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## **Students Learn More with Computer-Supported Homework**

**Ravi Singh, Muhammad B. Saleem, Prabodha R. Pradhan, Cristina Heffernan, Neil T. Heffernan, Leena Razzaq, Matthew D. Dailey, Cristine O'Connor, and Courtney Mulcahy**

**Computer Science  
Technical Report  
Series**



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**WORCESTER POLYTECHNIC INSTITUTE**

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Computer Science Department

100 Institute Road, Worcester, Massachusetts 01609-2280

**This technical report is meant to be an archival quality repository for the measures used in an experiment. A full journal article is being submitted, but we want other researchers to have access to these measures. Journals often don't have space to print all such measures.**

**The abstract and the appendix follow.**

## **Students Learn More with Computer-Supported Homework**

**Ravi Singh** (raviksingh@wpi.edu)

Worcester Polytechnic Institute, Department of Computer Science  
100 Institute Road, Worcester, MA 01609 USA

**Muhammad B. Saleem** (msaleem@wpi.edu)

Worcester Polytechnic Institute, Department of Computer Science  
100 Institute Road, Worcester, MA 01609 USA

**Prabodha R. Pradhan** (prpradhan@wpi.edu)

Worcester Polytechnic Institute, Department of Computer Science  
100 Institute Road, Worcester, MA 01609 USA

**Cristina Heffernan** (ch@wpi.edu)

Worcester Polytechnic Institute, Department of Computer Science  
100 Institute Road, Worcester, MA 01609 USA

**Neil T. Heffernan** (nth@wpi.edu)

Worcester Polytechnic Institute, Department of Computer Science  
100 Institute Road, Worcester, MA 01609 USA

**Leena Razzaq** (lrazzaq@gmail.com)

University of Massachusetts, Department of Computer Science  
140 Governors Drive, Amherst, MA 01003 USA

**Matthew D. Dailey** (mdailey@wpi.edu)

Worcester Polytechnic Institute, Department of Computer Science  
100 Institute Road, Worcester, MA 01609 USA

**Cristine O'Connor** (COConnor@shrewsbury.k12.ma.us)

Teacher Oak Middle School, 45 Oak Street, Shrewsbury, MA 01545 USA

**Courtney Mulcahy** (CMulcahy@shrewsbury.k12.ma.us)

Teacher Oak Middle School, 45 Oak Street, Shrewsbury, MA 01545 USA

## Abstract

Prior work has shown that computer supported homework can lead to more learning over traditional paper-and-pencil homework. This paper examines various factors such as, immediate feedback and tutoring, for causing learning. The primary study about learning from homework involved the comparison between instant-feedback with tutoring versus a control condition where students got feedback the next school day in math class. Eight grade students were assigned homework from these two conditions. The computer supported web-based homework provided instant feedback in terms of step-by-step scaffolding to solve a problem. After analyzing the students who participated in both conditions, it was found that students learned significantly more (effect size of 0.40) with computer supported homework. The difference was reliable. This result has enormous practical significance as it suggests an effective improvement over the widely used paper-and-pencil homework assignment method. We followed this main result with a second set of studies that tried to pull apart and better understand this result: is it more because of the better timeliness of computer homework, or is it more about getting high quality explanation?

Note: if you would like to access problems as seen by students, you may create a teacher's account at [www.assistment.org](http://www.assistment.org) and preview problems sets with the following ID numbers: 10794, 9540, 9598, 9599, 9539 and 10198.

## Appendix A: Problems used in Experiment 1

### First Round Pretest and Posttest forms

#### Form A

NAME \_\_\_\_\_ CLASS \_\_\_\_\_

DATE \_\_\_\_\_

Practice Problems. Do your best!

Work on a separate sheet of paper, label each question with the number provided. Turn both sheets in. **You do not need to show all your work just keep what work you do organized.**

Put your answer in the box under each problem.

#### 91318 a

A laboratory has a 160-gram sample of a radioactive material. The half-life of the material is 25 days. (This means that it takes 25 days for half of the initial mass to decay.) The formula below can be used to find  $m$ , the remaining mass in grams, in terms of  $t$ , the number of 25 day intervals the mass has been decaying.

$$m = 160(0.5)^t$$

Based on the formula, what is the mass of the laboratory's sample remaining after 75 days?

Answer:

#### 15142 a

Samantha usually drives the 900 miles from Boston, Massachusetts to Pittsburgh, Pennsylvania in 18 hours. If she increases her average speed by 10 miles per hour, how much time will the trip take?

Answer:

**14524 a**

Both of the rental car companies Sam can use on his business trips charge a fixed daily fee, plus an additional charge for each mile the car is driven. The two companies' charges are shown in the cart below.

## Rental Car Charges

Company	Fixed Daily Fee	Charge Per Mile
Paragon	\$22	\$0.25
Atlas	\$20	\$0.30

On a one-day rental, for what number of miles driven would Sam be charged the same total amount by either of the two companies?

Answer:

**27590 a**

Patricia plans to ride her bicycle a mean of 45 miles per week. During the last five weeks she has recorded distances of 60, 35, 32, 45 and 52 miles.

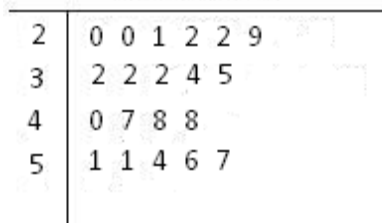
How many miles must Patricia ride this week to obtain a 6-week mean of 45 miles?

Answer:

**25793 a**

The stem-and-leaf plot below shows the prices, rounded to the nearest dollar, of 20 sweaters sold in the women's department at a store.

**Sweater Prices**  
(in dollars)



**Key**

2 | 3 represents 23

What percent of the sweater prices are less than 33 dollars?

Answer:

**15839 a**

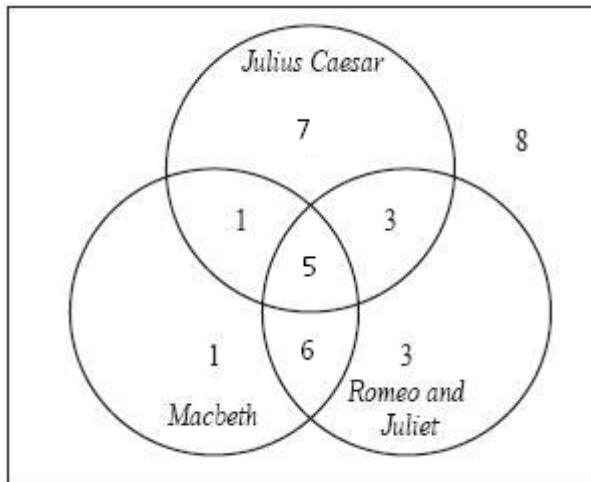
Write an equation of the line with slope -3 that passes through the point (-2, 5).

Write your equation in the form  $y =$  \_\_\_\_\_

Answer:

**64289 a**

Julia surveyed her friends to see which of Shakespeare's plays they had read during the school year. Her results are shown in the Venn diagram below:



How many of Sarah's friends read Macbeth but not Julius Caesar?

Answer:

**73671 a**

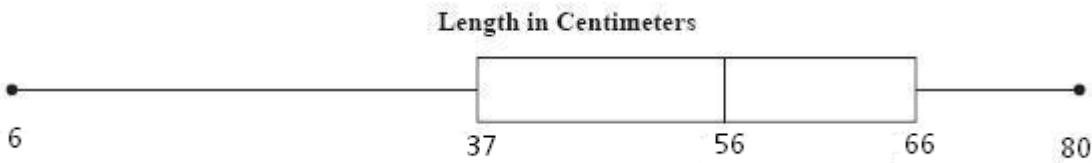
What is the y-intercept of the line represented by the equation below?

$$3x + 8y = -24$$

Answer:

**62836 a**

The box-and-whisker plot shown below represents the approximate length (in centimeters) of fish caught by a certain fisherman.



What is the range of the data?

Answer:

**70255 a**

Mr. Smith plans to build a fence along the back of his property. At a home improvement store, he saw the table below listing the least number of fence posts he will need for different fence lengths. According to the linear pattern in the table, what is the least number of fence posts Mr. Smith will need to build a fence that is 58 feet long?

Fence Length	Least number of fence posts needed
30	7
40	12
50	17
60	22

Answer:



**Form B**

NAME \_\_\_\_\_ CLASS \_\_\_\_\_

DATE \_\_\_\_\_

Practice Problems. Do your best!

Work on a separate sheet of paper, label each question with the number provided. Turn both sheets in.  
**You do not need to show all your work just keep what work you do organized.**

Put your answer in the box under each problem.

**91318 a**

A laboratory has a 160-gram sample of a radioactive material. The half-life of the material is 25 days. (This means that it takes 25 days for half of the initial mass to decay.) The formula below can be used to find  $m$ , the remaining mass in grams, in terms of  $t$ , the number of 25 day intervals the mass has been decaying.

$$m = 160(0.5)^t$$

Based on the formula, what is the mass of the laboratory's sample remaining after 75 days?

Answer:

**15142 a**

Samantha usually drives the 900 miles from Boston, Massachusetts to Pittsburgh, Pennsylvania in 18 hours. If she increases her average speed by 10 miles per hour, how much time will the trip take?

Answer:

**14524 a**

Both of the rental car companies Sam can use on his business trips charge a fixed daily fee, plus an additional charge for each mile the car is driven. The two companies' charges are shown in the cart below.

## Rental Car Charges

Company	Fixed Daily Fee	Charge Per Mile
Paragon	\$22	\$0.25
Atlas	\$20	\$0.30

On a one-day rental, for what number of miles driven would Sam be charged the same total amount by either of the two companies?

Answer:

**27590 a**

Patricia plans to ride her bicycle a mean of 45 miles per week. During the last five weeks she has recorded distances of 60, 35, 32, 45 and 52 miles.

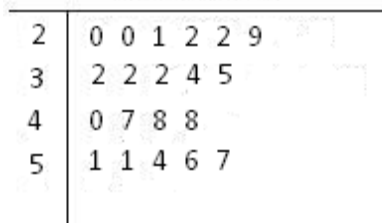
How many miles must Patricia ride this week to obtain a 6-week mean of 45 miles?

Answer:

**25793 a**

The stem-and-leaf plot below shows the prices, rounded to the nearest dollar, of 20 sweaters sold in the women's department at a store.

**Sweater Prices**  
(in dollars)



**Key**

2 | 3 represents 23

What percent of the sweater prices are less than 33 dollars?

Answer:

**15839 a**

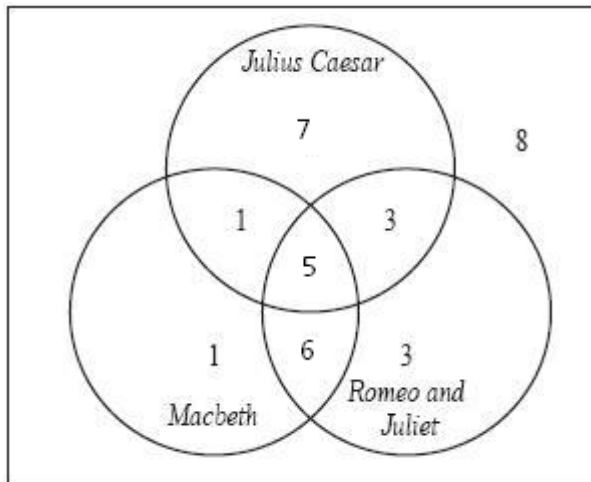
Write an equation of the line with slope -3 that passes through the point (-2, 5).

Write your equation in the form  $y =$  \_\_\_\_\_

Answer:

**64289 a**

Julia surveyed her friends to see which of Shakespeare's plays they had read during the school year. Her results are shown in the Venn diagram below:



How many of Sarah's friends read Macbeth but not Julius Caesar?

Answer:

**73671 a**

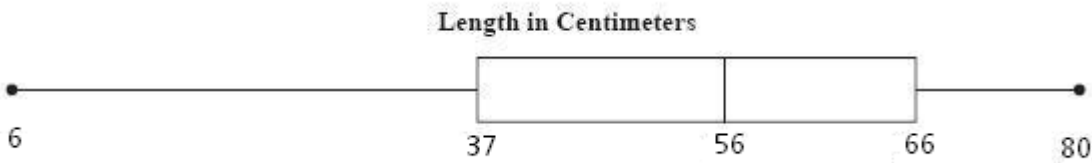
What is the y-intercept of the line represented by the equation below?

$$3x + 8y = -24$$

Answer:

**62836 a**

The box-and-whisker plot shown below represents the approximate length (in centimeters) of fish caught by a certain fisherman.



What is the range of the data?

