



## X-Figure Contents

**THIS IS AN UNLICENSED COPY OF X-FIGURE.**  
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## **X-Figure Version 1.60**

X-Figure puzzles are similar to crosswords, except that the clues refer to numbers rather than to words. Just answer the clues and fill in the grid. At the simplest level this requires only straightforward arithmetic. Harder puzzles, however, need some careful deduction to get them started.

The program creates each new puzzle from scratch and will almost certainly never generate the same one twice. There is always a possible solution, although in some cases there may be more than one.

X-Figure is shareware. Please distribute it as widely as possible, using the original .ZIP file to keep the component files together. If you use the program regularly then your registration will be greatly appreciated and will encourage the author to fix bugs and to add various improvements - possibly including any suggested by you. In addition, one or two features are only available when the program is registered.

This version of X-Figure had no known bugs at the time of release (mid 1996). If you discover any problems or have any useful suggestions then please let us know. Where possible and relevant, please save puzzles that give rise to bug reports.

X-Figure is distributed and supported by SP Services, who can be contacted via electronic mail as **sshipps@cix.compulink.co.uk** or on **CompuServe** as **100016,1625**.

The author is **Alan Saul**.

## Shareware Registration

For more details, and an order form, please see the document ORDER.WRI that should have accompanied this software (the file is in Windows Write format).

X-Figure is distributed as shareware. If you use it regularly then please register your appreciation and support future development by sending a cheque, payable to SP Services, for £10 to:

**SP Services**  
**PO Box 456**  
**Southampton**  
**SO17 1LP**  
**UK**

or telephone/fax (credit cards accepted):

Tel: (01703) 550037 [international +44 1703 550037]

Fax: (01703) 322416 [international +44 1703 322416]

Credit card instructions may also be sent by electronic mail to:

**sphipp@cix.compulink.co.uk** or on Compuserve to **100016,1625**. We accept Visa, Mastercard, American Express and all variants of these. Remember to include the credit card start and expiry dates.

When registering, please state the name that you want to appear in the 'About Box' and other screens. This should be up to 30 characters in length. The number you will be given will only work with these details.

### **US and Other Non-UK Users**

If you register using your credit card then we will debit your account in pounds sterling and the credit card company will do any necessary currency conversion. As a special incentive, there are no extra shipping costs for non-UK orders! If you really cannot avoid paying in a currency other than pounds sterling, please add the equivalent of £6 sterling to the price you send to cover part of our currency exchange costs.

### **What You Will Get**

You will be sent a certificate giving a registration code which will allow you to enter your personal details (specified with your order) into the program. Having done this all references to the fact that you hadn't previously paid for the software will disappear.

You will not normally be sent a disc. If, however, you enclose an additional £5 handling charge, you will be sent the latest version of X-Figure and other shareware programs (please state disc format).

When you receive the certificate, select the menu options *Help, About X-Figure* and then click on the *Register* button. Enter the details exactly as they appear on the certificate.

If you upgrade to a later version of X-Figure, simply copy the new files over the existing ones. Your registration details will remain intact.

See also **[Disclaimer and Agreement](#)**

## **Disclaimer and Agreement**

Users of X-Figure must accept this disclaimer of warranty. If you do not accept this disclaimer, do not use the program.

THE X-FIGURE PROGRAM IS SUPPLIED AS IS. THE AUTHOR DISCLAIMS ALL WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR ANY PURPOSE. THE AUTHOR ASSUMES NO LIABILITY FOR DAMAGES, DIRECT OR CONSEQUENTIAL, WHICH MAY RESULT FROM THE USE OF X-FIGURE, EVEN IF THE AUTHOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

THE LICENCE AGREEMENT AND WARRANTY SHALL BE CONSTRUED, INTERPRETED AND GOVERNED BY THE LAWS OF ENGLAND AND WALES. YOU MAY HAVE OTHER RIGHTS WHICH VARY FROM ONE STATE TO ANOTHER.

Copyright for this software remains the property of:

**Alan Saul**  
**Gloucestershire**  
**United Kingdom**

All contact should be made with SP Services in the first instance.

