



PASSING THE MINNESOTA  
8th GRADE MCA-II  
IN  
MATHEMATICS

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# Diagnostic Test

## Segment 1

You may NOT use a calculator for this segment.

1. Which of the following sets of decimals are in order from SMALLEST TO LARGEST?

(A) 0.5, 0.056, 0.65, 0.665  
(B) 0.43, 0.58, 0.6, 0.088  
(C) 0.097, 0.7, 0.79, 0.97  
(D) 0.221, 0.281, 0.310, 0.308

II.A.1

2. Which of the following numbers is closest to  $\sqrt{85}$ ?

(A) 3  
(B) 9  
(C) 12  
(D) 10

II.B.2

3. Which of these operations would you perform first in the following expression?

$$5\{19 - (4 + 2 \times 6)\}$$

(A) Multiply  $5 \times 19$   
(B) Subtract  $19 - 4$   
(C) Add  $4 + 2$   
(D) Multiply  $2 \times 6$

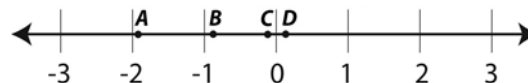
II.B.5

4. Richard can throw a football 60 yards. How many feet can he throw it?

(A) 10  
(B) 20  
(C) 180  
(D) 600

V.C.1

5. Use the following diagram for this question.



Which dash on the number line could be  $-0.21$ ?

(A) A  
(B) B  
(C) C  
(D) D

II.A.1

6. Zaduk from planet Zenon, wants to take his wife and kids on an interplanetary vacation. The nearest planet is 35,000,000 miles away. How far is that in scientific notation?

(A)  $3.5 \times 10^7$  miles  
(B)  $3.5 \times 10^6$  miles  
(C)  $3.5 \times 10^{-6}$  miles  
(D)  $3.5 \times 10^{-7}$  miles

II.A.3

7. Which of the following contains only rational numbers?

(A) 13, 6.5,  $\sqrt{16}$ , 0.545454...  
(B) 22.18,  $\frac{98}{7}$ ,  $\sqrt{39}$ , 2  
(C)  $19\frac{6}{13}$ ,  $\sqrt{2}$ ,  $\frac{12}{2}$ , 13.636363...  
(D)  $52\frac{3}{2}$ ,  $\sqrt{24}$ , 3.14

II.A.4

### 3.8 Order of Operations

In long math problems with  $+$ ,  $-$ ,  $\times$ ,  $\div$ ,  $()$ , and exponents, you have to know what to do first. Without following the same rules, you could get different answers. If you memorize the silly sentence, Please Excuse My Dear Aunt Sally, you can memorize the order you must follow.

**Please**      "**P**" stands for parentheses. You must get rid of parentheses first.  
Examples:  $3(1 + 4) = 3(5) = 15$   
 $6(10 - 6) = 6(4) = 24$

**Excuse**      "**E**" stands for exponents. You must eliminate exponents next.  
Example:  $4^2 = 4 \times 4 = 16$

**My Dear**      "**M**" stands for multiply. "**D**" stands for divide. Start on the left of the equation and perform all multiplications and divisions in the order in which they appear.

**Aunt Sally**      "**A**" stands for add. "**S**" stands for subtract. Start on the left and perform all additions and subtractions in the order they appear.

**Example 15:**  $12 \div 2(6 - 3) + 3^2 - 1$

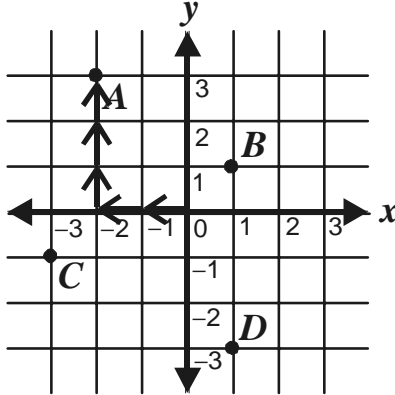
<b>Please</b>	Eliminate <b>parentheses</b> . $6 - 3 = 3$ so now we have	$12 \div 2 \times 3 + 3^2 - 1$
<b>Excuse</b>	Eliminate <b>exponents</b> . $3^2 = 9$ so now we have	$12 \div 2 \times 3 + 9 - 1$
<b>My Dear</b>	<b>Multiply</b> and <b>divide</b> next in order from left to right.	$12 \div 2 = 6$ then $6 \times 3 = 18$
<b>Aunt Sally</b>	Last, we <b>add</b> and <b>subtract</b> in order from left to right.	$18 + 9 - 1 = 26$

