

**ANSWERS MATH B – January 29<sup>th</sup> 2004**

- 1) One of the formulas on the formula page included with the regents is the equation for the Function of the Difference of Two Angles. The one for **cos(a - b)** matches in form the expression given. You are presented with the expression:

$$\cos 40^\circ \cos 10^\circ + \sin 40^\circ \sin 10^\circ$$

In the above case  $a=40^\circ$  and  $b=10^\circ$

$$\cos(a - b) = \cos a \cos b + \sin a \sin b$$

$$\text{Therefore } a - b = 40 - 10 = 30$$

**Choice 1**

- 2)  $\sec \theta = 1/\cos \theta$        $\csc \theta = 1/\sin \theta$   
 $\sec \theta / \csc \theta$  is therefore equal to:

$$\frac{1}{\cos \theta} \div \frac{1}{\sin \theta} = \frac{1}{\cos \theta} \times \frac{\sin \theta}{1}$$

The above is equal to  $\frac{\sin \theta}{\cos \theta}$

**Choice 3**

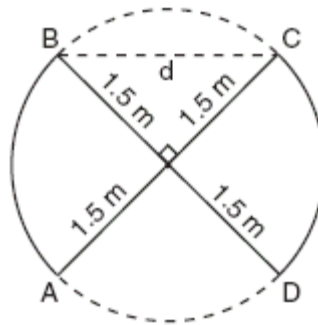
- 3) As pictured in the diagram ,  
 "d" is the hypotenuse of an  
 isosceles triangle whose legs  
 measure 1.5. The long way of  
 doing this problem  
 would be to use the  
 Pythagorean Theorem.

$$(1.5)^2 + (1.5)^2 = d^2$$

$$d^2 = 4.5$$

$$d = 2.1213$$

$$d \approx 2.12$$



Easier way using special  
 triangles:

For an isosceles right  
 triangle, the  
 hypotenuse equals  
 the length of a leg  
 times the square root  
 of 2.

$$d = 1.5 \sqrt{2}$$

$$d \approx 2.12$$

**Choice 4**

- 4) 9 raised to the  $\frac{1}{2} = 3$       9 raised to the  $-\frac{1}{2} = 1/3$

Therefore  $-\cos x = -\frac{1}{2}$  or  $\cos x = \frac{1}{2}$

Use any method to figure out which angle has a cosine of  $\frac{1}{2}$ . To use your  
 TI 83+ graphing calculator, hit the following keys:

**2nd** **COS** **(** **1** **÷** **2** **)** **ENTER**

You will obtain **60°**

**CHOICE 3**

**Please note: In the above example, after hitting the 2nd key and then the COS key, you are not really accessing the COS key but the  $\text{Cos}^{-1}$  key. Every time you hit that orange colored 2nd key, and then another key, you are actually accessing a 2<sup>nd</sup> operation which is the operation in yellow above the key and to its left.**

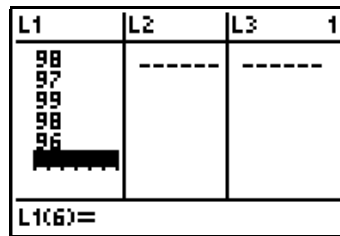
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- 5) Multiply numerator and denominator by the conjugate of the denominator in order to rationalize the fraction. The conjugate is  $2 + \sqrt{3}$ .  
 The numerator becomes  $7(2 + \sqrt{3})$  or  $14 + 7\sqrt{3}$ .  
 The denominator becomes  $(2 - \sqrt{3})(2 + \sqrt{3}) = 4 - 3 = 1$   
 Final answer  **$14 + 7\sqrt{3}$**  **Choice 2**

- 6) This problem simply wants you to find both standard deviations, and to compare them. To find the standard deviation using your calculator, first we will enter the math test scores into **L1** as follows:

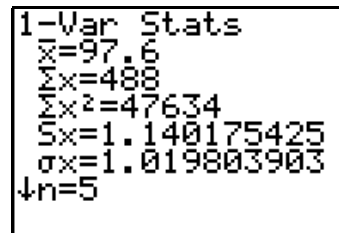
**STAT** **ENTER** **9** **8** **ENTER** **9** **7** **ENTER** **9** **9** **ENTER**  
**9** **8** **ENTER** **9** **6** **ENTER**

Your screen will now look like the screen at the right. To find the standard deviation for the data in **L1** continue with the following key strokes:

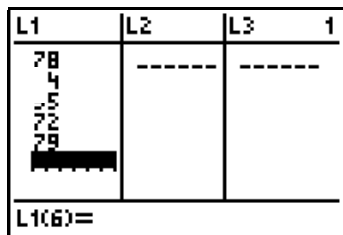


**STAT** **▶** **ENTER** **ENTER**

Your screen will now look as follows:  
**The standard deviation is 1.019803903**  
 Now hit the following keys:



