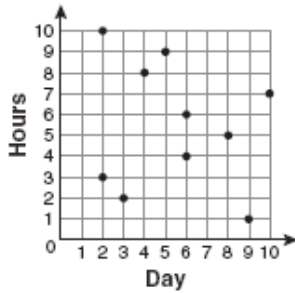


## PART 1

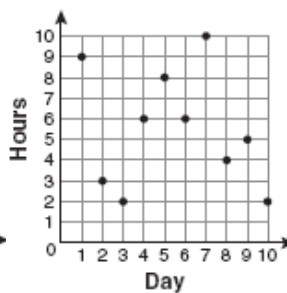
- 1) You are presented with 4 scatter plots and asked which one represents the information shown in the table below.

Day	1	2	3	4	5	6	7	8	9	10
Hours	9	3	2	6	8	6	10	4	5	2

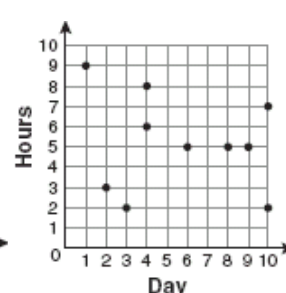
Your choice of scatter plots are shown below.



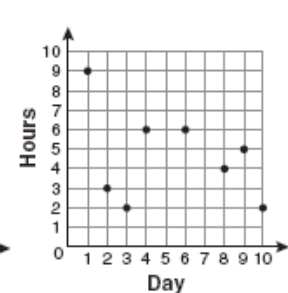
(1)



(2)



(3)



(4)

Choice 1 can be ruled out immediately because it shows no hours for Day 1. The other three choices show the correct information for Day 1.

For Day 2, the table indicates 3 hours, and the remaining scatter plots show this as well.

For Day 3, the table indicates 2 hours. The remaining scatter plots show this as well.

For Day 4, the table indicates 6 hours. Choice 3 is now ruled out. It shows two different sets of data for that day.

For Day 5, the table indicates 8 hours. Choices 3 is again ruled out, as is choice 4. They show no hours on Day 5.

Choice 2 remains as the only scatter plot that shows the data correctly.

**ANSWER: (2)**

- 2) The names of 8 mathematicians are listed. You are asked for the probability that a name selected at random will begin with the letter E or A.

There are 3 names beginning with the letter E, and 1 beginning with the letter A.

This means that out of the 8 names, a total of 4 names satisfy the condition that is being looked for. The probability is therefore  $\frac{4}{8}$ .

**ANSWER: (3)**

- 3) This problem requires you to simplify:  $\frac{(2x^3)(8x^5)}{4x^6}$

Let's simplify the numerator first.  $(2x^3)(8x^5) = (2)(8)(x^3)(x^5) = 16x^8$ .

Now divide  $16x^8$  by  $4x^6$  the denominator. 16 divided by 4 = 4, and

$x^8$  divided by  $x^6 = x^2$ . The final answer is  $4x^2$ .

**ANSWER: (3)**

- 4) This question is based on the topic of interval notation. It is new to the curriculum. Interval notation is a method used for describing a span of numbers. You are used to seeing the following type of inequality:  $2 \leq X \leq 7$ . This tells you that X is greater than or equal to 2, and less than or equal to 7. In other words, X is a number between 2 and 7 **inclusive**. In interval notation this would be written as **[2,7]**. This is the answer to this problem. Think of the brackets as not allowing the 2 and 7 to escape.

What if X were a number greater than 2 but less than 7? This would be written using interval notation as (2,7). The parentheses are less restrictive than brackets and allow the 2 and 7 to escape--they are excluded. How about a number greater than 2 but less than or equal to 7? If you guessed (2,7], you are correct. One more. How about greater than or equal to 2, but less than 7? Now the answer would be [2,7).

What about a simple inequality like  $X \geq 2$ ? This means that X begins at 2 and is not bound at the right. It goes to infinity. The symbol for infinity is  $\infty$ . Using interval notation,  $X \geq 2$  would look as follows: [2, $\infty$ ). Infinity symbols are always accompanied by a round parenthesis.  $X \leq 2$  would be represented as ( $-\infty$ ,2], while  $X < 2$  would be ( $-\infty$ ,2).

There is still one other possibility. What about something like  $X < 2$  or  $X \geq 5$ . This means that X can be all the numbers less than 2, or all the numbers greater than or equal to 5. Using interval notation would now require us to use the symbol U, which looks like the letter U and stands for "union." Here is how the above inequality would look in interval notation: ( $-\infty$ ,2) U [5,  $\infty$ )      **ANSWER: (4)**

- 5) You are asked which property is illustrated by the following:  $ax + ay = a(x + y)$   
**The above is an example of the distributive property.** The a is distributed to the elements inside the parentheses.

$a + (b+c) = (a+b) + c$  would be an example of the associative property. On one side of the equal sign, the b and c are associates (partners), while on the other side the a and b are associates. The order of the elements on both sides are the same.

$a + b = b + a$  would be an example of the commutative law. The a and b are commuting. They are switching their positions.