## Using the Mouse

Numbers can be entered with the mouse by using the on-screen number pad. If this is not visible then you can make it appear by selecting *Number Pad* from the *View* menu. If the pad obscures your view then you can move it by selecting the bar just above the numbers and dragging it around the screen. To alter the layout between the standard keypad shape and horizontal and vertical rows of buttons, click in this region with the right mouse button.

To enter a number in the grid select the appropriate square (by clicking on it with the left button), and then click on a digit on the number pad.

If a whole clue has been highlighted then the input focus will move to the next digit. However, if the selected square intersects with two clues, X-Figure may not know if you are answering the across clue or the down clue and will not move the focus.

There are a number of ways to indicate whether you want to enter numbers across or down...

- Click on one of the direction buttons or
- Click on the text of the clue, rather than in the grid.
- Select a square that only belongs to one clue - this will highlight the whole answer. If you now select another square in the same answer, that answer will stay selected.

See also: **Using the Keyboard**, **Entering Notes**, **Entering Guesses**, **Mouse Buttons**

## Mouse Buttons

In common with normal Windows practice most mouse actions within X-Figure use the left mouse button. Unless otherwise stated, references to 'clicking' mean that the left button should be used.

A few actions, however, are performed by clicking or pointing with the right mouse button...

- Entering notes from the Number Pad.
- Deleting notes or answers using the button on the Number Pad.
- Resizing the Number Pad, by right clicking in the drag region.
- Hiding clues that are no longer of interest, by clicking on the text of the clue with the right button. (To bring one of these clues back into view, select *Show Hidden Clues* from the *View* menu and right click on it again).

## Using the Keyboard

To enter a number in the grid, simply type it in the normal way. Depending on the status of **Notes Using Keypad** on the Edit menu, the keys to the side of the main keyboard may have a different effect from those in the top row.

The cursor keys can be used to select a different square.

If a whole clue has been highlighted then the input focus will move to the next digit as you type. However, if the selected square intersects with two clues, X-Figure may not know if you are answering the across clue or the down clue and will not move the focus.

In order to indicate in which direction you want to enter numbers...

- Use Ctrl + one of the direction keys.
- Select a square that only belongs to one clue. If you then select any square in the same clue, the whole clue will remain selected. This is easier to do than to explain - try it.

See also: **Using the Mouse**, **Entering Notes**, **Entering Guesses**



## Verifying Your Answers

There are two ways to verify what you have entered...

### Automatic Verification

Enable *Verify* on the *View* menu. Now, as you enter numbers in the grid, the text of any relevant clues will be highlighted and have ✓ or ✗ displayed alongside them. The default highlights are black for undecided, blue for correct, and red for incorrect.

Verify may be turned on or off at any time.

It is important to remember that a blue or ticked clue only indicates that you have satisfied that particular clue (e.g. entered a square number for the clue 'A perfect square'), not that you have given the correct answer. The number you have given may yet make the rest of the puzzle impossible to complete!

### Reveal

Enable *Reveal* on the *View* menu. This will show the known solution to the puzzle (it is possible for there to be more than one correct solution). Where you have already supplied the correct answer, the grid will be unchanged. Empty squares will have the answer shown.

If you have given an answer which disagrees with the known solution, then the correct number will be shown in red (unless you have changed this to something else) with your answer displayed in the top right corner of the square.

See also: [How Answers are Verified](#), [Change Screen Appearance](#)

An undecided answer is one which has not yet been filled in, or whose clue refers to another which has not yet been answered.

A correct answer is one which matches the clue - whether or not it fits in with solution to the complete puzzle. See **How Answers are Verified** for examples of `correct' answers that are actually incorrect.

An incorrect answer is one that fails to match the clue.

## Creating a New Puzzle

To create a new puzzle, either select *New Puzzle* from the *File* menu or make a selection from the *Puzzle* menu.

*New Puzzle* will create another puzzle of the same size and degree of difficulty as the current one. The **Puzzle Menu** allows you to alter these settings.

See also: **Seed Codes**

## Entering Notes

While solving a cryptic puzzle you will probably want to make notes as you work things out. These notes can be entered into squares in place of answers. When you then enter an answer, it will hide any notes.

Letters and punctuation characters can simply be typed in from the keyboard. Numbers can be entered in one of several ways...

- From the keyboard using Ctrl+Number
- From the keyboard using the separate numeric pad. *Notes Using Keypad* on the *Edit* menu will have to be enabled for this to work, and NumLock should be on.
- Using the right mouse button in the Number Pad.