Answer:

**70255 a**

Mr. Smith plans to build a fence along the back of his property. At a home improvement store, he saw the table below listing the least number of fence posts he will need for different fence lengths. According to the linear pattern in the table, what is the least number of fence posts Mr. Smith will need to build a fence that is 58 feet long?

Fence Length	Least number of fence posts needed
30	7
40	12
50	17
60	22

Answer:

## Second Round Pretest and Posttest forms

### Form A

NAME \_\_\_\_\_ CLASS \_\_\_\_\_

DATE \_\_\_\_\_

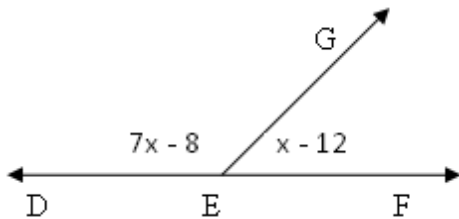
Practice Problems. Do your best!

Work on a separate sheet of paper, label each question with the number provided. Turn both sheets in. **You do not need to show all your work just keep what work you do organized.**

Put your answer in the box under each problem.

**91834 a**

Find the measure of angle DEG.



Answer:

**64470 a**

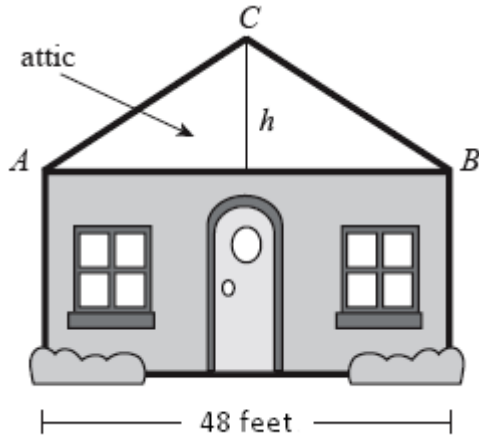
The lengths of three sides of a triangle are in the ratio of 3:4:5 and the perimeter of the triangle is 36 inches.

What is the length of the longest side of the triangle.

Answer:

12969 a

The figure below shows a house with an attic, represented by triangle  $ABC$  with  $AC=BC$ . The distance from  $A$  to  $B$  is 48 feet. The slope (commonly referred to as the pitch) of the roof is  $5/6$ . How many feet tall is the height,  $h$ , of the attic?



Answer:

75010 a

The chart below separates the number of students majoring in math/science from students pursuing other majors at a state college:

	Freshmen	Sophomores	Juniors	Seniors
Math/Science Majors	300	203	175	72
Other Majors	1290	1510	750	500

What percent of math/science majors are freshmen?

Answer:

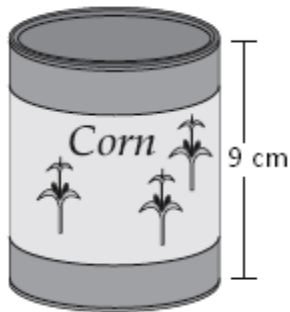
**1818 a**

The can of corn shown below is a right circular cylinder with a height of 9 cm.

The volume of the can is 426 centimeters.

What is the approximate radius of the can of corn in centimeters?

Round your answer to the nearest tenth and use 3.14 for Pi.



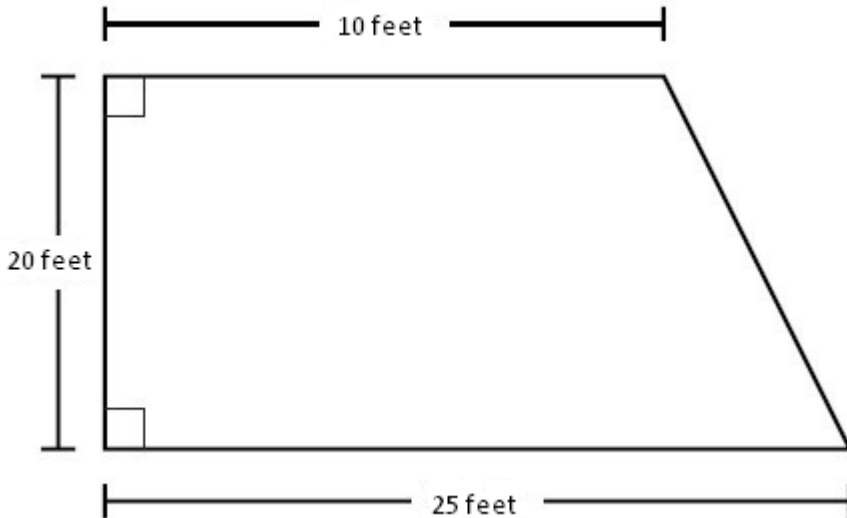
$$V \text{ of a cylinder} = \pi r^2 h$$

Answer:



63586 a

The figure below shows the dimensions of the floor of a room that Jack wants to carpet in his basement. What is the area of the floor?

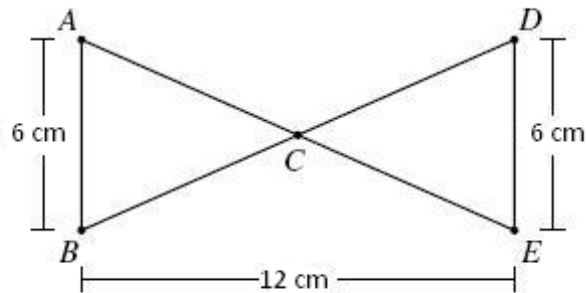


(Picture is not to scale)

Answer:

14039 a

In the figure below,  $\overline{AB}$  is parallel to  $\overline{DE}$ , and  $\overline{AE}$  intersects  $\overline{BD}$  at point  $C$ .



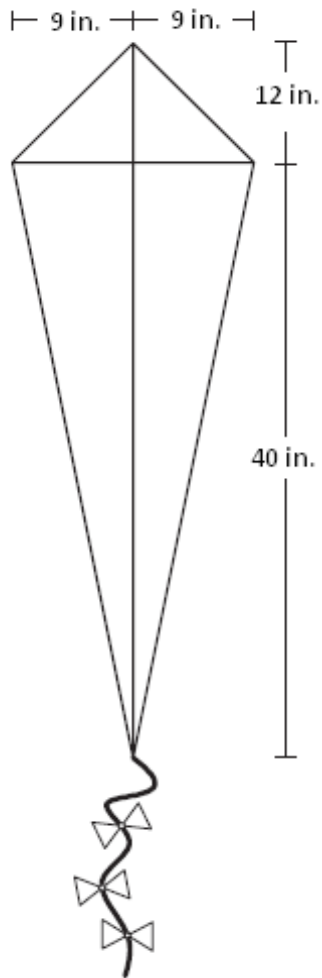
What is the sum, in square centimeters, of the area of triangle  $ABC$  and triangle  $EDC$ ?

Answer:

57374 a

A kite has perpendicular diagonals with the measures shown in the drawing below.

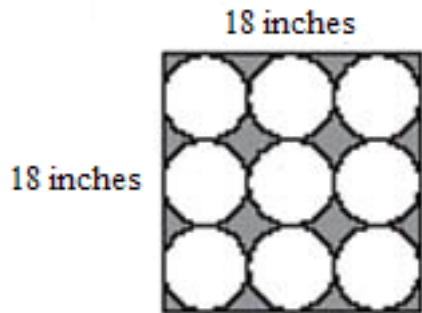
What is the perimeter, in inches of the kite?



Answer:

1301 a

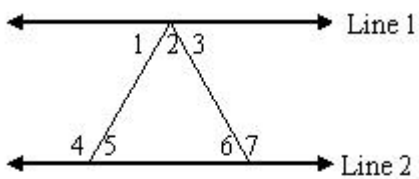
What is the area of the shaded part of this figure? Assume  $\pi = 3.14$ .



Answer:

91833 a

If line 1 is parallel to line 2, and angle 1 = 45, angle 2 = 60, what is the measure of angle 6?



(Picture not to scale)

Answer:

**Form B**

NAME \_\_\_\_\_ CLASS \_\_\_\_\_

DATE \_\_\_\_\_

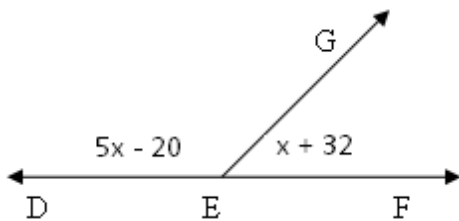
Practice Problems. Do your best!

Work on a separate sheet of paper, label each question with the number provided. Turn both sheets in.  
**You do not need to show all your work just keep what work you do organized.**

Put your answer in the box under each problem.

**91834 b**

Find the measure of angle DEG.



Answer:

**64470 b**

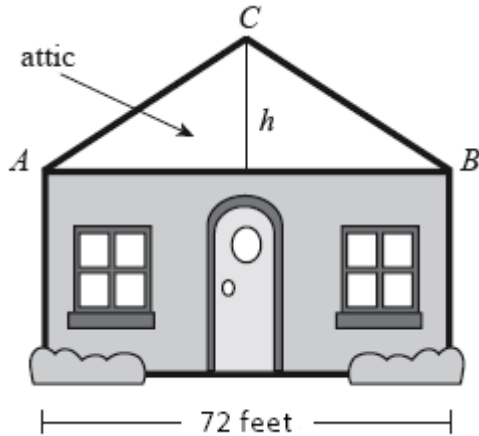
The lengths of three sides of a triangle are in the ratio of 3:4:5 and the perimeter of the triangle is 60 inches.

What is the length of the longest side of the triangle.

Answer:

12969 a

The figure below shows a house with an attic, represented by triangle  $ABC$  with  $AC=BC$ . The distance from  $A$  to  $B$  is 72 feet. The slope (commonly referred to as the pitch) of the roof is  $\frac{3}{4}$ . How many feet tall is the height,  $h$ , of the attic?



Answer:

75010 b

The cart below separates the number of students majoring in math/science from students pursuing other majors at a state college:

	Freshmen	Sophomores	Juniors	Seniors
Math/Science Majors	140	160	226	274
Other Majors	1400	1520	1705	1800

What percent of math/science majors are sophomores?

Answer:

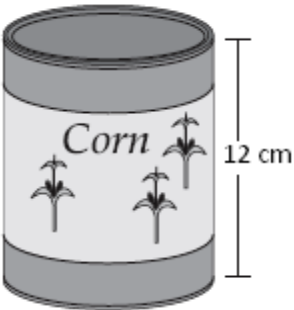
**91818 b**

The can of corn shown below is a right circular cylinder with a height of 12 cm.

The volume of the can is 531 centimeters.

What is the approximate radius of the can of corn in centimeters?

Round your answer to the nearest tenth and use 3.14 for Pi.

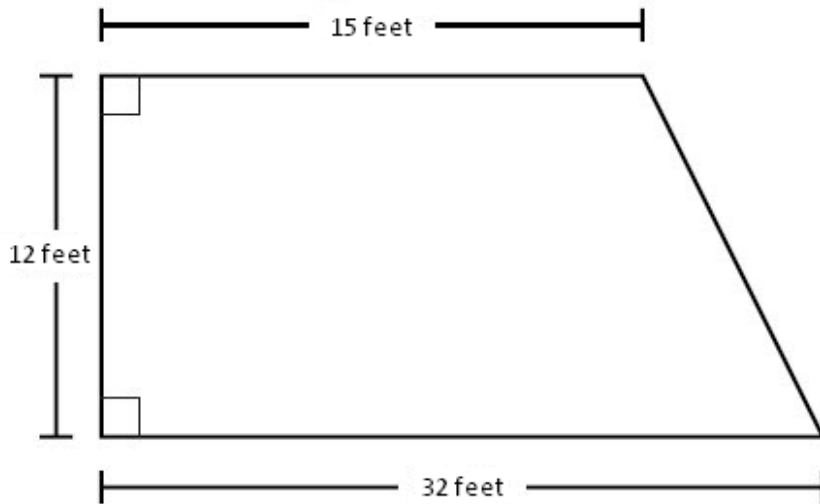


$$V \text{ of a cylinder} = \pi r^2 h$$

Answer:

63586 b

The figure below shows the dimensions of the floor of a room that Paul wants to carpet in his basement. What is the area of the floor?

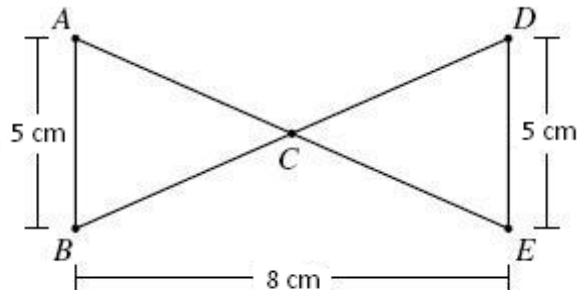


(Picture is not to scale)

Answer:

14039 b

In the figure below,  $\overline{AB}$  is parallel to  $\overline{DE}$ , and  $\overline{AE}$  intersects  $\overline{BD}$  at point  $C$ .