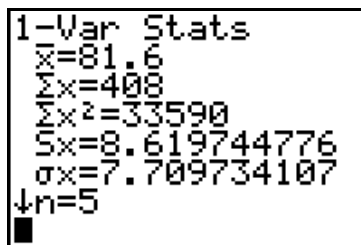
**STAT** **ENTER** You will now see the first screen again – the one that lists the data for **L1**. Begin entering the scores for the English test in the same manner as you entered the first set of mathematics test scores. You will be overwriting the existing **L1** data. When you are done your screen will look as follows:



Find the new standard deviation for the data you just entered by hitting the same keys as before

**STAT** **▶** **ENTER** **ENTER**

The new screen will look as follows:



**The standard deviation for the new data is 7.709734107.** This set of scores (the English scores) has a greater standard deviation than the first set of scores. The answer is **CHOICE 1.**

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- 7) This problem requires you to know the relationship known as the Law of Sines: In the problem presented set up the proportion as follows:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$\frac{19}{\sin 111^\circ} = \frac{10}{\sin C} \quad \text{Cross multiply}$$

$$19 \sin C = 10 \sin 111^\circ \quad \text{Divide both sides by 19}$$

$$\sin C = \frac{10 \sin 111^\circ}{19}$$

None of the answers seem to match. But wait!  
111 degrees is an angle in the second quadrant.  
 $180 - 111 = 69$  In other words,  **$\sin 111^\circ = \sin 69^\circ$** .

$$\sin C = \frac{10 \sin 69^\circ}{19}$$

**CHOICE 4**

- 8) This problem is asking you to find “**g of f of x.**”

Step number 1 is to find “f of x.” It is given as  $\frac{2}{x+3}$

Step number 2 is to find “g of that.” “g of x” is given as **1 divided by x.**  
Once we know the answer to “f of x”, all we have to do is to now substitute the “x”  
In “g of x” with its value. For example, if “f of x” were 7, then g(7) would be 1/7.

Well, in our case f(x) is  $\frac{2}{x+3}$  g of that would be 1 divided by f(x). In other words,

**It would be its reciprocal or  $\frac{x+3}{2}$  CHOICE 3**

- 9) This problem requires you to know some of the rules of logarithms.

For example,  $\log 5^2 = 2 \log 5$ . In the same vein,  $\log x^2 = 2 \log x$ .

$\log (3 \text{ times } 5) = \log 3 + \log 5$ . The numerator in our problem is:  **$x^2 y$**

Using the above two log rules, this would become  **$2 \log x + \log y$**

Let us continue.  $\log x / y = \log x - \log y$ . Therefore in our problem it will be the log of the numerator minus the log of the denominator. The denominator in our case is

**the square root of z.** This can be rewritten as  **$z^{1/2}$** . Using our law from above,

$\log z^{1/2} = \frac{1}{2} \log z$  The numerator – the denominator is now:

**$(2 \log x + \log y) - \frac{1}{2} \log z$**

We are told that  $\log x = a$   $\log y = b$   $\log z = c$ . Substituting above, we get:

**$(2a + b) - \frac{1}{2} c$  CHOICE 4**

- 10) Choice 1 is the equation for a nonrectangular hyperbola.

Choice 3 is simply a parabola.

Choice 4 is a circle.

**Choice 2 is the equation for an ellipse.** When the numerical coefficients of the  $x^2$  and the

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$y^2$  are unequal we have the equation for an ellipse, when they are equal we have the equation of a circle.

**CHOICE 2**

- 11) The mean is given as 500 and the standard deviation as 61. This means that 561 is one standard deviation above the mean. Based on the Normal Curve – Standard Deviation diagram depicted on the Formula page, we see that 34.1% of the scores fall within 1 standard deviation of the mean. This question wants to know what percent of batteries have longer lifetimes than 561. The answer is  $50 - 34.1$  or 15.9, **which is approximately 16.**

**CHOICE 1**

- 12)  $\log_3(8-x)$  mean that 3 raised to some power will be equal to “8-x.”  
Choice # 1 states that x is greater than 8. If x is greater than 8, then 8-x would give us a negative number. We cannot raise 3 to a power and end up with a negative number.  
Choice # 2, in addition to stating that x is greater than 8, also states that x can be equal to 8. If x is equal to 8 then 8-x would be 0. We cannot raise 3 to a power and end up with 0.  
Choice # 4 also includes that that x is equal to 8.