See also: **Entering Guesses**

## Entering Guesses

If you want to try out a train of thought which may turn out to be incorrect, be wary of simply entering numbers into the grid as it is easy to lose track of which ones need to be removed if the original idea proved wrong. Instead, select **Enter Guesses** from the *Edit* Menu. Any numbers typed in now will appear in yellow.

Once you have decided whether or not the original guess was correct, select either **Upgrade Guesses** or **Remove Guesses**

It isn't a bad idea to have *Enter Guesses* selected all the time and to upgrade the guesses periodically - at times that you are sure that everything entered so far is correct.

## Changing the Screen Appearance

The *Appearance* option on the *View* menu displays a dialog allowing most of the screen attributes to be changed. Some of these (such as the background of the clue boxes) are tied to the settings given in the Windows control panel and cannot be altered from within X-Figure.

Select an item in the list box and the button corresponding to its current appearance will be depressed. To change it, click on the desired button.

Rather than have separate foreground and background settings for each item, backgrounds of the grid squares are items in themselves. It is quite possible to make the foreground and background of some things the same, thus rendering them invisible. It is up to you to avoid doing this (unless, of course, you particularly want to make something disappear).

This dialog also allows you to change the shape of the number pad, or to remove it from the screen entirely. Simply depress the appropriate button (the shape of the number pad can also be changed by clicking with the right mouse button in its drag region).



## How Answers are Verified

For the purposes of verifying your answers and highlighting clues, your answer is matched against the logic of the clue, **not** the known solution.

For example, consider the clues...

### Across

1. A perfect square (2 digits)
2. 1 across times two (2 digits)

Entering any of 01, 04, 09, 16, 25, 36, 49, 64 or 81 will result in 1 across being displayed as correct. In fact 01, 04 and 09 are not allowable, since answers never start with zero, and 64 and 81 are clearly impossible since the answer to 2 across would need to have three digits.

Whatever answer you give for 2 across, this will be shown as correct so long as it is twice your answer to 1 across. So if you enter **24** for 1 across and **48** for 2 across then X-Figure will regard 1 across as incorrect (24 is not a square), but 2 across as correct (48 is twice 24).

## Clue and Puzzle Types

Puzzles differ in a number of ways which may be seen by selecting *Custom* from the *Puzzle* menu. In addition to choosing the size of the grid, different categories of clues may be allowed or disallowed. The predefined puzzle types (simple, quick, cryptic and hard) are simply samples of those that you can define for yourself.

### Clue Categories

- **Conversion Factors**  
These provide an easy starting point to the puzzle since they can always be answered without looking at any other clues. E.g. *Inches in a foot.*
- **Cross References**  
These link two or more clues, so that the answer to one depends on the answer to another. E.g. *Two times 1 across.*
- **Miscellaneous**  
These are clues with more than one possible answer. The correct one will have to be determined from looking at other answers that depend on it. E.g. *A prime number.*

### Predefined Types

- **Simple**  
There will always be at least one clue that can be used to get you started.
- **Quick**  
Similar to simple puzzles, but the grid is larger and multiples of ten are avoided.
- **Cryptic**  
These do not have any conversion factor clues. Starting will require a little thought.
- **Hard**  
These select the toughest settings available.

See also: [Customising Puzzles](#), [Conversion Factors](#), [Seed Codes](#)

## Customise Level

Selecting *Custom* from the *Puzzle* menu gives you the opportunity to create puzzles of the type you prefer. Choose from the following...

### Clue Types

Check or uncheck the boxes to select the types of clue that may be used.

Provided that you allow X-Figure reasonable scope for generating puzzles then it will abide by your choices. If, however, you do not select enough clue types then some others may have to be used.

For example, if you choose only metric conversion factors then these will be generated along with clues of the type *1 across plus n* and possibly some others. On the other hand, a puzzle consisting entirely of anagrams is quite reasonable and, if you check just the anagrams box, that is what you will get.

Basically, the rules are that in the Conversion Factor and Number Type groups, clearing a check box means that this type of clue will definitely not appear. In the Cross Reference group it only makes it less likely. Checking a particular box is never a guarantee that the clue type **will** be used in any particular puzzle, only that it **may**.

