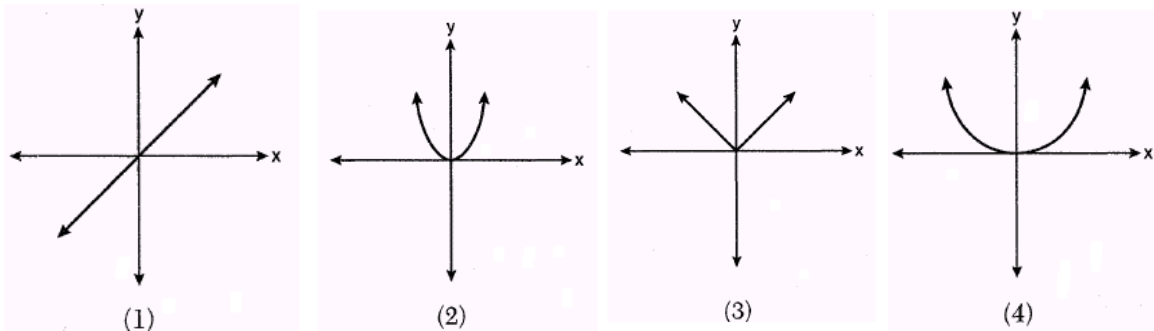


PART 1

- 1) **Which graph represents a linear function?**



A straight line represents the graph of a linear function. Of the four given choices, only choice 1 is a straight line and therefore represents a linear function.

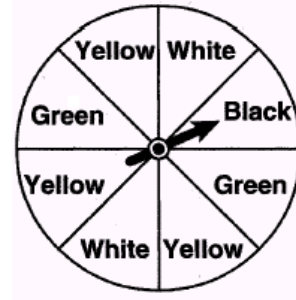
ANSWER: (1)

- 2) The spinner shown is divided into eight equal parts.
Here is a breakdown of the parts relative to each color:

$$\text{Yellow: } \frac{3}{8} \quad \text{White: } \frac{2}{8} \quad \text{Green: } \frac{2}{8} \quad \text{Black: } \frac{1}{8}$$

You are given four choices and asked which one is most likely to occur.
Here are the choices and their probability based on the diagram.

- 1) Green or White = $\frac{2}{8} + \frac{2}{8} = \frac{4}{8}$
 2) Green or Black = $\frac{2}{8} + \frac{1}{8} = \frac{3}{8}$
 3) Yellow or Black = $\frac{3}{8} + \frac{1}{8} = \frac{4}{8}$
 4) **Yellow or Green** = $\frac{3}{8} + \frac{2}{8} = \frac{5}{8}$



Choice number 4, yellow or green, is the one that is most likely to occur.

ANSWER: (4)

- 3) **A school wants to add a coed soccer program. To determine student interest in the program, a survey will be taken. In order to get an unbiased sample, which group should the school survey?**
 (1) every third student entering the building
 (2) every member of the varsity football team
 (3) every member in Ms. Zimmer's drama classes
 (4) every student having a second-period French class

An unbiased sample is one that will be as objective as possible. Choice number 1 will be unbiased.

ANSWER: (1)

- 4) You are asked to factor the difference of two perfect squares.

$16x^2$ is a perfect square. Its square root is $4x$.

$25y^2$ is a perfect square. Its square root is $5y$.

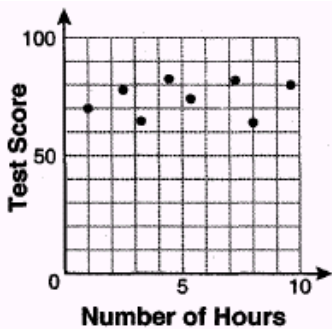
They are joined with a minus sign.

When factoring the difference of two squares, your result will be the product of the sum and difference of their square roots. As such, $16x^2 - 25y^2$, is factored as follows:

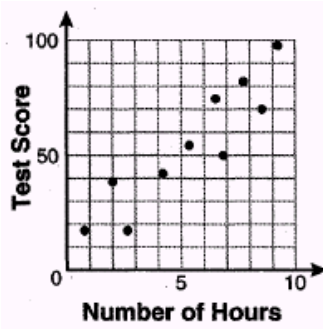
$$(4x + 5y)(4x - 5y)$$

ANSWER: (1)

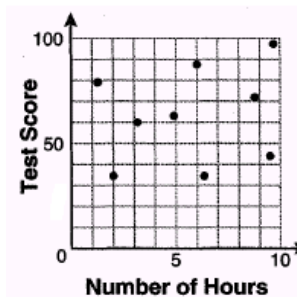
- 5) *There is a negative correlation between the number of hours a student watches television and his or her social studies test score. Which scatter plot below displays this correlation?*



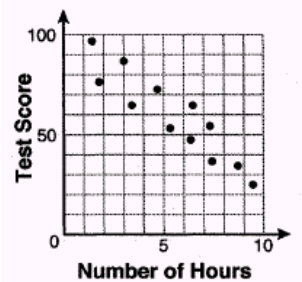
(1)



(2)



(3)



(4)

You are presented with four scatter plots and asked to select the one that displays a negative correlation. A negative correlation is one where as one variable increases, the other will decrease. **Choice 4 is your answer.** It shows the "test scores" decreasing as "number of hours" increases. A negative correlation will fall from left to right and have a negative slope. Choice 2 shows a positive slope and therefore a positive correlation.

