

think: $2^4 = 2 \times 2 \times 2 \times 2$
 NOT 2×4

1. Another representation of the expression $\left(\frac{2}{3}\right)^4$ is

A. $\frac{2+4}{3+4}$

B. $\frac{2 \times 4}{3 \times 4}$

C. $\frac{2+2+2+2}{3+3+3+3}$

D. $\frac{2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 3}$

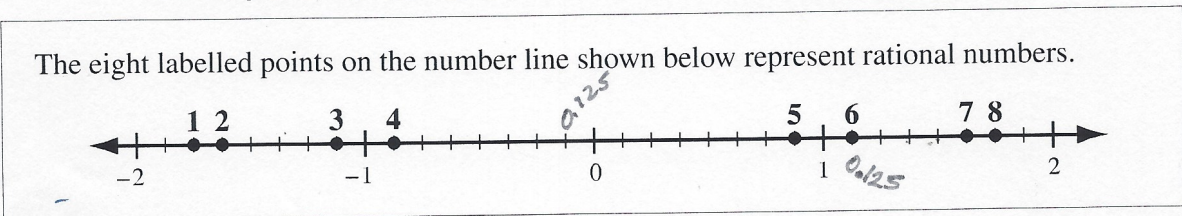
This means $\left(\frac{2}{3}\right)$ four times

Or $\left(\frac{2}{3}\right) \times \left(\frac{2}{3}\right) \times \left(\frac{2}{3}\right) \times \left(\frac{2}{3}\right)$

Multiplying Fractions:

$\frac{2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 3} = \frac{16}{81}$

Use the following information to answer numerical-response question 1.



Numerical Response

Each line is 0.125

1. Match each of the following rational numbers to its corresponding point on the number line shown above.

$-1\frac{3}{4}$ is located at Point 1. (Record in the **first** column)

$\frac{13}{8}$ is located at Point 7. (Record in the **second** column)

1.125 is located at Point 6. (Record in the **third** column)

-0.875 is located at Point 4. (Record in the **fourth** column)

(Record your answer in the numerical-response section on the answer sheet.)

$-\frac{3}{4} = -1.75$

$\frac{.75}{0.125} = 6 \rightarrow 6\text{th line}$

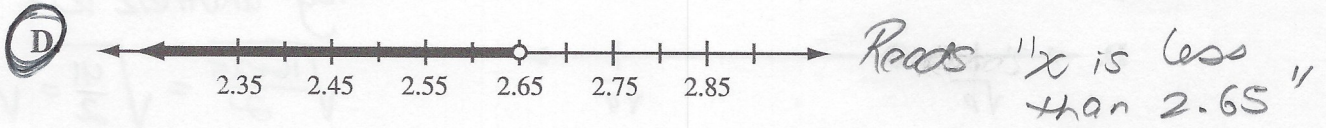
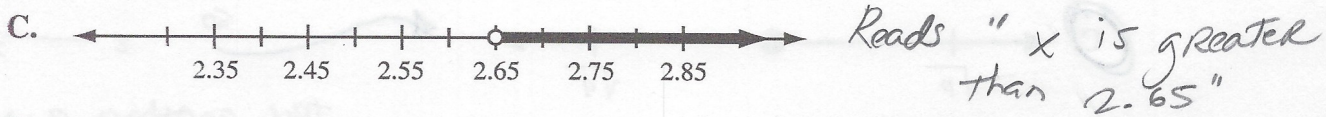
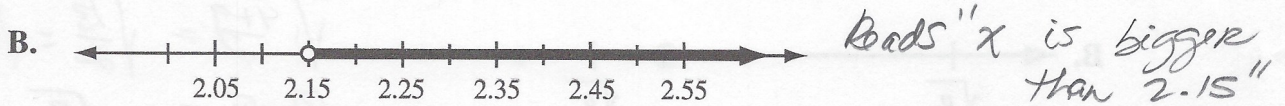
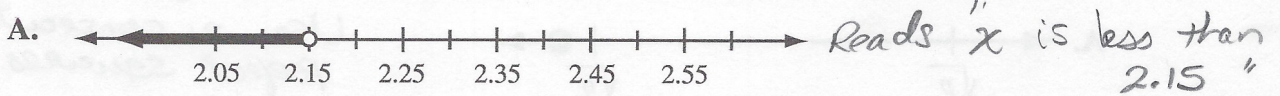
$\frac{13}{8} = 1.625$

$\frac{.625}{0.125} = 5\text{th line}$

Use the following information to answer question 2.

Aaron buys a cheeseburger for \$6.50 and a container of milk for \$0.80. Sam buys a tossed salad and a bowl of soup. The soup costs \$2.00 more than the salad. Sam's meal is less expensive than Aaron's meal.

2. Which of the following number lines could represent the price of Sam's salad?



<u>Aaron</u>		<u>Sam</u>
cheeseburger + milk	>	Salad + soup
\$6.50 + \$0.80		x + (2 + x)
$\$7.30$	>	$2x + 2$
-2		-2
$\$5.30$	>	$\frac{2x}{2}$
$\frac{2}{2}$		$\frac{2}{2}$
		$2.65 > x$

For Sam's food to be cheaper, he has to pay less than 2.65 for the salad

$2.65 > x$ Reads "x is less than 2.65"

Use the following information to answer question 6.

Catherine sells cupcakes, c , for \$1.50 each. The ingredients for each cupcake cost her \$0.30, and the sum of all of her other expenses is \$20.00/month.

6. Which of the following expressions represents Catherine's profit each month?

- A. $1.5c - (20 + 0.3c)$
- B. $20c - (1.5 + 0.3c)$
- C. $(20 + 0.3c) - 1.5c$
- D. $(1.5 + 0.3c) - 20c$

To make a profit, Catherine has to make more than she spends.
 $\$0.30c + \$20 \rightarrow$ Expenses
 $\$1.50c \rightarrow$ Profit

$$1.50c - (20 + 0.30c)$$

independent of how many cupcakes.
 Use the following information to answer question 7.

Jennifer's goal is to save \$1 200. Each week she saves 20% of her weekly income of \$576.