### Grid Size

X-Figure has a number of pre-defined grid shapes of each size. Select the grid size you prefer.

### Times Tables

This setting is in indication of the multiplication tables that are likely to be used for clues such as *1 across times n*. It does not affect the choice of conversion factors. If *Hidden Multiples* is selected then the constant in multiples or divisions may not be given, resulting in clues such as *Multiple of 1 across*.

See also: [Conversion Factors](#)

## **Conversion Factors**

X-Figure knows about the following types of conversion factor...

### **Metric**

These are all multiples of ten, such as *mm* to the *cm*.

### **Non-Metric**

Measures such as inches to the yard. X-Figure knows about certain differences in the UK and the US (e.g. US hundredweight = 100lbs; UK hundredweight = 112lbs), and uses the international settings in the Control Panel to generate correct questions for the country your PC thinks it's in (at least for UK and US).

### **Time**

'Days in a week' etc.

### **Miscellaneous**

These are mostly alternative forms of numbers, such as *dozen*, rather than true conversion factors.

## Printing Options

Having selected either *Print* or *Print Preview* from the *File* Menu, you are asked to select how the printed puzzle should appear. You may choose to print the full puzzle, just the clues, or just the grid. If printing the grid then you can leave it empty, containing any answers that you have entered so far, or showing the full solution.

Where possible, the whole puzzle is fitted onto a single page. If it does not fit then try reducing the grid width or font sizes. If you want the grid and clues on different pages then print the two items separately.

### Title

If you specify a title then it will be printed at the top of the first page.

### Print

Select how much of the puzzle is to be printed...

*Empty Grid and Clues* The clues and grid, with nothing filled in.

*Filled Grid and Clues* The clues and grid, with anything you have entered shown.

*Empty Grid Only* No clues. Nothing is filled in the grid.

*Filled Grid Only* No clues. Anything you have entered so far is shown in the grid.

*Solution Only* No clues. The grid contains the correct answers. Clue numbers are not printed in the grid (this is similar to the way in which newspapers show crossword solutions).

*Clues Only* Just the clues.

### Grid Alignment

The grid may be aligned to the left, right, or centre of the page. If there is space, the clues will be placed alongside the grid.

### Grid Width

The width (and height) of the grid.

### Fonts

*Title* Used for the title, if given.

*Headers* 'Across' and 'Down'.

*Clues* The actual clues.

## **Menus**

**File Menu**

**Edit Menu**

**View Menu**

**Puzzle Menu**

## **The File Menu**

**New Puzzle**

**Retrieve...**

**Save**

**Save As...**

**Print...**

**Print Preview...**

**Print Setup...**

**Verify Solution...**

**Exit**

## **New Puzzle**

Generate a new puzzle from scratch, at the same level as the current one.



## **Retrieve**

Recover a puzzle that was saved earlier

## **Save**

Save the current puzzle, along with any answers or notes that you have entered. If you have not yet saved this puzzle, you will be prompted for a filename.

## **Save As...**

You will be asked to supply the name of a file, in which the current puzzle will be saved along with all answers or notes that you have entered.

## **Print...**

The puzzle will be sent to your printer. The **Print Options** dialog is displayed, allowing you to select various aspects of the presentation before the printing goes ahead. To see what the printed output will look like use *Print Preview...*

## **Print Preview...**

This allows you to choose and see how the puzzle will appear on paper, prior to selecting *Print...*

## **Print Setup...**

This allows you to select the printer and printer related settings, such as the paper size and orientation. The *Printer* button on the **Print Options** dialog provides the same options.

**Exit**

Exit the X-Figure program. Settings such as window position and appearance will be saved - the current puzzle will not.

## **The Edit Menu**

**Enter Guesses**

**Upgrade Guesses**

**Remove Guesses**

**Copy**

**Clipboard Settings...**

**Notes Using Keypad**



## **Enter Guesses**

With this menu option enabled, your answers will be shown differently from normal (usually in yellow) to indicate that they are currently guesses. These numbers can later be removed all one go or converted to firm answers.

## **Upgrade Guesses**

Convert all current guesses to firm answers.

## **Remove Guesses**

Delete all guesses from the grid.