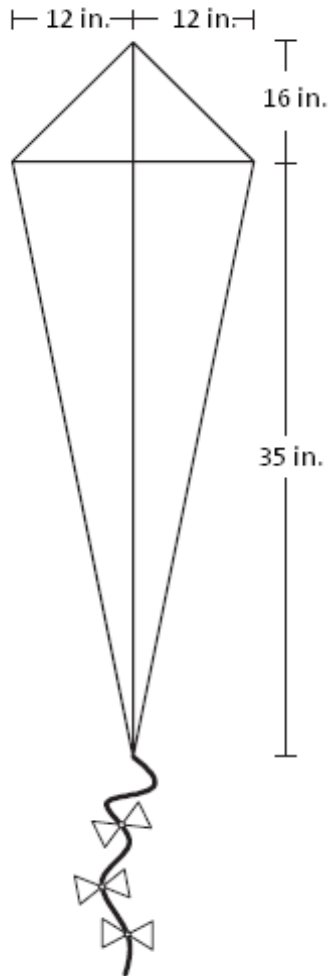
What is the sum, in square centimeters, of the area of triangle  $ABC$  and triangle  $EDC$ ?

Answer:

57374 b

A kite has perpendicular diagonals with the measures shown in the drawing below.

What is the perimeter, in inches of the kite?

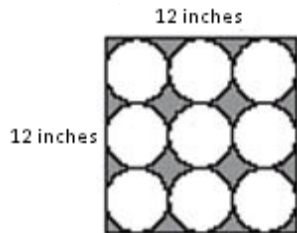


Answer:



1301 b

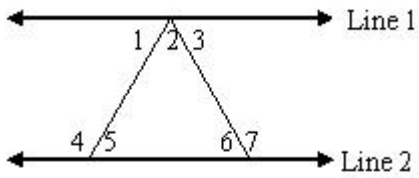
What is the area of the shaded part of this figure? Assume  $\pi = 3.14$ .



Answer:

91833 b

If line 1 is parallel to line 2, and angle 1 = 42, angle 2 = 53, what is the measure of angle 6?



(Picture not to scale)

Answer:

## First Homework Assignment

1) Assistentment #91318 "91318 - November 2005 re-test, Grade 10, Algebra, Item 35 (2006/09/26 15:09:35)"

A laboratory has a 75-gram sample of a radioactive material. The half-life of the material is 10 days. (This means that it takes 10 days for half of the initial mass to decay.) The formula below can be used to find  $m$ , the remaining mass in grams, in terms of  $t$ , the number of 10 day intervals the mass has been decaying.

$$m = 75(0.5)^t$$

Based on the formula, what is the mass of the laboratory's sample remaining after 30 days?

---

2) Assistentment #14524 "14524 - November\_2004\_40\_10"

Both of the rental car companies Myra can use on her business trips charge a fixed daily fee, plus an additional charge for each mile the car is driven. The two companies' charges are shown in the chart below.

### Rental Car Charges

Company	Fixed Daily Fee	Charge per Mile
Paragon	\$35	\$0.14
Atlas	\$34	\$0.16

On a one-day rental, for what number of miles driven would Myra be charged the same total amount by either of the two companies?

---

3) Assistentment #15142 "15142 - Fall 2001 retest gr. 10 no. 34"

Yuon Mee usually drives the 600 miles from Boston, Massachusetts to Pittsburgh, Pennsylvania in 12 hours. If she increases her average speed by 10 miles per hour, how much time will the trip take?

---

4) Assistentment #27590 "27590 - Spring\_2004\_18\_10"

Latrice plans to ride her bicycle a mean of 80 miles per week. During the last four weeks she has recorded distances of 76, 80, 82, and 74 miles.

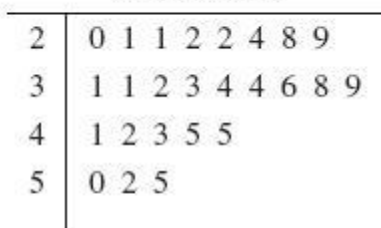
How many miles must Latrice ride this week to obtain a 5-week mean of 80 miles?

---

5) Assistentment #25793 "25793 - 2006\_Spring\_25\_gr10"

The stem-and-leaf plot below shows the prices, rounded to the nearest dollar, of 25 sweaters sold in the women's department at a store.

**Sweater Prices**  
(in dollars)



<b>Key</b>
2   3 represents 23

What percent of the sweater prices are less than 40 dollars?

---

6) Assistentment #15839 "15839 - November\_2004\_3\_10(non-multiple choice)"

Write an equation of the line with slope 2 that passes through the point (-1, -4).

Write your equation in the form  $y =$  \_\_\_\_\_

---

7) Assistentment #70255 "70255 - march\_2006\_12\_10(non-multiple choice)"

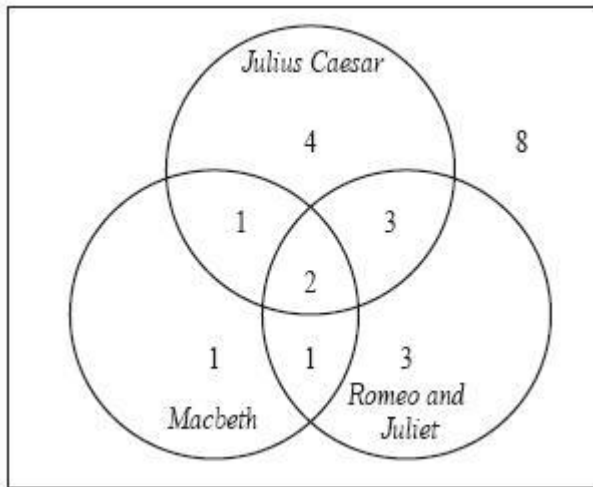
Mr. Johnson plans to build a fence along the back of his property. At a home improvement

store, he saw the table below listing the least number of fence posts he will need for different fence lengths. According to the linear pattern in the table, what is the least number of fence posts Mr. Johnson will need to build a fence that is 80 feet long?

Fence Length (in feet)	Least Number of Fence Posts Needed
50	6
100	11
150	16
200	21

8) Assisment #64289 "64289 - 2001\_fall\_3\_10(non-multiple choice)"

Sarah surveyed her friends to see which of Shakespeare's plays they had read during the school year. Her results are shown in the Venn diagram below:



How many of Sarah's friends read *Julius Caesar* but **not** *Romeo and Juliet*?

9) Assisment #73671 "73671 - March\_2005\_25\_10(non-multiple choice)"

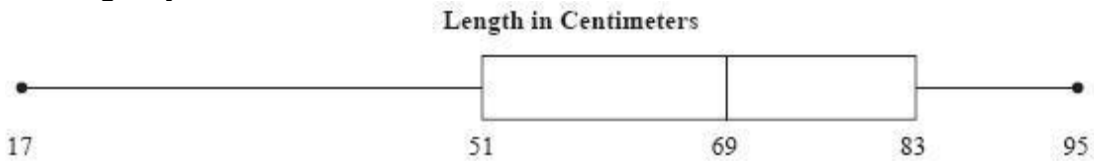
What is the y-intercept of the line represented by the equation below?

$$4x - 3y = 12$$

---

10) Assistent #62836 "62836 - fall\_2002\_30\_10(non\_multiple choice)"

The box-and-whisker plot shown below represents the approximate length (in centimeters) of fish caught by a certain fisherman



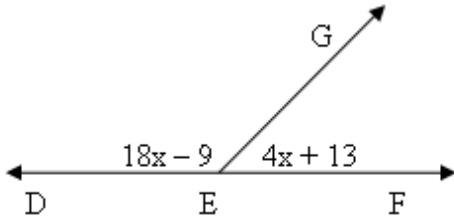
What is the **range** of the data?

## Second Day Homework

Problem Set "Day 2 Practice Set. Oak Middle School v2" id:[10794]

1) Assistentment #91834 "91834 - Review Set 10-7(Supplementary\_Algebra)"

Find the measure of angle DEG.



---

2) Assistentment #64470 "64470 - 1998.20.10.geo.s"

The lengths of three sides of a triangle are in the ratio of 3:4:5 and the perimeter of the triangle is 48 inches.

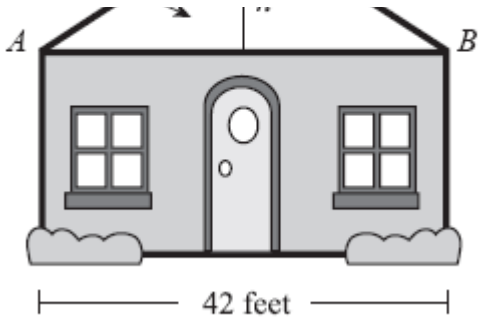
What is the length of the **longest** side of the triangle.

---

3) Assistentment #12969 "12969 - 2002\_3\_gr10\_scaffold"

The figure below shows a house with an attic, represented by triangle ABC with  $AC=BC$ . The distance from A to B is 42 feet. The slope (commonly referred to as the pitch) of the roof is  $\frac{2}{3}$ .

How many feet tall is the height,  $h$ , of the attic?




4) Assistentment #75010 "75010 - 05\_March\_37\_10(non-multiple choice)"

The chart below separates the number of students majoring in math/science from students pursuing other majors at a state college:

**Students' Majors by Class**

	Freshmen	Sophomores	Juniors	Seniors
<b>Math/Science Majors</b>	260	310	200	330
<b>Other Majors</b>	1390	1510	1450	1550

What percent of math/science majors are seniors?

5) Assistentment #91818 "91818 - 2002\_33\_gr10\_scaffold (2006/09/17 20:46:37)"

The can of corn shown below is a right circular cylinder with a height of 11 cm.

The volume of the can is 486 cubic centimeters.

What is the approximate radius of the can of corn in centimeters?

**Round your answer to the nearest tenth and use 3.14 for pi.**



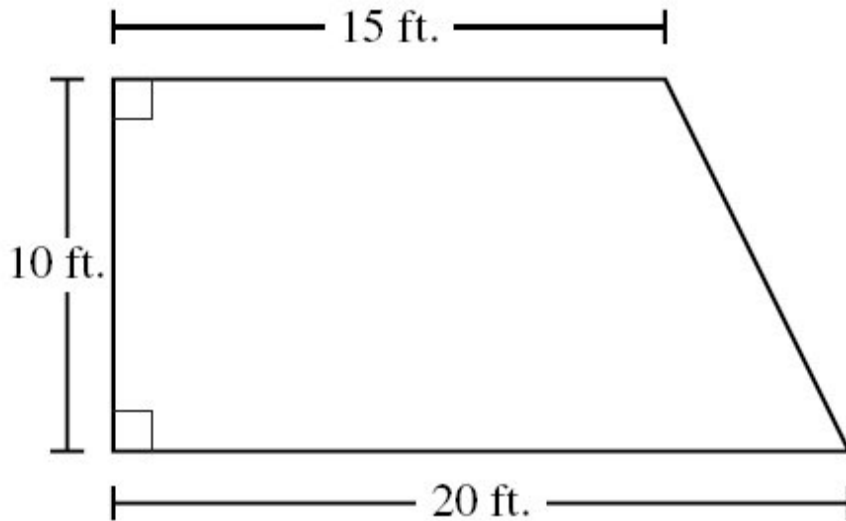
V of a cylinder =  $\pi r^2 h$

---

6) Assistentment #63586 "63586 - 2006Nov\_30\_gr10\_calc"

The figure above shows the dimensions of the floor of a room that Enrico wants to carpet in his basement.

What is the area of the floor?



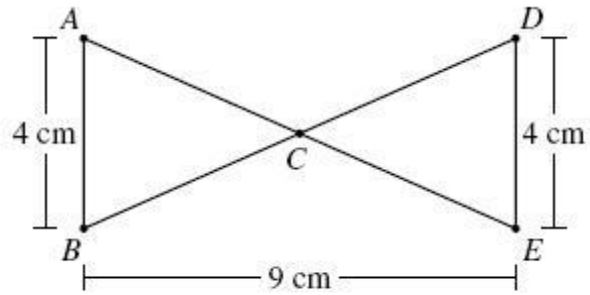
(Picture is not to scale)

---

7) Assistentment #14039 "14039 - march2006-19CT"



In the figure below,  $\overline{AB}$  is parallel to  $\overline{DE}$ , and  $\overline{AE}$  intersects  $\overline{BD}$  at point  $C$ .