$a + 0 = a$  would be an example of additive identity while  $a \cdot 1 = a$  would be an example of multiplicative identity. Your result keeps its identity. It does not change.      **ANSWER: (3)**

- 6) You are asked for the equivalent of  $x^2 - 16$ . This is an example of the difference of two squares.  $x^2$  is a perfect square because x times x equals  $x^2$ , and 16 is a perfect square because 4 times 4 equals 16. Such an expression can be factored as the product of the sum and difference of square roots:  $(x + 4)(x - 4)$   
**ANSWER: (3)**

- 7) Choice 1 is not a causal relationship. The crowing of the rooster does not cause the sun to rise.      **ANSWER: (1)**

- 8) You are given two equations that represent the amount of money collected from the ticket sales of a school concert. Each equation contains the two variables  $x$  and  $y$ . The cost of each adult ticket is represented by  $x$ , and the cost of each student ticket is represented by  $y$ . You are asked to find the cost of each adult ticket. In other words you are being asked to solve the two equations for  $x$ .  
Line up your two equations and solve for  $x$ .

$$5x + 2y = 48$$

$$\underline{3x + 2y = 32} \text{ Multiply each term by } -1$$

$$5x + 2y = 48$$

$$\underline{-3x - 2y = -32} \text{ Combine}$$

$$2x = 16 \text{ Divide both sides by } 2.$$

$$x = 8$$

Each adult ticket cost \$8.

ANSWER: (3)

- 9) This problem requires you to know how to set up a box-and-whisker plot based on given data. When drawing a box-and-whisker plot, you will have to find five values. The first two are quite simple. You are looking for the lowest and highest value data items. In order to do this you should first set up all your data in ascending order. This problem has already done this for you.

The data given is: 5, 6, 7, 8, 9, 9, 9, 10, 12, 14, 17, 17, 18, 19, 19

To the right are your 4 choices for the box-and-whisker plot for the above data. The first and last vertical lines indicate the lowest and highest data.

Choice 1 is immediately ruled out because it indicates 2 as being the lowest number of hours. The remaining choices show the correct **low hour of 5 and high hour of 19**.

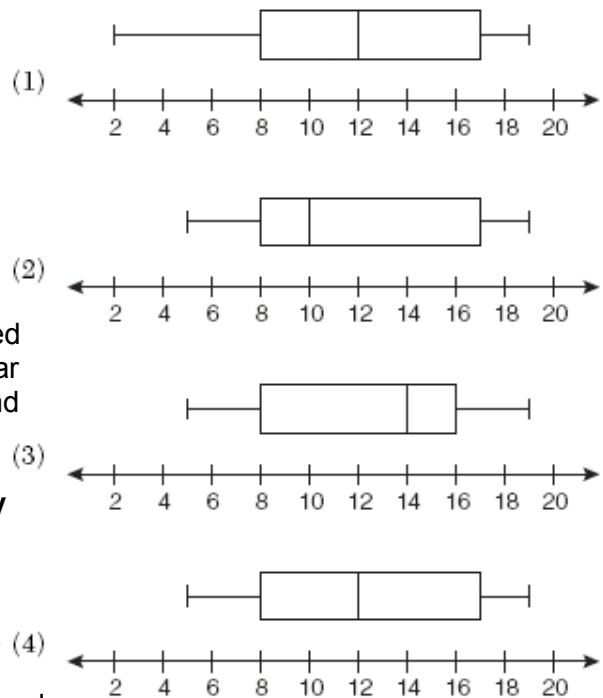
Now we need to find the median. It is indicated by the larger vertical line within the rectangular box. There are 15 data items.  $15 + 1 = 16$ , and half of 16 is 8. The 8<sup>th</sup> data item will be the median. The 8<sup>th</sup> data item above is 10. The median is therefore 10. **Choice 2 is the only plot that shows a median of 10 and is therefore the correct answer.**

The left vertical line of the rectangle indicates (4) the first quartile. It is the median using the data items to the left of the median we just found.

In other words, it is the median of the following data items.

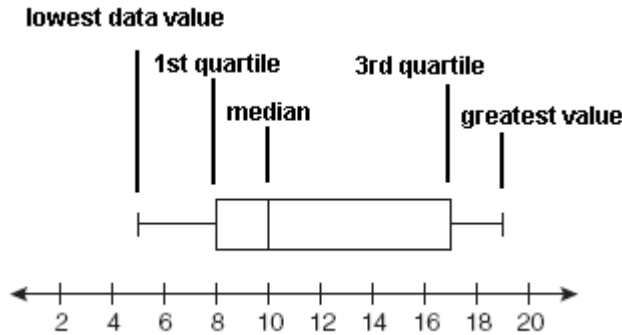
5, 6, 7, 8, 9, 9, 9 There are 7 items.  $7 + 1$  is 8, and half of 8 is 4. The median of this data will be the 4<sup>th</sup> item, or 8. Look at choice 2 and you will see that the **first quartile is indicated as being 8**.

The right vertical line of the rectangle indicates the upper or third quartile. It will be the median of the data to the right of the median of all data through the highest data item.



In our case it is the median of the following: 12, 14, 17, 17, 18, 19, 19. Again, there are 7 items, making the 4<sup>th</sup> one the median. The median is therefore **17. This is the upper quartile.**

Here is the correct box-and-whisker plot again:



As a quick review here are the steps in drawing a box-and-whisker plot.

**Step 1** - Set up the data in order so that you can find the median. By the way, the median can also be referred to as the second quartile.

**Step 2** - On a number line, mark the lowest data value and greatest data value. Those two points become the end of the whiskers.

**Step 3** - Find the median (2<sup>nd</sup> quartile) and mark it down as well.

**Step 4** - Now find the first quartile. It will be the median of the data listed from the lowest until the median found in step 3.

**Step 5** - Now find the third quartile. It will be the median of the data listed from the median found in step 3 through the greatest data item.

