

## ANSWERS MATH A – June 16<sup>th</sup> 2004

- 1) To properly answer this question, all you have to do is tally the scores as you read them. **Table 4** has the correct frequency for the set of data.

**ANSWER: (4)**

- 2) Three units to the right means that we are adding 3 to the x...  $x+3$ .  
Seven units down means that we are subtracting 7 from the y...  $y-7$   
The final answer is choice 1... **( $x+3,y-7$ )**

**ANSWER: (1)**

- 3) This question is an example of the counting principle. To arrive at your answer, simply multiply  $2 \times 3 \times 4$  which equal **24**.

**ANSWER: (3)**

- 4)  $3(x-2) = 2x+6$  First use the distributive law  
 $3x - 6 = 2x + 6$  Add 6 to both sides  
 $3x = 2x + 12$  Subtract  $2x$  from both sides  
 **$x = 12$**

**ANSWER: (3)**

- 5) A statement and its contrapositive are logically equivalent.  
The contrapositive of a statement is arrived at by 1 of two ways.  
First you can find the inverse of the statement and then its converse, or you can first find its converse and then its inverse. Given the statement "If a triangle is an isosceles triangle, then it has two congruent sides", we obtain the converse "If a triangle has two congruent sides then it is an isosceles triangle." And the inverse of that converse would be "**If a triangle does not have two congruent sides then it is not an isosceles triangle.**" That is what choice 2 states.

**ANSWER: (2)**

- 6) First subtract \$5.00 from \$12.50. \$5.00 is the amount for the first hour. Margo is now left with \$7.50. Since each additional 30 minutes will cost \$1.50, we can now divide the \$7.50 by \$1.50 and obtain the result of 5. That means that the additional \$7.50 will allow us to rent the garage for an additional  $5 \times 30$  minutes or 150 minutes, which equals 2.5 hours. Add that to the initial 1 hour and we have enough money for a total of  **$3 \frac{1}{2}$  hours**.

**ANSWER: (2)**

- 7)  $C = 5/9 (F-32)$  The problem asks us to use this formula to solve for C when F is equal to  $23^\circ$

$$C = 5/9 (23 - 32) \quad \text{Calculate } 23 - 32 \text{ first.}$$

$$C = 5/9 (-9) \quad \text{Multiply}$$

$$C = -5$$

**ANSWER: (1)**

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- 8) If 2 items cost  $d$  dollars each, then the total cost for these 2 items would be  $2d$ . Tara gave the cashier \$20 dollars. Her change would be represented by:  $20 - 2d$

**ANSWER: (1)**

- 9) Let  $x$  = the number

The product of 7 and the number would be represented by  $7x$

6 less than the product of 7 and the number would be represented by  $7x - 6$

We are told that it is equal to 85.

$$7x - 6 = 85 \quad \text{Add 6 to both sides.}$$

$$7x = 91 \quad \text{Divide both sides by 7.}$$

$$x = 91/7 \text{ or } 13$$

**ANSWER: (2)**

- 10) If the complete graph is rotated 90 degrees about the origin, then the triangle now in quadrant 1 would be oriented exactly the way we now see the triangle in quadrant 1.

**ANSWER: (4)**

- 11) When two triangles are similar then their perimeters will be similar as well, and in the same ratio as their sides. So step number 1 in this problem requires you to calculate the perimeter. Add up all the sides given for the larger triangle (sail).  $10+24+26= 60$ . The shortest side of the smaller measures 6 ft., the shortest side of the larger sail measures 10ft. This gives us a ratio of 6/10. Now set up a proportion using the perimeters as well. Let  $x$  be the perimeter of the smaller side.

$$\frac{6}{10} = \frac{x}{60}$$

$$10x = (60)(6)$$

$$10x = 360$$

$$x = 36$$

**ANSWER: (2)**

- 12) The least common denominator (LCD) will be the lowest expression that is divisible by 2,  $7x$ , and  $x$ . Choice 1,  $9x$ , is only divisible by  $x$ . Choice 2,  $2x$  is only divisible by 2 and  $x$ . **Choice 3**,  $14x$ , is divisible by all 3 denominators. Choice 4, is also divisible by all 3 denominators but it is not the "lowest" common denominator, as  $14x$  is lower.