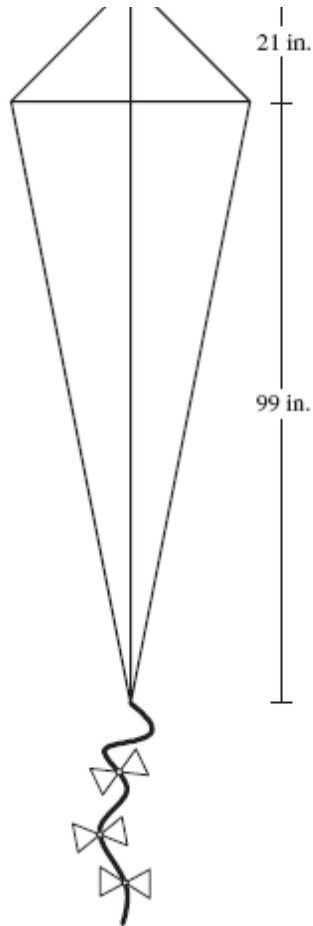
What is the sum, in square centimeters, of the area of triangle ABC and triangle EDC?

---

8) Assistentment #57374 "57374 - Spring\_2005\_32\_10(non-multiple choice)"

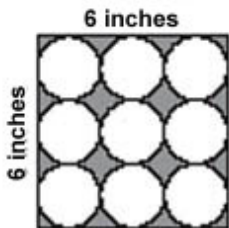
A kite has perpendicular diagonals with the measures shown in the drawing below.

What is the perimeter, in inches of the kite?



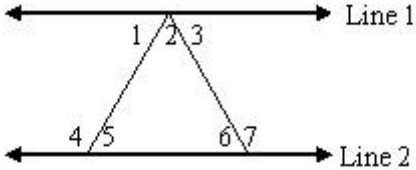

9) Assistentment #1301 "1301 - 1999 - 38a (Scaffolding)"

What is the area of the shaded part of this figure? Assume  $\pi = 3.14$ .




10) Assistentment #91833 "91833 - Review Set 3-4(Angle\_relationships)"

If line 1 is parallel to line 2, and angle 1 = 57, angle 2 = 54, what is the measure of angle 6?



(Picture not to scale)

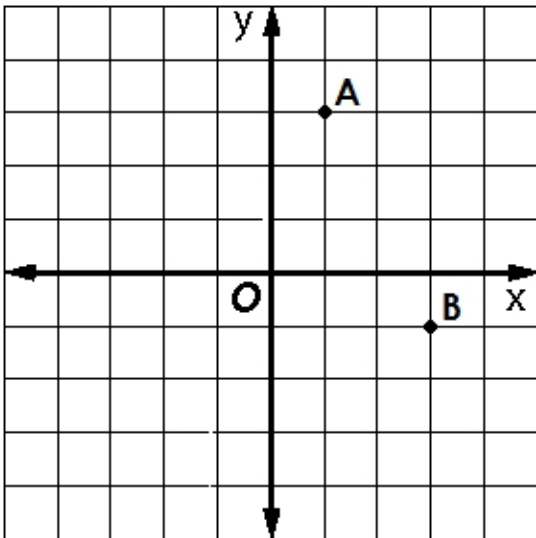
## Appendix B: Problems used in Experiment 2-A

### Homework Assignment #1

Problem Set "Looking for Pythagoras Investigation 1 (10 questions)" id:[9540]

1) Assistentment #34879 "34879 - Looking for Pythagoras Investigation 1 #1-Morph1"

The position of two houses (A and B) are shown on a coordinate plane below. If you were able to walk between the location of house A and house B in a direct line, what would be the halfway point (or midpoint) of the houses?

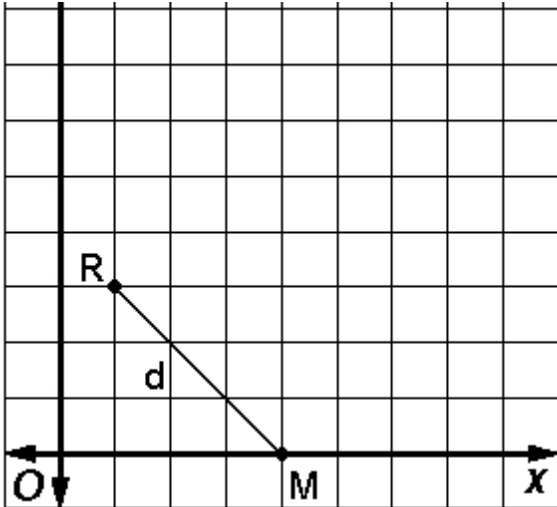


- (1, 3)
- (2, 1)
- (3, -1)
- (1, 2)

---

2) Assistentment #36383 "36383 - Looking for Pythagoras Investigation 1 #2-Morph1"

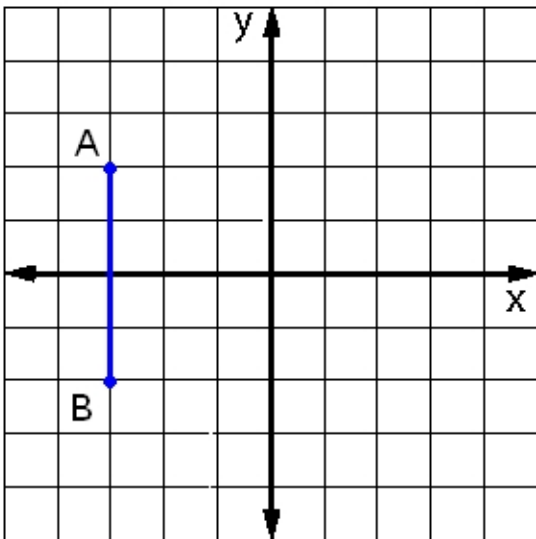
If you draw a line from R to M, as shown below, which statement is true about the distance  $d$ ? Assume a unit is the length of the side of a square on the grid.



- A.  $d = 3$  units
- B.  $d < 3$  units
- C.  $d > 3$  units

3) Assistentment #36385 "36385 - Looking for Pythagoras Investigation 1 #3-Morph1"

Suppose you want to place two points C and D on the graph in order to create a rectangular parallelogram ABCD. Which of the following locations for point C and point D would create a rectangular parallelogram?

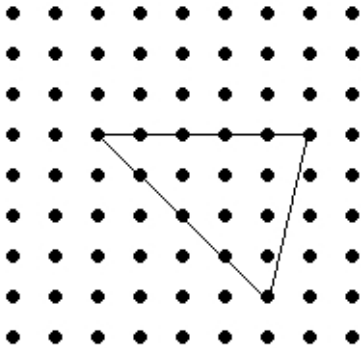


- A)  $C(-1,3); D(-1,-1)$

- B) C(0,3); D(0,-2)
- C) C(1,2); D(1,-2)

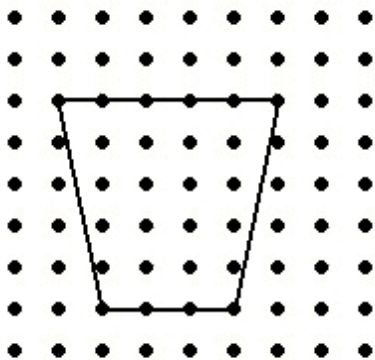
4) Assistent #36387 "36387 - Looking for Pythagoras Investigation 1 #4-Morph1"

What is the area of the triangle shown below? (*Assume the distance between each dot represents 1 unit. Enter your answer as a whole number without any units or labels*)



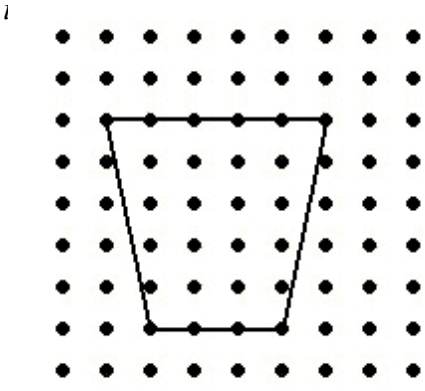

5) Assistent #36389 "36389 - Looking for Pythagoras Investigation 1 #5-Morph1"

Find the area of the figure shown. (*Note: The horizontal and vertical distance between each dot is 1 unit*)



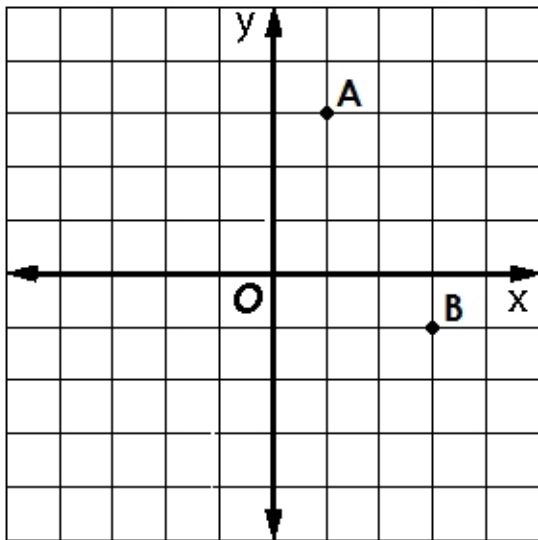

6) Assistent #81704 "81704 - 36389 - Looking for Pythagoras Investigation 1 #5-Morph1"

Find the area of the figure shown. (*Note: The horizontal and vertical distance between each dot*




7) Assistent #81700 "81700 - 34879 - Looking for Pythagoras Investigation 1 #1-Morph1"

The position of two houses (A and B) are shown on a coordinate plane below. If you were able to walk between the location of house A and house B in a direct line, what would be the halfway point (or midpoint) of the houses?

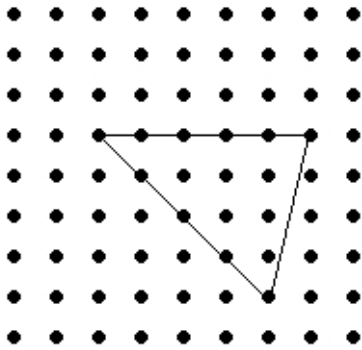


- (1, 3)
- (2, 1)
- (3, -1)
- (1, 2)

---

8) Assistentment #81703 "81703 - 36387 - Looking for Pythagoras Investigation 1 #4-Morph1"

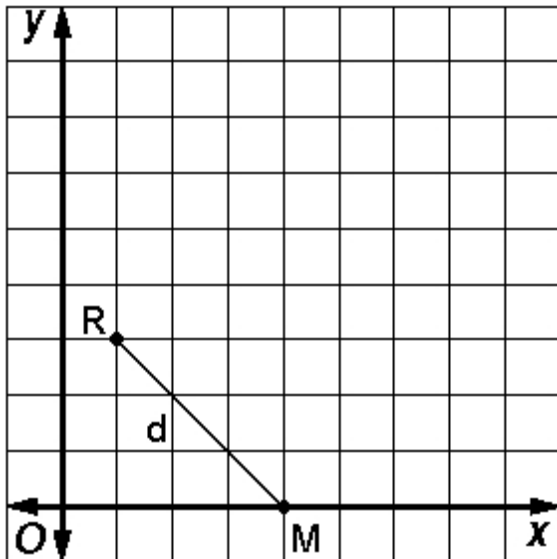
What is the area of the triangle shown below? (*Assume the distance between each dot represents 1 unit. Enter your answer as a whole number without any units or labels*)



---

9) Assistentment #81701 "81701 - 36383 - Looking for Pythagoras Investigation 1 #2-Morph1"

If you draw a line from R to M, as shown below, which statement is true about the distance **d**? Assume a unit is the length of the side of a square on the grid.



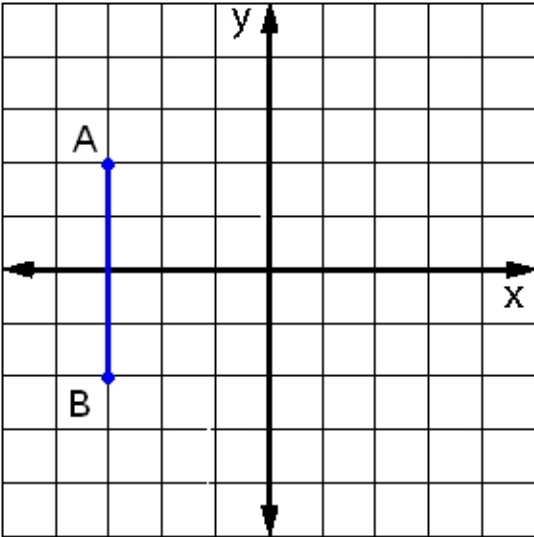
- A.  $d = 3$  units
- B.  $d < 3$  units
- C.  $d > 3$  units



---

10) Assistentment #81702 "81702 - 36385 - Looking for Pythagoras Investigation 1 #3-Morph1"

Suppose you want to place two points C and D on the graph in order to create a rectangular parallelogram ABCD. Which of the following locations for point C and point D would create a rectangular parallelogram?

