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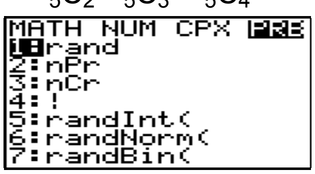
1) f(g(3)) means that we first solve for g of 3, and then find f of that answer.
   You are given that $g(x)= x^2 – 2$. g(3) would therefore be $3^2 -2 =9-2= 7$.
   Now solve f(7). f(x) is given as -2x + 7. f(7)= -2(7)+7= -14+7 = -7 **ANSWER: (1)**

2) The diagram for this problem depicts a curve that resembles the **cosine curve**.
   ANSWER: (2)

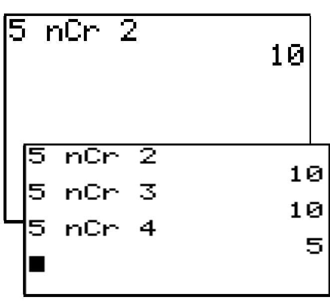
3) When two quantities vary inversely, their products will always equal a constant. As a result, when one is multiplied by a factor, the other will be divided by that same factor. In our problem, You are given that R varies inversely as S, and are asked what happens to R when S is doubled. When S is doubled, R is divided by 2 or multiplied by ½.
   ANSWER: (1)

4) You are given the following function and asked for its domain.
   $\frac{3x^2}{x^2-49}$ The domain would include all real numbers except for +7 or -7. Both these values would cause the denominator of the given function to equal 0. A fraction is undefined when its denominator has a value of 0. The correct answer, choice #2 reads as follows:
   $\{x | x \in \text{real numbers}, x \neq \pm 7\}$ The answer is x, such that x is an element of the set of real numbers, and x is not equal to plus or minus 7. **ANSWER: (2)**

5) Find the value of:
   $\sum_{r=2}^{4} {}_5C_r$ This is a problem dealing with summation. It is asking you to find the sum of all the values for ${}_5C_r$, as r changes from 2 thru 4. In other words, solve the following:
   ${}_5C_2 + {}_5C_3 + {}_5C_4$ You can use your TI-83 Plus calculator to solve combinations. To evaluate ${}_5C_2$ use the following sequence of keys. **Remember that after hitting the yellow 2nd key, you will be accessing the symbol to the upper left of the key you are actually hitting.**



[5] [MATH] ► ► ► To your left is a screen capture up to this point. You have just accessed the Probability menu. Choice 3 is the one you want . Now continue: [3] [ENTER] What you will see now on your screen is shown at the left. That is the answer to ${}_5C_2$. Do the same for ${}_5C_3$ and ${}_5C_4$. As you see at the left, ${}_5C_2 = 10$ ${}_5C_3 = 10$ ${}_5C_4 = 5$
Adding these values together you end up with 25.



ANSWER: (3)

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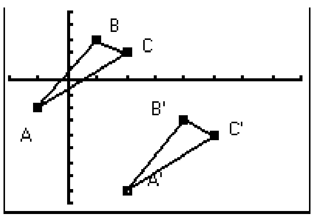
6) You are being asked for the product of (5ab) and $(-2a^2b)^3$.
Step #1 requires you to work out the answer to $(-2a^2b)^3$.
Begin by cubing each factor in the parenthesis.
$(-2)^3 = -8$ $(a^2)^3 = a^6$ $(b)^3 = b^3$ Therefore, $(-2a^2b)^3 = -8a^6b^3$
Now $(5ab)(-8a^6b^3) = -40a^7b^4$

ANSWER: (4)

7) A transformation is a direct isometry if it preserves distance and orientation. If orientation is not preserved, it is considered an opposite isometry. Line reflections are opposite isometries. Below is an example of what each of the choices would look like using sample coordinates.

Choice 1:

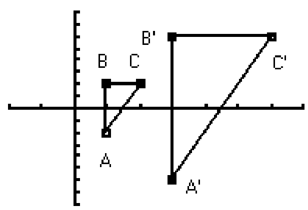
$(x,y) \rightarrow (x+3, y-6)$



This is an example of a translation. Each point is moved 3 units to the right, and 6 units down It is a direct isometry.

Choice 2:

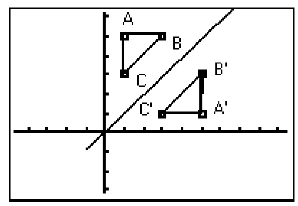
$(x,y) \rightarrow (3x, 3y)$



This is an example of a dilation. The x and y coordinates of each point are multiplied by 3. This is not an isometry because distance is not preserved.

Choice 3:

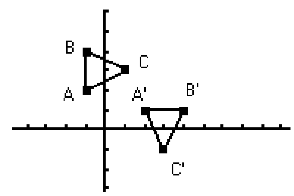
$(x,y) \rightarrow (y,x)$



This is an example of a reflection through the line y=x. **It is an opposite isometry.** Points A,B,C have a clockwise orientation A',B',C' have a counterclockwise orientation.

Choice 4:

$(x,y) \rightarrow (y,-x)$



This is an example of a -90 degree rotation about the origin. Distance and and orientation are are preserved so it is a direct isometry.