7. How many weeks will it take Jennifer to reach her goal?

- A. 10
- B. 11
- C. 24
- D. 29

• Calculate the 20% of \$576
 $\rightarrow (0.20) \times 576 = 115.2$
 Convert % to decimal

Each week, then, she saves \$115.2
 To see how many weeks it would take to save \$1200:

$$\frac{\$576}{100\%} = \frac{x}{20\%}$$

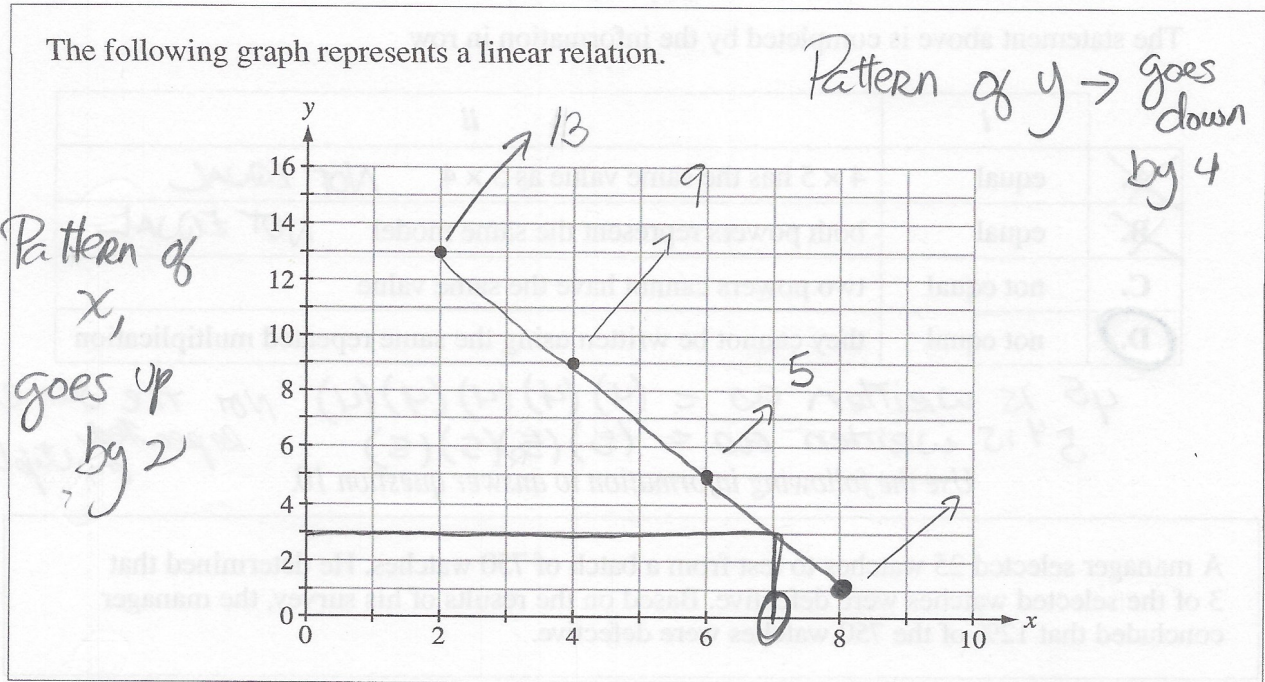
$$\frac{1200}{115.2} = 10.41 \text{ weeks}$$

$$100x = (576)(20)$$

$$x = \frac{(576)(20)}{(100)}$$

\rightarrow 11 weeks.
 By 11 weeks, \$1200 will have been saved

Use the following information to answer numerical-response question 2.



Numerical Response

2. Based on the linear relation shown above, when the y -coordinate is 3, the x -coordinate is 7.

(Record your answer in the numerical-response section on the answer sheet.)

Extrapolate. Notice that

x	y
2	13
4	9
6	5
8	1 (we can determine this)

+2 () -4

y goes down by 4

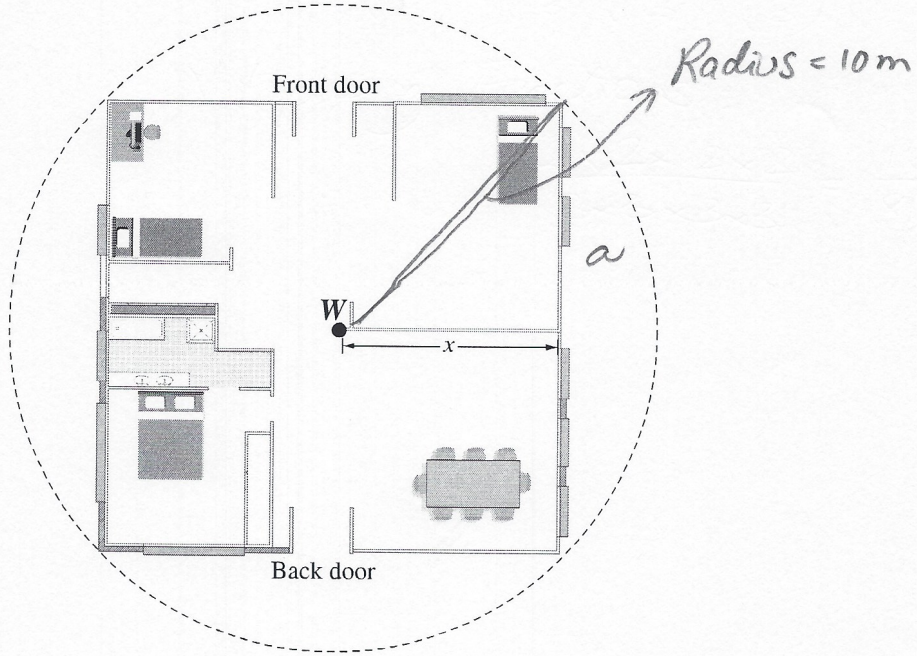
Use the

graph:

when $y = 3$, then $x = 7$

Use the following information to answer question 11.

The letter W is in the centre of the diagram below and represents the location of a wireless router for Internet access in a square house. The router provides access to the area represented by the dotted circle in the diagram below. This circular area has a diameter of 20 m.



11. To the nearest tenth of a metre, the distance, x , from the router, W, to the middle of one outside wall is

- A. 7.1 m
- B. 8.9 m
- C. 10.0 m
- D. 14.1 m

So

C. Can not be because x is shorter than a radius.

D. Impossible \rightarrow also bigger than the radius

Since x and a are equal, then

$$10^2 = x^2 + x^2$$

$$10^2 = 2x^2$$

$$\frac{100}{2} = x^2$$

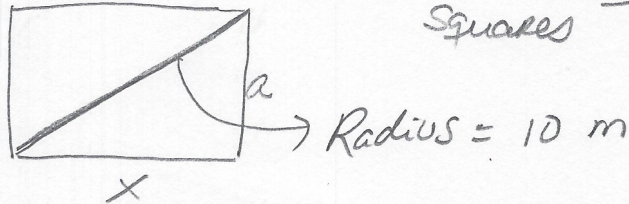
$$50 = x^2$$

$$\text{or } x = \sqrt{50}$$

$$\sqrt{x = 7.07}$$

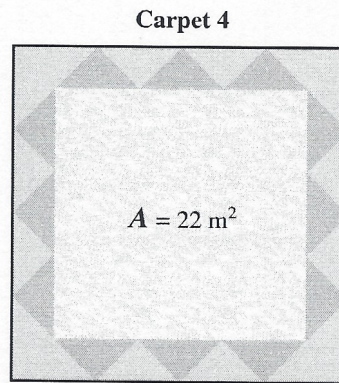
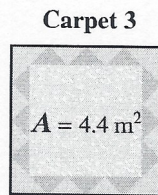
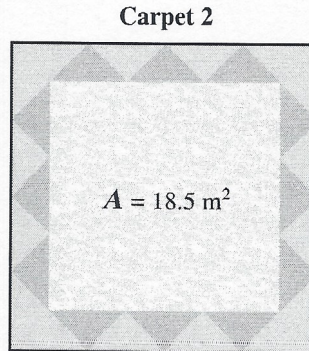
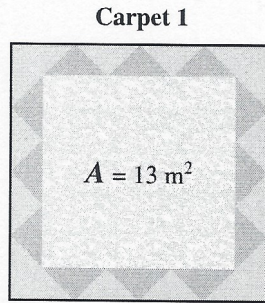
• First, Notice that W is in the center, and that x is a bisector.
 • Also notice that W is in the center, and that the distance from the center to the upper wall, the lower wall, and the left wall is the same.