## **Notes Using Keypad**

With this enabled, the separate numeric pad on your keyboard can be used to enter notes while the numbers on the top row of the keyboard enter answers. Note that NumLock must be on, otherwise the numeric keypad provides cursor movement.

## Clipboard Settings

When Copy is selected from the *Edit* menu, the grid and clues are copied to the clipboard.

Select the type of grid that you want to be copied...

- |                 |  |
|-----------------|--|
| <i>Empty</i>    | Just the grid.   |
| <i>Filled</i>   | Any answers that you have filled in so far (or the solution, if reveal has been selected).   |
| <i>Solution</i> | The full solution to the puzzle. This differs from the other grids in that the clue numbers do not appear (as is normal when printing the solution to a crossword puzzle). |

## **Clipboard Settings...**

This dialog allows you to specify what will be copied when *Copy* is selected from the *Edit* menu.

## **Copy**

Copy the puzzle to the clipboard, for pasting into other applications.

The grid and clues are copied, and must be pasted, as separate items. The clues are in simple text format, and can be pasted into any application that accepts data from the clipboard. The grid is copied as a picture (metafile) which is accepted by most word processors etc.

The type of grid that is copied is controlled by the *Clipboard Settings...* dialog. Options are an empty grid; a filled grid, which contains any answers that you have supplied; and the solution.

## **The View Menu**

**Verify & Reveal**

**Show Hidden Clues**

**Number Pad**

**Status Bar**

**Appearance...**



## **Show Hidden Clues**

When you are no longer interested in a particular clue, you may right click on the text to hide it. If this menu option is selected, however, hidden clues are displayed, but greyed out. This allows you to retrieve a hidden clue by clicking on it again with the right button.

## **Status Bar**

Use this to toggle the display of the status bar at the bottom of the screen.

## Hints

A good strategy, particularly for cryptic puzzles, is to look at each clue in turn and to enter notes in the grid about anything you can determine. Eventually notes from different clues will combine to yield the contents of a square.

- Make notes about anything you know, however trivial, such as that the last digit of a multiple of two is even.
- Answers never start with zero (this is more a rule than a hint).
- Multiples of five are often good clues to get you started.
- If the sum of two numbers or the difference between them is known, and also the last digit of one of the numbers, then the last digit of the other can be determined. For example; if 1 across is 2 down plus 16, and its answer is known to end in 3, then 2 down must end in 7.
- Where one number is a multiple of another, the number of digits in each number provides a useful clue. For example; if 40 times a two digit number gives three digits, then the two digit number must be less than 25 (i.e. it starts with 1 or 2), and the product is at least 400.
- X-Figure never creates an impossible puzzle. Honest!

See also: **Tables of Squares** and **Cubes, Entering Guesses.**

## One to Four Digit Cubes

	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9
<b>0</b>	0	1	8	27	64	125	216	343	512	729
<b>10</b>	1000	1331	1728	2197	2744	3375	4096	4913	5832	6859
<b>20</b>	8000	9261								

See also: [One to Four Digit Squares](#)

## One to Four Digit Squares

	<b>-0</b>	<b>-1</b>	<b>-2</b>	<b>-3</b>	<b>-4</b>	<b>-5</b>	<b>-6</b>	<b>-7</b>	<b>-8</b>	<b>-9</b>
<b>0</b>	0	1	4	9	16	25	36	49	64	81
<b>10</b>	100	121	144	169	196	225	256	289	324	361
<b>20</b>	400	441	484	529	576	625	676	729	784	841
<b>30</b>	900	961	1024	1089	1156	1225	1296	1369	1444	1521
<b>40</b>	1600	1681	1764	1849	1936	2025	2116	2209	2304	2401
<b>50</b>	2500	2601	2704	2809	2916	3025	3136	3249	3364	3481
<b>60</b>	3600	3721	3844	3969	4096	4225	4356	4489	4624	4761
<b>70</b>	4900	5041	5184	5329	5476	5625	5776	5929	6084	6241
<b>80</b>	6400	6561	6724	6889	7056	7225	7396	7569	7744	7921
<b>90</b>	8100	8281	8464	8649	8836	9025	9216	9409	9604	9801

See also: [One to Four Digit Cubes](#)

## Seed Codes

*Seed Codes* are used to completely identify a given puzzle so that any number of people can work on their own copy without having to distribute a file.