**That leaves choice 3 which states that x is less than 8.**

**CHOICE 3**

- 13) Any expression raised to a negative exponent is equal to 1 over the same expression raised to the positive exponent. ( $2^{-3}$  would be equal to  $1 / 2^3$ ). This immediately leaves only choices 1 and 2. When a number is raised to a fractional exponent, the numerator represents the power while the denominator represents the root. “b” raised to the  $3/2$  would mean that we are finding the square root of b and then raising it to the 3<sup>rd</sup> power. (We could also first raise “b” to the 3<sup>rd</sup> power and then take the square root). **The answer is choice 2.**

**CHOICE 2**

- 14) We are being asked to find the graph that depicts the absolute value of  $f(x)$ .  
In such a graph, “y” cannot be negative. **Choice 1 is the only possibility.**

**CHOICE 1**

- 15) To answer this question, we have to substitute “i” for each “x” in the original expression:

$$i^3 - 2i^2$$

$$i = \sqrt{-1} \quad i^2 = (\sqrt{-1})^2 = -1 \quad i^3 = i^2(i) = -i$$

$$i^3 - 2i^2 = -i - 2(-1) = -i + 2 = \mathbf{2 - i}$$

**CHOICE 4**

- 16) If a parabola does not intersect the x-axis, its roots are imaginary.  
The part of the quadratic equation  $b^2 - 4ac$  is known as the discriminant. It is the part of the quadratic equation that is under the radical. If it is negative, you know the roots have to be imaginary because the square root of a negative number is imaginary.

**Choice 2 states that  $b^2 - 4ac < 0$ , in other words negative.**

**CHOICE 2**

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- 17) As with most problems, there is more than one way to solve this one. Perhaps the easiest way is to use the formula for the area of a triangle that is given on the “formula” page:  
 $K = \frac{1}{2} ab \sin C$ , where  $a$  and  $b$  are two sides of a triangle and  $C$  is the “included” angle.  
 In the case of the problem presented here, the two sides are each 10. The included angle is  $60^\circ$ , since our triangle is equilateral. So we now have:  
 $K = \frac{1}{2} (10)(10) \sin 60^\circ$  We know that  $\sin 60 = \frac{\sqrt{3}}{2}$   
 $= \frac{1}{2} (100) (\frac{\sqrt{3}}{2}) = 50 (\frac{\sqrt{3}}{2}) = 25\sqrt{3}$

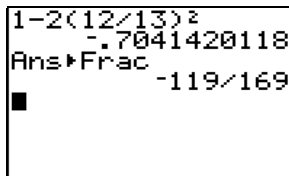
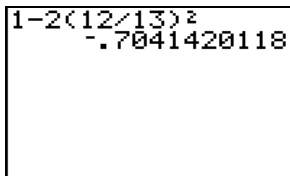
**CHOICE 2**

- 18) One of the double-angle identities for cos as seen on the formula page is:

**$\cos 2A = 1 - 2 \sin^2 A$**  or in our case:  **$\cos 2x = 1 - 2 \sin^2 x$**   
 $= 1 - 2 (12/13)^2 = 1 - 2 (144/169) = -.7041420118 = -119/169.$

Here is what your screen would look like if you use your calculator:  
 To change the answer to a fraction hit the following keys:

**MATH** **ENTER** **ENTER**

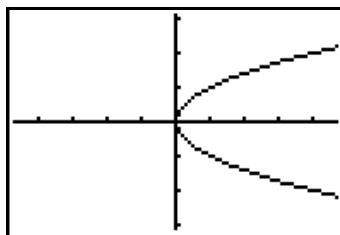
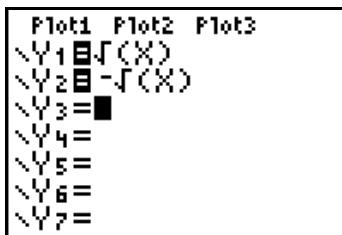


**CHOICE 4**

- 19) We can simply graph  $x=y^2$  and see its line of symmetry. First we have to solve the equation in terms of  $y$ . To do this, we take the square root of both sides and end up with:  
 $y = \pm \sqrt{x}$  In order to graph this equation using your calculator, press the following keys:

**y=** **2nd** **x<sup>2</sup>** **x,T,θ,n** **)** **ENTER** followed by **2nd** **x<sup>2</sup>** **x,T,θ,n** **)** **ENTER**

Your screen will now look like the screen shot below at the left. Now hit **GRAPH** and you will see the screen at the right. **Obviously the x-axis is the axis of symmetry.**



**CHOICE 1**

- 20) Choice 3 is the graph of a logarithmic function. It is the inverse of choice 1 which is an example of an exponential function. If choice 1 would be the graph of  $g=b^h$ , then choice 3 would be  $h = b^g$ . In terms of  $g$  it would become  **$g = \log_b h$** .

**CHOICE 3**

- 21) There are 8 equal sections.  $360/8 = 45$ . Each car is  $45^\circ$  from the next car. We want to move from position 4 to 7. That is  $45 \times 3$ , or  $135^\circ$ . Change 135 to radian measure:  
 $135(\pi/180) = 3\pi/4$  **ANSWER  $3\pi/4$  or  $3\pi/4$**

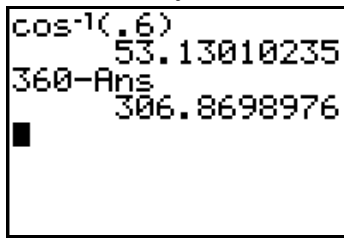
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- 22) We are presented with a unit circle where  $p\theta$  intersects the circle at  $(.6,-.8)$   
 In such a case, the point  $(x,y)$  can also be represented as  $(\cos \theta, \sin \theta)$ . In other words, we are presented here with a 4th quadrant angle whose cos is .6 and whose sin is -.8. We can use our calculator to figure out which angle has a cos of .6:

**2nd** **COS** **.** **6** **)** **ENTER**  
**3** **6** **0** **-** **2nd** **(-)** **ENTER**

Now we have to subtract this answer from 360 since the angle we want is in the 4th quadrant.