**Step 6** - Finally draw your box and whiskers, as you see above.

**ANSWER: (2)**

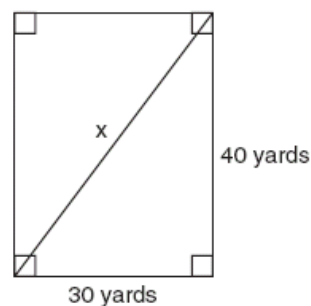
- 10) Sets A and B are named, and you are asked for their intersection. This is another topic new to the algebra curriculum. As mentioned briefly in the explanation to problem 4, the union of two sets is indicated by the symbol  $\cup$ . The union of sets contain all the elements in the sets. The intersection of sets is indicated by the symbol  $\cap$ . The intersection of sets A and B,  $A \cap B$ , will contain only the elements common to both.

Set A =  $\{(-2,-1), (-1,0), (1,8)\}$  Set B =  $\{(-3,-4), (-2,-1), (-1,2), (1,8)\}$

**You can see that the elements common to both, found in both, are the points (-2,-1) and (1,8).**

**ANSWER: (3)**

- 11) You are presented with the diagram at the right and asked for the measure of its diagonal. If you recall your basic 3,4,5 right triangle, this one can easily be answered. One side measures 3(10), and the other 4(10). This means that the hypotenuse will be 5(10) or **50 yards**. Or you can use the Pythagorean Theorem..



$$c^2 = a^2 + b^2$$

a and b represent the legs of a right triangle, and c represents the hypotenuse.

$$c^2 = a^2 + b^2$$

Substitute the given values for a, b, and c.

$$x^2 = (30)^2 + (40)^2$$

Simplify

$$x^2 = 900 + 1600$$

Continue simplifying

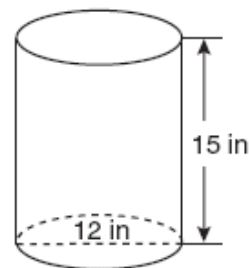
$$x^2 = 2500$$

Find square root of both sides.

$$x = 50$$

**ANSWER: (1)**

- 12) You are shown the diagram of the cylinder at the right and are asked to find its volume. If you do not recall the formula for the volume of a cylinder, you can always check the reference sheet attached to your regents booklet. It is  $v = \pi r^2 h$ . The radius is represented by r, and is half of the diameter. The diameter is shown to be 12 inches, so the **radius equals 6 inches**. The **height, h, is 5 inches**. When doing your calculations, use the pi key on your calculator.



$$v = \pi r^2 h$$

Substitute your known values.

$$v = \pi(6)^2(15)$$

Use your calculator.

$$\pi * 6^2 * 15$$

1696.460033

$$v = 1696.460033$$

To the nearest tenth, this is **1696.5**.

**ANSWER: (4)**

- 13) The equation of a line can be given as  $y = mx + b$ , where the slope is represented by m, and the y-intercept is represented by b. The y-intercept is the point where the line crosses the y-axis. At that point, the x-coordinate will always equal 0. One of the points you are given for this line is (0,3). Since the x-coordinate is 0, this is the point where the line will cross the y-axis. The y-intercept will therefore be 3.

Only **choice 1 is the equation of a line with a y-intercept of 3**. Choice 2 is that of a line with a y-intercept of -3.

**ANSWER: (1)**

- 14) Again, a term new to the curriculum. Bivariate data is data used to describe a relationship between two variables. For bivariate data, there will always be two sets of data. **Choice 2 would be an example of a study using bivariate data**. One variable would be shoe size, and the other would be height.

**ANSWER: (2)**

- 15) A DVD player is represented by  $d$ , and a cordless phone is represented by  $c$ . The store makes \$75 profit on each DVD player. In our case, therefore, the profit can be represented by  $75d$ . The profit on a cordless phone is \$30. In our case this would be represented as  $30c$ . At this point the total profit would be represented by  $75d + 30c$ . You want this profit to be at least \$225. At least 225 means 225 or more. In other words the greater than or equal symbol would be used.  $75d + 30c \geq 225$

**ANSWER: (4)**

- 16) You are given two points and asked for the slope of the line that contains them. The reference sheet gives you the formula for finding the slope of a line when given two of its points. The slope will be the quotient of the difference of the two y-coordinates divided by the difference of the two x-coordinates.

The two given points are (3,4) and (-6,10).

First let us find the difference of the two y-coordinates:  $10 - 4 = 6$

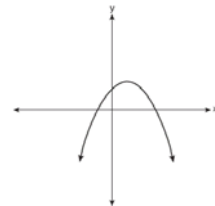
Now for the difference of the two x-coordinates:  $-6 - 3 = -9$

The slope equals the quotient of the y-difference and the x-difference.

$$\text{Slope} = m = \frac{6}{-9} = -\frac{2}{3}$$

**ANSWER: (3)**

- 17) The graph shown at the right is that of a parabola. It represents the graph of a quadratic.



**ANSWER: (4)**

- 18) This problem requires you to simplify  $\frac{9x^4 - 27x^6}{3x^3}$

One way to do this is to divide each term in the numerator by the denominator.

When dividing powers with the same base, the powers are subtracted.

Let us begin.  $9x^4 \div 3x^3 = 3x$        $-27x^6 \div 3x^3 = -9x^3$ . Your answer is  $3x - 9x^3$ .

This can however be factored as each term is now divisible by  $3x$ .

$$3x(1 - 3x^2)$$

**ANSWER: (2)**

- 19) A printer depreciates at the rate of 5% per year. What will be its approximate value at the end of 4 years? Its initial value is \$35,000.

**METHOD 1:** 5% as a decimal is .05. Calculate 5% of 35,000, and subtract this result from 35,000.

$35,000(.05) = 1,750$      $\$35,000 - \$1,750 = \mathbf{\$33,250}$  Value at end of year 1. Continue...

