option on the **miscellaneous** menu which makes it possible to inspect text files distributed along SuperMemo software

**wave file** - file used to store sounds associated with a SuperMemo item. Wave files used in SuperMemo have the extensions YAA, YAB, YAC, YAD, etc.

**wipe** - option on the **miscellaneous** menu that is used to (1) postpone repeating the most **intractable items**, or  
(2) remove the most **intractable items** from the process

**wipe-reset** - see [wipe](#)[2]

**word-wrapping** - option in the **options** dialog which turns word-wrapping in the item editor on or off (databases developed with word-wrapping on are not compatible with SuperMemo 6 for DOS)

**workload** - (1) daily amount of time the learner has to spend with **SuperMemo** (2) (in learning parameters)  
approximation of **workload**[1]:

$$\text{workload} = (\text{mean time}) * \text{burden}[1]$$

**write options** - option in the **miscellaneous : options** dialog box that is used to save the **parameter set** on the disk

## **Programmable SuperMemo**

Programmable SuperMemo makes it possible to use all imaginable forms of knowledge representation and repetitions procedures in the process of learning. This makes it possible to use SuperMemo in procedural learning that includes motor tasks such as touch typing, playing musical instruments, drivers training, motor rehabilitation, etc. Programmable SuperMemo also widens the application of SuperMemo in guided problem solving that includes: all sorts of mathematical and algorithmic skills, intelligence tests, creativity tests, etc. The only limitation to the applicability of Programmable SuperMemo in any form of learning is the database authors imagination.

A programmed database must include a Windows compatible dynamic link library that implements the minimum set of the rehearsal procedures that will later be used by SuperMemo in the process of spacing repetitions. This means that the database author(s) must have the ability to write DLL modules in a programming language of choice.

In the simplest case, the database author will implement only the repetition procedure whose only obligatory output is the response grade. For example, to develop a database for learning musical notation, the author will have to implement a procedure that would test the student on his or her ability to write down MIDI tunes in a selected notation. This procedure placed in an appropriate DLL file will make Programmable SuperMemo supervise the entire learning process in a standard way, while the authors procedure would be responsible only for the act of repetition. The entire SuperMemo shell will retain its standard functions.

See also: [Using programmed databases](#) and [Principles of Programmable SuperMemo](#)

All programmers who wish to write programmed database will obtain full and free support from SuperMemo World with respect to the programmed database specification, possible implementation problems, as well as possible extensions to the presented release in cases where specific service for a particular database is needed. It is also possible to enroll in a beta-testing program on the development of new components of the present model.

With all your questions call SuperMemo World, Research and Development Department, tel. (48) 61 203157, 11 a.m. - 1 p.m. CET.

## Using programmed databases

Programmable SuperMemo databases can be used in exactly the same way as databases designed for the standard SuperMemo for Windows. Although writing programmed databases might not be easy, there is no inherent increase in the difficulty of learning per se. Indeed, it is up to the database programmer to make sure that the act of repetitions is simple and intuitive.

A standard session with a programmed database will basically differ only in this that repetitions may follow the course designed by the database author. For example, instead of reading the question, showing the answer and providing the grade, the learner may be asked to do the following:

- \* in a touch-typing database, type in the practised phrase as many times as the database program requires
- \* in a piano training database, play the passages displayed on the screen on the keyboard connected via a MIDI interface
- \* in a histopathology training database, click the diseased cells on the screen image
- \* in a vocal training database, sing a tone to the microphone upon being given a reference tone
- \* in a movie database, select the correct title of the movie presented in a video sequence, etc., etc.

The training procedure is entirely designed by the database programmer.