**Simplify the following problems.**

- |                                 |                               |
|---------------------------------|-------------------------------|
| 1. $6 + 9 \times 2 - 4$         | 11. $8 + 4^2 \times 2 - 6$    |
| 2. $3(4 + 2) - 6^2$             | 12. $3^2(4 + 6) + 3$          |
| 3. $3(6 - 3) - 2^3$             | 13. $(12 - 6) + 27 \div 3^2$  |
| 4. $49 \div 7 - 3 \times 3$     | 14. $82^0 - 1 + 4 \div 2^2$   |
| 5. $10 \times 4 - (7 - 2)$      | 15. $1 - (2 - 3) + 8$         |
| 6. $2 \times 3 \div 6 \times 4$ | 16. $12 - 4(7 - 2)$           |
| 7. $4^3 \div 8(4 + 2)$          | 17. $18 \div (6 + 3) - 12$    |
| 8. $7 + 8(14 - 6) \div 4$       | 18. $10^2 + 3^3 - 2 \times 3$ |
| 9. $(2 + 8 - 12) \times 4$      | 19. $4^2 + (7 + 2) \div 3$    |
| 10. $4(8 - 13) \times 4$        | 20. $7 \times 4 - 9 \div 3$   |

## 6.6 Identifying Ordered Pairs

When identifying ordered pairs, count how far left or right of 0 to find the  $x$ -coordinate and then how far up or down from 0 to find the  $y$ -coordinate.



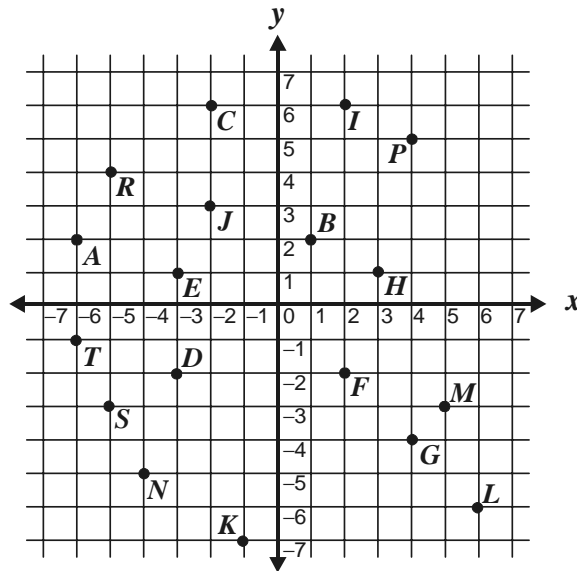
**Point A:** Left (negative) two and up (positive) three =  $(-2, 3)$  in quadrant II

**Point B:** Right (positive) one and up (positive) one =  $(1, 1)$  in quadrant I

**Point C:** Left (negative) three and down (negative) one =  $(-3, -1)$  in quadrant III

**Point D:** Right (positive) one and down (negative) three =  $(1, -3)$  in quadrant IV

**Fill in the ordered pair for each point, and tell which quadrant it is in.**



- |              |              |              |               |               |               |
|--------------|--------------|--------------|---------------|---------------|---------------|
| 1. point $A$ | 4. point $D$ | 7. point $G$ | 10. point $J$ | 13. point $M$ | 16. point $R$ |
| 2. point $B$ | 5. point $E$ | 8. point $H$ | 11. point $K$ | 14. point $N$ | 17. point $S$ |
| 3. point $C$ | 6. point $F$ | 9. point $I$ | 12. point $L$ | 15. point $P$ | 18. point $T$ |

## 8.7 Multi-Step Algebra Problems

You can now use what you know about removing parentheses, combining like terms, and solving simple algebra problems to solve problems that involve three or more steps. Study the examples below to see how easy it is to solve multi-step problems.