Here is what your screen would look like after both sets of instructions:



**ANSWER: Rounded to the nearest degree your answer is 307.**

- 23) When 2 variables vary inversely, their products will be equal to a constant. In other words,  $8 \times 1548 = 12 \times ?$  To find the answer, multiply 8 by 1548 and then divide by 12.  
 $8(1548) = 12,384$      $12,384/12 = 1032$     **ANSWER: 1032 revolutions.**

- 24) You are presented with a quadratic equation. The general form of a quadratic equation is  $ax^2+bx+c=0$  In our case the “a” term is negative, which means that the parabola (which is the graph of a quadratic equation) will open downwards and have a maximum value. You are asked to find this maximum value. To find the “x” value for the axis of symmetry of a parabola we can solve for the value of  $-b/2a$ . This “x” value will end up being either the maximum or minimum value of the parabola depending on whether it opens upward or downward. In our case it opens downward so  $-b/2a$  will result in a maximum point, which is what the problem is asking you to find.

The given equation is:  $w= 120I - 12I^2$  or  $w= -12I^2 + 120I$

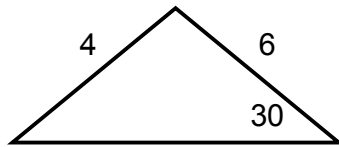
In the above,  $a=-12$      $b = 120$

$X = -b / 2a = - 120 / 2 ( - 12 ) = -120/-24 = 5$     **ANSWER: 5**

- 25) In the equation  $y=a \sin bx$ , the absolute value of a represents the amplitude. The period is  $2\pi/b$ . The equation we are presented with has undergone a shift of 6 units up from the x-axis. Its period, though, still remains  $2\pi/b$ . In our equation,  $b= \pi/4$ . Its period will therefore be  $2\pi / (\pi/4) = \frac{2\pi}{1} \cdot \frac{4}{\pi} = 8$     **ANSWER: 8**

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26)

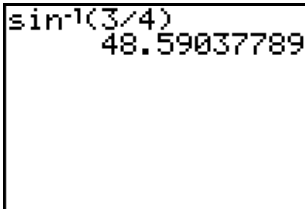


(Not drawn to scale)

To solve these types of problems, always use the law of sines, which does appear on the formula page. In our case the proportion would be set up as follows:

$$\frac{4}{\sin 30} = \frac{6}{\sin X}$$

We now cross multiply and get:  $6 \sin 30 = 4 \sin X$   
 Divide both sides by 4 and get:  $(6 \sin 30)/4 = \sin X$   
 $\sin 30 = \frac{1}{2}$  therefore  $6 \sin 30 = 6(\frac{1}{2}) = 3$   
 $\sin X = \frac{3}{4}$ . What angle will have a sin of  $\frac{3}{4}$ ?  
 Hit the following keys on your calculator:



**2nd** **SIN** **3** **÷** **4** **)** **ENTER**

At the left is what your screen will look like.

You now have two of the angles in the given triangle --  $30^\circ$  and  $48.6^\circ$ . We can figure out the third angle by subtracting the sum of these two from 180:

**$180 - (30 + 48.6) = 101.4$**  So we have at least 1 triangle with angles of 30, 48.6, and 101.4.

You will recall that your calculator gave an answer of 48.5 for the sine whose angle is  $\frac{3}{4}$ . That however is not the only answer. There is also an angle in the second quadrant whose sine will be  $\frac{3}{4}$  as well. To find this angle we have to subtract 48.5 from 180.

**$180 - 48.5 = 131.5$**  This means that we can also have a triangle with an angle of 30 and an angle of 131.5 – making the 3<sup>rd</sup> angle  $180 - (30 + 131.5)$  or 18.5.

Two triangles are therefore possible—one having angles of 30, 48.6, and 101.4 while the other would have angles of 30, 131.5, and 18.5

**Two triangles are possible**

27)

$$\begin{aligned} \sqrt{x+5} + 1 &= x \\ \sqrt{x+5} &= x - 1 \end{aligned}$$

Step # 1 would be to subtract 1 from both sides.  
 Now square both sides.

$$\begin{aligned} x + 5 &= x^2 - 2x + 1 \\ x^2 - 2x + 1 - x - 5 &= 0 \\ x^2 - 3x - 4 &= 0 \\ (x - 4)(x + 1) &= 0 \\ x - 4 = 0 & \quad x + 1 = 0 \\ x = 4 & \quad x = -1 \end{aligned}$$

Bring everything over to one side.  
 Combine.  
 Factor.

