

ANSWERS MATH A – January 26th 2006

- 1) Given the equation
 $5(2x-7)= 15x-10$ Multiply using the distributive property
 $10x - 35 = 15x - 10$ Subtract $10x$ from both sides.
 $-35 = 5x - 10$ Add 10 to both sides.
 $-25 = 5x$ Divide both sides by 5.
 $-5 = x$ **ANSWER: (3)**
- 2) **Choice number 3** depicts a diagram of a line reflection.
Choices 1 and 4 involve translations. Choice 2 depicts a dilation. **ANSWER: (3)**
- 3) To find the perimeter of a polygon, simply add up all the sides..
 $x + x + y + y + yz$ Combine like terms.
 $2x + 2y + yz$ **ANSWER: (4)**
- 4) Which expression represents "5 less than the product of 7 and x"?
 $7x$ represents the product of 7 and x.
 $7x - 5$ represents 5 less than this product. **ANSWER: (2)**
- 5) $y = mx + b$ represents the slope intercept form of a line. The slope is represented by m , while the y -intercept is represented by b . Given the following equation:
 $y = -\frac{2}{5}x + 4$
The slope in the above is "m" or $-2/5$, while the **y-intercept** is "b" or **4**. **ANSWER: (4)**
- 6) The equation represented by the line $x=3$ is the axis of symmetry for the given parabola. **ANSWER: (3)**
- 7) A fraction is undefined when its denominator equals 0. Given the fraction
 $\frac{3}{2x+4}$, it will be undefined when its denominator $2x+4$ is equal to 0.
Set the denominator equal to 0 and solve.
 $2x + 4 = 0$ subtract 4 from both sides.
 $2x = -4$ divide both sides by 2.
 $x = -2$ **ANSWER: (1)**
- 8) The original equation is $A = \frac{1}{2}(12)(3 + 7)$. **Choice number 4** indicates that 12 is divided by 2 and 10 is divided by 2. This would yield a wrong answer since it would mean that you are multiplying twice by $1/2$. **ANSWER: (4)**
- 9) You are told that the size of a certain molecule is 0.00009078 inch. What would this number be expressed in scientific notation? You are told that it will be 9.078×10^n , and you are asked for the value of n . You see that the decimal point is now right after the 9, but you know it belongs 5 places to the **left**. You can actually move the decimal one place to the left of the 9. Moving it four more places results in the four 0's following the decimal point in the original number. Since you end up moving that decimal point 5 to the left, the value of n will be **-5**. **ANSWER: (1)**

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- 10) The graph shown for **choice number 1** depicts a variable that is at least equal to 36, but can also be greater than 36. In addition, based on the graph, you see that it does not equal 48 (it is less than 48), because unlike the 36, the circle for the 48 is not shaded.

ANSWER: (1)

- 11) First add up the amounts that comprise the complete circle graph. Their sum is \$600. The section labeled Chores is \$100 of these \$600 or 1/6 of the total. The degree measures of the four central angles add up to 360 degrees -- a circle. 1/6 of the circle, the section represented by Chores would therefore be 1/6 of 360 degrees or **60 degrees**.

ANSWER: (2)

- 12) This is simply a problem that requires the use of the counting principle. If one event has x outcomes and the second event has y outcomes, then the first event followed by the second event has x times y outcomes. In this problem you are asked for the number of outcomes of three events. All that you have to do is multiply the numbers of their outcomes: **8 times 6 times 5**.

ANSWER: (2)

- 13) You are presented, more or less, with the following diagram. You are told that the measure of angle CBD is 30 degrees, and that line segment AB is congruent to line segment BC. This makes ABC an isosceles triangle with angles A and C being congruent. We know that $m\angle CBD = 30$. This makes



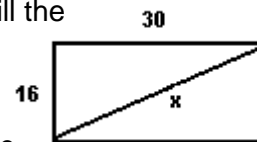
$m\angle ABC = 180 - 30$ or 150. Once you know that the measure of $\angle ABC$ is 150° , you are left with 30 degrees more to distribute between the angles A and C, the two congruent angles. This is true because the sum of the measure of the three angles of a triangle will always equal 180° . 30 degrees divided by 2 will be 15. This means that each of the congruent angles will equal 15° . **The measure of angle A is therefore 15° .**