• This means the big square can be divided into 4 equal squares



Use the following information to answer question 12.

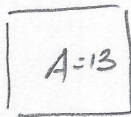
The area, A , of four square carpets is shown below.



12. Which carpet will cover the most floor area, without touching a wall, when it is laid flat in a square room that has a width of 4.5 m?

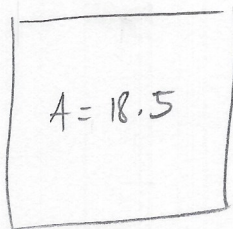
- A. Carpet 1
- B. Carpet 2
- C. Carpet 3
- D. Carpet 4

Carpet 1



side length = $\sqrt{13} = 3.6$

Carpet 2



side length = $\sqrt{18.5} = 4.3$

Carpet 4

$A = 22$

side length = $\sqrt{22} = 4.69$

Carpet 3

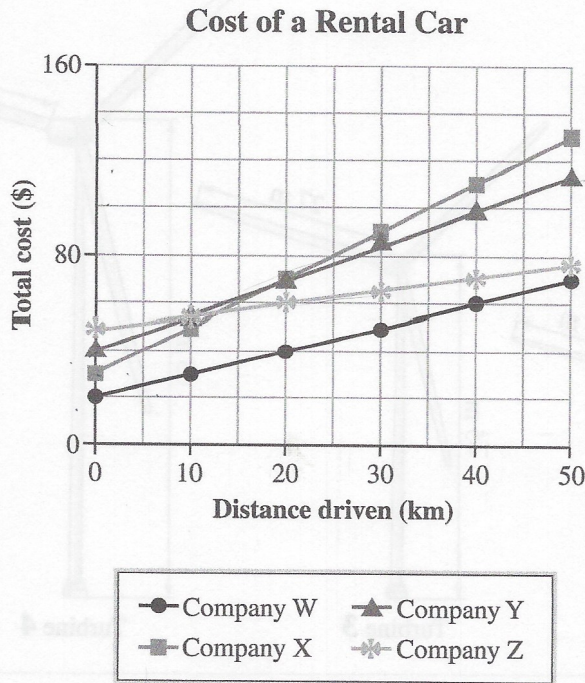
$A = 4.4$

side length = $\sqrt{4.4} = 2.09$

• Carpet 4 is too big
• Carpets 1 and 3 are too small

Use the following information to answer question 13.

The cost of renting a car includes the base fee and a charge for each kilometre driven. The graph below represents the total cost of renting a vehicle at four different rental car companies.



13. Which rental car company has the smallest charge for each kilometre driven?

- A. Company W
- B. Company X
- C. Company Y
- D. Company Z**

\$ 100

↑

Company X: \$ 30 + Price of 50 Km = \$ 130

Each kilometer, then

Company W

Price of 50 Km

↑

$$\$20 + \frac{50}{50} = \$70$$

$$\frac{\$50}{50 \text{ Km}} = \$1 \text{ per Km}$$

$$\frac{\$100}{50 \text{ Km}} = \$2 \text{ per Km}$$

Company Y

\$ 70

↑

$$\$40 + \text{Price of } \frac{70}{50 \text{ Km}} = \$110$$

$$\frac{\$70}{50 \text{ Km}} = \$1.4 \text{ per Km}$$

Company Z

\$ 25

↑

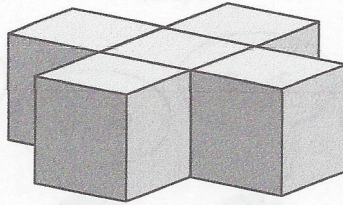
$$\$50 + \text{Price of } \frac{25}{50 \text{ Km}} = \$75$$

$$\frac{\$25}{50 \text{ Km}} = \$0.50 \text{ per Kilometer}$$

Use the following information to answer question 14.

The following 3-D object is composed of identical cubes. The volume of each cube is 8 cm^3 .

$V = 8$
means
 $V = \text{length} \times \text{width} \times \text{depth}$
 $2 \times 2 \times 2$



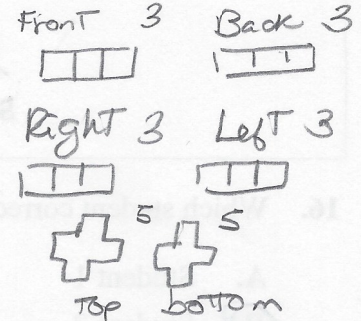
so, area of each face

$\frac{2}{2} \times \frac{2}{2} = 4 \text{ cm}^2$

14. What is the total surface area of the 3-D object shown above?

- A. 120 cm^2
- B. 100 cm^2
- C. 88 cm^2**
- D. 72 cm^2

Total Area = 22 faces \times 4 cm^2
 $= 88 \text{ cm}^2$



15. The value of x in the equation $3(2x - 1) = \frac{1}{2}(x + 6)$ is

- A. $\frac{8}{11}$
- B. $\frac{12}{11}$**
- C. $\frac{14}{11}$
- D. $\frac{18}{11}$