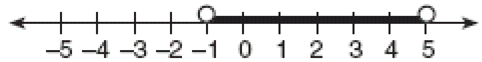
ANSWER: (3)

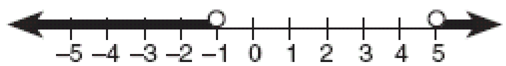
8) You are asked which choice is equivalent to :
$\frac{\tan\theta}{\sec\theta}$ Realize that $\tan\theta = \frac{\sin\theta}{\cos\theta}$ and $\sec\theta = \frac{1}{\cos\theta}$. Therefore

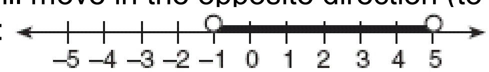
$\frac{\tan\theta}{\sec\theta} = \frac{\sin\theta}{\cos\theta} \div \frac{1}{\cos\theta}$ or $\frac{\sin\theta}{\cos\theta} \bullet \frac{\cos\theta}{1}$ Now, cosθ will cancel , and you are left with $\frac{\sin\theta}{1}$ or simply **sinθ .**

ANSWER: (4)

9) This problem requires you to graph the solution set of a quadratic inequality.
In general, the first step involves setting the quadratic equal to 0 and then solving it.
You will generally end up with 2 solutions. Continue reading for a little explanation of how to then depict this solution set for the inequality (rather than the equation) on a number line
Let's begin by first setting the inequality equal to 0 and solving it.

$x^2 - 4x - 5 = 0$
$(x + 1)(x - 5) = 0$ The roots of this equation are therefore -1 and +5.
The correct choice for the inequality will be: 

Here is a way you can remember how to depict solution sets.
For an inequality greater than 0, think of the direction of the symbol. It is pointing to the right. This means that you will **move to the right from your greater root**, and in the opposite direction (to the left) from the lower root. Using the above example, had the inequality been $x^2 - 4x - 5 > 0$, you would first solve it set equal to 0. You get -1 and +5. You would set up your number line showing that $x > 5$ (moving to the right), and $x < -1$ (moving to the left). It would look like choice 4: 

Had the inequality been ≥ 0, then it would look the same as choice 4 above but the empty points (-1 and 5) would be shaded as well since they would be part of the solution set.
The inequality you were presented with in this problem was < 0. Again, you solve it as a quadratic equation equal to 0. You get the same roots of -1 and 5. This time since the inequality says < 0 (pointing to the left), **you will move to the left from your greater root:** $x < 5$ The other root will move in the opposite direction (to the right) $x > -1$.
That is exactly what choice 1 is showing: 

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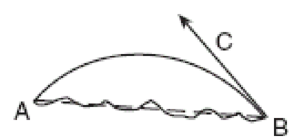
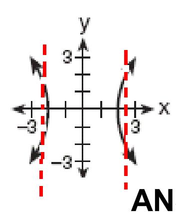
ANSWER: (1)

10) The diagram at the right presented with this problem is in essence a representation of an angle formed by a chord and a tangent. The measure of such and angle is simply ½ the intercepted arc. You are given that the angle, ∠ABC, equals 45º. This means that the arc it intercepts must be equal to twice 45 or 90º. And that is the answer. The measure of Arc AB is equal to 90º.



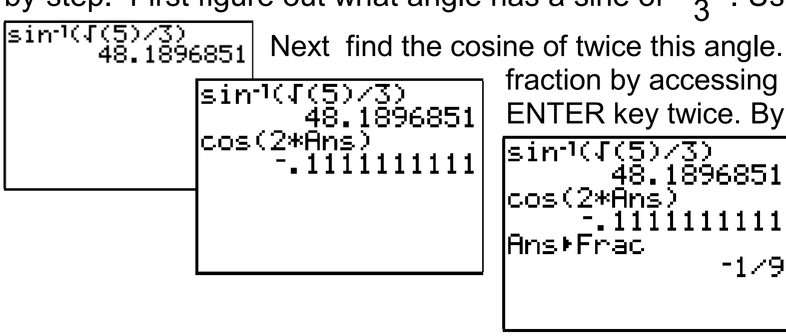
ANSWER: (2)

11) To determine whether or not an equation represents a function, you can use the "vertical-line" test on its graph. If any vertical line can be drawn that intersects the graph in more than 1 point then the graph does not represent a function. In our problem, choice 1 fails the vertical line test as you can see at the right



ANSWER: (1)

12) This problem is easily done using your calculator. It can be done in one step, but here it is step-by-step. First figure out what angle has a sine of $\frac{\sqrt{5}}{3}$. Use the $\sin^{-1}$ as seen at the left below.



Next find the cosine of twice this angle. And finally change this decimal to a fraction by accessing the MATH menu and hitting your ENTER key twice. By the way, to use the answer from a previous calculation on your calculator, hit the 2nd key followed by the (-) key.

ANSWER: (2)

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13) $2x^2-8x-4=0$ You are asked to determine the nature of the roots. In order to do that, you have to solve the value of the discriminant b^2-4ac. In our case, a=2 b= -8 c= -4

b^2-4ac Substitute the values for a, b, and c.