**Example 10:**  $3(x + 6) = 5x - 2$

<b>Step 1:</b>	Use the distributive property to remove parentheses.	$3x + 18 = 5x - 2$
<b>Step 2:</b>	Subtract $5x$ from each side to move the terms with variables to the left side of the equation.	$\frac{-5x}{-2x + 18} = \frac{-5x}{-2}$
<b>Step 3:</b>	Subtract 18 from each side to move the integers to the right side of the equation.	$\frac{-18}{-2x} = \frac{-18}{-2}$
<b>Step 4:</b>	Divide both sides by $-2$ to solve for $x$ .	$x = 10$

**Example 11:**  $\frac{3(x - 3)}{2} = 9$

<b>Step 1:</b>	Use the distributive property to remove parentheses.	$\frac{3x - 9}{2} = 9$
<b>Step 2:</b>	Multiply both sides by 2 to eliminate the fraction.	$\frac{2(3x - 9)}{2} = 2(9)$
<b>Step 3:</b>	Add 9 to both sides, and combine like terms.	$\frac{3x - 9}{+9} = \frac{18}{+9}$
<b>Step 4:</b>	Divide both sides by 3 to solve for $x$ .	$\frac{3x}{3} = \frac{27}{3}$ $x = 9$

**Solve the following multi-step algebra problems.**

1.  $2(y - 3) = 4y + 6$

5.  $2x + 3x = 30 - x$

2.  $\frac{2(a + 4)}{2} = 12$

6.  $\frac{2a + 1}{3} = a + 5$

3.  $\frac{10(x - 2)}{5} = 14$

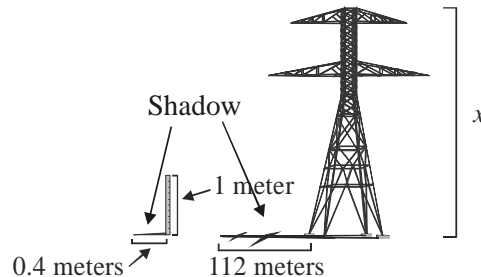
7.  $5(b - 4) = 10b + 5$

4.  $\frac{12y - 18}{6} = 4y + 3$

8.  $-8(y + 4) = 10y + 4$

### 9.3 Ratio and Proportion Word Problems

**Example 3:** A stick one meter long is held perpendicular to the ground and casts a shadow 0.4 meters long. At the same time, an electrical tower casts a shadow 112 meters long. Use ratio and proportion to find the height of the tower.



**Step 1:** Set up a proportion using the numbers in the problem. Put the shadow lengths on one side of the equation and put the heights on the other side. The 1 meter height is paired with the 0.4 meter length, so let them both be top numbers. Let the unknown height be  $x$ .

$$\begin{array}{ccc} \text{shadow} & & \text{object} \\ \text{length} & & \text{height} \\ \hline 0.4 & = & 1 \\ \hline 112 & & x \end{array}$$

**Step 2:** Solve the proportion as you did on page 98.

$$112 \times 1 = 112 \qquad 112 \div 0.4 = 280$$

**Answer:** The tower height is 280 meters.

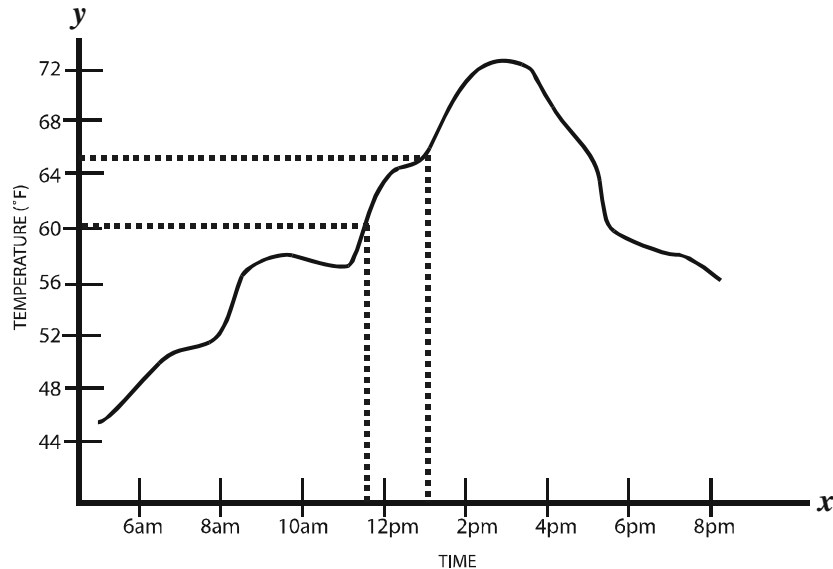
**Use ratio and proportion to solve the following problems.**