ANSWER: (4)

- 6) There are at least two ways to do this problem. Here's how one of my students did it. Jack bought two more slices of mushroom pizza than did Grace. These two additional slices upped his total to \$12.50. This was \$4 more than Grace's total of \$8.50. The rest is easy. The two slices upped his total by \$4. This means that each slice of mushroom pizza must have cost \$2.

Alternate Method: (really the same method, but algebraically)
 Let c=cheese pizza m=mushroom pizza

$$3c + 4m = 12.50$$

$$\underline{3c + 2m = 8.50} \quad \text{Subtract bottom equation from top equation}$$

$$2m = 4 \quad \text{Divide both sides by 2.}$$

$$m = 2$$

ANSWER: (2)

7) **What is the product of $-3x^2y$ and $(5xy^2 + xy)$?**

You arrive at your answer using the distributive property.

$$-3x^2y(5xy^2 + xy) = (-3x^2y)(5xy^2) + (-3x^2y)(xy)$$

$$-15x^3y^3 - 3x^3y^2$$

ANSWER: (1)

8) A team consisting of 10 members want to choose a president, vice president, and secretary. Which expression can be used to determine the number of ways this is possible? You know that the answer will be either ${}_{10}P_3$ or ${}_{10}C_3$. P represents a permutation, while C represents a combination. When order is significant we use P. When order is not significant we use C. In this problem you are looking to select 3 individuals where order will play a role. One will be president, an other will be vice president, and the third will be secretary. Therefore the answer is ${}_{10}P_3$.

ANSWER: (3)

9) The volume of a cube is found by finding the product of its length, width, and height. In a cube these dimensions are congruent. Therefore to find your answer simply cube the given edge of 1.5.

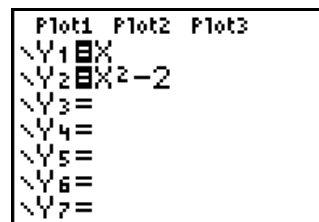
$$(1.5)^3 = 1.5 \times 1.5 \times 1.5 = 3.375$$

ANSWER: (2)

10) **Which ordered pair is a solution to the system of equations $y = x$ and $y = x^2 - 2$?**

Perhaps the easiest way to do this problem is to use your graphing calculator.

Enter both equations using the **y=** editor. To the right is a screen capture of your calculator screen after you have entered the equations.



Now access the **TABLE** screen as follows.

First hit the **2nd** key, followed by the **GRAPH** key.

Notice the word **TABLE** above the **GRAPH** key.

After hitting the **2nd** key you are accessing the function written above the key you hit next. In this case you are in essence hitting the TABLE key. To the right is what your calculator screen will look like.

(If your screen shows different x values, scroll up or down accordingly. I scrolled to these values based on the choices given as answers).

X	Y1	Y2
-2	-2	2
-1	-1	1
0	0	0
1	1	1
2	4	4

X=-2

Here is what that screen shows. It shows the x and y values for both equations you entered. The columns x and y1 show the values for the first equation where $y = x$. The column y2 show the corresponding y-values for the second equation, $y = x^2 - 2$.

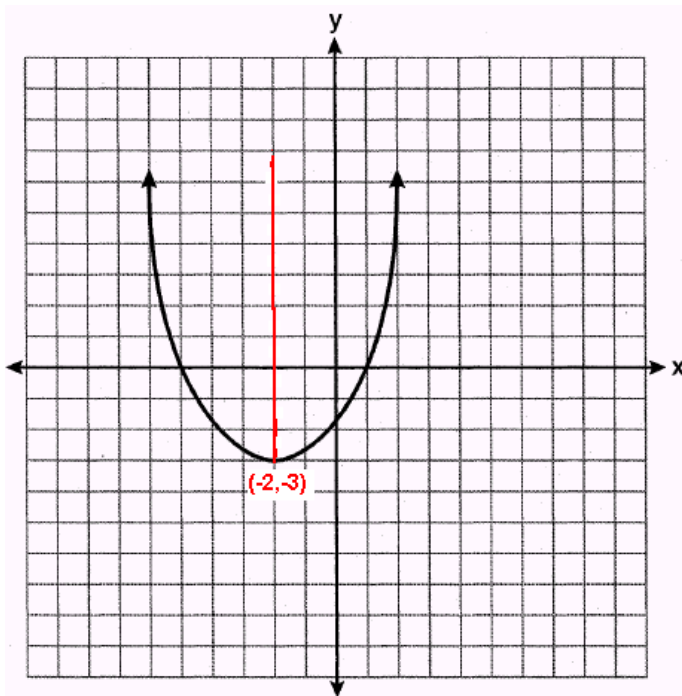
The solution set will be the x value where both y1 and y2 are equal.

You can see that the ordered pairs that will be a solution are (-1,-1) and (2,2).

Choice 4 is your answer.