$33,250(.05) = 1,662.50$      $\$33,250 - \$1,662.50 = \mathbf{\$31,587.50}$  end of year 2.

$31,587.50(.05) = 1579.375$      $31,587.50 - 1579.375 = \mathbf{\$30008.125}$  end of year 3.

$\$30008.125(.05) = 1500.40625 = \mathbf{\$30008.125} - 1500.40625 = \mathbf{28507.7125}$  end of year 4.

**Choice 3 is the correct answer.** It is rounded to the nearest cent.

**METHOD 2:** If it depreciates by 5%, it will be worth 95% of its original value. Multiplying by .95 will therefore save you the trouble of subtracting each time. For example  $35,000(.95)$  immediately gets you the answer of 33,250. You can now multiply this answer by .95 to get the value at the end of 2 years, and then again by .95 to get the value at the end of each year until the year you are looking for. So to get its value at the end of 4 years all you have to do is the following:  $35,000(.95)(.95)(.95)(.95)$ . To make life even easier you can do the following  $35,000(.95)^4$   $35000 * (.95)^4$   
 The above equals to **\$28,507.72** to the nearest cent. 28507.71875

**ANSWER: (3)**

20)

You are presented the graph at the right and asked to select the inequality it represents. You notice right away that the line is shaded downwards. This means that the inequality will be "less than." This is not enough information to exclude any of the given choices.

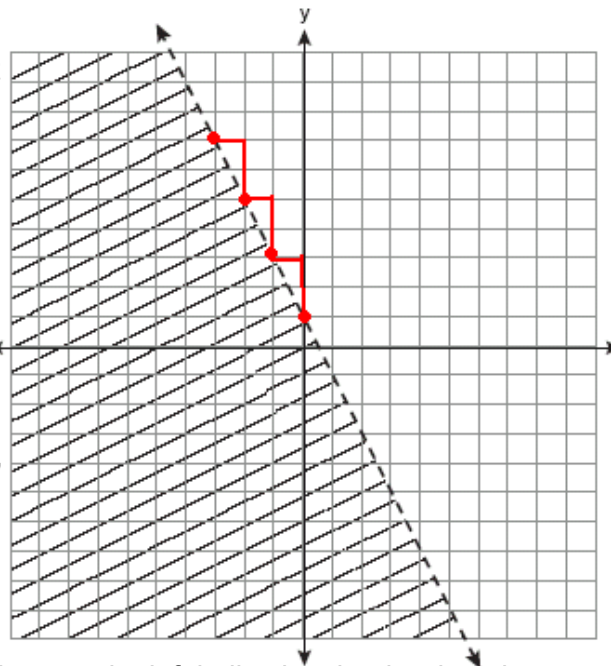
You will also notice that the line shown is also not a solid line which means that it is not included in the solution set. This means that the inequality will be "less than", and not "less than or equal." Still not enough info.

Let's look at the y-intercept-- the point at which the line crosses the y-axis. It is +1. Each inequality listed indicates +1 as the y-intercept.

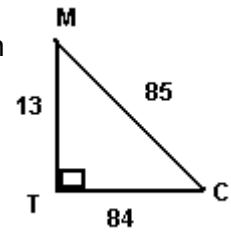
Finally, let's look at the slope. The line slants to the left indicating that its slope is negative. Only choices 2 and 4 indicate a negative slope. Choice has a slope of -2, while choice 4 has a slope of  $-\frac{1}{2}$ .

Look at the bold red lines I drew on the coordinate axis. To move from one point, up to the next point you would move +2 units in the y direction, followed by -1 unit in the x direction. This indicates a slope of  $-\frac{2}{1}$  or a slope of -2. **Choice 2 is the inequality representing a line with a slope of -2.**

(Yes you could have looked at the slope immediately but that would have meant missing all the other wonderful information!) **ANSWER: (2)**



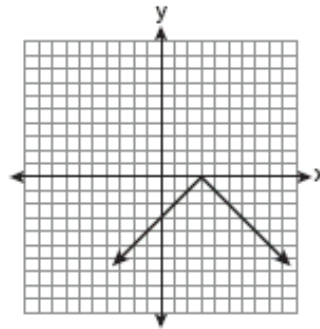
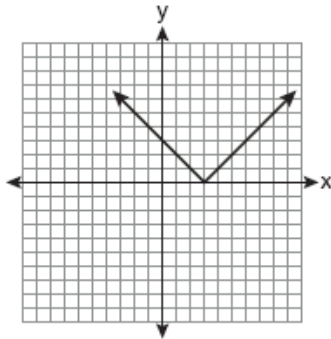
- 21) When presented with a right triangle, the sine of an angle will be the ratio of the measure of the side opposite the angle, divided by the hypotenuse. The triangle at the right, not drawn to scale, represents the information given in this problem. You are asked for the ratio that represents sine C. In the case at the right, the side **opposite** angle C is **MT**, while the **hypotenuse** is **MC**, the longest side of the triangle.



You know that  $\text{sine } \angle C = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{(MT)}{(MC)} = \frac{13}{85}$

**ANSWER: (1)**

- 22) Below to the left is the graph of the equation  $y = |x - 3|$ . You are asked to select the graph of  $y = -|x - 3|$ . Below to the right is your answer.



Now for a brief explanation. Both graphs happen to be that of absolute value equations. What that means will be left for another time. Specifically for this problem, the second equation is saying that y will equal the negative (opposite) of what it equaled in the first equation. This means the x-coordinate will remain the same but the y-coordinate will become negative.