- Rudolph can mow a lawn that measures 1,000 square feet in 2 hours. At that rate, how long would it take him to mow a lawn 3,500 square feet?
- Faye wants to know how tall her school building is. On a sunny day, she measures the shadow of the building to be 6 feet. At the same time she measures the shadow cast by a 5 foot statue to be 2 feet. How tall is her school building?
- Out of every 5 students surveyed, 2 listen to country music. At that rate, how many students in a school of 800 listen to country music?
- Butterfly, a Labrador retriever, has a litter of 8 puppies. Four are black. At that rate, how many puppies in a litter of 10 would be black?
- According to the instructions on a bag of fertilizer, 5 pounds of fertilizer are needed for every 100 square feet of lawn. How many square feet will a 25-pound bag cover?
- A race car can travel 2 laps in 5 minutes. At this rate, how long will it take the race car to complete 100 laps ?
- If it takes 7 cups of flour to make 4 loaves of bread, how many loaves of bread can you make from 35 cups of flour?
- If 3 pounds of jelly beans cost \$6.30, how much would 2 pounds cost?
- For the first 4 home football games, the concession stand sold a total of 600 hotdogs. If that ratio stays constant, how many hotdogs will sell for all 10 home games?

## 10.12 Identifying Graphs of Real-World Situations

Real-world situations are sometimes modeled by graphs. Although an equation cannot be written for most of these graphs, interpreting these graphs provides valuable information. Situations may be represented on a graph as a function of time, length, temperature, etc.

The graph below depicts the temperature of a pond at different times of the day. Refer to the graph as you read through examples 1 and 2.



**Example 20:** If it is known that a specific breed of fish is most active in waters between  $60^{\circ}\text{F}$  and  $65^{\circ}\text{F}$ , what time of the day would this fish be the most active in this particular pond?

To find the answer, draw lines from the  $60^{\circ}\text{F}$  and  $65^{\circ}\text{F}$  points on the y-axis to the graph. Then, draw vertical lines from the graph to the x-axis. The time range between the two vertical lines on the x-axis indicates the time that the fish are most active. It can be determined from the graph that the fish are most active between 11:30 am and 1:00 PM.

**Example 21:** Describe the way the temperature of the pond acts as a function of time.

At 6 AM, the temperature of the pond is about  $47^{\circ}\text{F}$ . The temperature increases relatively steadily throughout the morning and early afternoon. The temperature peaks at  $72^{\circ}\text{F}$ , which is around 2:30 PM during the day. Afterwards, the temperature of the pond starts to decrease. The later it gets in the evening, the more the temperature of the water decreases. The graph shows that at 8 PM the temperature of the pond is about  $57^{\circ}\text{F}$ .

**Find the probability of the following problems. Express the answer as a percent.**

1. A computer chooses a random number between 1 and 50. What is the probability that you will guess the same number that the computer chose in 1 try?

2. There are 24 candy-coated chocolate pieces in a bag. Eight have defects in the coating that can be seen only with close inspection. What is the probability of pulling out a defective piece without looking?

3. Seven sisters have to choose which day each will wash the dishes. They put equal-sized pieces of paper in a hat, each labeled with a day of the week. What is the probability that the first sister who draws will choose a weekend day?

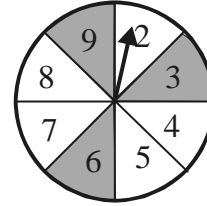
4. For his garden, Clay has a mixture of 12 white corn seeds, 24 yellow corn seeds, and 16 bicolor corn seeds. If he reaches for a seed without looking, what is the probability that Clay will plant a bicolor corn seed first?