Simpler solution: The measure of the exterior \angle of a triangle =s the sum of the measures of the two remote interior \angle 's. In our case, $x + x = 30$. x will equal 15. **ANSWER: (1)**

- 14) You are told that the image of point (-2,3) under a translation T is (3,-1). You now have enough information to determine the translation rule. The x-coordinate changes from -2 to 3. That is a change of +5. The y-coordinate changes from 3 to -1. That is a change of -4. The translation rule is $T_{5,-4}$. Using this rule, the image of (4,2) would become: (4+5,2-4) or **(9,-2)**.

ANSWER: (4)

- 15) You intend to build a deck with dimensions of 16 by 30. What will the diagonal measure so that the sides of the deck will form right angles? If you recall one of the Pythagorean triples as being 8, 15, 17, then this problem is quite simple. The side of 16 is twice 8, the side of 30 is twice 15, while the side of x will be twice 17 or 34. If you don't recall this triple, then use the Pythagorean theorem to solve for x .



$$\begin{aligned}
 x^2 &= 16^2 + 30^2 && \text{Simplify} \\
 x^2 &= 256 + 900 && \text{Simplify} \\
 x^2 &= 1156 && \text{Find the square root of both sides.} \\
 x &= \pm 34 && \text{Reject the negative value as the dimension can't be negative.} \\
 \mathbf{x} &= \mathbf{34} &&
 \end{aligned}$$

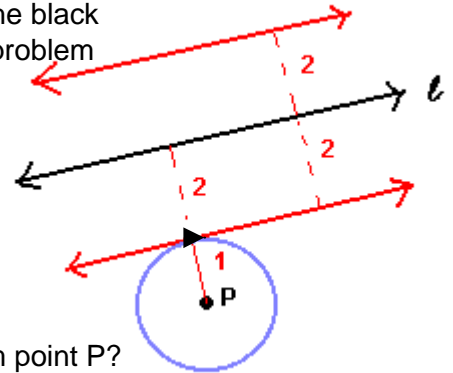
ANSWER: (3)

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- 16) Given a statement "If p then q," its inverse would be "If not p then not q."
 Each part of the compound sentence is negated. Also keep in mind that the inverse of "not p" would become "p." You are presented with the statement "If the waves are small, I do not go surfing." Its inverse would be "**If the waves are not small, I go surfing.**"
ANSWER: (4)
- 17) Based on the information provided you know that the area the dog will be able to roam comprises a circle with its center being the stake to which the rope is tied, and having a radius of 5 which is the length of the rope. The formula for finding the area of a circle is given as: $A = \mathbf{B}r^2$. Substitute
 $A = \mathbf{B}(5)^2$ Simplify
 $A = \mathbf{25B}$
ANSWER: (1)
- 18) Put the test scores in order: 75, 75, 83. You immediately see that the mode is 75 and that the median is also 75. Therefore, the **mode equals the median** which is choice number 3. If you wish to eliminate choice number 1 you can compute the mean (average). $(75+75+83)/3 = 77.6666$. This is not less than the mode of 75.
ANSWER: (3)
- 19) When subtracting two numbers, change the sign of the subtrahend (the second number). The number being subtracted from is the minuend (first number). Our problem can be written as follows: $4a^2 - 3a + 4 - (3a^2 - 7a + 6)$
 In order to do this problem, we have to first change the sign of the $3a^2 - 7a + 6$ which is considered the subtrahend in the above problem. The problem now becomes:
 $4a^2 - 3a + 4 - 3a^2 + 7a - 6$ Combine like terms.
 $a^2 + 4a - 2$
ANSWER: (1)
- 20) You are given the equation $A = p + prt$ and asked to solve in terms of t.
 $A = p + prt$ Subtract p from both sides.
 $A - p = prt$ Divide both sides by pr.
 $\frac{A - p}{pr} = t$
ANSWER: (2)
- 21) The Venn diagram shows 20 individuals did not claim that they get the news either by reading newspapers or watching television. In addition it shows that 15 individuals claim they get the news by reading newspapers only. That makes for a total of 35 individuals who do not claim television as a source of getting their news. To determine how many individuals were surveyed we add up all the numbers. This comes to a total of 100. The answer to this question is therefore **35/100**.
ANSWER: (2)
- 22) You are being asked to simplify $\frac{6\sqrt{20}}{3\sqrt{5}} = \frac{6\sqrt{4}\sqrt{5}}{3\sqrt{5}} = \frac{6(2)\sqrt{5}}{3\sqrt{5}} = \frac{12}{3} = 4$
ANSWER: (4)