**ANSWER: (3)**

- 13) The property illustrates a number and its opposite being added and resulting in 0.

This is an example of the **additive inverse** since 0 is the additive identity.

To find the inverse of an element under an operation, you first have to identify the identity element.

**ANSWER: (4)**

- 14) Supplementary angles are two angles, the sum of whose measures is 180 degrees.

Since the given angles are in the ratio of 2:7, we have  $2x$  and  $7x$ .

$$2x + 7x = 180$$

$$9x = 180$$

$$x = 20$$

The smaller angle is therefore  $2x$  or  $2(20)=40$  degrees

**ANSWER: (4)**

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- 15) A prime number is a number **greater than 1** that has only two factors—itsself and 1. You are asked to chose from the set 1 through 6. By the above definition, 1 is not prime. 2 is prime. Its only factors are 1 and 2. As a matter of fact it is the only even prime number. 3 is also prime as it has only two factors—1 and 3. 4 is not prime. Its factors are 1, 2, 4. 5 is prime. Its factors being only 1 and 5. 6 is not prime. It has 3 factors—1,2, and 3. So out of the 6 numbers 3 of them are prime (2, 3, 5). **That is 3/6.**

**ANSWER: (2)**

- 16) You are presented with a conjunction. For a conjunction to be true, both of its parts have to be true. In other words, x will not be equal to the square of an integer, and x has to be a multiple of 3. The only choice that satisfies both of these conditions is **18**. It is not equal to the square of an integer, and it is a multiple of 3.

**ANSWER: (2)**

- 17) The sum of the measures of angles of a triangle equal 180 degrees. A triangle can therefore not have a right angle, and in addition to this right angle, contain an obtuse angle.

**ANSWER: (4)**

- 18) The two subcommittees have an equal number of members. Therefore:

$$\frac{2}{3}x - 5 = \frac{x}{4} \quad \text{Multiply all terms by 12 to cancel out the denominators.}$$

$$4(2x) - 12(5) = 3x$$

$$8x - 60 = 3x$$

$$-60 = -5x$$

$$12 = x$$

Subtract 8x from both sides.

Divide both sides by -5.

**ANSWER: (2)**

- 19) Here is a diagram depicting the problem.



Assuming that A is the top of the tree AB, and C is 25 feet away from the base of the tree B, and the angle of elevation is 30, which equation can be used to find x, the height of the tree? You are given angle C. You want to find x which is **opposite** angle C, and you are also given side BC which is 25 and **adjacent** to angle C.

The trigonometric function that contains an opposite and adjacent is tangent.

$$\tan 30^{\circ} = \frac{x}{25}$$

**ANSWER: (1)**

- 20) The CD cost \$18.99 but Rashawn paid \$20.51 which means that the tax on the CD was \$20.51 - \$18.99 or \$1.52. The rate of sales tax will be the answer to the following: \$1.52 is what percent of \$18.99 ? 1.52 divided by 18.99 which, equals .08004. Move the decimal 2 places to the right to change to a percent and your answer is 8%.