You end up with two answer that have to be checked in the original equation.

For  $x = 4$

For  $x = -1$

$$\begin{aligned} \sqrt{x+5} + 1 &= x \\ \sqrt{(4+5)} + 1 &? 4 \\ \sqrt{9} + 1 &? 4 \\ 3 + 1 &? 4 \\ 4 &= 4 \text{ good} \end{aligned}$$

$$\begin{aligned} \sqrt{x+5} + 1 &= x \\ \sqrt{(-1+5)} + 1 &? -1 \\ \sqrt{4} + 1 &? -1 \\ 2 + 1 &? -1 \\ 3 &\neq -1 \text{ reject} \end{aligned}$$

**ANSWER 4**

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- 28) To begin with, we know that the probability of spinning an even number is:  $2/5$   
 The probability of spinning an odd number (non even) is  $3/5$ .  
 Spinning an even number **no more than two times** means that 0, 1, and 2 times would satisfy the conditions of the problem. What we will now do is figure out the probability of getting 0 even numbers on 4 spins, 1 even number on 4 spins, 2 even numbers on 4 spins, and then **adding up these probabilities for the final answer**.

P(0 even numbers on 4 spins, 4 odd numbers)  
 ${}_4C_0$  (probability of 0 even) (probability of 4 odd)  
 ${}_4C_0 (2/5)^0 (3/5)^4 = 1(1)(81/625) = \mathbf{81/625}$

P(1 even number, 3 odd numbers)  
 ${}_4C_1 (2/5)^1 (3/5)^3 = 4(2/5)(27/125) = \mathbf{216/625}$

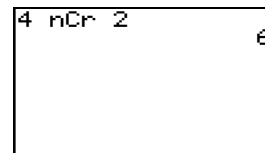
P(2 even numbers, 2 odd numbers)  
 ${}_4C_2 (2/5)^2 (3/5)^2 = 6(4/25)(9/25) = \mathbf{216/625}$

**ANSWER      513/625**

**PLEASE NOTE:**

Here is how you can do  ${}_4C_2$  on your calculator. To continue with  $(2/5)^2 (3/5)^2$  just follow the appropriate key strokes.

**4 MATH ►►► 3 | 2 ENTER**



To multiply the fractions by the answer 6, don't hit ENTER "but" continue inputting the following:

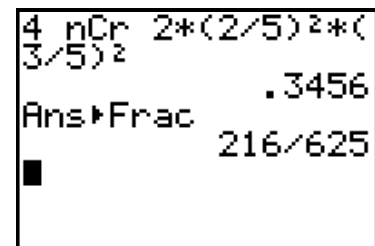
**X ( 2 ÷ 5 ) x<sup>2</sup> X ( 3 ÷ 5 ) x<sup>2</sup> ENTER**

Your screen will look like the one below to the left. To change the .3456 to a fraction, input the following:



**MATH ENTER ENTER**

The screen will now look like the one at the right.



## ANSWERS MATH B – January 29<sup>th</sup> 2004

$$29) p = (0.5)^{t/H}$$

We are told that  $p = 1/5$   $H = 6,000$ . We are asked to solve for “t”.  
We can use the laws of logarithms to solve for “t”.

$$\log p = (t/H) \log 0.5$$

Substitute the given values for the variables.

$$\log (1/5) = (t / 6,000) \log .5$$

Multiply both sides by 6000.

$$6000 \log 1/5 = t \log .5$$

Divide both sides by  $\log .5$

$$t = \frac{6,000 \log (1/5)}{\log .5}$$

Use your calculator.

**6** **0** **0** **0** **LOG** **1** **÷** **5** **)** **÷** **LOG** **.** **5** **)** **ENTER**

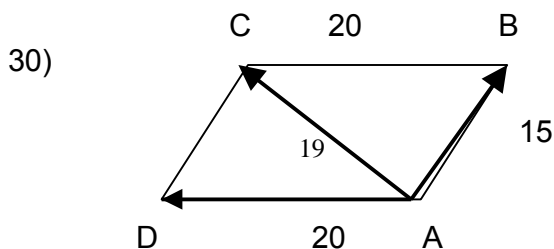
Here is a screen capture of what the above will yield:

```
6000log(1/5)/log  
(.5)  
13931.56857
```

Rounded to the nearest thousand years the answer will be:

**14,000 years**

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AD is the force of 20

AB is the force of 15

AC is the resultant force of 19

Complete the figure of a parallelogram.  
BC is 20 as well.

The plan to solve this problem is as follows. We can figure out what angle B is by using the law of cosines. Once we know what angle B is, we know that angle BAC (the angle between the two forces) will be its supplement. In other words, angle A + angle B will equal 180°.

$$a^2 = b^2 + c^2 - 2bc \cos A$$

a, b, and c will always be 3 sides of the triangle, and A will be the angle between sides b and c. We want to figure out angle B so we can set up the equation as follows:

$$19^2 = 20^2 + 15^2 - 2(20)(15) \cos B$$

$$361 = 400 + 225 - 600 \cos B$$

$$361 = 625 - 600 \cos B$$

$$-264 = -600 \cos B$$

Subtract 625 from both sides

Divide both sides by -600

$$\cos B = \frac{-264}{-600}$$

Use the  $\cos^{-1}$  key to solve for angle B.