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- 23) In the original problem you are presented with line ℓ which is the black line pictured to the right, and also with point P. This is a locus problem that is easily solved if we take each part separately. First, you want to figure out the locus of points that would be 2 centimeters from line ℓ the black line. This locus is pictured by the two red lines. We have to further imagine that the each red line is parallel to the black line and also a distance of two centimeters from that line. Point P is given as being 3 centimeters from the given line. Notice that this puts point P 1 centimeter from one of the locus lines. Now, what would be the locus of points 1 centimeter from point P?



This locus is shown by the blue circle whose radius is 1, and whose center is point P. It is obvious that the point where the circle and red line touch (point of tangency) is the answer being sought. That point, which I indicate with a small black triangle, is 1 centimeter from point P and also 2 centimeters from line ℓ . It is the only point that satisfies both conditions. The answer to this question therefore is that **there is only 1 point satisfying the locus of both conditions.** **ANSWER: (1)**

- 24) Let one supplementary angle be represented by $3x$, and the other by $6x$ since they are in a ratio of 3 to 6. The sum of the measures of supplementary angles is 180 degrees. Set up your equation and solve for x .

$$\begin{aligned} 3x + 6x &= 180 && \text{Combine like terms.} \\ 9x &= 180 && \text{Divide both sides by 9.} \\ x &= 20 \end{aligned}$$

Now back to the beginning of the problem. One angle was represented by $3x$ and the other by $6x$. You are asked for the measure of the smaller angle. The smaller angle is represented by $3x$. **Its measure will therefore be 3 (20) or 60 degrees.** **ANSWER: (4)**

- 25) You are given four points and asked which one is on the circle represented by the equation $x^2 + y^2 = 289$. One way of solving this problem is to simply substitute the given coordinates for the x and y variables in the equation. Choice 4, $(8, -15)$ will be the only one that works.

$$\begin{aligned} x^2 + y^2 &= 289 && \text{Substitute 8 for } x, \text{ and } -15 \text{ for } y. \\ 8^2 + (-15)^2 &= 289 && \text{Simplify.} \\ 64 + 225 &= 289 \\ 289 &= 289 \end{aligned}$$

ANSWER: (4)

- 26) To solve this problem, set up a proportion. 5% as a fraction is $5/100$. This means that 5% is 5 out of 100. 500 bulbs out of a total of how many bulbs would be equal to 5 out of 100. Here is what the proportion looks like.

$$\begin{aligned} \frac{5}{100} &= \frac{500}{x} && \text{Cross multiply. (The product of the means equals product of the extremes)} \\ 5x &= 500(100) && \text{Simplify.} \\ 5x &= 50,000 && \text{Divide both sides by 5.} \\ x &= 10,000 \end{aligned}$$

ANSWER: (3)

- 27) Given two statements represented by p and q , the biconditional would be: p if and only if q . Choice 3 is the only correct answer. The other three choices are simply conditionals. **ANSWER: (3)**

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- 28) You are told that you have a group of 9 freshmen and 7 sophomores. The question is how many different committees can be chosen that will consist of 3 freshmen and 2 sophomores?