ANSWER: (4)

- 11) What are the vertex and the axis of symmetry of the parabola shown? I have indicated the coordinates of the turning point in red. The turning point is the vertex. The axis of symmetry is the line that would divide the parabola into two halves. I indicated that using the red vertical line. As you can see, the **vertex** is the point **(-2,-3)** and the **axis of symmetry** is the line where **$x = -2$** .



ANSWER: (1)

- 12) ***Pam is playing with red and black marbles. The number of red marbles she has is three more than twice the number of black marbles she has. She has 42 marbles in all. How many red marbles does Pam have?***

Let x = number of black marbles
 $2x + 3$ = number of red marbles (3 more than twice as much...)
 The total number of marbles is 42.

$x + (2x + 3) = 42$	Combine your x terms.
$3x + 3 = 42$	Subtract 3 from both sides.
$3x = 39$	Divide both sides by 3.
$x = 13$	

The number of red marbles was represented by $2x + 3$.
 Substitute 13 for x .

$2x + 3$	
$2(13) + 3$	Multiply
$26 + 3$	Add
29	

Pam has 29 red marbles.

ANSWER: (3)

- 13) ***What is half of 2^6 ?***

To find half of a number, divide by 2.

$$\frac{2^6}{2^1} = 2^5$$

Remember the rule for dividing powers with the same base: $\frac{x^a}{x^b} = x^{a-b}$

ANSWER: (4)

- 14) ***Which equation represents a line that is parallel to the line $y = -4x + 5$?***

The general equation of a line is represented by $y = mx + b$, where m represents the slope and b represents the y -intercept. The slope of the line represented by the above equation is therefore -4 .

Parallel lines have equal slopes. Look for the equation than will be in the form of $y = mx + b$, and $m = -4$.

The answer is **$y = -4x + 3$**

ANSWER: (1)

- 15) You are asked for the product of $\frac{x^2 - 1}{x + 1}$ and $\frac{x + 3}{3x - 3}$.

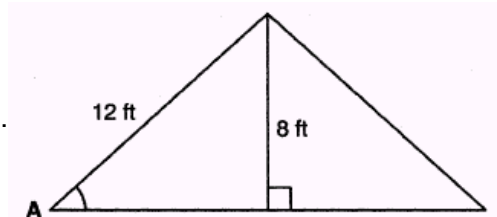
$$\frac{x^2 - 1}{x + 1} \cdot \frac{x + 3}{3x - 3} \quad \text{Factor}$$

$$\frac{(x + 1)(x - 1)}{x + 1} \cdot \frac{x + 3}{3(x - 1)} \quad \text{Cancel}$$

$$\frac{\cancel{(x + 1)}(\cancel{x - 1})}{\cancel{x + 1}} \cdot \frac{x + 3}{3\cancel{(x - 1)}} = \frac{x + 3}{3}$$

ANSWER: (4)

- 16) You are presented with the diagram at the right and asked to determine the measure of angle A to the nearest degree. Relative to angle A, the side of 8 ft. is an opposite. The side of 12 is the hypotenuse. The trigonometric ratio that contains the opposite and the hypotenuse is sine.



$$\text{In our case, } \sin A = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{8}{12}$$

When solving for angle measure, when the sides are given, use the **2nd** key on your calculator to access the **inverse** trigonometric function shown on your calculator. In this case, the **SIN⁻¹** key.

Here is what it will look like on your calculator:
To the nearest degree, your answer is 42.

```
sin-1(8/12)
41.8103149
```

ANSWER: (2)

- 17) **Which value of x makes the expression $\frac{x + 4}{x - 3}$ undefined?**

A fraction is undefined when its denominator equals 0. All you have to do here is set the denominator $x - 3$ equal to 0 and solve for x.

$$\begin{aligned} x - 3 &= 0 && \text{Add 3 to both sides.} \\ x &= 3 \end{aligned}$$

ANSWER: (3)

- 18) **Consider the set of integers greater than -2 and less than 6. A subset of this set is the positive factors of 5. What is the complement of this subset?**

Here are the elements of the set of integers greater than -2 and less than 6:
 $\{-1, 0, 1, 2, 3, 4, 5\}$

The subset containing positive factors of 5 would be the following set:
 $\{1, 5\}$

The complement of this subset would be all the elements contained in the original set but not in the subset. (The original set is considered the universe for this set of elements).

$\{-1, 0, 2, 3, 4\}$

ANSWER: (2)

- 19) **Which data set describes a situation that could be classified as qualitative?**

Quantitative data deals with numbers. Qualitative data does not. Opinions are qualitative. The answer is therefore choice 3.

ANSWER: (3)

- 20) **What is the slope of the line that passes through the points (-6,1) and(4, -4)?**

When given a pair of points, the slope of the lines passing through these points will be the difference in the y-coordinates divided by the difference in the x-coordinates. That is what is meant by the change in y over the change in x. So all you have to do is subtract your y's and x's and set them up with the difference in the x's as being the denominator. Let (-6,1) be x_1 and y_1 . This means that $x_1 = -6$ and $y_1 = 1$
 Let (4,-4) be x_2 and y_2 . This means that $x_2 = 4$ and $y_2 = -4$

Subtract the y's: $1 - (-4) = 5$

Subtract the x's: $-6 - (4) = -10$

The slope is $\frac{5}{-10}$ or $-\frac{1}{2}$

ANSWER: (3)

- 21) **Students in a ninth grade class measured their heights, h , in centimeters. The height of the shortest student was 155 cm, and the height of the tallest student was 190 cm. Which inequality represents the range of heights?**

The heights were between 155 and 190 (including 155 and 190 as well). This means $h \geq 155$ and $h \leq 190$. That is **$155 \leq h \leq 190$** .