$\cos B = 64\%$  to the nearest degree.

Angle A will be equal to  $180 - 64$  or **116°**.

**ANSWER 116°**

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31) We are given the equation  $S(t) = -16t^2 + 25$

We are also told that the acorn falls from a tree 25 feet above the ground, and that the distance is represented by  $S$ . In other words, when we graph this equation, the Distance  $S$  will be our vertical  $y$ -axis. " $t$ " which represents the time will be our  $x$ -axis. We are asked to sketch the above situation and to calculate the value of " $t$ " at the point the acorn hits the ground. Well, at point the acorn hits the ground, the distance above the ground will be 0. Let us set the above equation equal to 0 and solve for " $t$ ."

$$-16t^2 + 25 = 0$$

This can be rewritten as what you see on the second line.

$$25 - 16t^2 = 0$$

It is a binomial that is the product of the difference of 2 squares.

$$(5 + 4t)(5 - 4t)$$

$$5 + 4t = 0 \quad 5 - 4t = 0$$

$$4t = -5 \quad -4t = -5$$

$$t = -5/4 \quad t = -5/-4 = 5/4$$

REJ.

or  **$t = 1.25$**

We will reject the negative answer as we are not working in negative time.

**The answer for the second part is 1.25**

Now for the first part. How can we sketch this graph?

Using your calculator you can enter the equation and then define the viewing window.

**Y=** **(-)** **1** **6** **X,T,θ,n** **x<sup>2</sup>** **+** **2** **5** **ENTER**

The first screen capture to the left below shows your screen after the above is input.

You can now define a window by hitting the **WINDOW** key, and inputting the information so that your screen will look like the screen below to the right.

```

Plot1 Plot2 Plot3
\Y1= -16X^2+25
\Y2=
\Y3=
\Y4=
\Y5=
\Y6=
\Y7=
    
```

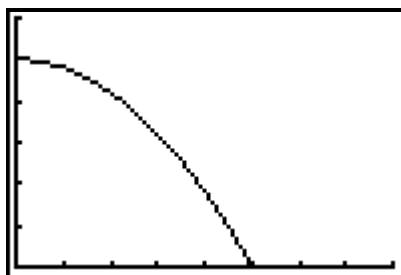
```

WINDOW
Xmin=0
Xmax=2
Xscl=.25
Ymin=0
Ymax=30
Yscl=5
Xres=1
    
```

Here is a bit of an explanation of why the window is set up the way it is.

$X_{min}$  is 0 because the  $x$ -axis represents the flow of time in our problem. The time starts at 0, and that is also why the  $Y_{max}$  is 30. Actually the  $Y_{max}$  could have been 25 because that will be the highest point (the greatest distance above the ground for the acorn). 30 just looked a bit neater to me. For the  $Y_{scl}$  I selected 5, which means that each tick unit on the graph represents 5 units. For  $X_{max}$  I selected 2. Again I did not have to go as far as 2 as we already know that the greatest time (which is represented by the  $x$ -axis) will be 1.25 which was the value we computed when  $S$  was set equal to 0. And as long as .25 was a solution when  $Y$  (really  $S$ ) was 0, I selected .25 as my  $X_{scl}$ . In other words, each tick mark on the  $x$ -axis will represent .25 or  $\frac{1}{4}$  of a second. Now when you hit the **GRAPH** key on your calculator you will see the screen that appears on the next page.

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Based on the screen capture on the left you see the path acorn takes as it falls from the tree 25 feet above the ground. By the way you can see actual values by hitting the following keys on your calculator:

**2nd** **GRAPH**

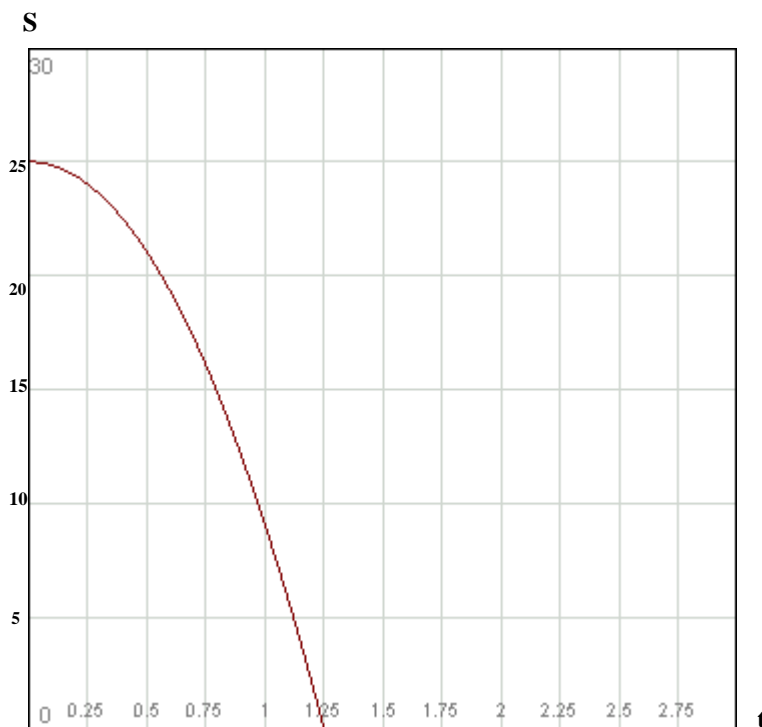
Below to the left is a screen capture of what you will see. You can use the cursor keys to move up and down to more values.