to get rid of bracket,
Do the distributive property

Total $5 + 5 + 6 + 6 = 22$ faces

$6x - 3 = \frac{x}{2} + \frac{6}{2}(3)$

$6x - 3 = \frac{x}{2} + 3$
 $+3$ $+3$

$6x = \frac{x}{2} + 6$
 $-\frac{x}{2}$ $-\frac{x}{2}$

$6x - \frac{x}{2} = 6$

$\frac{6x(2)}{1(2)} - \frac{x}{2} = 6$

$\frac{12x}{2} - \frac{x}{2} = 6$

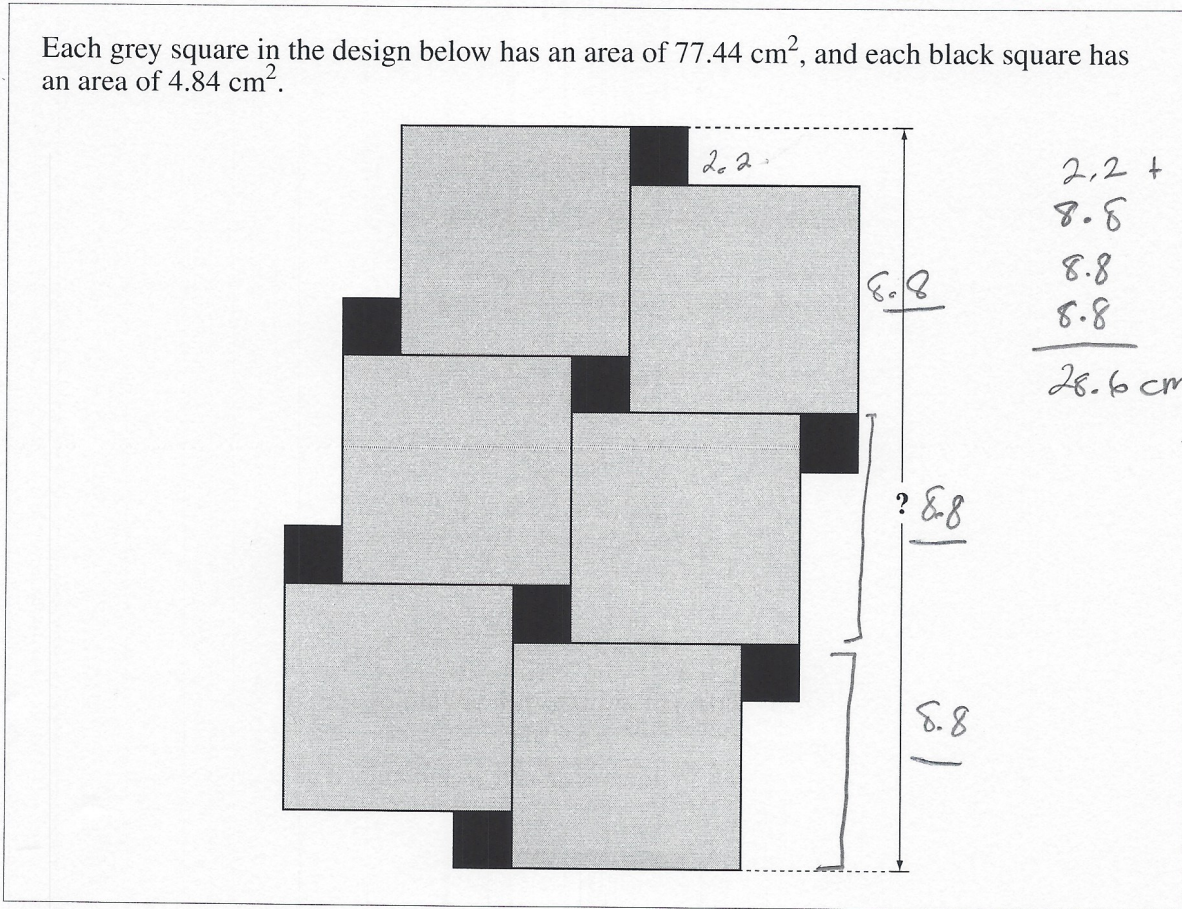
$\frac{11x}{2} = 6(2)$

$\frac{11x}{11} = \frac{12}{11}$

$x = \frac{12}{11}$

Use the following information to answer question 18.

Each grey square in the design below has an area of 77.44 cm^2 , and each black square has an area of 4.84 cm^2 .



18. To the nearest tenth of a centimetre, what is the height of the design shown above?

- A. 28.6 cm
- B. 33.0 cm
- C. 35.2 cm
- D. 59.3 cm

Area of 4.84

Side length = 2.2

Area of 77.44

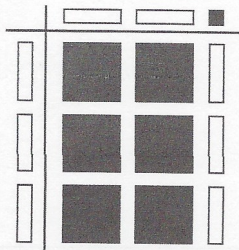
Side length = 8.8

Use the following information to answer question 19.

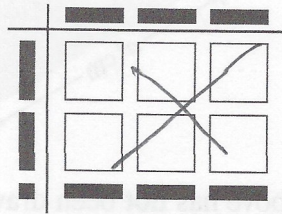
Legend		
■ = 1	▬ = x	■ = x ²
□ = -1	▬ = -x	□ = -x ²

19. Which of the following models could be used to represent the division of $6x^2 - 3x$ by $-3x$?

A.



B.

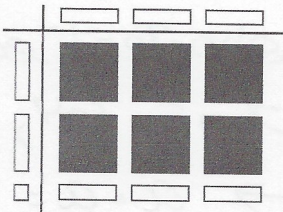


• Match the (inside)

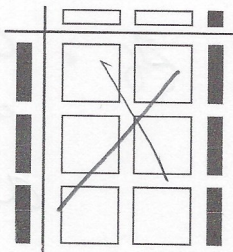
A OR C

• Find $-3x$ on the side or on top (outside)

C.



D.



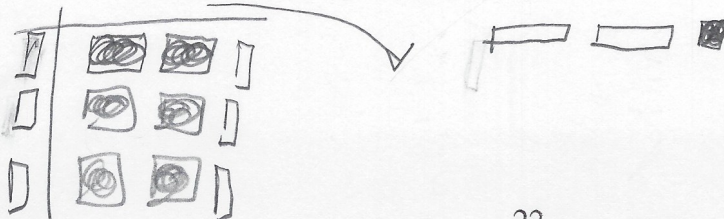
A OR C

• Now multiply the top/side tiles on A and C, and you'll see the error

• If you do NOT want to do it using Tiles, do the division first, then match

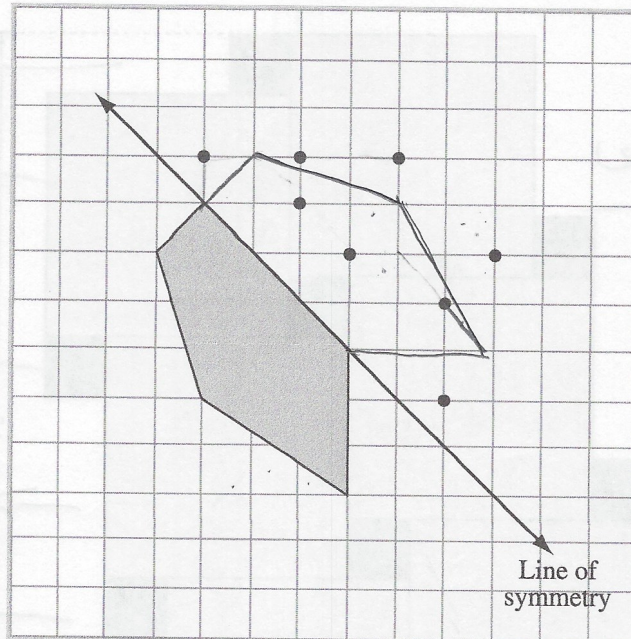
$$\frac{6x^2 - 3x}{-3x} = \frac{6x^2}{-3x} - \frac{3x}{-3x} = -2x + 1$$

• this should be inside



Use the following information to answer numerical-response question 4.