ANSWER: (2)

- 22) You are presented with the cumulative frequency distribution table at the right and are asked how many runners are in their forties?

Cumulative Frequency Distribution of Runners' Ages

Age Group	Total
20-29	8
20-39	18
20-49	25
20-59	31
20-69	35

Since the table is cumulative you can figure out each age group as follows. There are 8 runners in the 20 to 29 interval. There are 18 in the 20-39 interval. This means that in reality there are 10 (18 minus 8) in the 30 to 39 age group. How many are there in the 40 to 49 age group? There are 25 in the 20-49 age group. There are 18 in the 20-39 group. This means there are 7 (25 minus 18) in the age group 40 to 49. The answer is, there are 7 runners in their forties. **ANSWER: (3)**

- 23) *Mr. Turner bought x boxes of pencils. Each box holds 25 pencils. He left 3 boxes of pencils at home and took the rest to school. Which expression represents the total number of pencils he took to school?*

Each box holds 25 pencils. This means that x boxes will hold $25x$ pencils. He left three boxes at home. That is a total of 75 (25×3) pencils. He now has $25x - 75$ that he takes to school. **ANSWER: (4)**

- 24) You are given four choices and asked which one represents $\frac{2x^2 - 12x}{x - 6}$ in simplest form.

You have to factor the numerator and then cancel.

$$\frac{2x^2 - 12x}{x - 6} = \frac{2x(x - 6)}{x - 6} = \frac{2x \cancel{(x - 6)}}{\cancel{x - 6}} = 2x$$

ANSWER: (2)

- 25) You are given the diagram at the right and presented with four equations. Which one can be used to find the distance x ,

Whenever you are given two sides of a right triangle and are asked to find the third side, you can use the Pythagorean Theorem: $c^2 = a^2 + b^2$

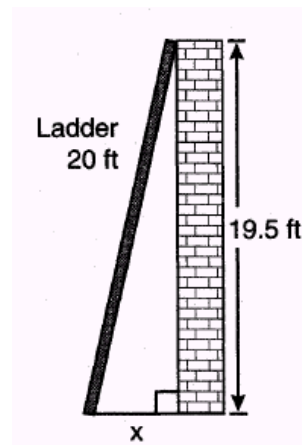
The two legs of the triangle are represented by a and b , while the hypotenuse is represented by c . The hypotenuse is 20.

In our case here substitute the given values for a, b, c .

$$(20)^2 = x^2 + (19.5)^2 \quad \text{Subtract } (19.5)^2 \text{ from both sides.}$$

$$(20)^2 - (19.5)^2 = x^2 \quad \text{Take square root of both sides.}$$

$$\sqrt{(20)^2 - (19.5)^2} = x$$



ANSWER: (3)

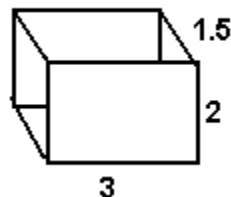
- 26) **Which value of x is a solution of $\frac{5}{x} = \frac{x+13}{6}$?**

An equation where two ratios (fractions) equal each other is called a proportion. In a proportion, the product of the means equal the product of the extremes. This is what you know as cross-multiplying.

$$\begin{array}{ll} x(x+13) = 5(6) & \text{Multiply} \\ x^2 + 13x = 30 & \text{Subtract 30 from both sides.} \\ x^2 + 13x - 30 = 0 & \text{Factor} \\ (x+15)(x-2) = 0 & \text{Set factors equal to 0 and solve for } x. \end{array}$$

$$\begin{array}{llll} x+15=0 & \text{Subtract 15 from both sides} & x-2=0 & \text{Add 2 to both sides.} \\ x=-15 & & x=2 & \text{ANSWER: (4)} \end{array}$$

- 27) **Mrs. Ayer is painting the outside of her son's toy box, including the top and bottom. The toy box measures 3 feet long, 1.5 feet wide, and 2 feet high. What is the total surface area she will paint?**



Picture the box that I drew at the right. It has six surfaces. To determine the total surface area, you have to find the sum of the areas of each side.

$$\begin{array}{ll} \text{Two sides have dimensions of } 2 \times 3. & 2(2 \cdot 3) = 2(6) = 12 \\ \text{Two sides have dimensions of } 2 \times 1.5 & 2(2 \cdot 1.5) = 2(3) = 6 \\ \text{Two sides have dimensions of } 3 \times 1.5 & 2(3 \cdot 1.5) = 2(4.5) = \frac{9}{2} \end{array}$$

ANSWER: (4)