First you have to figure out how many committees of 3 freshmen are possible when you have a total of 9 freshmen. The answer to this question is 9C_3 . The next part to solve is how many committees of 2 sophomores are possible out of a total of 7. The answer to this is 7C_2 . The rest of the solution involves the counting principle. There are a total of 9C_3 ways to satisfy one of the given conditions, **and** a total of 7C_2 ways to satisfy the second condition. This means there are a total of ${}^9C_3 \cdot {}^7C_2$ to satisfy both conditions. (See item 12 on this regents.) **ANSWER: (2)**

- 29) The graph depicts a dashed line going through the point $y=3$. Since the line is not solid, and is shaded downwards (in the negative direction) its equation is $y < 3$. **ANSWER: (1)**

- 30) The multiplicative inverse property is indicated when the product of two factors is 1. This is true because the multiplicative identity is 1. The reciprocal of a number generally represents its multiplicative inverse. **Choice 2 illustrates this property.** **ANSWER: (2)**

- 31) You are asked to simplify the following:

$$\frac{x^2 + 6x + 5}{x^2 - 25} = \frac{(x+5)(x+1)}{(x+5)(x-5)} = \frac{x+1}{x-5}$$

Step 1 was simply to factor the numerator and denominator..

Step 2 involves canceling the $(x+5)$ in the numerator and denominator.

Final answer: $\frac{x+1}{x-5}$

- 32) $\sqrt{2}$ is an irrational number. Any number that can not be represented in the form of $\frac{a}{b}$ (a divided b), where a and b are both integers and b is not equal to 0, is an irrational number.

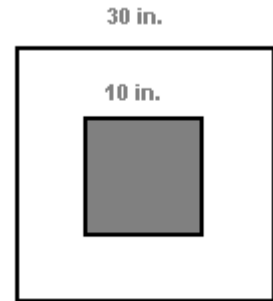
- 33) In essence, this problem presents you with a line segment. In addition it gives you the coordinates of its midpoint and one of its endpoints. You are asked for the coordinates of the other endpoint. Imagine if the problem had been one where you are given both endpoints and were asked to find the coordinates of the midpoint. All you would have to do is first add the 2 x-coordinates and divide by 2 for the x-coordinate of the midpoint, and then add the 2 y-coordinates and divide by 2 for the y-coordinate of the midpoint.

In our problem the x-coordinate of the endpoint is -1, and the x-coordinate of the midpoint is 2. So here is how you go about coming up with the x-coordinate of the other endpoint. You know that the midpoint is gotten after dividing by 2. Let's therefore work backwards and double that 2. This gives you 4. Now -1 plus what gets you 4. The answer is 5. This means that **the x-coordinate of the other endpoint would be 5.** (Let's check it. The two x endpoints would be -1 and 5. Add them together and you get 4. Divide by 2 and you get 2 which is the x-coordinate of the midpoint.

In the same manner we can find the y-coordinate of the endpoint. The y-coordinate of one endpoint is 5 and the y-coordinate of the midpoint is 3. Double the 3 and you get 6. Now, what plus 5 gets you 6. **The answer is obviously 1. That will be the y-coordinate of the other endpoint.** **ANSWER: (5,1)**

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- 34) You are presented with a dartboard in the shape of a square. The side of the dartboard measures 30 inches, while the side of the shaded center measures 10 inches. If a dart is thrown at the board, what is the probability that the dart **does not** land in the shaded region?



The area of the total square is $(30)^2$ or 900 sq. inches.
 The area of the shaded square is $(10)^2$ or 100 square inches.
 The shaded area is therefore $\frac{100}{900}$ or $\frac{1}{9}$ th of the total area. This means there would be a probability of **one-ninth** that the dart **would land** in the shaded area. Therefore **there is a probability of $\frac{8}{9}$ that the dart will not land in the shaded region.**

- 35) You are given the formula for finding the price of a bag of cashews. It is:

$$p = 2.59c + 1.72(8-c)$$

You are told that the price "p" of one bag is \$18.11 and are asked to determine how many pounds "c" of cashews it contains. It's now simply a matter of substitution:

$$p = 2.59c + 1.72(8-c)$$

$$18.11 = 2.59c + 1.72(8-c)$$

$$18.11 = 2.59c + 13.76 - 1.72c$$

$$18.11 = .87c + 13.76$$

$$4.35 = .87c$$

$$5 = c$$

Substitute \$18.11 for p.

Multiply (Distributive property)

Combine like terms.

Subtract 13.76 from both sides.