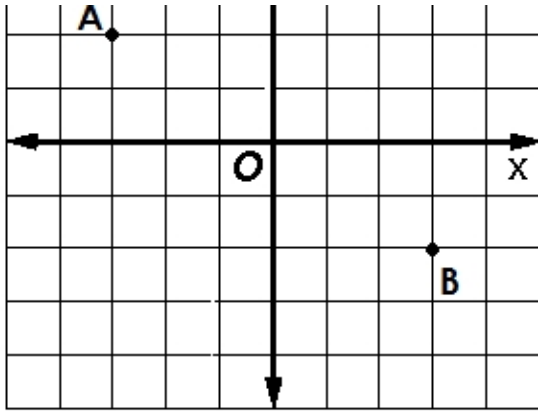


- A)  $C(-1,3); D(-1,-1)$
- B)  $C(0,3); D(0,-2)$
- C)  $C(1,2); D(1,-2)$

---

11) Assistentment #34880 "34880 - Looking for Pythagoras Investigation 1 #1-Morph2"

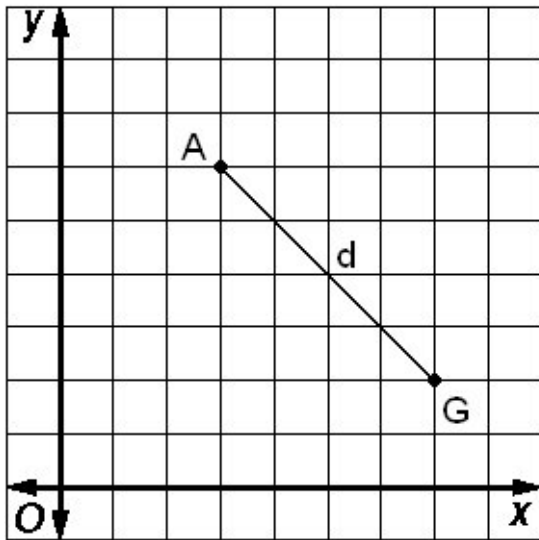
The position of two houses (A and B) are shown on a coordinate plane below. If you were able to walk between the location of house A and house B in a direct line, what would be the halfway point (or midpoint) of the houses?



- (-2, 3)
- (1, 0)
- (0, 0)
- (3, -2)

12) Assistentment #36384 "36384 - Looking for Pythagoras Investigation 1 #2-Morph2"

If you draw a line from A to G, as shown below, which statement is true about the distance  $d$ ? Assume a unit is the length of the side of a square on the grid.

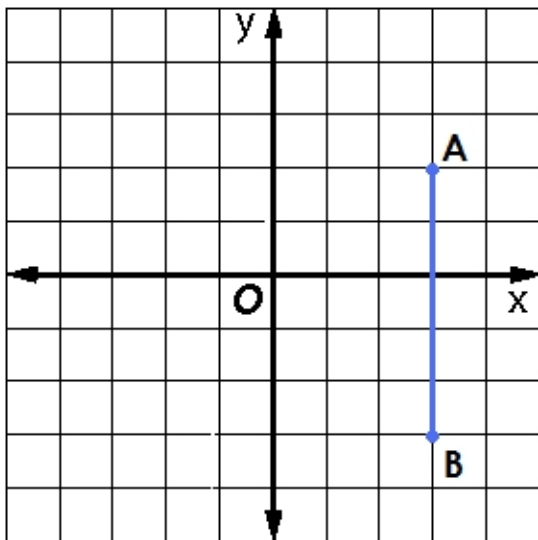


- A.  $d > 4$  units

- B.  $d < 4$  units
- C.  $d = 4$  units

13) Assistentment #36386 "36386 - Looking for Pythagoras Investigation 1 #3-Morph2"

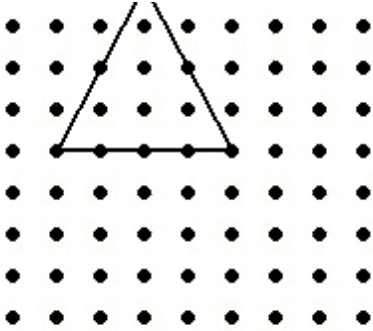
Suppose you want to place two points C and D on the graph in order to create a *nonrectangular* parallelogram ABCD. Which of the following locations for point C and point D would create a rectangular parallelogram?



- A) C(1,-2); D(1,3)
- B) C(1,-3); D(1,2)
- C) C(1,-2); D(1,1)

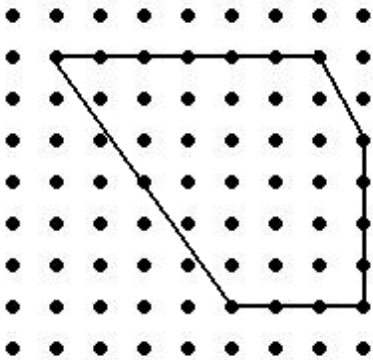
14) Assistentment #36388 "36388 - Looking for Pythagoras Investigation 1 #4-Morph2"

What is the area of the triangle shown below? (*Assume the distance between each dot represents 1 unit. Enter your answer as a whole number without any units or labels*)




15) Assistentment #36392 "36392 - Looking for Pythagoras Investigation 1 #5-Morph2"

Find the area of the figure shown. (*Note: The horizontal and vertical distance between each dot is 1 unit*)



## Homework Assignment #2

Problem Set "Looking for Pythagoras Investigation 2 (10 questions)" id:[9598]

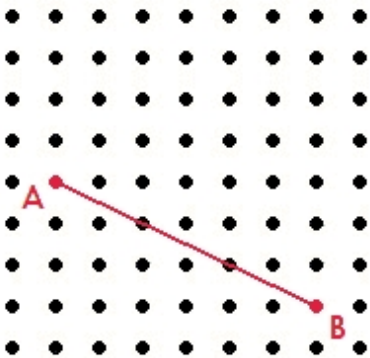
1) Assistent #36607 "36607 - Looking for Pythagoras Investigation 2 #3-Morph2"

What is the **smallest** whole number **greater** than  $\sqrt{27}$ ?

---

2) Assistent #43012 "43012 - Looking for Pythagoras Investigation 2 #4-Morph2"

How long is the line segment AB?



- 6
- 9
- $\sqrt{45}$
- 45

---

3) Assistent #36654 "36654 - Looking for Pythagoras Investigation 2 #5-Morph2"

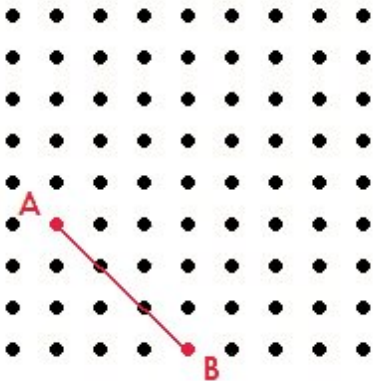
Which of the following answer choices shows  
the numbers in order from *least to greatest*?

$$\sqrt{37} \quad \sqrt{28} \quad -6 \quad 4.9 \quad 7.2 \quad -\sqrt{33}$$

- A.  $-\sqrt{33}$ ,  $-6$ ,  $4.9$ ,  $\sqrt{28}$ ,  $\sqrt{37}$ ,  $7.2$
- B.  $7.2$ ,  $\sqrt{37}$ ,  $\sqrt{28}$ ,  $4.9$ ,  $-\sqrt{33}$ ,  $-6$
- C.  $-6$ ,  $-\sqrt{33}$ ,  $4.9$ ,  $\sqrt{28}$ ,  $\sqrt{37}$ ,  $7.2$
- D.  $-\sqrt{33}$ ,  $-6$ ,  $4.9$ ,  $7.2$ ,  $\sqrt{28}$ ,  $\sqrt{37}$

4) Assistent #43009 "43009 - Looking for Pythagoras Investigation 2 #1-Morph2"

The figure below shows one side of a square, line segment AB. What is the *area* of the square?




5) Assistent #36605 "36605 - Looking for Pythagoras Investigation 2 #2-Morph2"

What is the largest whole number less than  $\sqrt{39}$ ?

6) Assistent #81705 "81705 - 36654 - Looking for Pythagoras Investigation 2 #5-Morph2"

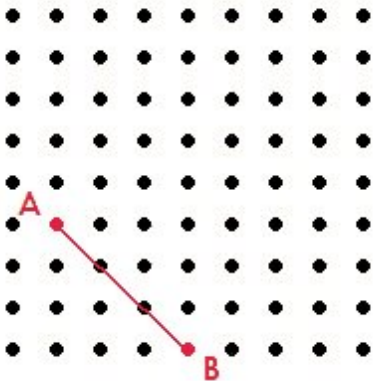
Which of the following answer choices shows the numbers in order from *least to greatest*?

$$\sqrt{37} \quad \sqrt{28} \quad -6 \quad 4.9 \quad 7.2 \quad -\sqrt{33}$$

- A.  $-\sqrt{33}$ ,  $-6$ ,  $4.9$ ,  $\sqrt{28}$ ,  $\sqrt{37}$ ,  $7.2$
- B.  $7.2$ ,  $\sqrt{37}$ ,  $\sqrt{28}$ ,  $4.9$ ,  $-\sqrt{33}$ ,  $-6$
- C.  $-6$ ,  $-\sqrt{33}$ ,  $4.9$ ,  $\sqrt{28}$ ,  $\sqrt{37}$ ,  $7.2$
- D.  $-\sqrt{33}$ ,  $-6$ ,  $4.9$ ,  $7.2$ ,  $\sqrt{28}$ ,  $\sqrt{37}$

7) Assistent #81706 "81706 - 43009 - Looking for Pythagoras Investigation 2 #1-Morph2"

The figure below shows one side of a square, line segment AB. What is the *area* of the square?

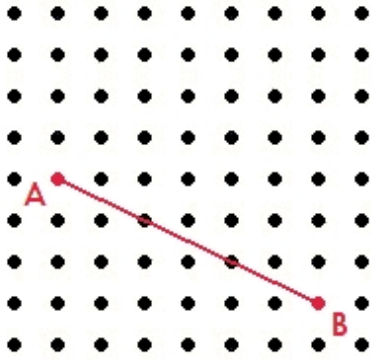



8) Assistent #81707 "81707 - 36607 - Looking for Pythagoras Investigation 2 #3-Morph2"

What is the **smallest** whole number **greater** than  $\sqrt{27}$ ?

9) Assistent #81708 "81708 - 43012 - Looking for Pythagoras Investigation 2 #4-Morph2"

How long is the line segment AB?



- 6
- 9
- $\sqrt{45}$
- 45

---

10) Assistent #81709 "81709 - 36605 - Looking for Pythagoras Investigation 2 #2-Morph2"

What is the largest whole number less than  $\sqrt{39}$ ?

---

11) Assistent #36606 "36606 - Looking for Pythagoras Investigation 2 #3 - Morph1"

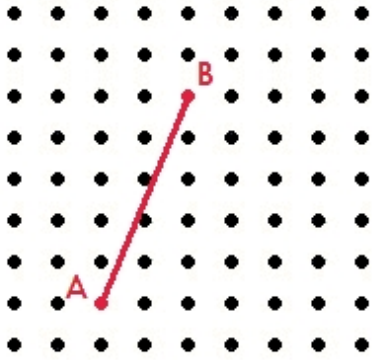
What is the **smallest** whole number **greater** than  $\sqrt{72}$ ?

---

12) Assistent #43010 "43010 - Looking for Pythagoras Investigation 2 #4-Morph1"

How long is the line segment AB?





- 9
- 4
- 29
- $\sqrt{29}$

13) Assistent #36747 "36747 - Looking for Pythagoras Investigation 2 #5-Morph1"

Which of the following answer choices shows the numbers in order from least to greatest?

5  $\sqrt{22}$   $-\sqrt{26}$   $-8$   $\sqrt{24}$   $\sqrt{63}$

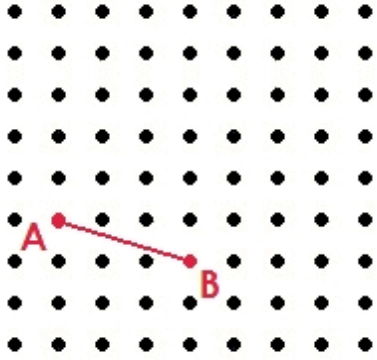
- 5,  $\sqrt{22}$ ,  $-\sqrt{26}$ ,  $-8$ ,  $\sqrt{24}$ ,  $\sqrt{63}$
- $-8$ ,  $-\sqrt{26}$ ,  $\sqrt{22}$ ,  $\sqrt{24}$ , 5,  $\sqrt{63}$
- $-\sqrt{26}$ ,  $-8$ ,  $\sqrt{22}$ ,  $\sqrt{24}$ , 5,  $\sqrt{63}$
- $-8$ ,  $-\sqrt{26}$ , 5,  $\sqrt{22}$ ,  $\sqrt{24}$ ,  $\sqrt{63}$

14) Assistent #36604 "36604 - Looking for Pythagoras Investigation 2 #2-Morph1"

What is the largest whole number less than  $\sqrt{62}$ ?