5. Mom just got a new department store credit card in the mail. What is the probability that the last digit is an odd number?

6. Alex has a paper bag of cookies that holds 8 chocolate chip, 4 peanut butter, 6 butterscotch chip, and 12 ginger. Without looking, his friend John reaches in the bag for a cookie. What is the probability that the cookie is peanut butter?

7. An umpire at a little league baseball game has 14 balls in his pockets. Five are brand A, 6 are brand B, and 3 are brand C. What is the probability that the next ball he throws to the pitcher is a brand C ball?

8. What is the probability that the spinner's arrow will land on an even number?



9. The spinner in the problem above stopped on a shaded wedge on the first spin and stopped on the number 2 on the second spin. What is the probability that it will not stop on a shaded wedge or on the 2 on the third spin?

10. A company is offering 1 grand prize, 3 second place prizes, and 25 third place prizes based on a random drawing of contest entries. If your entry is one of the 500 total entries, what is the probability you will win a third place prize?

11. In the contest problem above, what is the probability that you will win the grand prize or a second place prize?

12. A box of a dozen doughnuts has 3 lemon cream-filled, 5 chocolate cream-filled, and 4 vanilla cream-filled. If the doughnuts look identical, what is the probability of picking a lemon cream-filled?

### 13.11 Converting Units within the Metric System

Converting units such as kilograms to grams or centimeters to decimeters is easy now that you know how to multiply and divide by multiples of ten.

<b>Prefix</b>	<b>kilo</b> (k)	<b>hecto</b> (h)	<b>deka</b> (da)	<b>unit</b> (m, L, g)	<b>deci</b> (d)	<b>centi</b> (c)	<b>milli</b> (m)
<b>Meaning</b>	<b>1000</b>	<b>100</b>	<b>10</b>	<b>1</b>	<b>0.1</b>	<b>0.01</b>	<b>0.001</b>

**Example 4:** 2 L = \_\_\_\_ mL

$$\underline{2.000} \text{ L} = 2000 \text{ mL}$$

Look at the chart above. To move from liters to milliliters, you move to the right three places. So, to convert the 2 L to mL, move the decimal point three places to the right. You will need to add two zeros.

**Example 5:** 5.25 cm = \_\_\_\_ m

$$\underline{005.25} \text{ cm} = 0.0525 \text{ m}$$

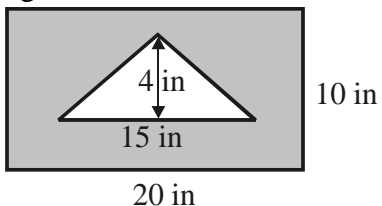
To move from centimeters to meters, you need to move two spaces to the left. So, to convert 5.25 cm to m, move the decimal point two spaces to the left. Again, you need to add zeros.

**Solve the following problems.**

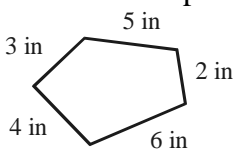
1. 35 mg = \_\_\_\_\_ g
2. 6 km = \_\_\_\_\_ m
3. 21.5 mL = \_\_\_\_\_ L
4. 4.9 mm = \_\_\_\_\_ cm
5. 5.35 kL = \_\_\_\_\_ mL
6. 32.1 mg = \_\_\_\_\_ kg
7. 156.4 m = \_\_\_\_\_ km
8. 25 mg = \_\_\_\_\_ cg
9. 17.5 L = \_\_\_\_\_ mL
10. 4.2 g = \_\_\_\_\_ kg
11. 0.06 daL = \_\_\_\_\_ dL
12. 0.417 kg = \_\_\_\_\_ cg
13. 18.2 cL = \_\_\_\_\_ L
14. 81.2 dm = \_\_\_\_\_ cm
15. 72.3 cm = \_\_\_\_\_ m
16. 0.003 kL = \_\_\_\_\_ L
17. 5.06 g = \_\_\_\_\_ mg
18. 1.058 mL = \_\_\_\_\_ cL
19. 43 hm = \_\_\_\_\_ km
20. 2.057 m = \_\_\_\_\_ cm
21. 564.3 g = \_\_\_\_\_ kg

### Chapter 14 Review

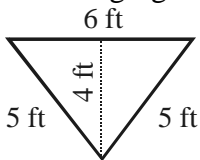
1. Find the area of the shaded region of the figure below.