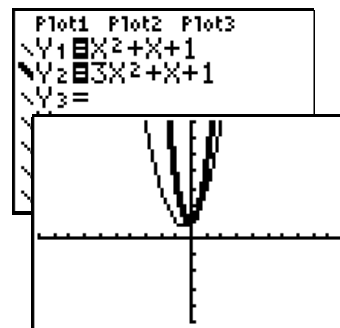
- 28) **What is $\frac{\sqrt{32}}{4}$ expressed in simplest radical form?**

$$\frac{\sqrt{32}}{4} = \frac{\sqrt{16}\sqrt{2}}{4} = \frac{4\sqrt{2}}{4} = \sqrt{2}$$

ANSWER: (1)

- 29) **Consider the graph of the equation $y = ax^2 + bx + c$, when $a \neq 0$. If a is multiplied by 3, what is true of the graph of the resulting parabola?**

Enter two equations using the Y= editor where one a is three times the other and look at the results. At the right you see the graphs of $y = x^2 + x + 1$ and $y = 3x^2 + x + 1$. When you enter the second equation you can move the cursor on your calculator over the symbol preceding the Y2 and hit enter to determine the type of marking you wish your graph to be drawn with. As you can see, the second graph is bolder than the first. You clearly see that it is narrower than the original parabola.



ANSWER: (4)

- 30) ***Kathy plans to purchase a car that depreciates (loses value) at a rate of 14% per year. The initial cost of the car is \$21,000. Which equation represents the value, v , of the car after 3 years?***

Here is one way to understand the answer. After 1 year the car will lose 14% or .14 of its value. To figure out its worth after 1 year you could get your answer as follows.

$21,000 - (21,000 \cdot .14)$ or simply $21,000(.86)$. (The reason both of these calculations get the same answer is because if something loses .14 of its value, its worth is really .86 of its value. $14\% + 86\%$ equals to 100%).

Based on the above, after 2 years it would be worth what it was worth after 1 year minus 14% of that value. Or again simply it will be worth .86 of its value of 1 year.

Since after 1 year it was worth $21,000(.86)$, after 2 years it will be worth $\{21,000(.86)\}(.86)$ or $21,000 (.86)^2$.

Using this pattern, you understand that after 3 years it would be worth **$21,000(.86)^3$** . That is your answer here. **$v = 21,000(0.86)^3$**

ANSWER: (2)

PART II

- 31) ***Tom drove 290 miles from his college to home and used 23.2 gallons of gasoline. His sister, Ann, drove 225 miles from her college to home and used 15 gallons of gasoline. Whose vehicle had better gas mileage? Justify your answer.***

The vehicle that gets more miles per gallon has better gas mileage.

To find how many miles Tom went on one gallon divide his miles driven by gallons of gas used. $290 \div 23.2 = 12.5$ **Tom managed 12.5 miles per gallon.**

To find Ann's miles per gallon divide 225 by 15. $225 \div 15 = 15$
Ann managed 15 miles per gallon.

Ann drove more miles on each gallon and therefore her vehicle had better gas mileage.

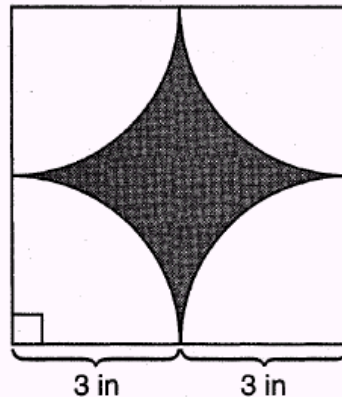
- 32) You are presented with the logo at the right.

Express, in terms of π , the exact area, in square inches, of the shaded region,

You should immediately realize that the complete square has sides of 6 inches.

Area of square equals 6×6 or 36 square inches.

Notice also that if you were to subtract the area of the white part you would remain with the shaded region.



The area of the white region is easily found if you notice that each one comprises one-fourth of a circle. All four together therefore form one circle with a radius of 3 in.

Area of white circle equals πr^2 . The radius represented by r is 3.

So the area of the circle is $\pi(3^2)$ or 9π .

As mentioned earlier, if this area of the circle is subtracted from the complete square, you would be left with the area of the shaded region.

Area of square = 36

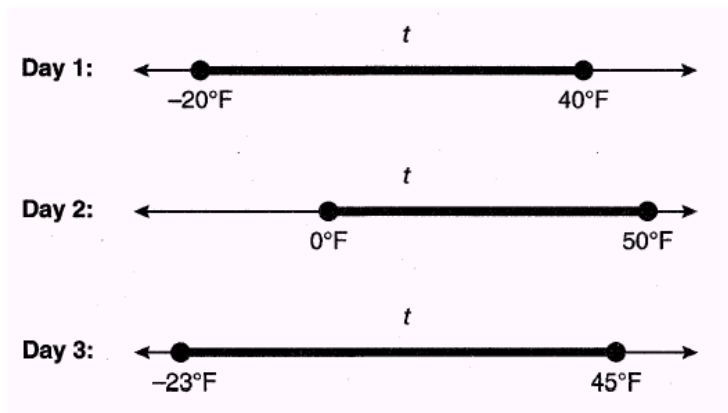
Area of circle = 9π

Area of square - area of circle = area of shaded region.