An incomplete 2-D shape and its line of symmetry are shown in the diagram below.



Numerical Response

4. When the 2-D shape is completely drawn, how many points will be inside the 2-D shape?

Answer: 3

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer question 21.

The organizer of a 16-team soccer tournament wants to conduct a survey to determine the minimum number of games each team in the tournament would like to play.

21. Which of the following samples would provide the most reliable results for her survey?

- A. One player each from half of the teams (not all teams have input)
- B. Every fourth team that registers in the tournament (what if they belong to same team)
- C. Three randomly selected players or coaches from each team (all teams are heard)
- D. All of the players and coaches from one randomly selected team (what about other teams)

Use the following information to answer numerical-response question 5.

In one month, Dale earned \$180.00. He earned \$45.00 by washing cars, and the rest by mowing lawns.

Numerical Response

5. How many lawns did Dale mow if he received \$9.00 for each lawn that he mowed?

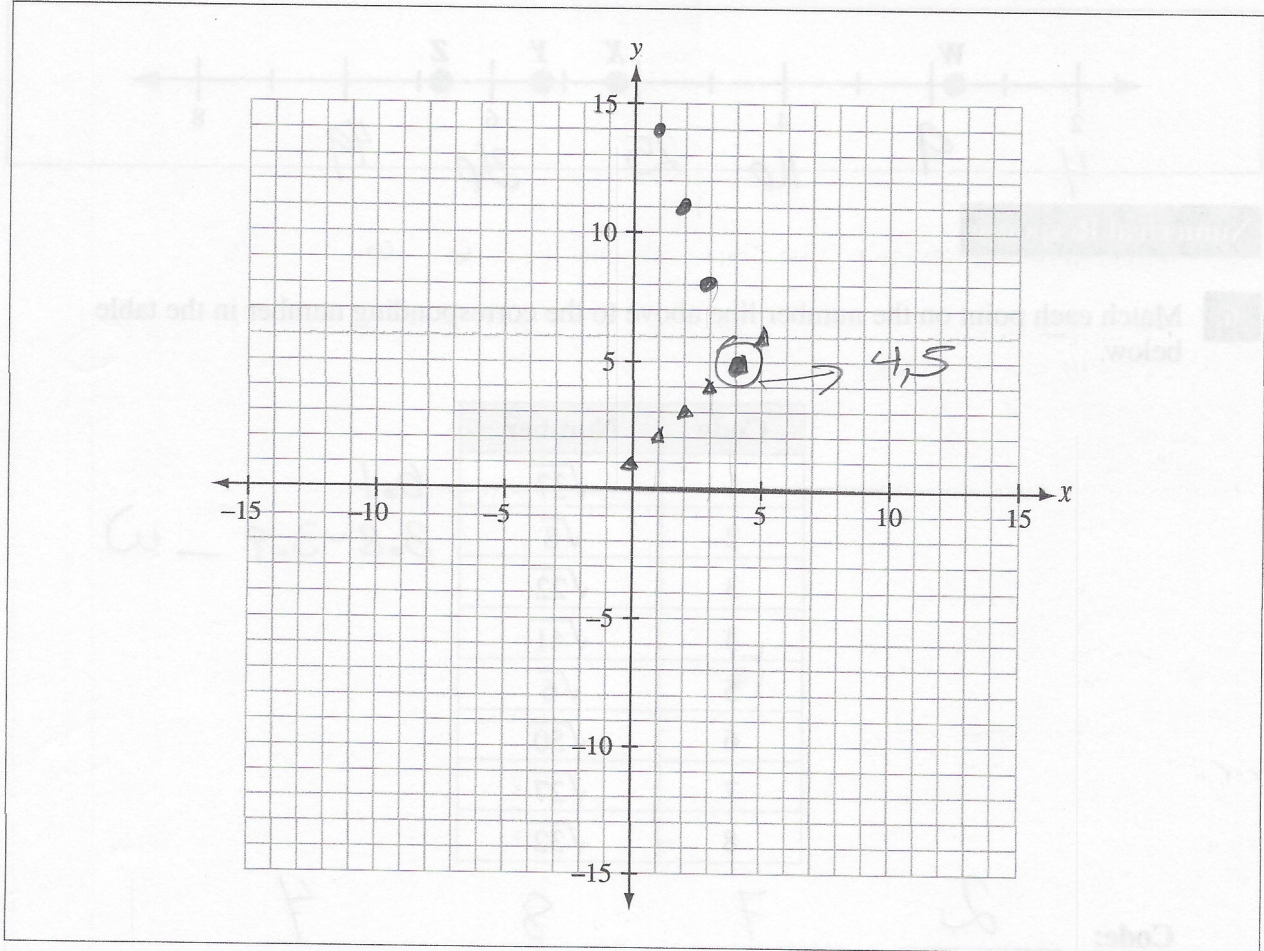
Answer: 15 lawns

(Record your answer in the numerical-response section on the answer sheet.)

$$\begin{array}{r} \$180 = \$45 + \$135 \\ \underbrace{\hspace{1.5cm}} \quad \underbrace{\hspace{1.5cm}} \\ \text{cars} \quad \text{lawn mowing} \end{array}$$

$$\begin{array}{r} \text{then } \frac{\$135}{\$9 \text{ per lawn}} = \underline{\underline{15 \text{ lawns}}} \end{array}$$

Use the following information to answer question 24.



24. The graphs of the relations $3x + y = 17$ and $y = x + 1$ intersect at the point with the coordinates

- A. (0, 1)
- B. (3, 8)
- C. (4, 5)
- D. (5, 4)

$$y = 17 - 3x$$

x	y
0	17
1	14
2	11
3	8
4	5

$$y = x + 1$$

x	y
0	1
1	2
2	3
3	4
4	5

Use the following information to answer question 25.

David creates the table of values shown below based on designs he assembles using black and white 2-D shapes.

Number of Black Shapes (b)	Number of White Shapes (w)
2	7
3	9
4	11

+2

25. Which of the following equations represents the linear relationship between the number of black shapes and the number of white shapes?