15) Assistent #43008 "43008 - Looking for Pythagoras Investigation 2 #1-Morph1"

The figure below shows one side of a square, line segment AB. What is the *area* of the square?

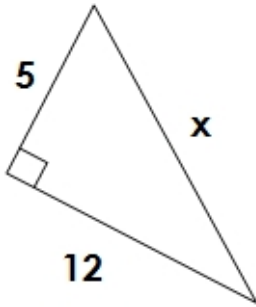


### Homework Assignment #3

Problem Set "Looking for Pythagoras Investigation 3 (8 questions)" id:[9599]

1) Assistentment #42272 "42272 - Looking for Pythagoras Investigation 3 #1 - Morph2"

What is the length of the hypotenuse of the right triangle shown below?



---

2) Assistentment #42907 "42907 - Looking for Pythagoras Investigation 3 #3 - Morph2"

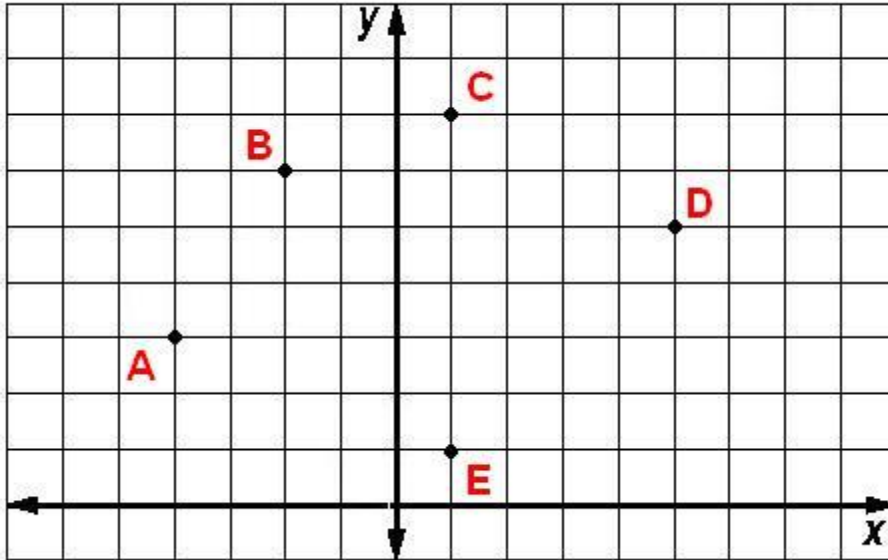
Which set of lengths would make a right triangle?

- A. 2, 4, 6
- B. 3, 6, 9
- C. 5, 12, 13
- D. 1, 2, 3

---

3) Assistentment #43059 "43059 - Looking for Pythagoras Investigation 3 #2-Morph2"

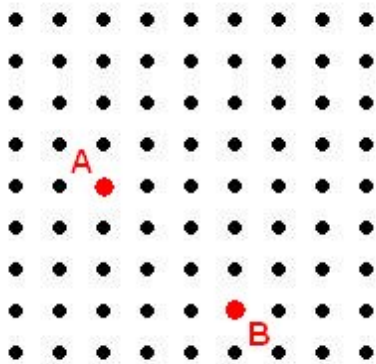
Which two points have a distance between them of  $\sqrt{32}$ ?



- A and B
- B and C
- C and D
- D and E

4) Assistentment #42960 "42960 - Looking for Pythagoras Investigation 3 #4-Morph2"

Use the Pythagorean Theorem to find the distance between point A and point B. (Note: The horizontal and vertical distance between each dot is 1 unit)



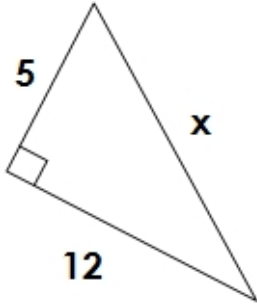
- $\sqrt{18}$  units
- 4 units

- 6 units
- $\sqrt{12}$  units

---

5) Assistent #81712 "81712 - 42272 - Looking for Pythagoras Investigation 3 #1 - Morph2"

What is the length of the hypotenuse of the right triangle shown below?



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6) Assistent #81713 "81713 - 42907 - Looking for Pythagoras Investigation 3 #3 - Morph2"

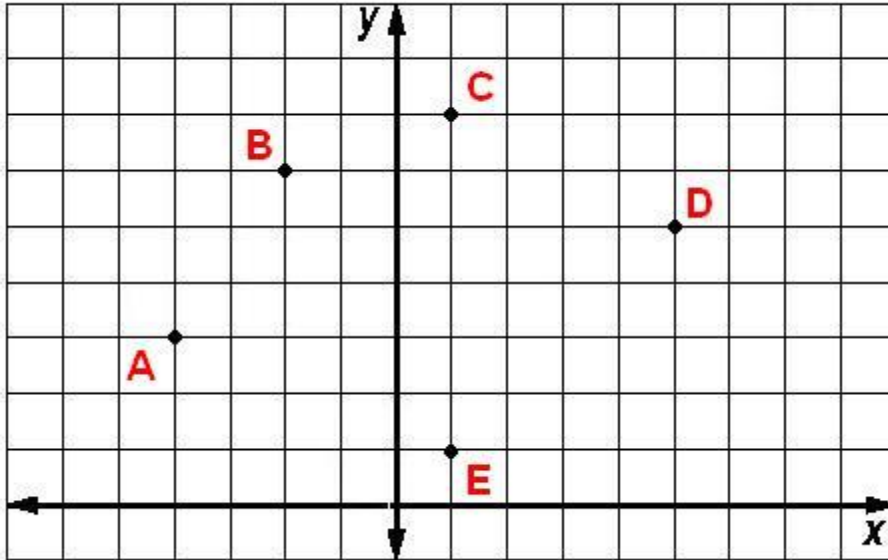
Which set of lengths would make a right triangle?

- A. 2, 4, 6
- B. 3, 6, 9
- C. 5, 12, 13
- D. 1, 2, 3

---

7) Assistent #81714 "81714 - 43059 - Looking for Pythagoras Investigation 3 #2-Morph2"

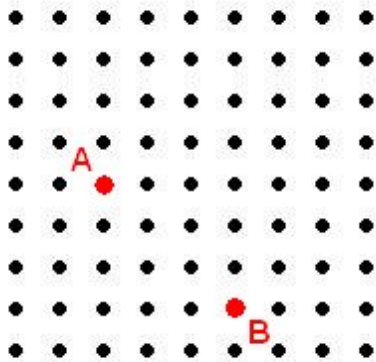
Which two points have a distance between them of  $\sqrt{32}$ ?



- A and B
- B and C
- C and D
- D and E

8) Assistentment #81715 "81715 - 42960 - Looking for Pythagoras Investigation 3 #4-Morph2"

Use the Pythagorean Theorem to find the distance between point A and point B. (Note: The horizontal and vertical distance between each dot is 1 unit)



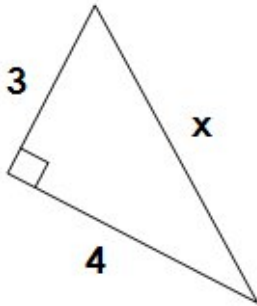
- $\sqrt{18}$  units
- 4 units

- 6 units
- $\sqrt{12}$  units

---

9) Assistent #42271 "42271 - Looking for Pythagoras Investigation 3 #1 - Morph1"

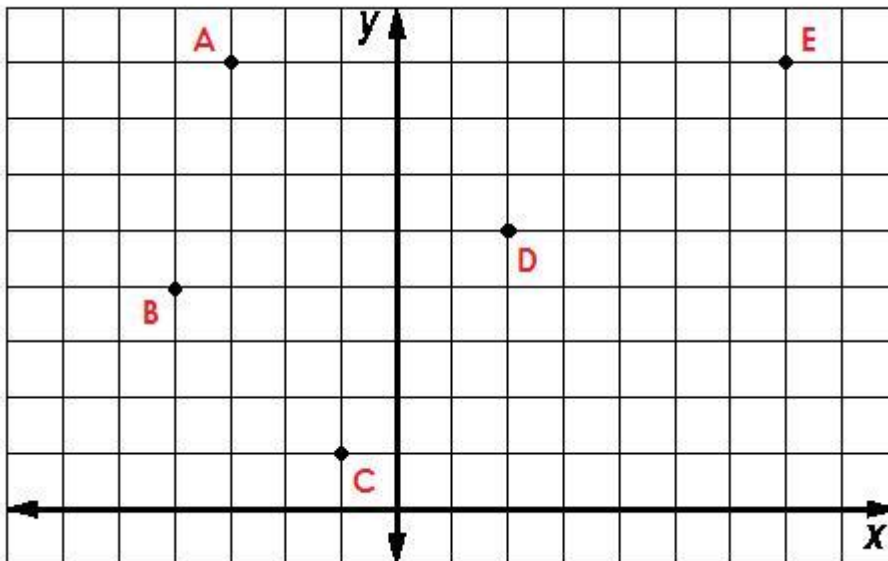
What is the length of the hypotenuse of the right triangle shown below?



---

10) Assistent #43013 "43013 - Looking for Pythagoras Investigation 3 #2-Morph1"

Which two points have a distance between them of 5?



- B and C
- D and E

- C and D
- B and D

---

11) Assistentment #42906 "42906 - Looking for Pythagoras Investigation 3 #3 - Morph1"

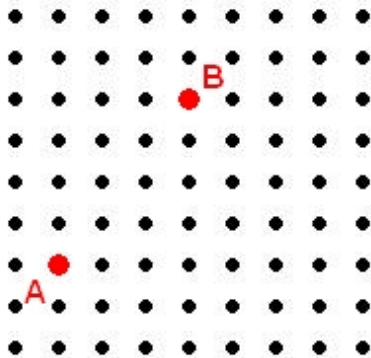
Which set of lengths would make a right triangle?

- A. 3, 4, 7
- B. 6, 8, 10
- C. 1, 2, 3
- D. 5,  $\sqrt{15}$ , 10

---

12) Assistentment #42959 "42959 - Looking for Pythagoras Investigation 3 #4-Morph1"

Use the Pythagorean Theorem to find the distance between point A and point B. (Note: the horizontal and vertical distance between each dot is 1 unit)



- $\sqrt{7}$  units
- $\sqrt{5}$  units
- 5 units
- 3.5 units



## Homework Assignment #4

Problem Set "Looking for Pythagoras Investigation 4 (4 questions)" id:[9539]

1) Assistentment #42962 "42962 - Looking for Pythagoras Investigation 4 #1-Morph2"

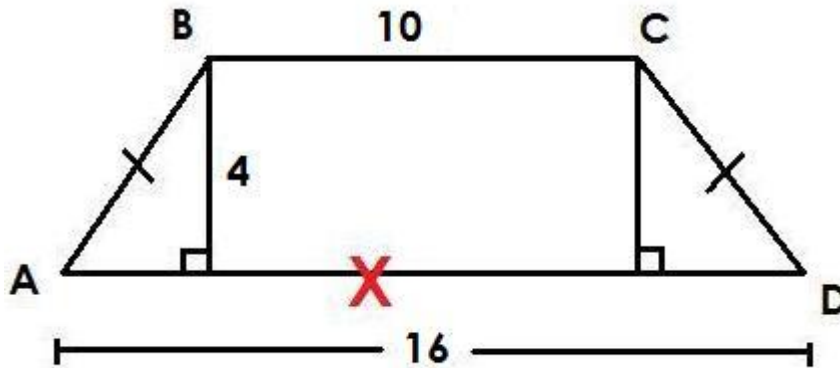
A right isocoeles triangle has a hypotenuse of 20 feet. What are the lengths of the legs of the triangle?

- $\sqrt{10}$  feet
- 40 feet
- 5 feet
- $\sqrt{200}$  feet

---

2) Assistentment #43198 "43198 - Looking for Pythagoras Investigation 4 #2-Morph2"

Mr. Erickson's daily commute (from point A to D) to work is normally 16 miles. Due to an accident he must take an alternative route (A to B to C to D). How far will Mr. Erickson's alternative commute be due to the accident?