**ANSWER: (4)**

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- 21) This question wants to know  $3x$  times what will result in  $3x^2 - 9x$ .  
You know that  $3x$  ( $x$ ) will be  $3x^2$ , and  $3x$  ( $-3$ ) will be  $9x$ . Therefore the answer is:  
 $3x(x - 3)$ .
- ANSWER: (3)**
- 22) The circle graph indicates that 25% of the income is spent on food. In terms of degrees, the complete circle represents  $360^\circ$ .  $25\%$  of  $360 = 360(.25) = 90$
- ANSWER: (3)**
- 23) The sum of the exterior angles of any polygon will be  $360^\circ$ . If the polygon in question is a regular polygon then all its exterior angles will be equal in measure. To find your answer, simply divide 360 by 60.  $360/60 = 6$ .
- ANSWER: (1)**
- 24) **Choice 1 is an example of the associative property.**  
Choice 2 is an example of the commutative property.  
Choice 3 is an example of the distributive property.  
Choice 4 is an example of the multiplicative identity.
- ANSWER: (1)**
- 25) The field currently measures  $100 \times 150$  for a total of 15,000 feet. An increase of 20% will be an increase of  $15,000(.20)$  or 3000 feet. The new area will therefore be  $15,000 + 3,000$  or **18,000 feet**. Each side of the original field will be increased by  $x$ . The side that was 100 will now be  **$100+x$**  and the other side of 150 will be  **$150+x$** . To find the new area you will have to multiply both sides :  $(100+x)(150+x)$ .  
We already know that the new area will be 18,000 feet, so the equation that will represent the new area is:  **$(100+x)(150+x)=18,000$** .
- ANSWER: (3)**
- 26) From a deck of 52 cards how many groups of 5 are possible?  ${}_{52}C_5$
- ANSWER: (2)**
- 27) The volume is equal to the length  $\times$  width  $\times$  height. In a cube these 3 sides (edges) are equal. The volume which is given as 64 will be equal to  $e^3$ , where  $e$  represents one edge.  
If  $e^3 = 64$ , then we take the cube root of both sides and obtain that  $e = \sqrt[3]{64} = 4$ .
- ANSWER: (4)**
- 28) First rewrite the given equation into the form  $y=mx+b$ .  
 $3x - 2y = 12$       Subtract  $3x$  from both sides.  
 $-2y = 12 - 3x$     Divide both side by  $-2$ .  
 $y = -6 + \frac{3}{2}x$  or  $y = \frac{3}{2}x - 6$ .  **$m$ , the slope is  $\frac{3}{2}$ ;  $b$ , the  $y$ -intercept is  $-6$ .**
- ANSWER: (1)**
- 29) If the mass of 1 proton is  $1.67 \times 10^{-24}$ , then the mass of 1,000 protons will be 1,000 times as much. Here is an easy way to do the multiplication. 1000 is equal to  $10^3$ . Therefore you now do the following multiplication:  $1.67 \times 10^{-24} (10^3) = 1.67 \times 10^{-21}$
- ANSWER: (4)**

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- 30) The middle term of the trinomial  $x^2 - x - w = 0$  is  $-1x$ . Using FOIL, the sum of the outers and inners equal this term. You are give one factor,  $(x-4)$ . The only way you can now end up with a middle term of minus  $-1x$  is by adding a  $-4$  and a  $+3$ . this means that the other factor would have to be  $(x+3)$ . When you multiply  $(x-4)(x+3)$ , the product is  $x^2 - x -12$ .  $w$  is therefore equal to **12**. **ANSWER: (1)**

- 31) In the given diagram,  $\angle CDE$  is an exterior angle. The exterior angle of a triangle is equal in measure to the sum of the measures of the 2 remote interior angles of the triangle. In other words,  $\angle CDE = \angle BCD + \angle CBD$  or  $130 = 70 + \angle CBD$ . This makes  $\angle CBD$  equal to 60. Once you know that  $\angle CBD$  is 60, you also know that  $\angle CBA$  is **120 degrees** since it is supplementary to  $\angle CBD$  which is 60 degrees. **ANSWER: 120°**

- 32) Evaluate  $2x^2 + 5$  when  $x=3$ . Brett came up with the answer of 41. This question has 2 parts. Was Brett correct and explain your answer. Substituting 3 for  $x$ , here is what you get:  
 $2(3)^2 + 5$     The power is done first.  
 $2(9) + 5$     Multiplication is done first.  
 $18 + 5$   
**23**

In other words, **Brett was wrong**. Showing the right method counts as your explanation. By the way, the reason Brett got the wrong answer was that he first multiplied the 2 by 3 and then raised the answer 6 to the second power, and then added five.

- 33) Use your calculator to change the value of the cards to their decimal equivalents.

$$\mathbf{B} = 3.14 \quad \sqrt{8} = 2.82 \quad \overline{3.1} = 3.11 \quad 2\sqrt{3} = 3.46 \quad 2\frac{4}{5} = 2.80$$

From least to greatest the cards are:

$$2\frac{4}{5} \quad \sqrt{8} \quad \overline{3.1} \quad \mathbf{B} \quad 2\sqrt{3}$$

Please note that to find the decimal equivalent of 2 radical 3, you multiply the value of radical 3 by 2. To find the decimal equivalent of 2 and 4/5 you can first change it to an improper fraction 14/5 and then divide 14 by 5.