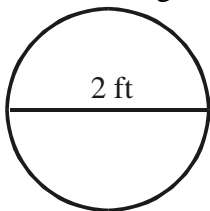
2. Calculate the perimeter.



3. Calculate the perimeter and area of the following figure.

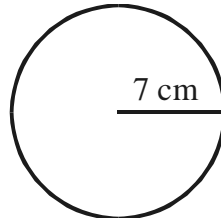


4. Calculate the circumference and the area of the following circle. Use  $\pi = 3.14$ .

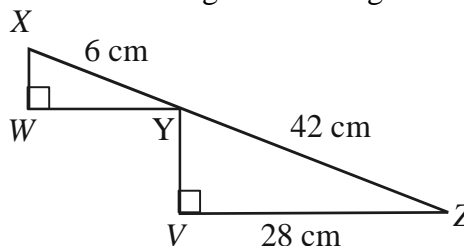


5. What is the area of a square which measures 8 inches on each side?
6. If you double the width of a square, how much does the area of the square increase?

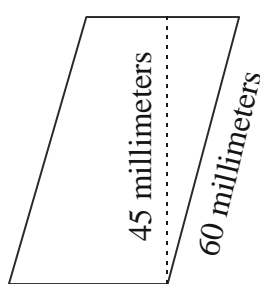
7. Calculate the circumference and the area of the following circle. Use  $\pi = \frac{22}{7}$ .



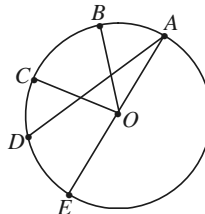
8. What is the length of line segment  $\overline{WY}$ ?



9. Find the area of the following figure.



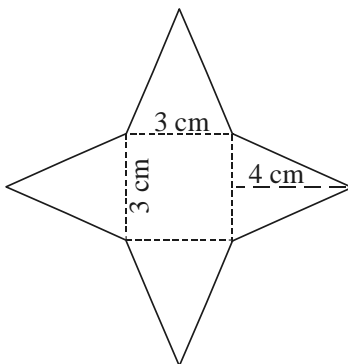
10. In the circle below,  $\overline{AE}$  is a diameter,  $\angle DAE$  measures  $30^\circ$  and  $m\widehat{BC} = 45$ . Find the measure of  $m\widehat{DE}$  and  $\angle BOC$ .



### 15.11 Using Nets To Find Surface Area

A **net** is a two dimensional representation of a three dimensional object. Nets clearly illustrate the plane figures that make up a solid.

**Example 4:** Find the surface area of the figure shown below.

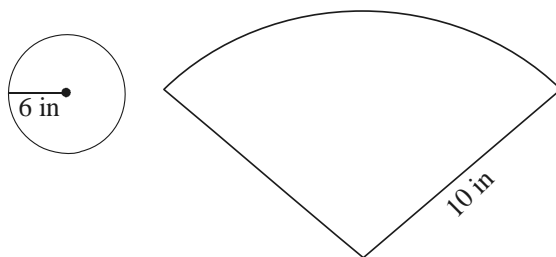


**Step 1:** Find the area of the 4 triangles  
 $A = \frac{1}{2}bh = \frac{1}{2} \times 3 \times 4 = 6 \text{ cm}^2$   
 Area of all 4 triangles =  $4 \times 6 = 24 \text{ cm}^2$

**Step 2:** Find the area of the base.  
 $A = lw = 3 \times 3 = 9 \text{ cm}^2$

**Step 3:** Find the sum of the areas of all the plane figures.  
 Surface Area =  $24 \text{ cm}^2 + 9 \text{ cm}^2$   
 $SA = 33 \text{ cm}^2$