$(-8)^2-4(2)(-4)$ Simplify

64 +32 Combine

96 The discriminant is positive and not a perfect square. This means that the roots will be **real, irrational, and unequal**. **ANSWER: (3)**

14) The equation of a circle whose center is (0,0) would be $x^2+y^2 = r^2$ where r is the radius.
The equation of a circle with a center other than the radius is:
$(x - \text{x-coordinate at center})^2 + (y - \text{y-coordinate at center})^2 = r^2$
In this problem you are given that the center of the circle in question is (-3,1) with a radius of 7.
This means that the equation will be:
$(x-(-3))^2 + (y-1)^2 = 7^2$ or $\mathbf{(x+3)^2 + (y-1)^2 = 49}$ **ANSWER: (4)**

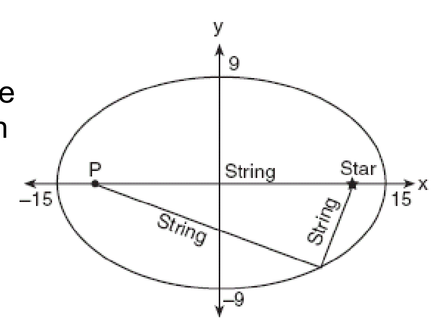
15) Choices 3 and 4 show no correlation. Choice 2 shows a negative correlation.
Choice 1 shows a positive correlation. **ANSWER: (1)**

16) You are being asked for the equivalent of the following expression: $\frac{7}{3-\sqrt{2}}$
This means you have to simplify or rather rationalize this expression.
To do this you have to multiply both the numerator and denominator by the conjugate of the denominator. The denominator $3-\sqrt{2}$, and $3+\sqrt{2}$ are conjugates.

$\frac{7}{3-\sqrt{2}}\left(\frac{3+\sqrt{2}}{3+\sqrt{2}}\right)$ Multiply numerator and denominator by the conjugate $3+\sqrt{2}$

$\frac{7}{3-\sqrt{2}}\left(\frac{3+\sqrt{2}}{3+\sqrt{2}}\right) = \frac{21+7\sqrt{2}}{9-2} = \frac{21+7\sqrt{2}}{7} = \mathbf{3+\sqrt{2}}$ **ANSWER: (3)**

17) Which equation can represent the diagram shown at the right?
First off you should realize that the diagram is that of an ellipse.
There are two types of ellipses—horizontal and vertical. The one pictured for this problem is the horizontal. The general equation for the horizontal ellipse is: $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$



For the vertical ellipse it is: $\frac{(x-h)^2}{b^2} + \frac{(y-k)^2}{a^2} = 1$

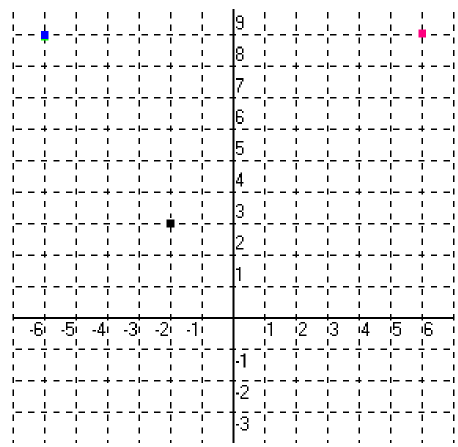
An ellipse will have a major axis and a minor axis. They are similar in a sense to what a diameter is in a circle. In an ellipse there are two axes—a vertical and horizontal. The greater axis is referred to as the major axis, and names the ellipse as being either horizontal or vertical. Therefore, the one pictured above is a horizontal ellipse. The vertices of an ellipse are "a" units from the center of the ellipse.The vertices are always along the major axis. Pictured above we see an ellipse whose center is the origin and whose vertices are (15,0) and (-15,0). The distance from the center to one of these points is 15, making "a" equal to 15, and a^2 equal to 225. The endpoints of the minor axis are pictured as being 9 units from the center of the

origin, making "b" equal to 9 and $b^2 = 81$.
Since the center of the ellipse is at the origin, there will be no "h" or "k" terms in the numerator of the equation. The x-coordinate of the center is represented by "h", while the y-coordinate of the center is represented by "k". This means that the equation for our ellipse is
$\frac{x^2}{225} + \frac{y^2}{81} = 1$ **ANSWER: (2)**

18) You are in essence being asked to simplify : $\frac{i^{16}}{i^3}$
Step #1 is simple. Use the rule for division of exponents and your answer is i^{13}.
For the next step, you need to know the following:
$i^0=1$ $i^1= i$ $i^2= (\sqrt{-1})(\sqrt{-1}) = -1$ $i^3=(i^2)(i)= -i$ $i^4=(i^2)(i^2)= 1$
Now, in order to simplify powers of i, simply divide by 4 and keep the remainder.
In our problem you want to simplify i^{13}. Divide the 13 by 4. Your answer is 3 with a **remainder of 1**. This means that i^{13} is equal to i^1. And as you recall, i^1 is equal to **i**. **ANSWER: (3)**

19) If $\log_5 x = 2$, what is the value of $\sqrt{x}$?
Try to remember this when dealing with logarithms:
$\log_{10}100 = 2$ because $10^2 = 100$ or $2 = \log_{10}100$
You can now rewrite $\log_5 x = 2$ as $5^2=x$
Now this is simple because you know that 5^2 is 25. So you now know that x = 25, but the problem is asking for $\sqrt{x}$. If x=25 then $\sqrt{x} =5$ **ANSWER: (3)**

20) This problem is asking you what the image of (-2,3) is after a reflection in the y-axis **following** a dilation of 3. Step 1 requires you to first perform a dilation of 3 on the given point (-2,3). Your new point will be the point (-6,9), pictured in blue on the coordinate axis at the right. Step number 2 requires you to reflect this new point, (-6,9) under a reflection in the y-axis. Your new point will be (6,9) as pictured at the right in red. Therefore, the coordinates of the image of (-2,3) under $\mathbf{r_{x\text{-}axis}} \circ \mathbf{D_3}$ will be (6,9). **ANSWER: (4)**