For example, a X-Figure puzzle may be printed in a magazine along with its *Seed Code*. Readers with a copy of X-Figure can type in this code to re-create the puzzle and allow them to solve it on-screen. The reveal function is disabled in order to prevent cheating.

### To Generate a Puzzle From a Seed Code

- Select *Seed Code* from the *Puzzle* menu.
- Type the code into the *Existing Puzzle* field (you may ignore dashes and spaces and type in upper or lower case).
- Click on the *Re-create* button.

### To Create New Puzzles Complete With Seed Codes

- Select *Seed Code* from the *Puzzle* menu and click on the *New* button (this automatically sets *Generate Codes*). Repeat until you have a puzzle you like.
- Save the puzzle using the *File* menu. Select *Seed Code* again and note the *Current Code*. Do not re-create the puzzle from the code until you have saved it, or you will not be able to *Reveal* the solution.
- All new puzzles created while *Generate Codes* is checked (the *Seed Codes* menu option will also be checked to reflect this) will have a seed code.

Normally X-Figure injects a high degree of randomness into each new puzzle, ensuring that no two are ever likely to be the same. A drawback of seed generated puzzles is that, since the codes are limited in length, there must be a limited number of different puzzles available (a large number - but finite). A compromise is therefore necessary between randomness and the length of the code. Because of this codes are only generated if you specify that you want them. If you do not need seed codes then, for the maximum variety of puzzles, uncheck *Generate Codes* in the *Seed Codes* dialog and click on *Close*.

See also: **[Creating Proof of Completion Codes](#), [Verifying Completion Codes](#).**

## **Creating Proof of Completion Codes**

If a puzzle has been generated from a seed code (such as one published in a magazine), then when it has been successfully completed a *Completion Code* will be generated. This code may be accepted by the competition organisers as proof that the puzzle has been completed. The code is a 10 or so digit number which should be easier to send in than a printed solution and is also easier to verify.

The *Completion Code* dialog is only displayed when the last digit of the puzzle is correctly entered (and for puzzles that were generated from a seed code). If you have already completed the puzzle and wish to redisplay the dialog, simply re-enter any digit in the grid and it will pop up.

### **Name or E-mail Address**

Each *Completion Code* is unique both to the puzzle and to the person that completed it, so it is not possible simply to find out someone else's code and submit that as your answer. You may use any text to identify yourself and 'brand' your code, but your name or E-mail address is recommended. Remember that if you do not submit this text to the organisers exactly as you entered it when generating the code, then they will not validate your entry.

### **Completion Code**

Once you have entered your name details, click on the *Check* button to reveal your code.

If you want to paste the code into a letter or e-mail message, click on *Copy to Clipboard* and then paste the details into your application. The name and number will be embedded inside brackets; leave them that way - especially if sending your code by e-mail - since the organisers may be using automated tools which rely on this formatting to check the entries.

## Verify Completion Codes Dialog

If a puzzle has been solved from a seed code, then the solver will have been given the option to create a *Completion Code* and optionally copy it into another application via the clipboard. If it was copied in this way then the name and code will be embedded inside angle brackets, for example...

<<NAME:John Smith>>

<<CODE:1234567890>>

Extract the name and number from the delimiters before entering them into this dialog.

### Seed Code

Enter the seed code that was generated when the puzzle was originally created,

### Name

The *Completion Code* must have been submitted along with some identification pertaining to the person who completed the puzzle. Enter this exactly as supplied.

### Completion Code

This should be a number of up to 10 digits.

### Check

Click on this button to see if the code indicates that the puzzle was solved. A status of **CORRECT** or **INCORRECT** will be displayed.



## **Verifying Completion Codes**

If you have published a puzzle as a competition, for example, and included a seed code for entrants to solve it on their PCs, then they can submit their answers in the form of a *Completion Code*. This can only be generated when the puzzle has been answered fully and correctly, and allows you to verify entrants more readily than checking printed solutions.

Each *Completion Code* is uniquely generated based on the seed code and a short piece of text supplied by the person completing the puzzle - usually their name. To check a submitted solution use the *Verify Solution* option on the *File* menu (this is only available in registered copies of X-Figure).

See also: **[Creating Proof of Completion Codes](#)**