---

3) Assistentment #81716 "81716 - 42962 - Looking for Pythagoras Investigation 4 #1-Morph2"

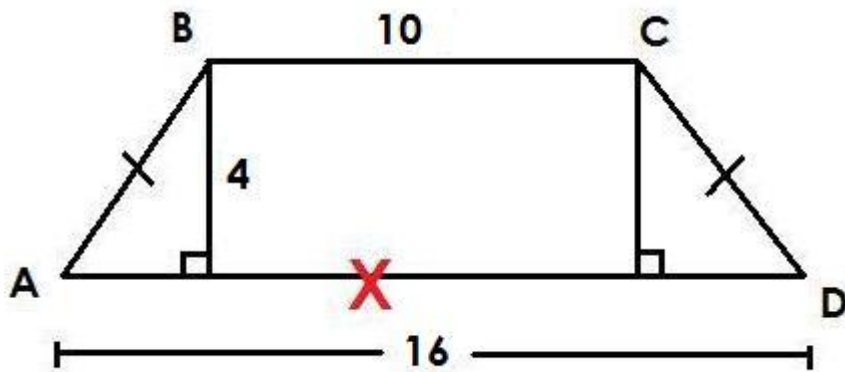
A right isocoeles triangle has a hypotenuse of 20 feet. What are the lengths of the legs of the triangle?

- $\sqrt{10}$  feet

- 40 feet
- 5 feet
- $\sqrt{200}$  feet

4) Assistentment #81717 "81717 - 43198 - Looking for Pythagoras Investigation 4 #2-Morph2"

Mr. Erickson's daily commute (from point A to D) to work is normally 16 miles. Due to an accident he must take an alternative route (A to B to C to D). How far will Mr. Erickson's alternative commute be due to the accident?



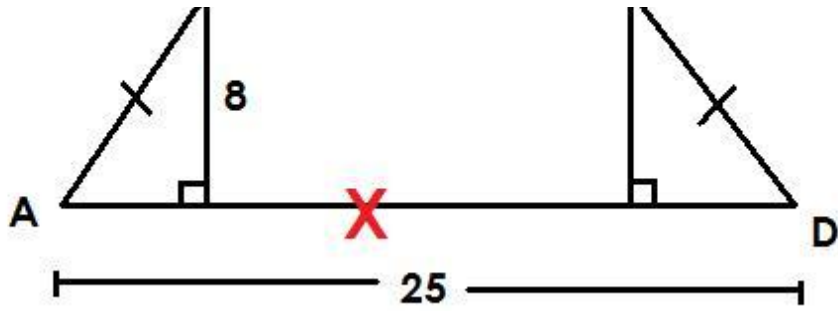

5) Assistentment #42961 "42961 - Looking for Pythagoras Investigation 4 #1-Morph1"

A right isoceses triangle has a hypotenuse of 10 feet. What are the lengths of the legs of the triangle?

- $\sqrt{5}$  feet
- $\sqrt{50}$  feet
- 5 feet
- 25 feet

6) Assistentment #43169 "43169 - Looking for Pythagoras Investigation 4 #2-Morph1"

Mr. Erickson's daily commute (from point A to D) to work is normally 25 miles. Due to an accident, indicated by the red X, he must take an alternative route (A to B to C to D). How far will Mr. Erickson's alternative commute be due to the accident?

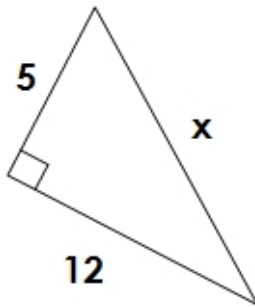


### Homework Assignment #3

Problem Set "Looking for Pythagoras Investigation 3 (8 questions)" id:[9599]

1) Assistentment #42272 "42272 - Looking for Pythagoras Investigation 3 #1 - Morph2"

What is the length of the hypotenuse of the right triangle shown below?



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2) Assistentment #42907 "42907 - Looking for Pythagoras Investigation 3 #3 - Morph2"

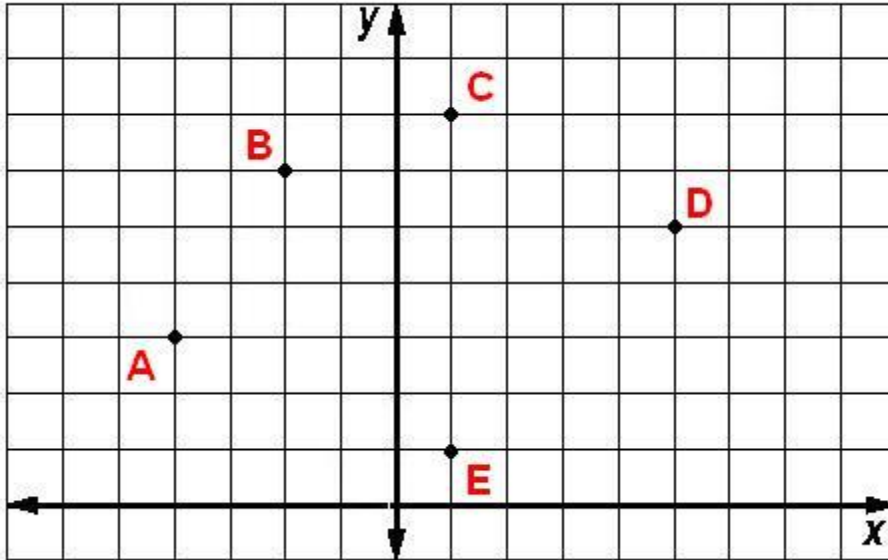
Which set of lengths would make a right triangle?

- A. 2, 4, 6
- B. 3, 6, 9
- C. 5, 12, 13
- D. 1, 2, 3

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3) Assistentment #43059 "43059 - Looking for Pythagoras Investigation 3 #2-Morph2"

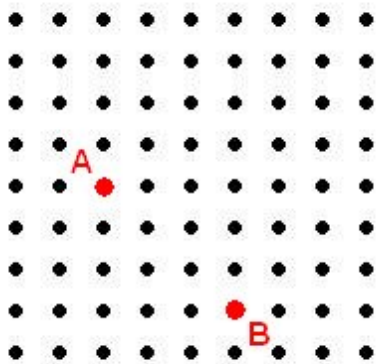
Which two points have a distance between them of  $\sqrt{32}$ ?



- A and B
- B and C
- C and D
- D and E

4) Assistentment #42960 "42960 - Looking for Pythagoras Investigation 3 #4-Morph2"

Use the Pythagorean Theorem to find the distance between point A and point B. (Note: The horizontal and vertical distance between each dot is 1 unit)

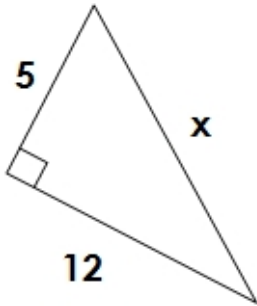


- $\sqrt{18}$  units
- 4 units

- 6 units
- $\sqrt{12}$  units

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5) Assistent #81712 "81712 - 42272 - Looking for Pythagoras Investigation 3 #1 - Morph2"  
What is the length of the hypotenuse of the right triangle shown below?



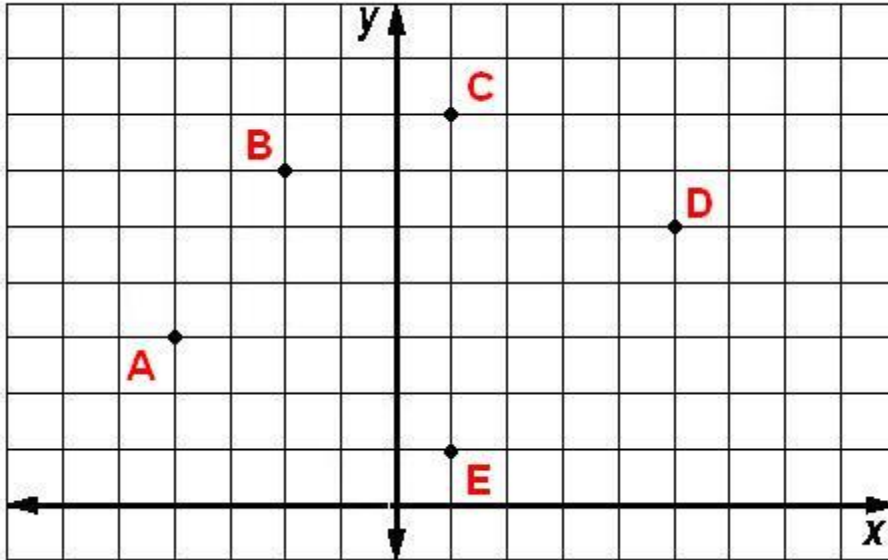
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6) Assistent #81713 "81713 - 42907 - Looking for Pythagoras Investigation 3 #3 - Morph2"  
Which set of lengths would make a right triangle?

- A. 2, 4, 6
- B. 3, 6, 9
- C. 5, 12, 13
- D. 1, 2, 3

---

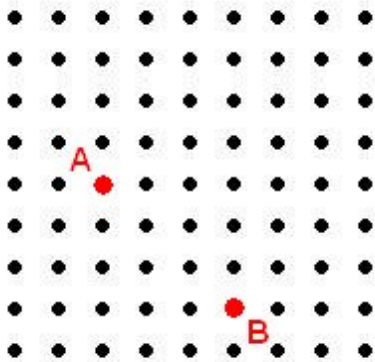
7) Assistent #81714 "81714 - 43059 - Looking for Pythagoras Investigation 3 #2-Morph2"  
Which two points have a distance between them of  $\sqrt{32}$ ?



- A and B
- B and C
- C and D
- D and E

8) Assistentment #81715 "81715 - 42960 - Looking for Pythagoras Investigation 3 #4-Morph2"

Use the Pythagorean Theorem to find the distance between point A and point B. (Note: The horizontal and vertical distance between each dot is 1 unit)



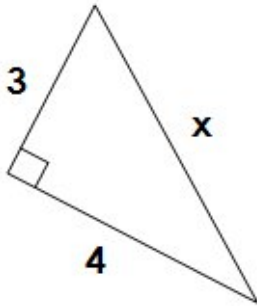
- $\sqrt{18}$  units
- 4 units

- 6 units
- $\sqrt{12}$  units

---

9) Assistentment #42271 "42271 - Looking for Pythagoras Investigation 3 #1 - Morph1"

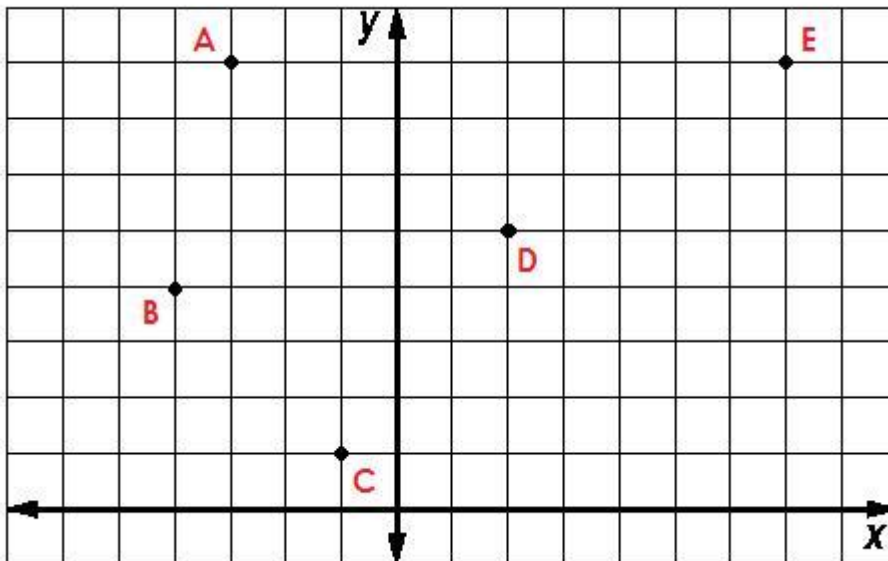
What is the length of the hypotenuse of the right triangle shown below?



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10) Assistentment #43013 "43013 - Looking for Pythagoras Investigation 3 #2-Morph1"

Which two points have a distance between them of 5?



- B and C
- D and E



- C and D
- B and D

---

11) Assistentment #42906 "42906 - Looking for Pythagoras Investigation 3 #3 - Morph1"

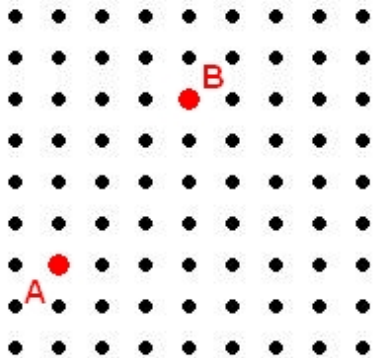
Which set of lengths would make a right triangle?