Let's look at some points on the original graph. For example, look at the points (0,3), (1,2), (4,1), (6,3)

Now corresponding to these points you can see the following on the graph at the left: (0,-3), (1,-2), (4,-1), (6,-3)

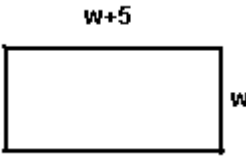
**ANSWER: (4)**

- 23) To find the relative error of measurement in this case, you first need to know the difference between the groundskeeper's measurement and the actual measurement. His measurement was 130 X 60. The actual measurement is given as 120 X 54. The difference in measure is (130)(60) - (120)(54). This difference when divided by the actual measurement is the relative error of measurement. In other words, in our case

$$\frac{(\text{wrong measure}) - (\text{actual measure})}{(\text{actual measure})} = \text{relative error of measurement} \quad \text{ANSWER: (1)}$$

- 24) You can try each choice or work it out algebraically as follows:  
 $-2x + 5 > 17$     Subtract 5 from both sides.  
 $-2x > 12$     Divide both sides by -2 (don't forget to switch inequality).  
 $x < -6$   
 Of the given choices, only -8 is less than -6 and is therefore the answer.    **ANSWER: (1)**

- 25) You are asked for the quotient of  $8.05 \times 10^6$  and  $3.5 \times 10^2$ .  
 First divide 8.5 by 3.5. Your answer is 2.3    Now divide  $10^6$  by  $10^2$ . Your answer is  $10^4$ .  
 Final answer  **$2.3 \times 10^4$** .  
 ALTERNATE METHOD .  
 Use your calculator.     $(8.05 \times 10^6) / (3.5 * 10^2)$     23000  
 You immediately get the answer of 23,000.  
 You can now try each choice and see  
 **$2.3 \times 10^4$**  is the answer because it equals 23,000.    **ANSWER: (2)**

- 26) You are told that the length of a rectangular window is 5 feet more than its width,  $w$ . You are also told that the area of the window equals 36 square feet. You are asked to select the equation that can be used to find the dimensions of this window. The formula for finding the area of a rectangle is  $A = lw$ , where the length is represented by  $l$ , and the width is represented by  $w$ . The rectangle at the right can represent the information you have just been given. Set up your equation:  
 $A = lw$     Substitute what is given for  $l$  and  $w$ .  
 $36 = (w+5)(w)$  or look at it as shown on the next line.  
 $36 = w(w+5)$  Multiply using the distributive property.  
 $36 = w^2 + 5w$  Subtract 36 from both sides.  
 $0 = w^2 + 5w - 36$  or  **$w^2 + 5w - 36 = 0$**     **ANSWER: (4)**
- 

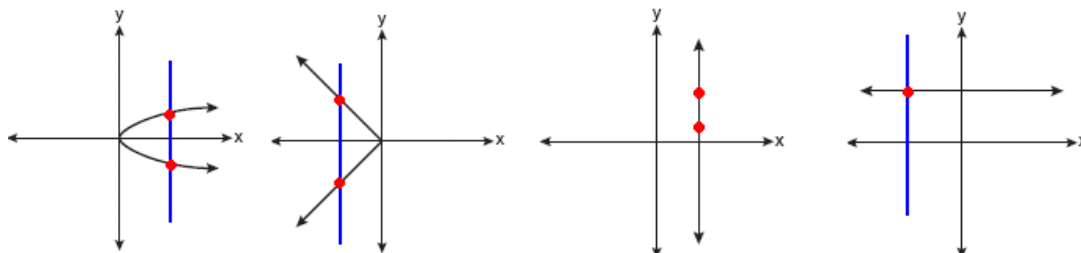
- 27) What is the sum of  $\frac{d}{2}$  and  $\frac{2d}{3}$  expressed in simplest form?  
 In order to add these two fractions you need to change them to like denominators. The lowest common denominator of 2 and 3 is 6.  
 $\frac{d}{2} = \frac{d(3)}{2(3)} = \frac{3d}{6}$      $\frac{2d}{3} = \frac{2d(2)}{3(2)} = \frac{4d}{6}$      $\frac{3d}{6} + \frac{4d}{6} = \frac{7d}{6}$     **ANSWER: (4)**

- 28) For which value of  $x$  is  $\frac{x-3}{x^2-4}$  undefined?  
 A fraction will be undefined when its denominator, in this case  $x^2 - 4$ , equals 0.  
 Set the denominator equal to 0 and solve for  $x$ .  
 $x^2 - 4 = 0$     Add 4 to both sides.  
 $x^2 = 4$     Take the square root of both sides.  
 $x = \pm 2$     **ANSWER: (1)**

- 29) Which verbal expression represents  $2(n - 6)$ ?  
 The above expression says that 2 is multiplied by  $(n-6)$ .  
 $(n - 6)$  means a number that is 6 less than  $n$ .

**ANSWER: (4)**

- 30) A function is a relation where for each element in the domain there is only one unique element in the range. What this means in relation to this problem is simply that for any given value of  $x$  there will be only one value for  $y$ . When looking at the graph of a relation, this is easily seen by using what is known as the "vertical line" test.



The first three graphs above fail the vertical line test. In each case, a vertical line can be drawn. In other words, the  $x$ -coordinate remains constant. You will therefore notice that on each one of the first three, there exists at least two different  $y$ -coordinates that share the same  $x$ -coordinate. The last graph is that of a function. There are no  $x$ -coordinates that share more than one  $y$ -coordinate.