- A. $5b - 3 = w$
- B. $4b - 1 = w$
- C. $3b + 1 = w$
- D. $2b + 3 = w$

Because the pattern at y is +2, then the equation has +2b

Since $b=2, w=7$ $2b=4$, to 7, needs 3

$$w = 2b + 3$$

26. When the expression $(x^2 - 5x + 4) - (3x^2 + 8x - 20)$ is simplified, the result is

- A. $-2x^2 - 13x + 24$
- B. $-2x^2 - 3x + 16$
- C. $2x^2 + 13x - 24$
- D. $2x^2 + 3x - 16$

• to simplify means to group "like" terms
 • to subtract means to "ADD the opposite"

$$\begin{aligned} & (x^2 - 5x + 4) + (-3x^2 - 8x + 20) \\ & \text{• group terms:} \\ & -3x^2 + x^2 - 5x - 8x + 4 + 20 \\ & -2x^2 - 13x + 24 \end{aligned}$$

Use the following information to answer question 29.

Legend		
■ = 1	▬ = x	■ = x ²
□ = -1	▬ = -x	□ = -x ²

Like Terms
↓
Same Variable AND
Same exponent

29. Which of the following pairs of expressions represents like terms?

- A. $3x$ and ■■■ $3x$ and x^2 (NOT like terms)
- B. $-6x^2$ and □□□□ $-6x^2$ and -4 (NOT like terms)
- C. $-2(4x)$ and ■■■■■■ $-8x$ and -5 (NOT like terms)
- D. $4(-1x)$ and ▬▬▬▬ $-4x$ and $3x$ → Same variable
Like Terms → Same exponent

Use the following information to answer question 30.

Expression 1	$(2^2)^3 + 2^2 = 2^6 + 2^2 = 64 + 4 = 68$
Expression 2	$4^2 + 4^3 - (4^3)^0 = 16 + 64 - 1 = 80 - 1 = 79$
Expression 3	$3^4 - 3^2 = 81 - 9 = 72$

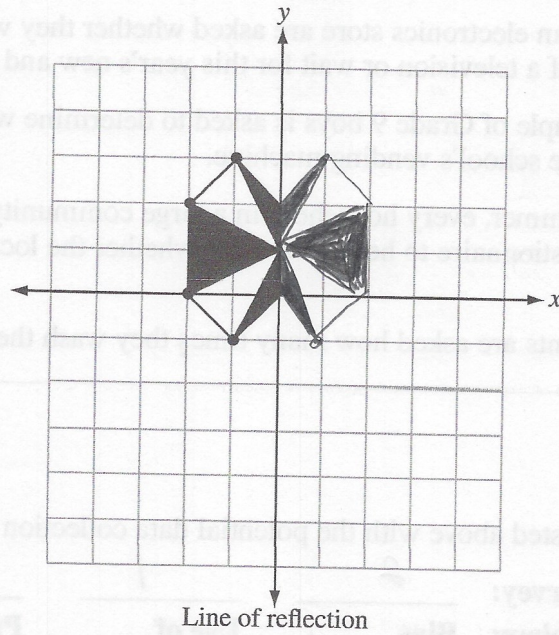
30. Which of the following rows correctly identifies the expression with the lowest value and the expression with the highest value?

Row	Lowest Value	Highest Value
A.	Expression 1	Expression 3
<input checked="" type="radio"/> B.	Expression 1	Expression 2
C.	Expression 3	Expression 2
D.	Expression 3	Expression 1

Lowest highest

Use the following information to answer question 32.

The 2-D shape shown on the Cartesian plane below is reflected about the y-axis.



32. If the original 2-D shape and the reflected image combine to form a new 2-D shape, what is the angle of rotational symmetry of the new 2-D shape?

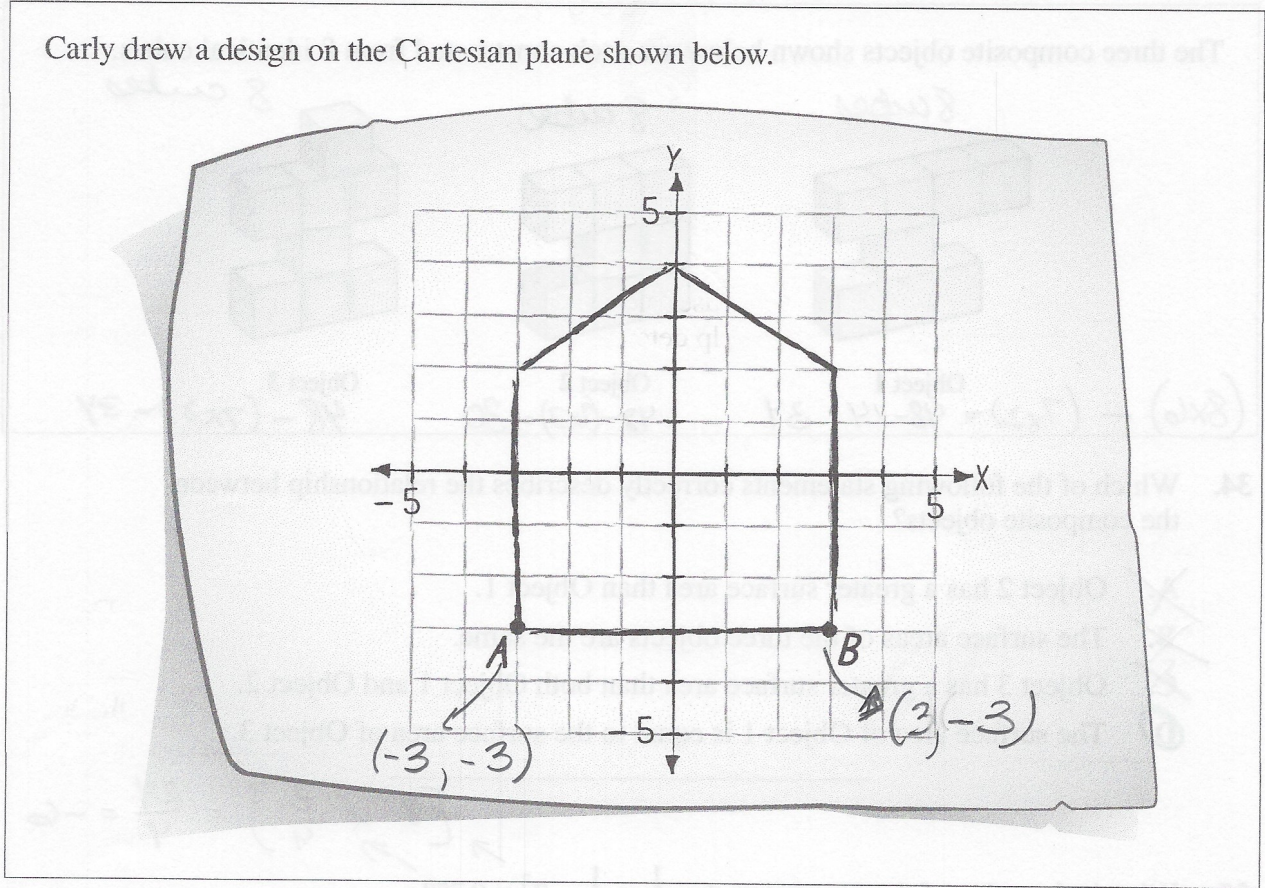
- A. 90°
- B. 180°
- C. 270°
- D. 360°

Order of 2 (twice it "fits" into itself)

$$\frac{360^\circ}{2} = 180^\circ$$

Use the following information to answer question 33.