- 34) Given line segment AB. A(x,y) Midpoint (2,4) B(3,7)  
 The sum of the two x-coordinates divided by 2 equals the x-coordinate of the midpoint.  
 The sum of the two y-coordinates divided by 2 equals the y-coordinate of the midpoint.

$$\frac{x+3}{2} = 2 \quad x+3 = 4 \quad x=1 \quad \text{The x-coordinate of the midpoint is 1.}$$

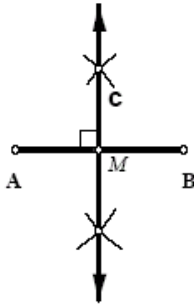
$$\frac{y+7}{2} = 4 \quad y+7 = 8 \quad y=1 \quad \text{The y-coordinate of the midpoint is also 1.}$$

**The coordinates of point A are (1,1)**

**ANSWER: (1,1)**

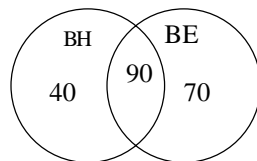
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35)



Pictured to the left is an accepted answer. **Step 1:** open your compass so that the radius will be greater than half of line segment AB. **Step 2:** Keep the point of your compass on A and draw one arc above and below AB. **Step 3:** Now, keeping the same radius, put your compass point on B and again draw one arc above and below AB. **Step 4:** Now simply draw a line from the intersection of the arcs above AB to the intersection of the arcs below AB. This is your perpendicular bisector. M would be the midpoint.

- 36) Using Venn diagrams, let the circle with BH represent brown-haired students, and the circle with BE represent brown-eyed students. 90 students have both brown hair and brown eyes. That is represented by the 90 in the intersection of the two circles. Since 130 have brown hair, that leaves the 40 that you see in the BH section ( $40+90=130$ ). Since 160 have brown eyes that leaves the 70 that you see in the BE section ( $70+90=160$ ). What is pictured in the Venn diagram now accounts for  $40+90+70$ , or 200 students. We are told, however, that there are a total of 250 students. That means **there are 50 students that have neither brown hair nor brown eyes.**



- 37) The given rectangle has sides of  $x+6$  and  $x-4$ . To find the perimeter we add the ALL the sides of the rectangle. Two of its sides are  $x+6$  and the two other sides are  $x-4$ .

$$2(x+6) + 2(x-4) \quad \text{Use the distributive property.}$$

$$2x + 12 + 2x - 8 \quad \text{Combine like terms.}$$

$$\mathbf{4x + 4}$$

To represent the area, simply multiply the length by the width.

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

$$\mathbf{x^2 + 2x - 24}$$

$$\mathbf{ANSWER: \quad Perimeter = 4x + 4 \quad AREA = x^2 + 2x - 24}$$

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- 38) Before you can determine the median of the scores, sort the scores. They are:  
78, 86, 91, 92, 92, 95 There are total of six scores. Half of 6 is 3. The median lies between the 3<sup>rd</sup> and 4<sup>th</sup> score. In other words the **median** can be found as follows:

$$\frac{91+92}{2} = \mathbf{91.5}$$

The mode is the score that appears most often. In this case the **mode** is **92**.

The mean at this point , after these 6 tests is:

$$(78+ 86+ 91+ 92+ 92+ 95 ) \div 6 = 534 \div 6 = 89$$

The problem is stating that Jerelyn took a 7<sup>th</sup> test and raised her mean by exactly 1 point. What was her score on that seventh test?

Her mean now is 89. If she raised it by one point it is a 90. For seven scores to have a mean of 90 the sum of these scores would have to be 90(7) or 630. The 6 scores right now only add up to 534. The **seventh test score** would have to be 630 – 534 = **96**.