**Example 5:** A net for a cone is shown below. Find the surface area of each part to find the total surface area.



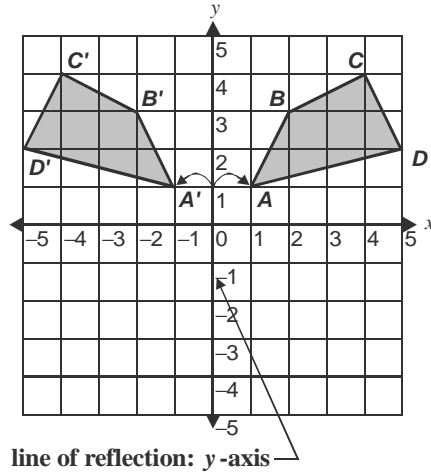
**Step 1:** Find the area of the base.  
 $A = \pi r^2 = 3.14 \times 6^2 = 3.14 \times 36 = 113.04 \text{ in}^2$

**Step 2:** Find the area of the cone section.  
 $A = \pi r s = 3.14 \times 6 \times 10 = 188.40 \text{ in}^2$

**Step 3:** Find the sum of the areas of the base and the cone section.  
 Surface area =  $113.04 \text{ in}^2 + 188.40 \text{ in}^2$   
 $SA = 301.44 \text{ in}^2$

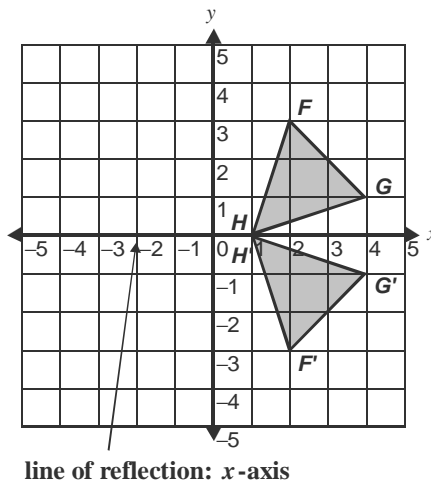
## 16.2 Reflections

A **reflection** of a geometric figure is a mirror image of the object. Placing a mirror on the **line of reflection** will give you the position of the reflected image.



Quadrilateral  $ABCD$  is reflected across the  $y$ -axis to form quadrilateral  $A'B'C'D'$ . The  $y$ -axis is the line of reflection. Point  $A'$  (read as  $A$  prime) is the reflection of point  $A$ , point  $B'$  corresponds to point  $B$ ,  $C'$  to  $C$ , and  $D'$  to  $D$ .

Point  $A$  is +1 space from the  $y$ -axis. Point  $A$ 's mirror image, point  $A'$ , is  $-1$  space from the  $y$ -axis.  
 Point  $B$  is +2 spaces from the  $y$ -axis. Point  $B'$  is  $-2$  spaces from the  $y$ -axis.  
 Point  $C$  is +4 spaces from the  $y$ -axis and point  $C'$  is  $-4$  spaces from the  $y$ -axis.  
 Point  $D$  is +5 spaces from the  $y$ -axis and point  $D'$  is  $-5$  spaces from the  $y$ -axis.



Triangle  $FGH$  is reflected across the  $x$ -axis to form triangle  $F'G'H'$ . The  $x$ -axis is the line of reflection. Point  $F'$  reflects point  $F$ . Point  $G'$  corresponds to point  $G$ , and  $H'$  mirrors  $H$ .

Point  $F$  is +3 spaces from the  $x$ -axis. Likewise, point  $F'$  is  $-3$  spaces from the  $x$ -axis.  
 Point  $G$  is +1 space from the  $x$ -axis, and point  $G'$  is  $-1$  space from the  $x$ -axis.  
 Point  $H$  is 0 spaces from the  $x$ -axis, so point  $H'$  is also 0 spaces from the  $x$ -axis.

# Practice Test 1

## Segment 1

You may NOT use a calculator for this segment. Use the formula sheet on page x as needed.

1. Which of the following numbers is irrational?

$$F = \frac{1}{3}$$

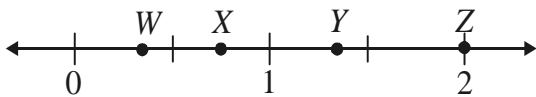
$$G = \sqrt{5}$$

$$H = \sqrt{9}$$

- (A)  $F$  only  
 (B)  $F$  and  $G$   
 (C)  $G$  and  $H$   
 (D)  $G$  only

II.A.4

2. Use the following diagram for this question.



Which of these could be the correct values for  $W$ ,  $X$ ,  $Y$ , and  $Z$ ?