Carly drew a design on the Cartesian plane shown below.



33. Which of the following equations describes line segment AB on the Cartesian plane shown above?

- A. $y = -3$
- B. $y = 3$
- C. $x = -3$
- D. $x = 3$

Remember:

\overline{AB} goes through (x, y)
 $y = -3$ regardless of the value of x .

Use the following information to answer question 36.

Legend

■ = 1	▬ = x	■ = x ²
□ = -1	▬ = -x	□ = -x ²

Polynomial 1:

Polynomial 2:

Polynomial 3:

Polynomial 4: ?

36. Which of the following expressions could represent Polynomial 4 if the sum of all four expressions is $6x$?

- A. $9x^2 - 5x - 1$
- B. $3x^2 + x - 2$
- C. $-x^2 - x + 5$
- D. $-3x^2 + 11x + 1$

Polynomial 1: $x^2 - x^2 + 4x - 2 + 1 = 0 + 4x - 1 +$

Polynomial 2: $3x - x - 2x^2 - 2 + 1 = -2x^2 + 2x - 1$

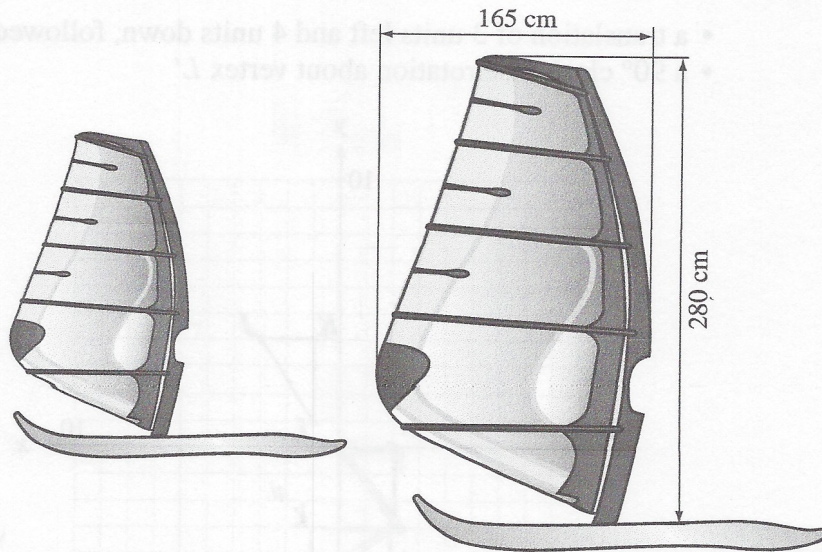
Polynomial 3: $4 - 2x + x - x^2 + x^2 - x^2 = -x^2 - x + 4$

Polynomial 4: $\underline{\hspace{10em}} \rightarrow \boxed{3x^2 + x - 2}$

$0 + 6x + 0$

Use the following information to answer numerical-response question 9.

The large sail shown below is an enlargement of the small sail.



Numerical Response

9. What is the height of the small sail if the scale factor of the enlargement is 2.50?

Answer: 112 cm

(Record your answer in the numerical-response section on the answer sheet.)

$$1.69 = \frac{280}{165} \rightarrow \text{Since the ratio is constant}$$

$$\text{height} \times 2.5 = 280$$

$$\text{height} = \frac{280}{2.5} = \underline{\underline{112 \text{ cm}}}$$

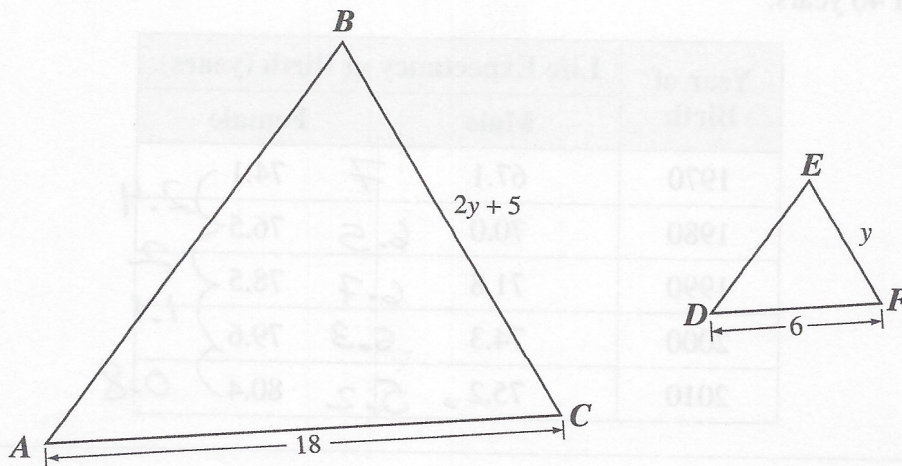
Prove:

$$\frac{165}{2.5} = 66 \text{ cm}$$

$$\text{Ratio} = \frac{112}{66} = \text{Ratio} = 1.69 \text{ (Same Ratio)}$$

Use the following information to answer question 39.

Triangle ABC is similar to triangle DEF .