ANSWER: $36 - 9\pi =$ area of shaded region.

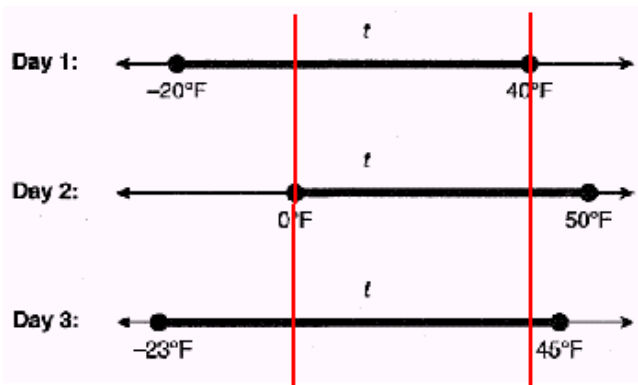
33 STARTS ON NEXT PAGE

- 33) *Maureen tracks the range of outdoor temperatures over three days. She records the following information.*



Express the intersection of the three sets as an inequality in terms of temperature, t .

The intersection of sets is a set that contains all the elements common to the sets in consideration. In this problem you are looking for the range of temperatures common to all three days. For example, Day 1 contains -20 . Day 3 also contains -20 . But Day 2 does not. So -20 is not part of the intersection of these three days. Notice the two red vertical lines in the diagram below.



It shows that the lowest temperature for Day 2, 0 , is contained in all three days. The highest temperature for Day 1, 40 , is also contained in all three days. This means that the intersection of temperatures, those common to all three days, ranged from 0 degrees thru 40 degrees. Written as inequality in terms of t , this would be

ANSWER: $0 \leq t \leq 40$

PART III

- 34) ***Peter begins his kindergarten year able to spell 10 words. He is going to learn to spell 2 new words every day. Write an inequality that can be used to determine how many days, d , it takes Peter to be able to spell at least 75 words.***

Peter already knows 10 words. After the first day he will know $10 + 2$ words. Each day he will learn 2 more new words. After d days he will have learned $2d$ words in addition to the 10 he already knew.

At least 75 means 75 or more (greater than).

Answer: $2d + 10 \geq 75$

Use this inequality to determine the minimum number of whole days it will take for him to be able to spell at least 75 words.

Solve for d :

$2d + 10 \geq 75$ Subtract 10 from both sides.

$2d \geq 65$ Divide both sides by 2.

$d \geq 32.5$

ANSWER: It will take a minimum of 33 days for him to be able to spell at least 75 words.

35 STARTS ON NEXT PAGE

- 35) ***The Hudson Record Store is having a going-out-of-business sale. CDs normally sell for \$18.00. During the first week of the sale, all CDs will sell for \$15.00.***

Written as a fraction, what is the rate of discount?

The rate of discount will be the amount of discount divided by the original price.

Amount of discount equals $18 - 15$ or \$3.

Original price = \$18

ANSWER: Rate of discount as a fraction = $\frac{3}{18}$ or $\frac{1}{6}$

What is this rate expressed as a percent? Round your answer to the nearest hundredth of a percent.

To change a fraction to a percent, divide the numerator by the denominator.

In this case: $\frac{3}{18}$ $3 \div 18 = .16666\dots$ and then move the decimal point two places to

the right. $.16666\dots$ becomes $16.666\dots\%$

Rounded to the nearest hundredth it is 16.67%

ANSWER: 16.67%

During the second week of the sale, the same CDs will be on sale for 25% off the original price. What is the price of a CD during the second week of the sale?

The original price was \$18. You will now receive a discount of 25% off.

Using the same idea as in problem 30, determine 75% of \$18 rather than first finding 25% of 18 and then subtracting that amount from 18.

$18 (.75) = \$13.50$

ANSWER: $\$13.50$

36 BEGINS ON THE NEXT PAGE

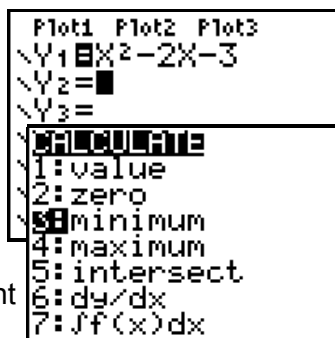
- 36) **Graph the equation $y = x^2 - 2x - 3$ on the accompanying set of axes. Using the graph, determine the roots of the equation $x^2 - 2x - 3 = 0$.**

You can use your graphing calculator to help determine which points you will use to graph the given quadratic equation. This quadratic is already in the form $y = ax^2 + bx + c$. Without a calculator you can determine the axis of symmetry by calculating $-b/2a$. In our case $a=1$ and $b = -2$.