- A. 3, 4, 7
- B. 6, 8, 10
- C. 1, 2, 3
- D. 5,  $\sqrt{15}$ , 10

---

12) Assistentment #42959 "42959 - Looking for Pythagoras Investigation 3 #4-Morph1"

Use the Pythagorean Theorem to find the distance between point A and point B. (Note: the horizontal and vertical distance between each dot is 1 unit)



- $\sqrt{7}$  units
- $\sqrt{5}$  units
- 5 units
- 3.5 units

## Homework Assignment #4

Problem Set "Looking for Pythagoras Investigation 4 (4 questions)" id:[9539]

1) Assistentment #42962 "42962 - Looking for Pythagoras Investigation 4 #1-Morph2"

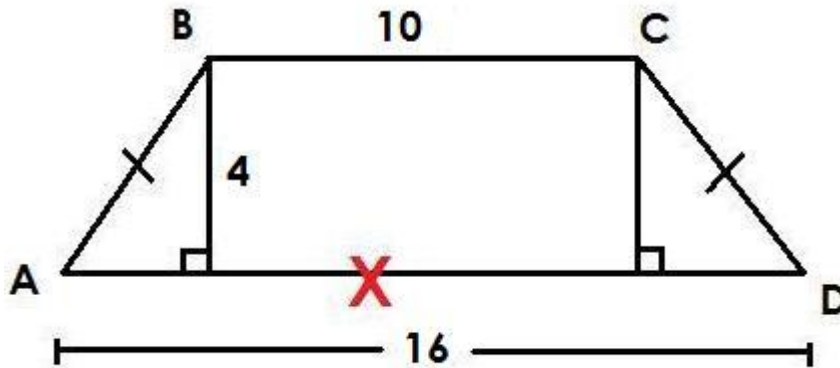
A right isocoeles triangle has a hypotenuse of 20 feet. What are the lengths of the legs of the triangle?

- $\sqrt{10}$  feet
- 40 feet
- 5 feet
- $\sqrt{200}$  feet

---

2) Assistentment #43198 "43198 - Looking for Pythagoras Investigation 4 #2-Morph2"

Mr. Erickson's daily commute (from point A to D) to work is normally 16 miles. Due to an accident he must take an alternative route (A to B to C to D). How far will Mr. Erickson's alternative commute be due to the accident?



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3) Assistentment #81716 "81716 - 42962 - Looking for Pythagoras Investigation 4 #1-Morph2"

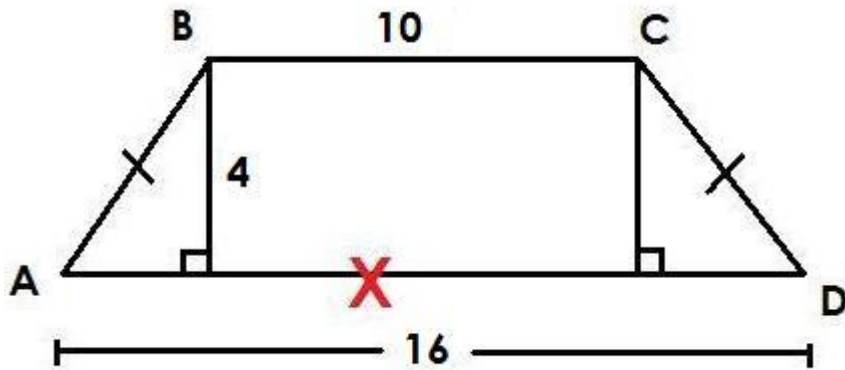
A right isocoeles triangle has a hypotenuse of 20 feet. What are the lengths of the legs of the triangle?

- $\sqrt{10}$  feet

- 40 feet
- 5 feet
- $\sqrt{200}$  feet

4) Assistentment #81717 "81717 - 43198 - Looking for Pythagoras Investigation 4 #2-Morph2"

Mr. Erickson's daily commute (from point A to D) to work is normally 16 miles. Due to an accident he must take an alternative route (A to B to C to D). How far will Mr. Erickson's alternative commute be due to the accident?



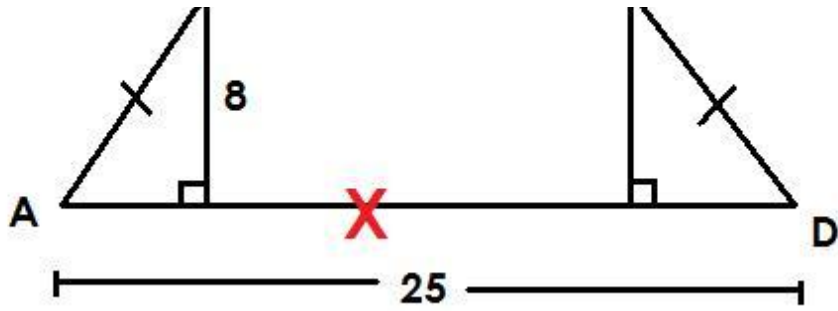

5) Assistentment #42961 "42961 - Looking for Pythagoras Investigation 4 #1-Morph1"

A right isoceses triangle has a hypotenuse of 10 feet. What are the lengths of the legs of the triangle?

- $\sqrt{5}$  feet
- $\sqrt{50}$  feet
- 5 feet
- 25 feet

6) Assistentment #43169 "43169 - Looking for Pythagoras Investigation 4 #2-Morph1"

Mr. Erickson's daily commute (from point A to D) to work is normally 25 miles. Due to an accident, indicated by the red X, he must take an alternative route (A to B to C to D). How far will Mr. Erickson's alternative commute be due to the accident?



## Appendix C: Problems used in Experiment 2-B

Problem Set "GGG Investigation 1 Review Problem Set" id:[10198]

1) Assistentment #84080 "84080 - Growing\_1\_1"

Type in 1 million. (do not use exponents)

---

2) Assistentment #84081 "84081 - Growing\_1\_3"

Bill wants to help out around the house. He made a proposal to his parents. At 10 years old, he did 1 chore a week. He promised that each year he will double the number of chores he does a week.

If he uses the table below, doubling the number of chores each year, how many chores will he be doing each week when he is 17?

Age	Number of Chores (per week)
10	1
11	
12	

---

3) Assistentment #84082 "84082 - Growing\_1\_4"

Which of the following is the expression  $4 \times 4 \times 4 \times 4 \times 4$  in exponential form?

- A.  $4^5$

- B.  $4^6$
- C.  $4^7$
- D.  $4^4$

---

4) Assistentment #84075 "84075 - Growing\_1\_5"

What is the exponent **n** in the equation  $3^n = 27$ ?

---

5) Assistentment #84083 "84083 - Growing\_1\_6"

Which table shows an exponential pattern?

**A**

x	0	1	2	3	4
y	5	55	105	155	205

**B**

x	0	1	2	3	4
y	3	6	12	24	48

**C**

x	0	1	2	3	4
y	4	8	12	24	28

- A
- B
- C

---

6) Assistentment #84078 "84078 - Growing\_1\_7"

Which table above is **linear**?

**A**

x	0	1	2	3	4
y	5	55	105	155	205

**B**

x	0	1	2	3	4
y	3	6	12	24	48

**C**

x	0	1	2	3	4
y	4	8	12	24	28

- A
- B
- C

7) Assistent #84084 "84084 - Growing\_1\_8"

What is the equation for the exponential pattern represented by the table?

x	0	1	2	3	4
y	3	6	12	24	48

- A.  $3^n$
- B.  $2 \cdot 3^n$
- C.  $3 \cdot 2^n$
- D.  $2^n$

8) Assistent #84085 "84085 - Growing\_1\_9"

Which of the following is the number 37,200,000 written in scientific notation?

- A.  $37.2 \times 10^5$
- B.  $372 \times 10^5$
- C.  $3.72 \times 10^8$
- D.  $3.72 \times 10^7$

---

9) Assistent #85732 "85732 - 30497 - Growing\_1\_1-Morph2"

Type in five million as a number. (do not use exponents)

---

10) Assistent #85733 "85733 - 30606 - Growing\_1\_4-Morph2"

What is the value of the exponent **n** in the equation  $2^n = 8$ ?

---

11) Assistent #85734 "85734 - 30611 - Growing\_1\_6-Moprh2"

Which table below is **linear**?

<b>A</b>	x	0	1	2	3	4
	y	3	6	9	12	15

<b>B</b>	x	1	2	3	4	5
	y	2	4	8	16	32

<b>C</b>	x	0	1	2	3	4
	y	1	3	6	10	15

- A
- B
- C

---

12) Assistent #85735 "85735 - 30609 - Growing\_1\_5-Morph2"

Which table shows an **exponential** pattern?



$4^n$	y	1	3	9	18	36
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<b>B</b>	x	0	1	2	3	4
	y	1	2	3	4	5

<b>C</b>	x	0	1	2	3	4
	y	2	4	8	16	32

- A
- B
- C

13) Assistent #85736 "85736 - 30604 - Growing\_1\_3-Morph2"

Which of the following represents the expression  $6 \times 6 \times 6 \times 6 \times 6$  written in exponential form?

- A.  $6^5$
- B.  $5^6$
- C.  $6^6$
- D. 30

14) Assistent #85737 "85737 - 30626 - Growing\_1\_7-Morph2"

What is the equation for the *exponential* pattern represented by the table?

<b>x</b>	0	1	2	3	4
<b>y</b>	5	10	20	40	80

- A.  $2^n$
- B.  $5^n$
- C.  $4 * 2^n$
- D.  $5 * 2^n$

15) Assistent #85738 "85738 - 30686 - Growing\_1\_8-Morph2"

The approximate distance between the earth and the sun is 93,000,000 miles. Which answer choice below represents this distance written in *scientific notation*?

- A.  $9.3 \times 10^7$
- B.  $9.3 \times 10^6$
- C.  $9.3 \times 10^{-7}$
- D.  $93 \times 10^6$

16) Assistent #85739 "85739 - 30602 - Growing\_1\_2-Morph2"

Shelly's new years resolution is to learn to play the piano. Since she is a beginner she plans to start slowly, practicing only 1 hour per week. Each month she will ***double the amount of time that she practices per week***. At this rate, how many hours per week will Shelly be practicing in July?

Month	Hours Per Week
January	1
February	
March	
April	
May	
June	
July	?

17) Assistent #30496 "30496 - Growing\_1\_1-Morph1"

Type in three million as a number. (do not use exponents)

18) Assistent #30498 "30498 - Growing\_1\_3-Morph1"

Randy wants to start a savings account. Since he is only 8 years old he doesn't have much money to start. His plan is to save \$5 for his first year of saving. If he continues to ***double the amount*** that he adds to his savings each year, how much money will he ***deposit*** into his account

AGE	Deposit Amount
8	\$5
9	
10	
11	
12	
13	
14	?



---

19) Assistent #30603 "30603 - Growing\_1\_4-Morph2"

Which of the following represents the expression  $7 \times 7 \times 7 \times 7$  written in exponential form?

- A.  $4^7$
- B. 28
- C.  $7^4$
- D.  $7^7$

---

20) Assistent #30605 "30605 - Growing\_1\_5-Morph1"

What is the value of the exponent  $n$  in the equation  $3^n = 81$ ?



---

21) Assistent #30608 "30608 - Growing\_1\_6-Morph1"

Which table shows an *exponential* pattern?

	y	1	4	9	16	25
--	---	---	---	---	----	----

<b>B</b>	x	0	1	2	3	4
	y	1	3	9	27	81

<b>C</b>	x	0	1	2	3	4
	y	5	10	15	20	25

- A
- B
- C

22) Assistent #30610 "30610 - Growing\_1\_7-Moprh1"

Which table below is **linear**?

<b>A</b>	x	0	1	2	3	4
	y	1	5	7	5	1

<b>B</b>	x	1	2	3	4	5
	y	1	2	3	4	5

<b>C</b>	x	0	1	2	3	4
	y	2	4	8	16	32

- A
- B
- C

23) Assistent #30625 "30625 - Growing\_1\_8-Morph1"

What is the equation for the **exponential** pattern represented by the table?

<b>x</b>	0	1	2	3	4
<b>y</b>	4	8	16	32	64

- A.  $2^n$

- B.  $2 \cdot 3^n$
- C.  $4 \cdot 2^n$
- D.  $4^n$

---

24) Assistentment #30685 "30685 - Growing\_1\_9-Morph1"

Which of the following represents the number 11,400,000 written in scientific notation?

- A.  $11.4 \times 10^5$
- B.  $114 \times 10^7$
- C.  $1.14 \times 10^7$
- D.  $11.4 \times 10^6$