## Principles of Programmable SuperMemo

At opening a database, Programmable SuperMemo checks if a database DLL file is present and if it exports the minimum set of procedures needed to run a programmed repetition. If these procedures are present, Programmable SuperMemo sets a flag which makes it substitute original SuperMemo procedures for procedures defined in the DLL file. For example, instead of running a standard repetition course, SuperMemo calls the external procedure **repetition** which is defined in the DLL file. This procedure obtains a pointer to a structure with data that might be useful for the programmer to implement a programmed repetition. This structure includes among others: (1) number of the repeated item, (2) question and answer strings (that may be used for any purpose the programmer chooses, for example, storing internal text data needed in the learning process), (3) current interval of the item, its last repetition date, number of lapses, and other item parameters, (4) handle to the **Learn** window, (5) handle to the main menu of SuperMemo, (6) extensions of two external files associated with the item (these can be images, sound, MIDI files, video clips, and whatever the programmer opts to use), (7) grade that should be set on output, and many more. The only obligatory member of the repetition data structure that must be used is **grade**. This member must be set on output to communicate to SuperMemo the outcome of the repetition. All the computation needed to schedule the date of the next repetition is done by SuperMemo.

Apart from the procedure **Repetition**, programmed database may implement many other database-specific actions as database initialization (e.g. in order to modify the menu of Programmable SuperMemo), database uninitialization (e.g. to restore the original menu), item appending procedure, and many more.

In the future, depending on the suggestions and requests of database programmers, SuperMemo World will work on extending the set of programmable components of SuperMemo to give the programmer the maximum control over the appearance and behavior of the program working with a particular database. Future versions of Programmable SuperMemo will rely on Object Linking and Embedding paradigm; however, maximum possible compatibility with the present specification will be retained.

## Audiovisual file access mode

The audiovisual file access mode, determined by the setting of **Options : AudioVis files**, specifies the way in which sound and bitmap files of a given database are accessed. Usually, the author of a database will specify the correct audiovisual file access mode in the database INI file. However, if you decide, for example, to use a CD-ROM drive denoted by a different drive letter, you might wish to understand how to set up the correct audiovisual file access mode. The following four modes are available:

**Standard** - audiovisual files are located in the same directory as the database, and their association with particular items is determined by their extension. For example, item no 1 is associated with a bitmap file whose extension is AAA and with a sound file YAA, item no 2 is associated with files AAB and YAB, etc. Use this mode to create your own audiovisual databases that do not contain many audiovisual items

**Linked** - audiovisual files are imported from an external database that uses **Standard** mode of audiovisual file access. Item no 1 imports sounds and graphics from item no 1 in the external database, item no 2 imports from external item no 2, etc. Use this mode to link yourself to a ready database used by another learner. You will save disk space, but you will be unable to edit external sound and graphics. The path that follows **Linked** in the **AudioVis files** edit control, specifies the path and name of the external database

**CD-ROM** - audiovisual files are located on CD-ROM in a CD-ROM tree structure of directories (see Advanced English Audio on the CD-ROM release to inspect the tree directory structure recognized by SuperMemo). You can use BRANCH.EXE to convert audiovisual files from **Standard** to **CD-ROM** mode. Use this mode if you want to prepare a database for CD-ROM release (upon using BRANCH.EXE, you can always use **CD-ROM** access mode if you want to speed up access to sounds and images in a large database; even if it is located on your hard disk). The path that follows **CD-ROM** in the **AudioVis files** edit control, specifies the path to the CD-ROM tree directory structure recognized by SuperMemo

**CD-ROM Alias** - audiovisual files are located on CD-ROM in a CD-ROM tree structure of directories as in the **CD-ROM** file access mode, but they are accessed via pointers stored in a file with the extension PTR. The use of pointer makes it possible to freely link audiovisual files stored on CD-ROM with items in your database. For example, item no 1 might be associated with sound file located at the position 33121 in the CD-ROM tree structure of directories. This way, by using **CD-ROM Alias** mode, you can copy files of the Audio Lexicon associated with Advanced English Audio on CD-ROM, and create your own database that will use the sound phrases stored in the Audio Lexicon of Advanced English. Audio Lexicon files have the extensions \*.V??. After copying the lexicon files to your database (e.g. COPY AE.V?? MY\_DB.\*), use **Audio : Import from Lexicon** to associate sound files on CD-ROM to items in your database