**ANSWER: (4)**

## PART II

- 31) Express  $5\sqrt{72}$  in simplest radical form.  
 When simplifying radicals, you want to factor the radicand, the number in the radical, as the product of at least one perfect square. It is best to use the greatest perfect square. In our case here with 72, one can use 9 and 8, but 9 is not the greatest possible factor that is a perfect square-- 36 is. (You can use 9 and 8 as well but then you would have to again factor 8, using 4 and 2).

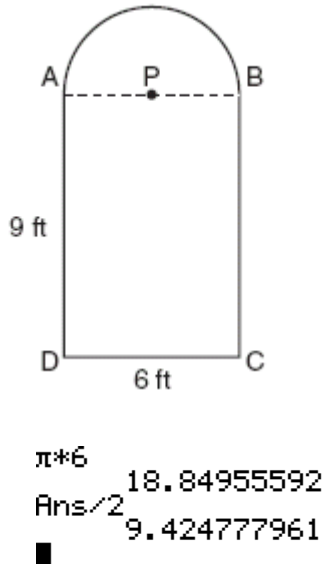
$$\begin{array}{ll} 5\sqrt{72} & \text{Simplify } \sqrt{72} \\ 5\sqrt{36}\sqrt{2} & \sqrt{36} = 6 \\ 5 \cdot 6\sqrt{2} & \text{Multiply} \\ 30\sqrt{2} & \end{array}$$

**ANSWER:  $30\sqrt{2}$**

- 32) Solve for  $g$ :  $3 + 2g = 5g - 9$   
 $3 + 2g = 5g - 9$  Subtract  $2g$  from both sides.  
 $3 = 3g - 9$  Add 9 to both sides.  
 $12 = 3g$  Divide both sides by 3.  
 $4 = g$

**ANSWER:  $g = 4$**

- 33) The diagram at the right represents Serena's garden. It is in the shape of a rectangle joined with a semicircle. She wants to put a fence around her garden. To the nearest tenth of a foot, what is the length of the fence? What you are really being asked is to find the perimeter of the garden. You can do this in two steps. First find the perimeter of the rectangle. Actually you will find the perimeter of the rectangle minus side AB. To do this simply add the three outer sides:  $9 + 6 + 9 = 24$  ft. Next find the perimeter or actually the circumference of part that is in the shape of a semicircle. The circumference of a circle can be found using the formula  $C = \pi d$ . The diameter is 6, the width of the rectangle.  $C = \pi d$  Substitute 6 for d.  
 $C = \pi(6)$  Use the pi key on your calculator  
 $C = 18.84955592$  Now divide by 2 because we have only a semicircle.  
 C of semicircle = **9.424777961**  
 Add this to the 24 which is the length of the rectangle and you get 33.4 to the nearest tenth.



**ANSWER: 33.4 feet to the nearest tenth of a foot.**

Number 34 begins on the next page.

## PART III

- 34) The formula used when working with distance problems is Distance = Rate X TIME. You are told that Hannah traveled 1.2 hours and covered the distance halfway to her cousin's house. The distance to her cousin's house is 120 miles. This means that she covered a distance of **60 miles in 1.2 hours**.  
 The equation on the first line above can be written as  $D = RT$ . If both sides are divided by  $T$ , you end up with  $R=D/T$ . In other words, to find the rate,  $R$ , all you have to do is divide the distance by the time. So in our case, her rate was 60 miles/1.2 hours. But the question requires you to give the rate in miles per hour. Set up a proportion.
- $$\frac{\text{distance}}{\text{time}} \quad \frac{60}{1.2} = \frac{x}{1} \quad x \text{ will be the miles over 1 hour. Cross multiply.}$$
- $$1.2x = 60(1)$$
- $$1.2x = 60 \quad \text{Divide both sides by 1.2.}$$
- $$x = 50$$

**ANSWER: Hannah's average rate was 50 miles per hour.**

The next part of the question tells you that Hannah completed the rest of the trip, the remaining 60 miles at the rate of 40mph. You are asked for the amount of time it took Hannah to travel the remaining distance to her cousin's house.  
 What we have to figure out here is the time it took Hannah to go 60 miles at a rate of 40 mph. Let's go back to the original equation of  $D=RT$ . We are now looking for the Time. Let's divide both sides by  $R$ . The result is  $T= D/R$ . Substituting our values, we get:  
 $T = 60/40 = 1.5 \text{ hours.}$  **ANSWER: The remainder of the trip took 1.5 hours.**

Now for the final part of the question...Hannah is traveling home along the same route. This tells you that the distance is the same--120 miles. Her average rate is 55 mph. After 2 hours of driving, her car breaks down. You are asked to determine how far away was she from her home.

Step number one requires you to figure out how far she traveled in those 2 hours. This is simple. You are told that she was traveling 55 miles per hour. This means that in 2 hours she traveled  $55(2)$ , or 110 miles. You know that the total distance to her home was 120 miles. This means that she is still 10 miles away from her home.

**ANSWER: She is 10 miles away from home.**

- 35) A prom ticket is \$120. Tom is going to walk his neighbor's dog for \$15 per week. He has already saved \$22. What is the minimum number of weeks he must walk the dog to earn enough to pay for a prom ticket?  
 First, you are told that he has already saved \$22. This means he still needs  $\$120 - \$22$ , or \$98.  
 He earns \$15 a week. You now have to figure out how many 15's there are in 98. That will be the number of weeks. 98 divided by 15 is 6.53333. This means that Tom will need 7 more weeks of walking the dog to earn those remaining \$98.