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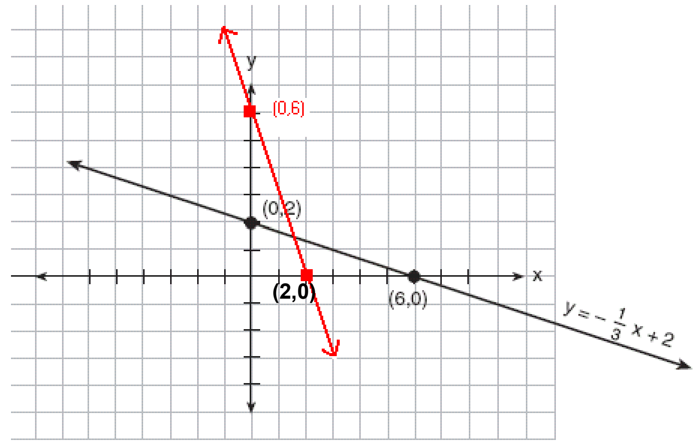
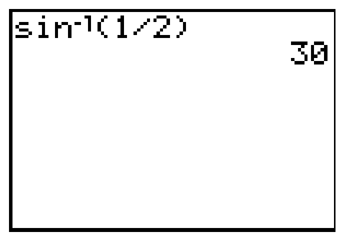
21) You are presented with the diagram at the left, minus the red line. The red line containing the point (0,6) is your answer. It is the graph of the inverse of the given function. In order to graph the inverse of a function when you know the coordinates of its points is quite simple. All you have to do is switch the x and y of each coordinate. In our case you are given the points (6,0) and (0,2). You therefore know that the inverse of this function will contain the points (0,6) and (2,0).



22) Imaginary roots of quadratic equations will always appear in conjugate pairs. If one root is a+bi, the other will be a-bi. You are given that one root of a quadratic equation is 2+3i. You therefore know that the other root is 2-3i. You are asked for the sum of the roots.
2+3i + 2 – 3i = 4 **The sum of the roots is 4.**

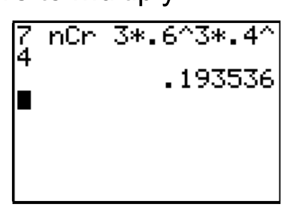
23) You are asked to solve 2 sin **2** - 1 = 0 for all values of **2** in the interval 0° ≤ **2** < 180°.

2 sin **2** - 1 = 0 Add 1 to both sides.
2 sin **2** = 1 Divide both sides by 2.
sin **2** = $\frac{1}{2}$ Now use your $\sin^{-1}$ key to find **2**. Remember that to access the $\sin^{-1}$ key, you first have to hit the yellow **2nd** key followed by the **sin** key. You see that an angle of 30º has a sin of ½. Remember that you are looking for all values of **2** between and including 0º and 180º. Also recall that sine of a second quadrant angle will be positive as well. This mean that there is another angle in the second quadrant whose sine will be ½. To find this angle subtract 30 from 180. Your answer is 150. An angle of 150º will also have a sine of ½.



ANSWER: 30º , 150º

24) Based on the given information you know that there is a 60% **chance of rain** this week. Written as a decimal this is **.6**. Now, if there is a .6 chance of rain, there is a **.4 chance of no rain**. You are being asked to find the probability that it will rain exactly 3 out of 7 days this week. For rain 3 times you will have to raise .6 to the 3rd power. This means that there will be no rain for 4 days so you will have to raise .4 to the 4th power. Then you will have to multiply by $_7C_3$ because you are being asked for this probability for 3 out of 7 days.
$_7C_3 (.6)^3 (.4)^4 = .193536$ At the right is a screen capture of the TI83+ screen. Review problem #5 in this regents to recall how to compute a problem such as $_7C_3$ involving combinations.



ANSWER: .193536 or 19.3536%

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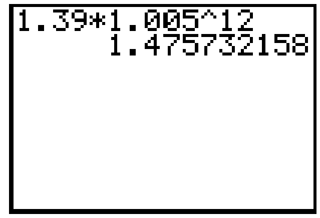
25) The price of gas is \$1.39 per gallon. It increased by .5% each month. What was the cost per gallon to the nearest cent 1 year (12 months) later. This is a problem of exponential growth. After 1 month the cost per gallon will be 1.39 (1.005). After 2 months it will be [1.39 (1.005)] (1.005) .

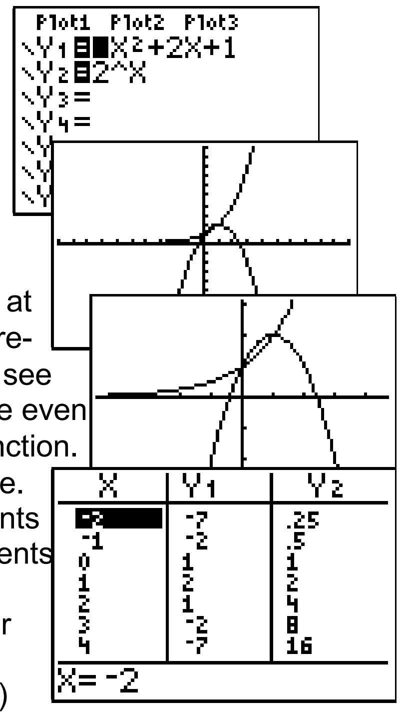


After 3 months it will be [1.39 (1.005)(1.005)] (1.005).
After 12 months it will be: $1.39\ (1.005)^{12}$

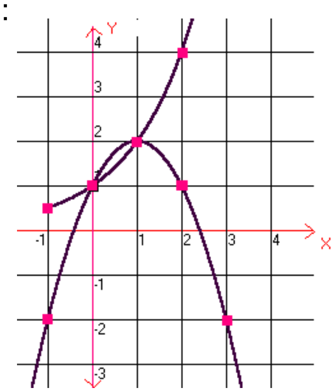
To the nearest cent, the answer is \$1.48.