X	Y1
0	25
.25	24
.5	21
.75	16
1	9
1.25	0
1.5	-11

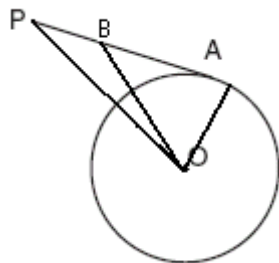
X=0

Based on all of this information you can finally sketch a graph based on the information given in the problem.

One such graph appears below.



32)



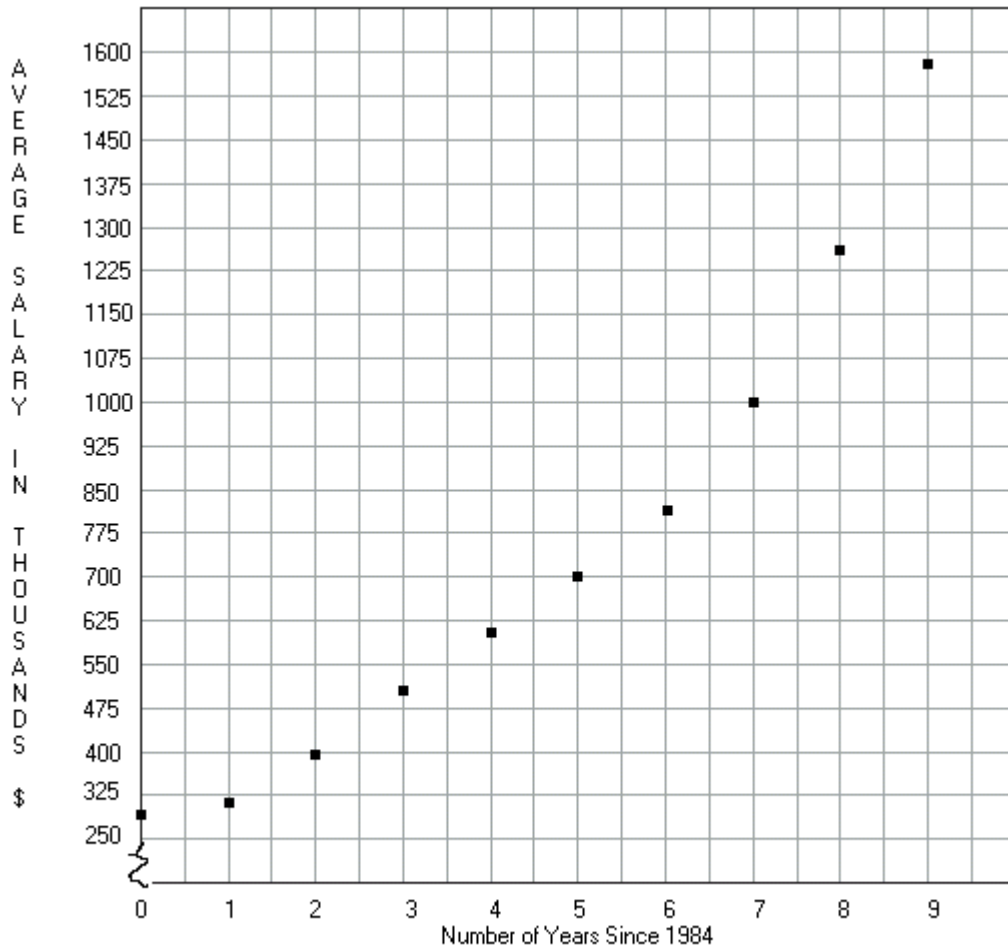
The diagram at the left shows tangent PA drawn to circle O. B has been placed on PA. Lines OA, OB, and OP have been drawn. You are asked to prove that OB is not perpendicular to PA.