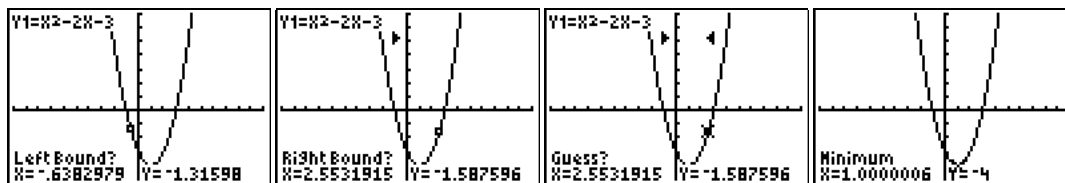
$$\text{For the axis of symmetry } X = \frac{-b}{2a} = \frac{-(-2)}{2(1)} = \frac{2}{2} = 1$$

You can now pick 3 x-coordinates on either side of the 1 and get their corresponding y-coordinates, and then graph them. In other words you would graph the quadratic for x going from -2 thru 4 (-2,-1,0,1,2,3,4), and for each x you would determine the y by substituting for x in the equation.

Here is the method using the calculator. Enter the equation using the **Y=** editor. Now let's figure out the x-coordinate of the turning point. Hit the **2nd** key followed by **TRACE**. This accesses the **CALCULATE** menu (notice the little **CALC** above the **TRACE** key). You will either scroll down to item 3, or simply enter the number 3 followed by **ENTER**. The reason you are selecting "minimum" is because you know that the parabola will open to the top and therefore have a minimum turning point. You know this because the coefficient of the x^2 is positive.



After entering 3 and hitting **ENTER** you will see the first screen below to the right. There will be a little blinking circle with an x on the left side of the parabola. You can move it more to the left by using your left cursor. Hit **ENTER** again, and this time there should be that blinking x on the right side of the parabola. If it is not on the right side, move it there by using the right scroll key. It is the second screen capture below. The bold triangle on the screen shows you the left bound. Now hit **ENTER** again, and you will see the third screen below. Hit **ENTER** one final time and you will see the last screen below. It indicates that the minimum x will be 1.



Your screens may not look exactly the same but here is again what will happen. The first screen will indicate what will be the left bound. Then you will hit enter and select the right bound of the parabola. Finally the calculator will guess at the minimum point.

Now hit the **2nd** key followed by **GRAPH**. This will access the **TABLE** screen. Scroll up or down accordingly, so that you end up with the screen you see at the right. This is why you first found the minimum point. Make sure that point, $x=1$, is on the screen, as well as the -2, and 4.

X	Y1	
-2	5	
-1	0	
0	-3	
1	-4	
2	-3	
3	0	
4	5	

X=4

These are the points you will plot on the given grid.

The points are

$(-2,5)$, $(-1,0)$, $(0,-3)$, $(1,-4)$, $(2,-3)$, $(3,0)$, $(4,5)$

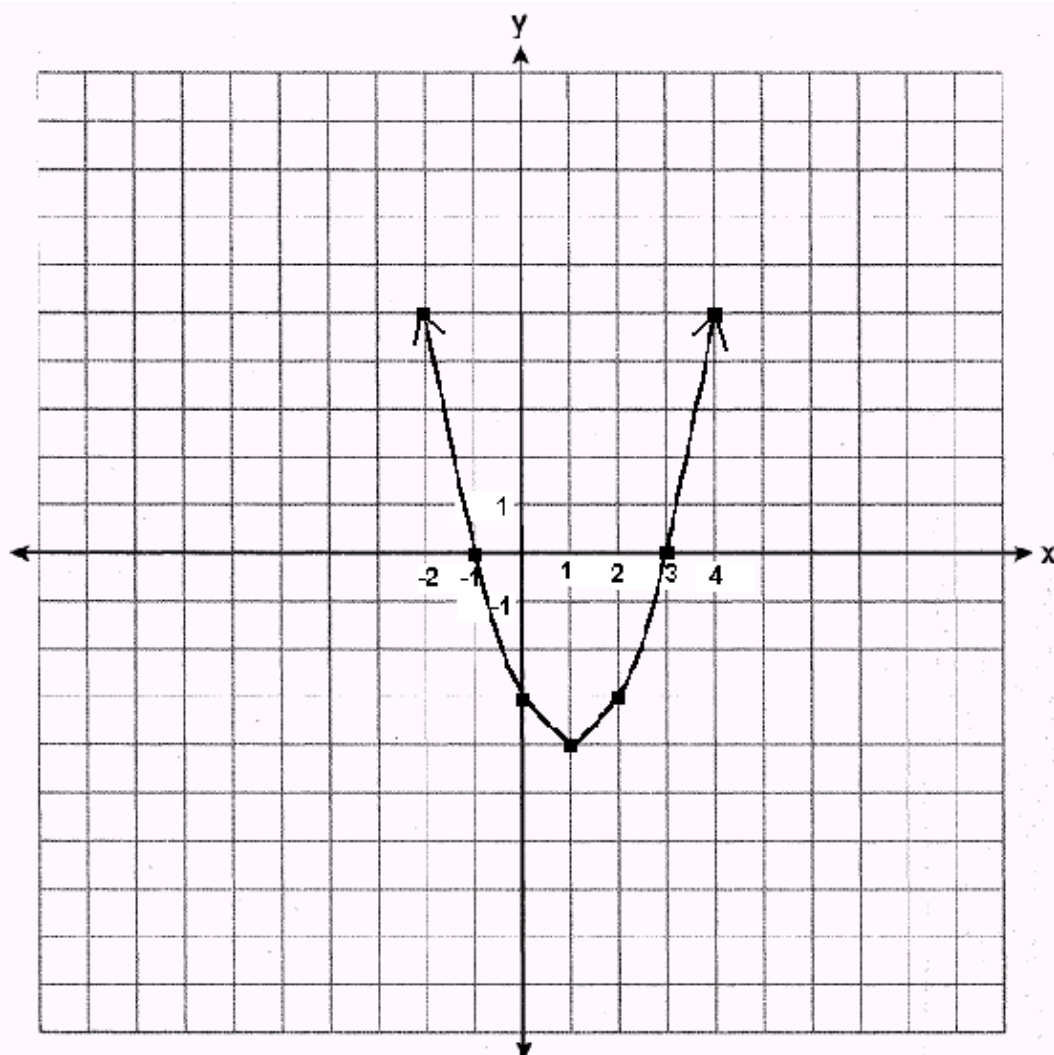
Notice that $x=1$ is the minimum point and also the turning point as the y values change direction at that point.