26) A central angle is equal to 1 radian measure if it intersects an arc equal to the length of the radius of that particular circle. You are given that the arc in this case happens to be 6 cm long. You are told that the central angle is 1.5 radian measures. This means that 1.5 times the radius will be 6. Therefore, **the radius is 6÷1.5 or 4.**
Had the arc been 4, the angle would have been 1 radian measure. However, the arc is 6, which is 1.5 time 4. **Answer: 4**

27) You are given the following set of equations to solve graphically:
$y= -x^2+2x+1$
$y= 2^x$
You are obviously required to graph these 2 equations. The point or points at which they intersect will be the solution. You can enter these two equations into your calculator using the y= key. At the right is what your screen should look like after entering the two equations. If you were to hit your GRAPH key at this point you would have an idea of what your graphs should look like. You can at this point hit the ZOOM key followed by choice 4 and you will be presented with a clearer picture of your two graphs. You can actually see the two points of intersection. They are (0,1) and (1,2). To make life even easier you can hit 2nd GRAPH which will access the **TABLE** function. The last screen capture at the right is what your screen will look like. You can actually scroll up and down at this point to make more points visible. Y1 represents your first equation—the parabola. Y2 represents your second equation. Here again, you can see the points of intersection are (0,1) and (1,2). You can use these points to graph your two equations. On the axis below, I've used the x values of –1 thru 3. The points being graphed for your parabola are: (-1,-2) (0,1) (1,2) (2,1) (3,-2). The points being graphed for the exponential function are: (-1,.5) (0,1) (1,2) (2,4) . To the right is what your graph should look like:



The points of intersection should be indicated as:
(0,1) and (1,2)



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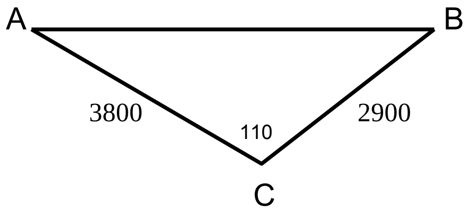
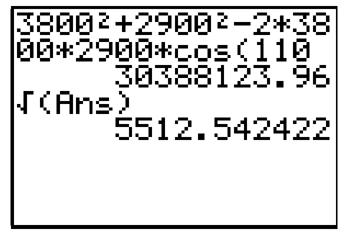
28) Based on the given information, you should be able to draw the following diagram:



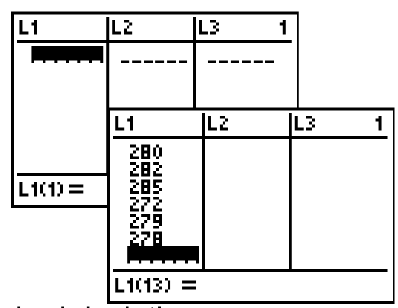
A and B represent the points of the proposed tunnel through a mountain. C is a point near the mountain. AC is 3800 meters, BC is 2900 meters, and angle ACB is 110 degrees. You are asked to draw the diagram and to find the length of the proposed tunnel—in this case, the length of AB.

Whenever you know two sides and the included angle of a triangle, and you are asked to find the side opposite this included angle, you use the law of cosines. In our case it would be:
$(AB)^2 = (AC)^2 + (BC)^2 - 2(AC)(BC)\cos C$ Now it's simply a matter of substitution:
$(AB)^2 = (3800)^2 + (2900)^2 - 2(3800)(2900)\cos 110^\circ$
Doing it in two steps on your calculator it would look like the screen capture at the right. $(AB)^2$ is equal to 30388123.96
To find the square root of this answer do the following:
2nd x^2 2nd (-) and you will get 5512.542422
(The first 2 key strokes above access the square root function while the second two access the last ANS on the screen.)

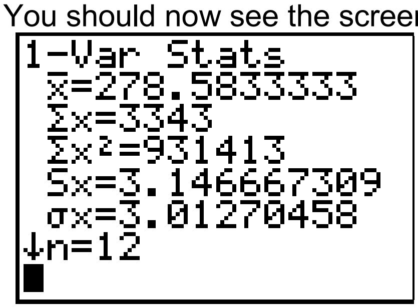


To the nearest meter, your answer is 5513.

29) You are given a set of scores and asked to find the standard deviation for the **sample**.
The scores are: 276, 279, 279, 277, 278, 278, 280, 282, 285, 272, 279, 278
Using your calculator and hit STAT ENTER This will bring up the first screen pictured at the left. You can now begin entering the given scores in the list L1. As you enter each score, hit the ENTER. When you are done your screen will look like the second one at the right. You are now ready to find the standard deviation for the data you just entered.