39. What is the length of side BC ?

- A. 11
- B. 13
- C. 15
- D. 17

$$\frac{18}{6} = \frac{2y + 5}{y}$$

$$18y = 6(2y + 5)$$

$$18y = 12y + 30$$

$$18y - 12y = 30$$

$$6y = 30$$

$$y = \frac{30}{6} = 5$$

so

$$BC = 2y + 5$$

$$= 2(5) + 5$$

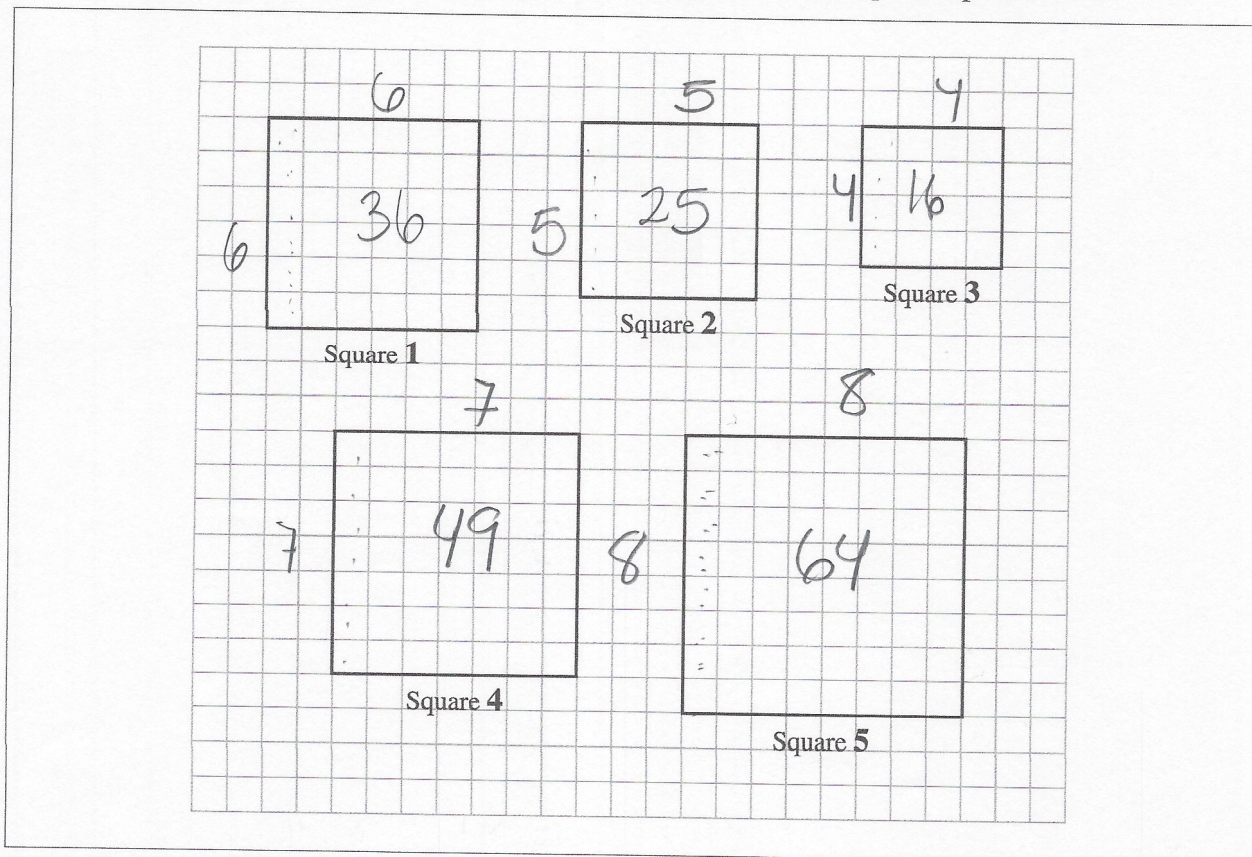
$$= 15$$

Prove:

$$\frac{18}{15} = \frac{6}{5}$$

$$1.2 = 1.2$$

Use the following information to answer numerical-response question 10.



Numerical Response

10. Which two squares shown above represent the **best** benchmarks for estimating the value of $\sqrt{43}$?

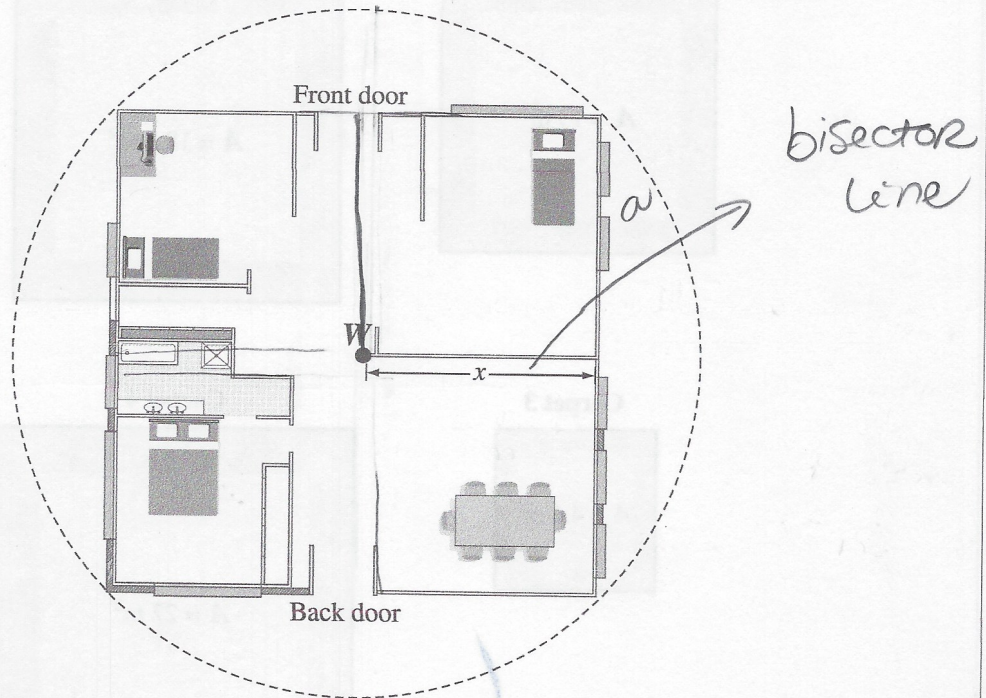
Answer: Square 1 and Square 4

(Record **both digits** of your answer **in any order** in the numerical-response section on the answer sheet.)

*You have now completed the test.
If you have time, you may wish to check your answers.*

Use the following information to answer question 11.

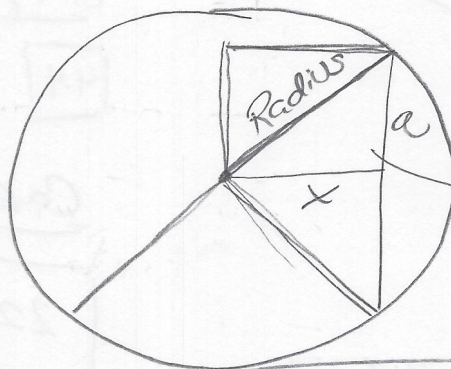
The letter W is in the centre of the diagram below and represents the location of a wireless router for Internet access in a square house. The router provides access to the area represented by the dotted circle in the diagram below. This circular area has a diameter of 20 m.



11. To the nearest tenth of a metre, the distance, x , from the router, W, to the middle of one outside wall is

- A. 7.1 m
- B. 8.9 m
- C. 10.0 m
- D. 14.1 m

Re-draw the circle



Since $d=20$ m,
then $r=10$ m

Since the square
can be divided
into 4 equal
squares, then
 $a = x$

D. It's impossible, since
the bisector can NOT
be bigger than Radius

C. NOT possible, since
 x is shorter than
Radius

If $x = 7.1$
then $a = \sqrt{10^2 - 7.1^2}$

$a = \sqrt{49.59} = 7.0414$

BUT this can't be, because it would make the chord

If $x = 8.9$

then $a = \sqrt{10^2 - 8.9^2} = \sqrt{100 - 79.21}$
 $= \sqrt{20.79} = 4.55$