- (A)  $W = \sqrt{2}$ ,  $X = \sqrt{4}$ ,  $Y = 0.75$ ,  $Z = \frac{3}{7}$   
 (B)  $W = \sqrt{2}$ ,  $X = 0.75$ ,  $Y = \frac{3}{7}$ ,  $Z = \sqrt{4}$   
 (C)  $W = \frac{3}{7}$ ,  $X = 0.75$ ,  $Y = \sqrt{4}$ ,  $Z = \sqrt{2}$   
 (D)  $W = \frac{3}{7}$ ,  $X = 0.75$ ,  $Y = \sqrt{2}$ ,  $Z = \sqrt{4}$

II.A.1

3. Which order of numbers is correct?

- (A)  $\frac{7}{3} > \frac{7}{4} > \frac{4}{7} > \frac{3}{7}$   
 (B)  $\frac{4}{7} > \frac{7}{4} > \frac{3}{7} > \frac{7}{3}$   
 (C)  $\frac{7}{3} > \frac{7}{4} > \frac{3}{7} > \frac{4}{7}$   
 (D)  $\frac{7}{4} > \frac{7}{3} > \frac{4}{7} > \frac{3}{7}$

II.A.1

4.  $\sqrt{84}$  is closest to what integer?

- (A) 6  
 (B) 8  
 (C) 9  
 (D) 10

II.B.2

5. Which of the following is an arithmetic progression?

Progression R: 1, 4, 7, 10, 13

Progression S: 1, 5, 25, 125, 625

- (A) Progression R  
 (B) Progression S  
 (C) Progression R and Progression S  
 (D) None of the above

III.A.1

6. Use the following expression for this question.

$$\frac{8x^5}{2x^2}$$

To simplify this expression, which of the following should you do with the exponents of  $x$ ?

- (A) Add:  $5 + 2$   
 (B) Subtract:  $5 - 2$   
 (C) Multiply:  $5 \times 2$   
 (D) Divide:  $5 \div 2$

III.B.1

# Practice Test 2

## Segment 1

You may NOT use a calculator for this segment. Use the formula sheet on page x as needed.

1. Jewel told her friends, "Pick a number between 0 and 10." They guessed, 2, 4, 5, and 8. Jewel said, "The number was  $\sqrt{14}$ ." Which guess was closest?

- (A) 2  
(B) 4  
(C) 5  
(D) 8

II.B.2

2. Find  $\sqrt{324}$ . Use the fact that  $324 = 2^2 \times 3^4$ .

- (A) 6  
(B) 18  
(C) 36  
(D) 162

II.B.4

3. A ray of light travels at 186,000 miles per second. What is "light speed" in scientific notation?

- (A)  $1.86 \times 10^{-3}$  mi/sec  
(B)  $1.86 \times 10^3$  mi/sec  
(C)  $1.86 \times 10^5$  mi/sec  
(D)  $18.6 \times 10^5$  mi/sec

II.A.3

4. Use the expression below to answer this question.

$$6 \times \sqrt{25 - 16} + 10 \div 2$$

What is the value of this expression?

- (A) 23  
(B) 14  
(C) 59  
(D) 11

II.B.5

5. Use the following table for this question.

Time of Day	# of Fans at Stadium
2 pm	2,000
3 pm	4,500
4 pm	7,000
5 pm	9,500
6 pm	?
7 pm	?

Fans start arriving for the Minnesota Vikings football game at 2 PM. If the pattern continues, how many fans will there be when the game starts at 7 PM?

- (A) 9,500  
(B) 12,000  
(C) 14,500  
(D) 24,500

III.A.1

6. Use the following expression for this question.

$$\frac{5x^6 \times x^6}{x^6}$$

Simplify this expression.

- (A) 5  
(B)  $5x$   
(C)  $5x^6$   
(D)  $5x^7$

III.B.1

7. Which of the following equalities is correct?

- (A)  $3^0 = 0$   
(B)  $3^0 = \frac{1}{3}$   
(C)  $3^0 = 1$   
(D)  $3^0 = 3$

II.B.3