Press the following keys: STAT ► ENTER ENTER
You should now see the screen below:

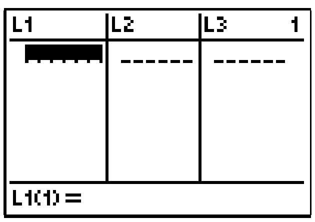


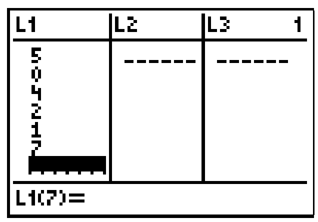
Normally you are asked for the standard deviation. That would be indicated by σx. In this problem you were asked for **the sample standard deviation which is indicated by Sx. The sample standard deviation is therefore 3.146667309. The mean is indicated by ū and is 278.5833333.** You are being asked for the percentage of scores that fall within 1 standard deviation of the mean. **One standard deviation below the mean would be 278.5833333 - 3.146667309 or 275.436666. One standard deviation above the mean would be 278.5833333 + 3.146667309 or 281.7300006.** So first let's see how many scores fall between **275.436666 and 281.7300006**. Of the given scores, all but 282, 285, and 272 fall within this range. That means that 9 out of the 12 scores do fall within one standard deviation of the mean. 9 out of 12 is **75%.**

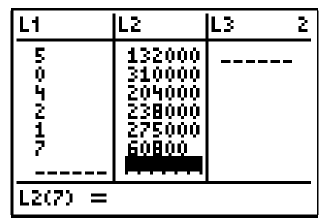
ANSWERS MATH B – January 28th 2005

Number of Blocks from the Beach (x)	Price of a Cottage (y)
5	$132,000
0	$310,000
4	$204,000
2	$238,000
1	$275,000
7	$60,800

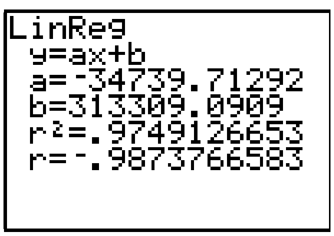
30) You are presented with the table at the right and asked to write a linear regression equation that relates the price of cottage to its distance from the beach. You are also asked to use that equation to predict the price of a cottage whose distance is 3 blocks from the beach. Step #1 requires you to enter the information on the table into lists L1 and L2 on your calculator.
Here are the instructions for step 1.
STAT **ENTER** This will get you to the first screen to the left below. The easiest way to now enter the data is to first enter all the values for L1 and then the ones for L2. Simply begin by inputting the data given in the column "Number of Blocks". Hit **ENTER** after entering each number. When you are done your screen will look like the middle one below. Now, scroll once to the right ▶ and enter the information for L2. When done, your screen will look like the third one below.







Now hit **STAT** ▶ 4 **ENTER** and you will see the screen below to the left.



Using the information at the left, **your linear regression equation is y= -34739.71292x + 313309.0909.**
PLEASE NOTE that your screen may look like the one at the left, minus the last two lines beginning with r^2 and r. These two lines deal with the correlation coefficient and the coefficient of determination. They are not necessary for this problem. To bring up these two lines you have to set the calculator's diagnostic mode to "on". To do this, from the home screen press 2nd 0 This will access the calculator's **CATALOG**. At this point the calculator's alpha-lock is on which means you can now input alpha characters (letters) without having to first hit the ALPHA key. So now, after accessing CATALOG, you can simply press the $\mathbf{x^{-1}}$ key which will jump to the first item beginning with the letter d. Now scroll down until you see the words DiagnosticOn and hit ENTER two times and you will see the following message at the top of your calculator:

Now to answer the second part of the question. You are asked to predict the price of a cottage a distance of 3 blocks from the beach. All you have to do now is input the linear regression equation into your calculator and substitute 3 for x.
(-34739.7)(3) + 313309.0909 = 209089.9521 To the nearest dollar, that's **$209,090**.

Your two answers for this problem are: **y= -34739.71292x + 313309.0909 and $209,090**

31) You are presented with the following inequality $\left|\frac{h-57.5}{2}\right| \le 3.25$ and asked to determine the interval for h to the nearest tenth.

Whenever you are presented with an absolute value equation or inequality, two equations or inequalities can be derived. In our case, the two inequalities are:

$\frac{h-57.5}{2} \le 3.25$ and $-\left(\frac{h-57.5}{2}\right) \le 3.25$ Let's solve the inequalities separately.

$\frac{h-57.5}{2} \le 3.25$ Multiply both sides by 2.

$h - 57.5 \le 6.5$ Add 57.5 to both sides.

$h \le 64$ Now remember that h is in inches and the problem is asking you for an answer to the nearest tenth of a foot! Divide 64 by 12 (12 inches to a foot) and you get 5.3333. To the nearest foot that is 5.3. **So one answer is $h \le 5.3$**

And now for the second inequality:

$-\left(\frac{h-57.5}{2}\right) \le 3.25$ Distribute the "–" (Think of it as multiplying by "-1").

$\frac{-h + 57.5}{2} \le 3.25$ Multiply both sides by 2.

$-h + 57.5 \le 6.5$ Subtract 57.5 from both sides.

$-h \le -51$ Divide both sides by -1. Remember to switch the inequality!

$h \ge 51$ As before, the 51 is inches and you are looking for feet. 51 divided by 12 is 4.25. To the nearest tenth that is 4.3. **So your other answer is $h \ge 4.3$**.

ANSWER: h will be between 4.3 and 5.3.

32) This problem asks you to do a few tasks. Let's begin by setting up a table of values.