**ANSWER: 7 weeks**

- 36) Mr. Laub has 3 children, 2 girls and one boy. After each meal one child is chosen at random to wash the dishes. The same child can be chosen for both lunch and dinner. You are asked to construct a tree diagram or list a sample space for all possible outcomes of who will wash dishes after lunch and dinner. The girls are Sue and Karen, and the boy is David. Here is a sample space of all possible outcomes:

<b>Sue, Sue</b>	<b>Karen, Sue</b>	<b>David, Sue</b>
<b>Sue, Karen</b>	<b>Karen, Karen</b>	<b>David, Karen</b>
<b>Sue, David</b>	<b>Karen, David</b>	<b>David, David</b>

The next part of the questions asks you to determine the probability that one boy and one girl will wash the dishes. Below is the sample space again with a check mark next to each case where a boy and a girl are doing the dishes.

Sue, Sue	Karen, Sue	David, Sue <b>T</b>
Sue, Karen	Karen, Karen	David, Karen <b>T</b>
Sue, David <b>T</b>	Karen, David <b>T</b>	David, David

4 out of a total of 9 cases are that of a boy and a girl washing the dishes.

**ANSWER: The probability is  $\frac{4}{9}$ .**

**PART IV**

- 37) The value of 11 houses are shown at the right. The first part of the question asks you for the mean value of these houses. The "mean" is the average. To find the average you add up all the values of the houses and divide by the number of houses. Remember there are more than 4 houses! Here is how to obtain the sum of their values and the mean:

Value per House	Number of Houses
\$100,000	1
\$175,000	5
\$200,000	4
\$700,000	1

$$\begin{aligned}
 \$100,000 \times 1 &= \$100,000 \\
 \$175,000 \times 5 &= \$875,000 \\
 \$200,000 \times 4 &= \$800,000 \\
 \$700,000 \times 1 &= \underline{\$700,000} \\
 \$2,475,000 \div 11 &= \mathbf{\$225,000}
 \end{aligned}$$

**ANSWER: The mean value is \$225,000**

Next you are asked to find the median value.

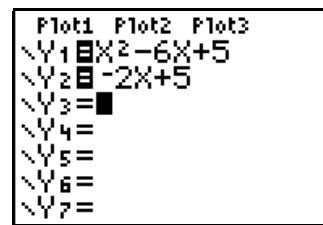
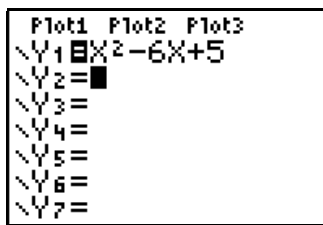
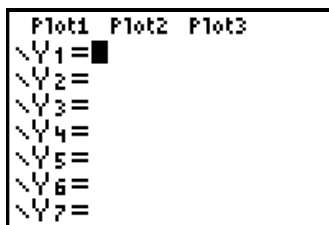
To find the median value you first need to have the values set up in either ascending or descending order. They are already set up properly in the above chart. The median value will be the middle value. There are 11 houses. To find the middle of an odd number of data items, add 1 and then divide by 2. In our case, 11+1 is 12, divided by 2 is 6. The 6<sup>th</sup> item will be the median. Now imagine all the values listed separately. There would be a long list of 11 values. The 6<sup>th</sup> value would be \$175,000. That is your median.

**ANSWER: Your median value is \$175,000.**

The final part of this question asks you to justify which of the above two measures of central tendency make the most sense for the above data.

**ANSWER: The median makes more sense than the mean, because in our case it reflects the value of the majority of the houses.**

- 38) The easiest way to do this problem is to use your graphing calculator. Enter the first equation into the y= editor. It is the key on your TI that reads **Y=**. When you hit that key your screen will look the way it does below to the right. At the blinking cursor, enter your first equation and hit **ENTER**. It is the second screen capture below. Now let's get ready to enter the second equation. You first have to transpose it so that it is in the form  $y =$  .  
 $2x + y = 5$       Subtract  $2x$  from both sides.  
 $y = -2x + 5$       This is the equation you enter into the calculator.  
 It is the third screen capture below.



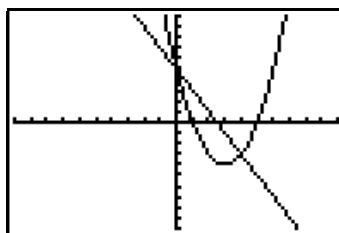
At this point you can actually hit the **GRAPH** key and see a graph of both equations on one coordinate plane. But let's do something else first. Hit the yellow **2<sup>nd</sup>** key, followed by the **GRAPH** key. After you hit that yellow **2<sup>nd</sup>** key, you are really accessing what is written in yellow above the key you hit next. In this case you are accessing the **TABLE** key which is written in yellow a bit to the left and above the **GRAPH** key.

To the right is a screen capture of what your screen will look like. It may not look exactly the same but you can use the scroll keys to get it to look the same. The column headed with an X lists the x-coordinates, while the Y1 column lists the corresponding y-coordinates for the first equation, and the Y2 column lists the corresponding y-coordinates for your second equation. Your first equation is a quadratic whose graph is a parabola. You can see above that its turning point will be when  $x=3$ . Y will then equal  $-4$ . You know that will be the turning point because you can see on the table that the values on either side of the  $-4$  are symmetric--they are the same. You will use these points to graph your first equation. It is customary to graph 3 points on either side of the turning point. In this case your points are  $(0,5)$ ,  $(1,0)$ ,  $(2,-3)$ ,  $(3,-4)$ ,  $(4,-3)$ ,  $(5,0)$ ,  $(6,5)$ . They are part of the parabola.