**ANSWER: Median = 91.5 Mode = 92 7<sup>th</sup> test score = 96**

- 39) Algebraic solution:

Equation 1)  $x^2 + y^2 = 25$

Equation 2)  $3y - 4x = 0$     Add 4x to both sides.  
 $3y = 4x$     Divide both sides by 3.

$$y = \frac{4x}{3}$$

$x^2 + y^2 = 25$     Now use value obtained above for y.

$x^2 + \left(\frac{4x}{3}\right)^2 = 25$     Square the fraction

$x^2 + \frac{16}{9}x^2 = 25$     Multiply all terms by 9.

$9x^2 + 16x^2 = 225$     Combine like terms.

$25x^2 = 225$     Divide both sides by 25.

$x^2 = 9$

**$x = \pm 3$  there are two values for x,  $x = 3$  and  $x = - 3$**

Now let's solve for y when  **$x=3$** ...

Using the equation:

$3y - 4x = 0$     Substitute 3 for x

$3y - 4(3) = 0$     Multiply

$3y - 12 = 0$     Add 12 to both sides.

$3y = 12$     Divide both sides by 3.

**$y = 4$**

Now let's solve for y when  **$x = - 3$**

Using the equation:

$3y - 4x = 0$     Substiute  $- 3$  for x

$3y - 4(-3) = 0$     Multiply

$3y + 12 = 0$     Subtract 12 from both sides.

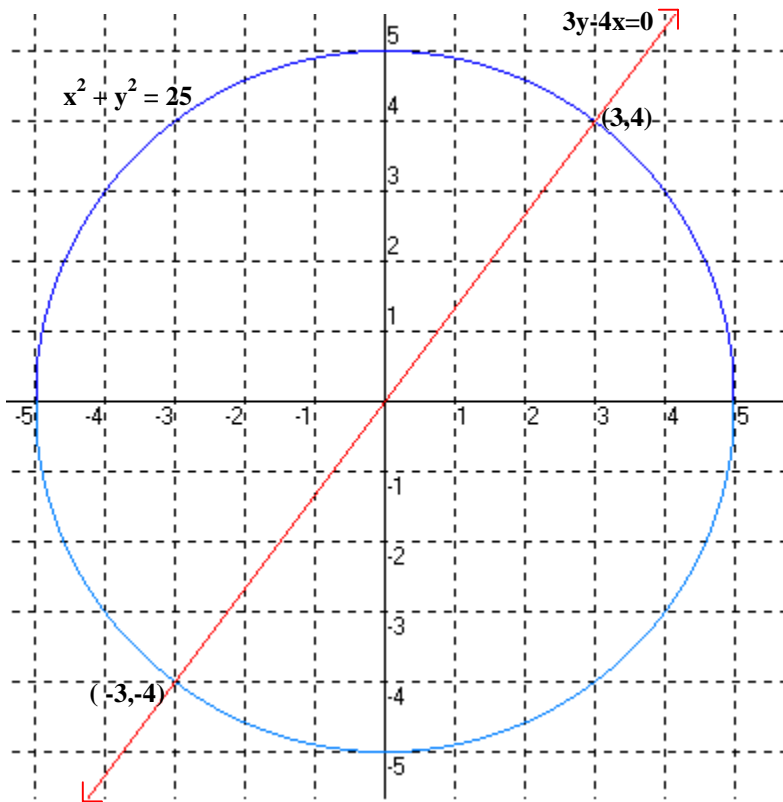
$3y = -12$     Divide both sides by 3.

**$y = - 4$**

**ANSWER: (3,4) and (-3,-4)**

See the next page for a graphic representation of these two equations.

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To the left you can see what both equations would look like graphed on the same plane.  $x^2 + y^2 = 25$  is a circle with its center at (0,0) and a radius of 5. The equation  $3y - 4x = 0$  can easily be graphed by first transposing it into the form of  $y = mx + b$  where  $m$  represents the slope and  $b$  represents the  $y$ -intercept. First add  $4x$  to both sides and you have  $3y = 4x$ . Now divide both sides by 3 and you end up with  $y = \frac{4}{3}x$ . In this case, the  $y$ -intercept is 0, and the slope is  $\frac{4}{3}$ . You can clearly see the points of intersection: **(3,4) and (-3,-4)**