The given function is: $\mathbf{y = 90\sqrt{3x} + 400}$

You can immediately see that x, which represents the number of months in this problem, can not be negative. In order to sketch this function we should use values for x that would result in 3x being a perfect square. Let's use the values of 0, 3,12, and 27.

x	$90\sqrt{3x}+400$	y
0	$90\sqrt{3(0)} + 400$	400
3	$90\sqrt{3(3)} + 400$	670
12	$90\sqrt{3(12)} + 400$	940
27	$90\sqrt{3(27)} + 400$	1210

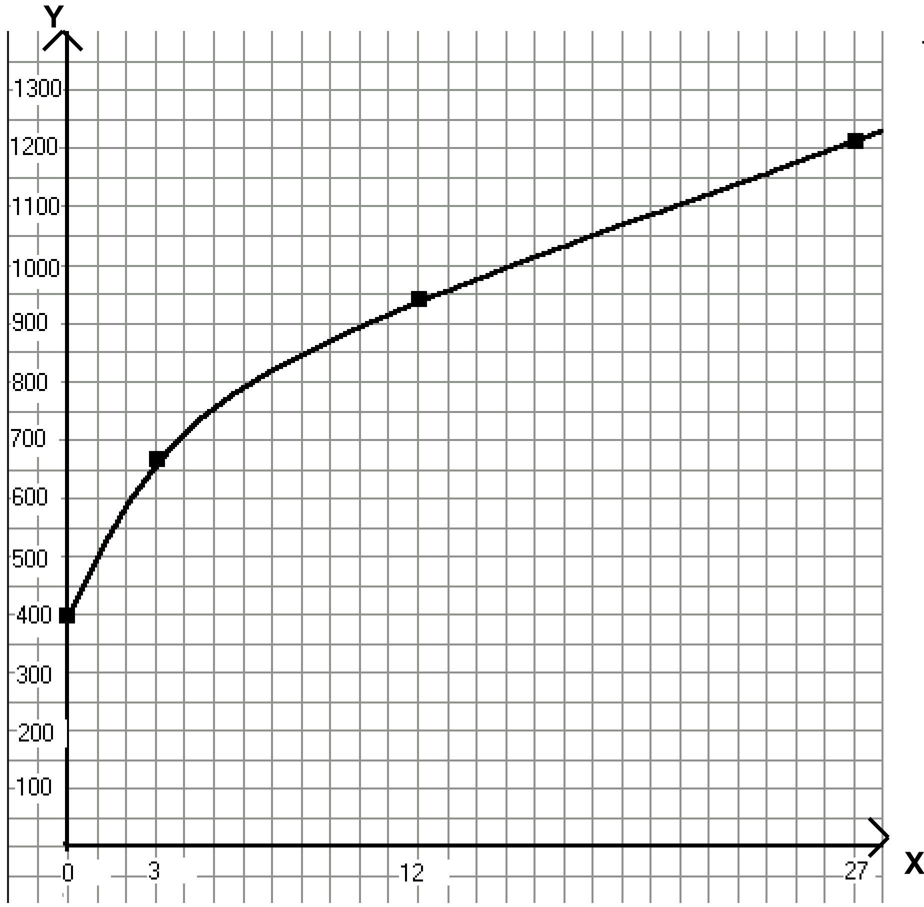
You can also obtain the y values for the given x values by using your calculator. First enter the equation into the **Y=** editor, and then press 2nd GRAPH to access the **TABLE** key. This will bring up a table of values. Keep scrolling until you see the desired x-value and the corresponding y–value. Here is an example:

X	Y1
0	400
1	555.88
2	620.45
3	670
4	711.77
5	748.57
6	781.84

X=0

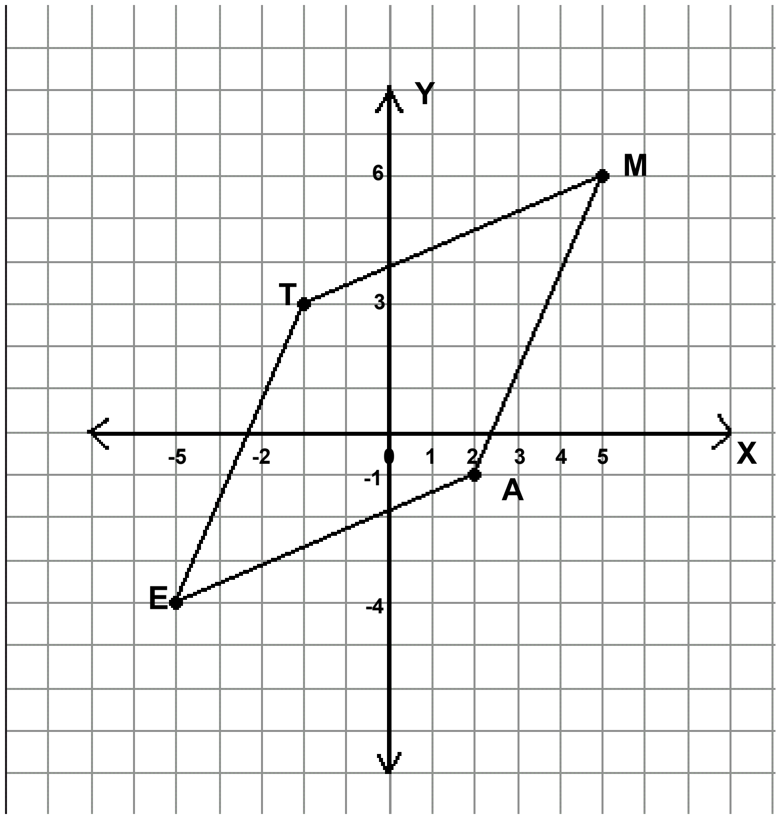
You can see the y-values when x is 0 and 3. Again, we are using x-values that will give us integral y-values. Simply scroll down your calculator and you will see the y values for 12 and 27.

By the way, one part of this question has already been answered. You are asked for **the number of people involved in recycling exactly 3 months after the plant opened. The answer is 670** which is the value obtained when x=3.