Divide both sides by .87

ANSWER: 5 pounds

- 36) You are asked to solve for x:

$$\frac{1}{16}x + \frac{1}{4} = \frac{1}{2}$$

Multiply each term by common factor of 16.

$$(16) \frac{1}{16}x + (16) \frac{1}{4} = (16) \frac{1}{2} \text{ Simplify.}$$

$$x + 4 = 8$$

Subtract 4 from both sides.

$$x = 4$$

ANSWER: x = 4

- 37) Solve for x:

$$x^2 + 2x - 24 = 0$$

Factor

$$(x+6)(x-4) = 0$$

Set both factors equal to 0 and solve.

$$x + 6 = 0$$

$$x - 4 = 0$$

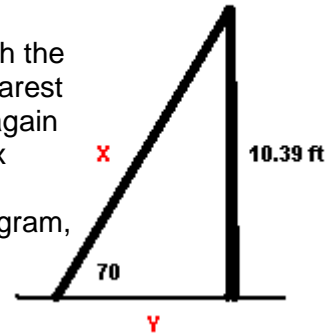
$$x = -6$$

$$x = 4$$

ANSWER: x = -6 and x = 4

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- 38) Use your imagination regarding the diagram at the right. Imagine a ladder with a length of X leaning against a wall whose height is 10.39 feet. The ladder makes an angle of 70 degrees with the ground. You are being asked for the length of the ladder to the nearest foot, and for the distance from the base of the ladder to the wall, again rounded to the nearest foot. (I am calling the length of the ladder x and the distance from the foot of the ladder to the wall Y).



To find the length of the ladder which is the hypotenuse in our diagram, we can use the sine ratio.

$$\sin 70^\circ = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{10.39}{X} \quad \text{Multiply both sides by X.}$$

$$(x) \sin 70^\circ = 10.39 \quad \text{Divide both sides by } \sin 70^\circ$$

$$X = \frac{10.39}{\sin 70} \quad \text{Use your calculator to divide 10.39 by the sin of 70 degrees}$$

X = 11.0568 To the nearest foot that is 11 feet.

We can solve for Y using the tangent ratio:

$$\tan 70^\circ = \frac{\text{opposite}}{\text{adjacent}} = \frac{10.39}{Y} \quad \text{Multiply both sides by Y.}$$

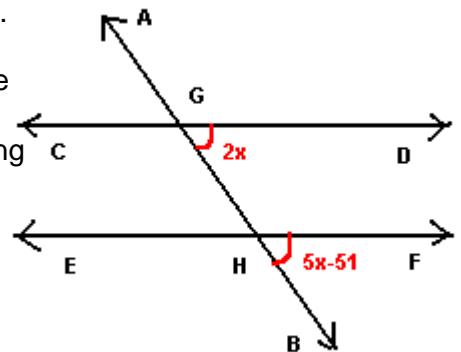
$$(Y) \tan 70^\circ = 10.39 \quad \text{Divide both sides by } \tan 70^\circ.$$

$$Y = \frac{10.39}{\tan 70} \quad \text{Use your calculator.}$$

X = 3.7816 To the nearest foot that is 4 feet.

ANSWER: The length of the ladder is 11 feet. The distance from the base of the ladder to the wall is 4 feet.

- 39) You are presented with a set of parallel lines and a transversal. The information I marked in red is the information the problem states but is not shown as part of the original diagram. You are asked to find the measure of angle $\angle BHE$. First of all, you should notice that the 2 angles marked in red are corresponding angles. As such, they are congruent.



Solve for x:

$$5x - 51 = 2x \quad \text{Add 51 to both sides.}$$

$$5x = 2x + 51 \quad \text{Subtract 2x from both sides}$$

$$3x = 51 \quad \text{Divide both sides by 3.}$$

$$x = 17$$

$\angle BHF$ which is $5x-51$ is therefore $5(17)-51$ degrees or 34° . However you are not looking for $\angle BHF$. You are asked for the measure of $\angle BHE$ which is supplementary to $\angle BHF$. $180 - 34 = 146$.

ANSWER: $\angle BHE$ measures 146° .