**ANSWER:**

1. We are given that PA is a tangent to the circle.
2. OA is a radius by definition.
3. The radius of a circle is always perpendicular to a tangent at its point of tangency.
3. OA, the radius is therefore perpendicular to PA, the tangent.
4. Angle OAP is therefore a right angle because perpendicular lines form right angles.
5. Angle OAP is equal to  $90^\circ$  (definition of right angle).
6. By definition, BOA is a triangle.
7. The sum of the measures of the angles of a triangle equals  $180^\circ$ .
8. If OB "is" perpendicular to PA, then angle OBA would be a right angle and equal to  $90^\circ$ .
9. A triangle CANNOT have two  $90^\circ$  angles.
10. OB can therefore NOT be perpendicular to PA.

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- 33) Below is the requested scatterplot. I used units of 75 on the vertical axis. You could have used whatever you are comfortable with.



The next part of the problem asks you for the exponential regression equation based on the data presented in the table.

I will also show you how to draw a scatterplot using your calculator.

First make sure to clear the screen that shows up when you hit the **Y=** key.

You can do this by hitting the **Y=** key and then hitting the **DEL** as many times as necessary, or simply **2nd CLEAR**

You also should clear any lists that you may have previously stored in memory. Here are the steps to do that: **2nd + 4 ENTER**

Step #1 involves entering the data presented by the table.

Since the average salary depends on the year, the average salary will be “y” variable, and the years which are independent variables will be the “x”.

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Begin by hitting **STAT** **ENTER** Your screen should look like the one below to the left.

L1	L2	L3	1
-----	-----	-----	
L1(1) =			

Make sure there is no information in any of the columns. The next part is easy. Enter into the **L1** column the numbers 0 thru 9. Simply hit the first number 0 followed by **ENTER**. Then 1 followed by **ENTER**, and so on until you have entered all the data from 0 thru 9 that appeared in the first column in the Baseball Player's Salaries table. Your screen will now look like the second one to the left.

L1	L2	L3	1
0 1 2 3 4 5 6 7 8 9	-----	-----	
L1(11) =			

Now use your cursor key **▶** to move into the **L2** column. Now enter the data found in the Average Salary column of the table. Begin with 290 followed by **ENTER**, and so on, until you have entered them all thru 1580. Don't forget to hit **ENTER**. You will now have completed the L1 and L2 column's with the data that was presented in the table. For each L1 you should have an accompanying L2. Check the screen at the left.

L1	L2	L3	2
0 1 2 3 4 5 6 7 8 9	600 700 820 1000 1250 1580	-----	
L2(11) =			

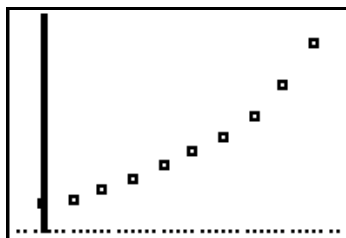
To set up a scatterplot for the inputted data hit the following:

**STAT** **2nd** **Y=** **ENTER** **ENTER** Plot 1 is On

Now use the down cursor **▼** **ENTER** to select the icon type. Now continue with: **▼** **ENTER** **ENTER** **ENTER** You just selected to use the data in L1, L2, and to use a little square in the scatterplot. Match your screen with the one at the left.

Plot1	Plot2	Plot3
Off	Off	Off
Type:		
Xlist: L1	Ylist: L2	Mark:  +

Now to display the scatterplot hit **ZOOM** **9**



There is your scatterplot looking just like the screen at the left. I hope!

There are still 2 slight problems left to complete. We need the exponential regression equation for this data. Hit the following keys:

**STAT** **▶** **0** **ENTER**

The problem states that coefficient and the base be rounded to the nearest hundredth.  $a=276.67$   $b=1.21$

**ANSWER:  $y = 276.67 (1.21)^x$**

To figure out the salary in the year 2005...2005 - 1984 = 21

Calculate:  $276.67(1.21)^{21} = 15151.47267$

To the nearest thousand: **ANSWER: \$15,151,000**

ExpReg
$y = a * b^x$
$a = 276.6739109$
$b = 1.207020638$

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34)  $\frac{4x + 8}{x + 1} \cdot \frac{2 - x}{3x - 15} \div \frac{x^2 - 4}{2x^2 - 8x - 10}$  Simplification will generally involve factoring.  
For division, multiply by the reciprocal.

$$\frac{4(x+2)}{x+1} \cdot \frac{2-x}{3(x-5)} \cdot \frac{2x^2-8x-10}{x^2-4}$$

$$\frac{4(x+2)}{x+1} \cdot \frac{2-x}{3(x-5)} \cdot \frac{2(x^2-4x-5)}{(x+2)(x-2)}$$

$$\frac{4(x+2)}{x+1} \cdot \frac{2-x}{3(x-5)} \cdot \frac{2(x-5)(x+1)}{(x+2)(x-2)}$$

The x+2, x-5, and x+1 all cancel

$$\frac{4}{1} \cdot \frac{2-x}{3} \cdot \frac{2}{x-2}$$

An x-2 and 2-x become a “-1”  
You can put the -1 in the numerator, or  
in the denominator.

$$\frac{4}{1} \cdot \frac{-1}{3} \cdot \frac{2}{1}$$

**ANSWER:  $-\frac{8}{3}$**