To the left is a sketch of the given function. The last part of the question asks after how many months will 940 people be involved in recycling? **The answer is 12 months**, which is obvious from the table of values.

33) You are given 4 coordinates and are told that Jim believes they form a rhombus but not a square. You are supposed to prove him right, which means that you are to prove that the quadrilateral is a rhombus but not a square. There are many ways to prove a quadrilateral a rhombus. Perhaps the easiest way is to show that its diagonals bisect and are perpendicular to each other. There is however 1 more quadrilateral whose diagonals are also perpendicular —the square. The easiest way to prove that something is not a square is to show that it does not contain a right angle. All angles of a square are by definition right angles. So that is our plan for this problem. We will prove its diagonals perpendicular, and then we will prove that one of its angles is not a right angle. On the next page I will graph the quadrilateral simply to give you an idea of its shape. The graphing of the quadrilateral is not necessary to complete the problem.



At the left you see quadrilateral TEAM. Its diagonals are lines EM and TA. In order to prove two lines perpendicular, show that their slopes are negative reciprocals. E is (-5,-4) . M is (5,6).

Slope EM = $\frac{6-(-4)}{5-(-5)} = \frac{10}{10} = 1$

Slope TA = $\frac{3-(-1)}{-2-(2)} = \frac{4}{-4} = -1$

The slopes are negative reciprocals. The diagonals are therefore perpendicular. This means that TEAM is at least a RHOMBUS.

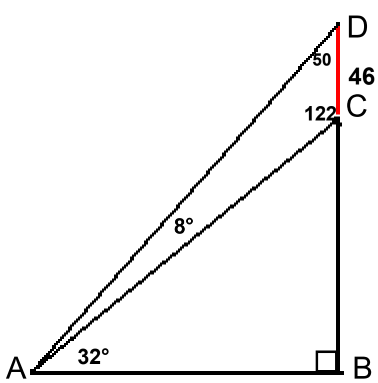
Now to prove that TEAM is not a square. Let's pick angle T and prove that it is not 90°. (We can do the same for any angle). In order to prove that angle T is not a right angle, we have to show that the slopes of TE and TM are not negative reciprocals.

Slope TE = $\frac{3-(-4)}{-2-(-5)} = \frac{7}{3}$

Slope TM = $\frac{3-(6)}{-2-(5)} = \frac{-3}{-7} = \frac{3}{7}$

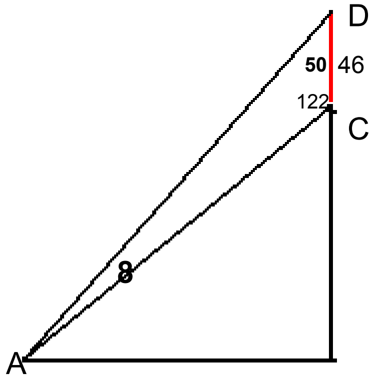
Slopes TE and TM are not negative reciprocals. Therefore angle T is not a right angle. This means that TEAM is not a square. It is however still a rhombus!

34) This is the diagram for this problem. Imagine CD is the sign with a height of 46. It is placed on wall BC. A is a point on the sidewalk level with B, the base of the building. From A, the angle of elevation to the bottom of the sign is 32°. The angle of elevation from A to the top of the sign, D, is 40°. Therefore, ∠CAD is 8° (40-32). You are being asked to find BC, the height of the building. We know that angle B is a right angle. Therefore, we can figure out ∠D. The measures of the three angles of Δ ABD add up to 180. We know that ∠B=90, and ∠DAB= 40. That leaves 50° for ∠D. Also ∠ACD is therefore 122°, because the sum of the 3 angles of Δ ACD equal 180° as well. [The sum of the measures of any triangle will equal 180.]



The plan for solving this problem is as follows. First we can use the Law of Sines on ΔACD to solve for side AC. Once we know AC, we can use the sine relationship on ΔABD to solve for BC which is the height of the wall. The work is shown on the next page.

This is the part of the diagram necessary for solving the length of side AC which we will require for step 2. Let's use the Sines. The Law of Sines states that all sides and the sines of the angles opposite these sides are in proportion. $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$



In our triangle that means

$\frac{46}{\sin 8} = \frac{AC}{\sin 50}$ Now cross multiply.

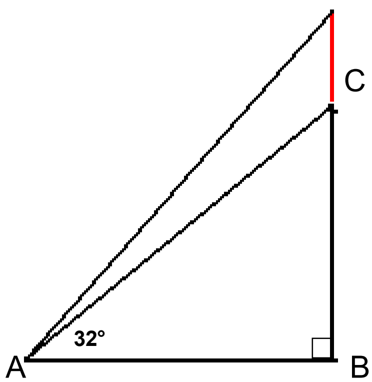
AC (sin 8) = 46(sin 50) Divide both sides by sin 8.

$AC = \frac{46 (\sin 50)}{\sin 8}$ Use your calculator to solve for AC.

```
46*sin(50)/sin(8
253.1957982
```

AC = 253.1957982

Now that you know AC, use the lower triangle, ∆ABC.



Use the sine relationship, opposite/hypotenuse

$\sin 32 = \frac{BC}{AC}$ Multiply both sides by AC.

AC (sin 32) = BC Substitute the value for AC.

253.1957982 (sin 32) = BC Multiply by sin 32.

134.1733311 = BC

```
253.1957982*sin(
32)
134.1733311
```

ANSWER: 134 to the nearest foot.