X	Y1	Y2
0	5	5
1	0	3
2	-3	1
3	-4	-1
4	-3	-3
5	0	-5
6	5	-7

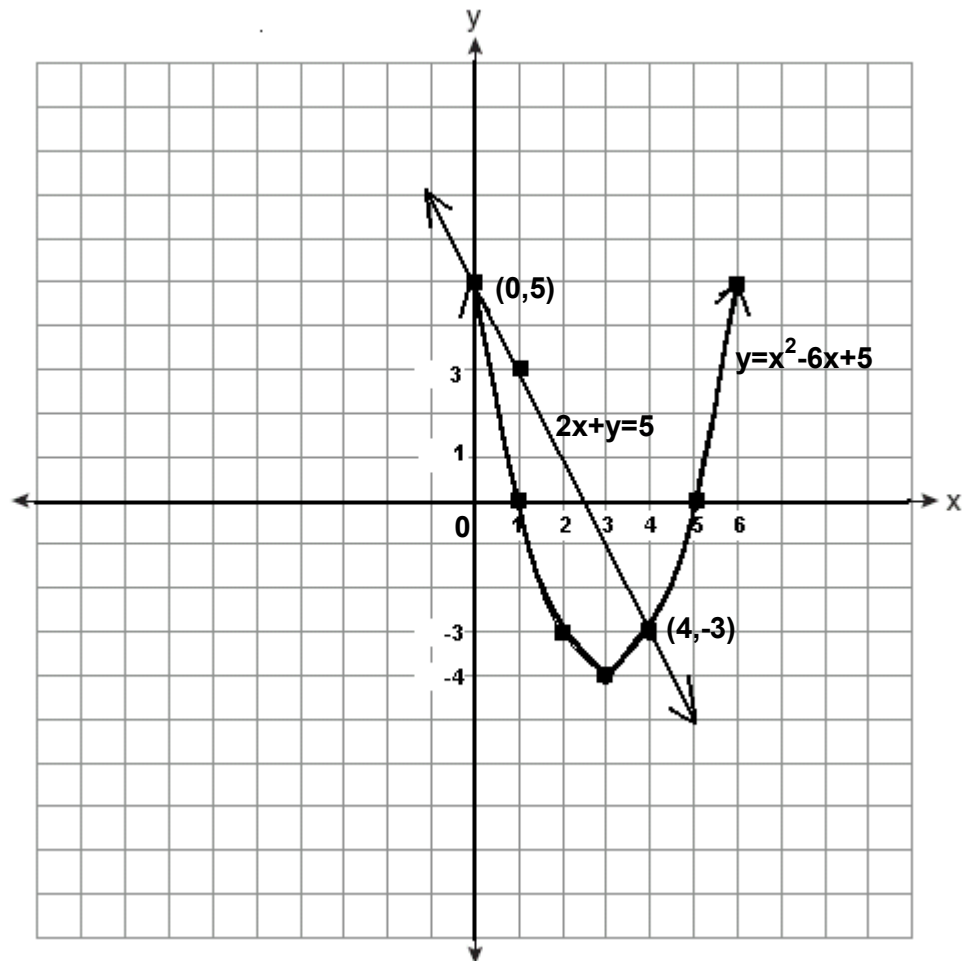
X=6

To graph a straight line, your second equation, all you really need is three points. You will want to use the points that are part of the solution set, that is they satisfy both equations. Look down the Y1 and Y2 columns where you see the numbers match. They match where the y's equal 5 and  $-3$ . So we will use those two points and one more. Let's use  $(0,5)$ ,  $(1,3)$ , and  $(4,-3)$ . On the next page is your coordinate axis with both equations graphed. Also indicated on the graph is the solution set. The solution set are the points that satisfy both equations. They are the two points where both graphs intersect. As you can see the two points are  $(0,5)$  and  $(4,-3)$ . Below is a screen capture of your graphs as they would look on your calculator.



Below are the graphs of your two equations. One of them is a parabola, and the other is a straight line.

The solution set is their points of intersection:  $(0,5)$  and  $(4,-3)$



Question 39 begins on the next page.

39) Solve for  $x$ :  $\frac{x+1}{x} = \frac{-7}{x-12}$

When ever you are presented with two fractions equal to each other, you can cross multiply. This is true because in a proportion, the product of the means equals the product of the extremes. So let's cross multiply:  **$(x+1)(x-12) = -7x$**   
 What remains now is to solve the above equation for  $x$ . First a brief explanation on how to obtain the product of two binomials such as  $(x+1)(x-12)$ .

Multiply  $(x+1)(x-12)$  Use FOIL (Firsts Outers Inners Lasts)

Firsts  $(x)(x) = x^2$

Outers  $(x)(-12) = -12x$

Inners  $(1)(x) = x$

Lasts  $(1)(-12) = -12$

Now combine these products:

$$x^2 - 12x + x - 12$$

$$\mathbf{x^2 - 11x - 12}$$

Now back to:

$$(x+1)(x-12) = -7x$$

Simplify using FOIL

$$x^2 - 11x - 12 = -7x$$

Add  $7x$  to both sides.

$$\mathbf{x^2 - 4x - 12 = 0}$$

Now factor this quadratic, and set the factors equal to 0.

$$(x-6)(x+2) = 0$$

$$x-6 = 0 \quad \text{Add 6 to both sides.}$$

$$\mathbf{x = 6}$$

$$x+2 = 0 \quad \text{Subtract 2 from both sides.}$$

$$\mathbf{x = -2}$$

**ANSWER:  $x = 6$ , and  $x = -2$**