(You could actually always find the turning point by scrolling up or down the **TABLE** screen until you find the point where the direction of the y changes.

If the graph has a minimum point, scroll in the direction where the x -coordinates get smaller. If the parabola has a maximum point scroll in the direction where the x -coordinates get larger.

Now graph the points listed in the table above.

X	Y1	
-2	5	
-1	0	
0	-3	
1	-4	
2	-3	
3	0	
4	5	



The roots of the equation $x^2 - 2x - 3 = 0$ are the x -coordinates of the point where the above parabola intersect with the x -axis. The roots are -1 and 3 .

PART IV

- 37) ***A contractor needs 54 square feet of brick to construct a rectangular walkway. The length of the walkway is 15 feet more than the width. Write an equation that could be used to determine the dimensions of the walkway. Solve this equation to find the length and width, in feet, of the walkway.***

You are told that the walkway is in the shape of a rectangle.

Let **x = width**

x + 15 = length

Area = 54 square feet.

To find the area of a rectangle we multiply length by width.

$A = lw$

$X(X + 15) = 54$ Multiply.

$X^2 + 15X = 54$ Subtract 54 from both sides.

$X^2 + 15X - 54 = 0$ Factor.

$(x + 18)(x - 3) = 0$ Set factors equal to 0 and solve for x.

$x + 18 = 0$	Subtract 18 from both sides.	$x - 3 = 0$	Add 3 to both sides.
$x = -18$	Reject as dimensions cannot be negative	$x = 3$	

$x = \text{width}$, therefore..... Width = 3

$x + 15 = \text{length}$, therefore... Length = 18

The dimensions of the walkway are 3 feet by 18 feet.

- 38) ***Sophie measured a piece of paper to be 21.7 cm by 28.5 cm. The piece of paper is actually 21.6 cm by 28.4 cm. Determine the number of square centimeters in the area of the piece of paper using Sophie's measurements.***

As in the problem right before this one, you will again be using the formula for finding the area of a rectangle since the piece of paper is in the shape of a rectangle.

Sophie's measurement: 21.7 by 28.5 centimeters.

Area = $21.7(28.5) = 618.45$ square centimeters.

Determine the number of square centimeters in the actual area of the piece of paper.

Find the area using the actual measurements.

Actual measurement: 21.6 by 28.4 centimeters.

Area = $21.6(28.4) = 613.44$ square centimeters.

Problem continues on next page

Determine the relative error in calculating the area. Express your answer as a decimal to the nearest thousandth.

The relative error is the difference between Sophie's measurement and the actual measurement, divided by the actual measurement.

$$\text{Relative error} = \frac{\text{Sophie's} - \text{actual}}{\text{actual}} = \frac{618.45 - 613.44}{613.44} = .0081670579$$

To the nearest thousandth, the relative error is .008,

Sophie does not think there is a significant amount of error. Do you agree or disagree? Justify your answer.

I agree with Sophie. The relative error is only .8%. This is quite insignificant when the measuring of a sheet of paper is involved.

- 39) **The prices of seven race cars sold last week are listed in the table below. What is the mean value of these race cars, in dollars?**

The mean is the average:
Add the prices of all the cars and divide the sum by the total number of cars.

$$\begin{array}{r} 126,000 \\ 140,000 \\ 140,000 \\ 180,000 \\ 400,000 \\ 400,000 \\ \hline 819,000 \\ 2,205,000 \div 7 = \mathbf{\$315,000} \end{array}$$

Price per Race Car	Number of Race Cars
\$126,000	1
\$140,000	2
\$180,000	1
\$400,000	2
\$819,000	1

Mean value = \$315,000

What is the median value of these race cars, in dollars?

The median value will be the middle value. When there is an odd number of data items, add 1 and divide by 2. In our case, there are 7 cars. Add 1 and divide by 2:

7 + 1 = 8 and 8 divided by 2 is 4. The fourth item is your median. In our case it is the car whose value is \$180,000. **Median value: \$180,000**

State which of these measures of central tendency best represents the value of the seven race cars. Justify your answer.

In this case, the **median is a much better measure of central tendency than the mean.** This is true because the **mean is thrown off by the final price of \$819,000 which is much greater than any of the other car prices.**