

**Final Exam Honors Algebra 2**

*Mr. Djoko, Mr. Shea, Ms. Tee, and Mrs. Walczewski*

NAME ANSWER KEY Class \_\_\_\_\_ Date \_\_\_\_\_

**Honors Algebra 2**

**2002 – 2003 Final Exam**

**Multiple Choice Section**

Each problem is worth 1 point.

**GENERAL DIRECTIONS:**

Write your name on the exam.

Check to see that you have all the pages before you begin. If you do not, please see the proctor.

You may write on the test booklet.

**FOR Mr. Shea and Ms Tee’s classes:**

CIRCLE THE BEST RESPONSE for problems 1 – 12.

**FOR Mr. Djoko and Mrs. Walczewski’s classes, use the SCANTRON Directions below.**

**SCANTRON Directions:**

Write your name on the scantron answer sheet

Use #2 pencil and completely fill in each space for problems 1-12.

**FoxTrot** by Bill Amend



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1. Find x:

$$\begin{bmatrix} 1 & 3x & 2 \\ 3 & 0 & 5 \end{bmatrix} \begin{bmatrix} 4 & 1 \\ 2 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} 16 & 3 \\ 6 & 2 \end{bmatrix} = 3 \begin{bmatrix} x-2 & 0 \\ 2 & 2 \end{bmatrix}$$

**B**

- a) 3
- b) 2
- c) 1
- d) 1/4

$$\begin{aligned} 1(4) + 3x(2) + 2(0) - 16 &= 3(x-2) \\ 6x - 3x &= 16 - 4 - 6 \\ 3x &= 6 \\ x &= 2 \end{aligned}$$

2. Which of the following is a factor of  $2x^4 - 6x^3 - 20x^2 + 48x$

**B**

- a)  $x - 3$
- b)  $x + 3$
- c)  $x - 1$
- d)  $x + 1$

Factor out  $2x$ :  $2x(x^3 - 3x^2 - 10x - 24)$  and use Factor Theorem to find that  $(-3)$  is a factor.

3. Solve for x:  $\frac{2x+3}{x-1} - \frac{2x-3}{x+1} = \frac{10}{x^2-1}$

**A**

- a) No solution
- b)  $x = 1$
- c)  $x = 2$
- d)  $x = \frac{3}{4}$

$$\begin{aligned} \text{LCD for equation} &= (x-1)(x+1) = (x^2 - 1) \\ (2x+3)(x+1) - (2x-3)(x-1) &= 10 \\ 2x^2 + 2x + 3x + 3 - (2x^2 - 2x - 3x + 3) - 10 &= 0 \\ 10x - 10 = 0 &\Rightarrow x = 1 \text{ and } 1 \text{ is extraneous.} \end{aligned}$$

4. When photographing a lighted object, the exposure time ( $t$ ) is inversely proportional to the square of the object's distance ( $d$ ) from the light source. Which equation best represents this relationship?

**B**

- a)  $t^2 = kd$
- b)  $t = \frac{k}{d^2}$
- c)  $t = \frac{k}{d}$
- d)  $t = kd$

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5. Simplify  $\sqrt{-18} + 7\sqrt{-98} - \frac{1}{5}\sqrt{-50} - \frac{4}{\sqrt{-8}}$

**D**

- a)  $-52\sqrt{2}$
- b)  $-52\sqrt{2i}$
- c)  $-52i\sqrt{2}$
- d)  $52i\sqrt{2}$

6. Express as a single log  $2\log_3 5 - \log_3 10 + 3\log_3 4$

**C**

- a)  $\log_3 \frac{5}{128}$
- b)  $\log_3 16$
- c)  $\log_3 160$
- d)  $\log_3 64$

7. If  $\log_7(x+1) + \log_7(x-5) = 1$ , then  $x =$

**C**

- a)  $-6$
- b)  $-2$
- c)  $6$
- d)  $7$

8. If  $\log R = a$  and  $\log S = b$ , then  $\log(R\sqrt{S})$  in terms of  $a$  and  $b$  is:

**D**

- a)  $\frac{1}{2}(a+b)$
- b)  $a\sqrt{b}$
- c)  $\frac{1}{2}a + b$
- d)  $a + \frac{1}{2}b$

9. Find the fifth term in the expansion of  $(x+y)^{10}$

**C**

- a)  $252x^5y^5$
- b)  $210x^4y^6$
- c)  $210x^6y^4$
- d)  $252x^6y^4$

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10. How many distinct permutations are there in the name **SEASHOLES** ?

**A**

- a) 30240
- b) 60480
- c) 181440
- d) 362880

11. How many groups of 3 people can be chosen for a math team out of a group of 7 people?

**B**

- a) 21
- b) 35
- c) 210
- d) 840

12. A set of 36 cards is numbered with positive integers from 1 to 36. If the cards are shuffled and one is chosen at random, what is the probability that the number on the card is a multiple of both 4 and 6?

**A**

- a)  $1/12$
- b)  $1/6$
- c)  $5/12$
- d)  $2/3$

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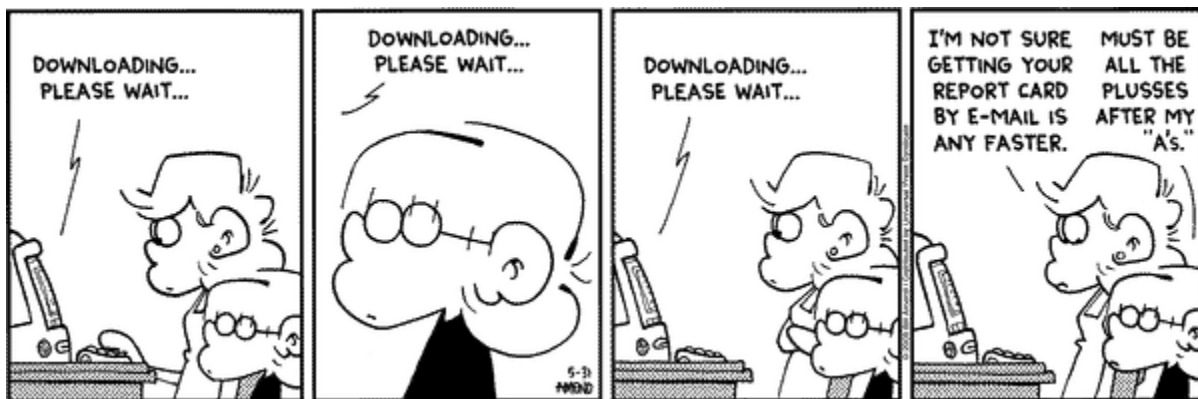
**Honors Algebra 2**  
**2002 – 2003 Final Exam**  
**Completion Section**

All problems are worth 6 points each.

SHOW ALL YOUR WORK FOR ANY PARTIAL CREDIT.

DO ALL WORK IN THE SPACE PROVIDED.

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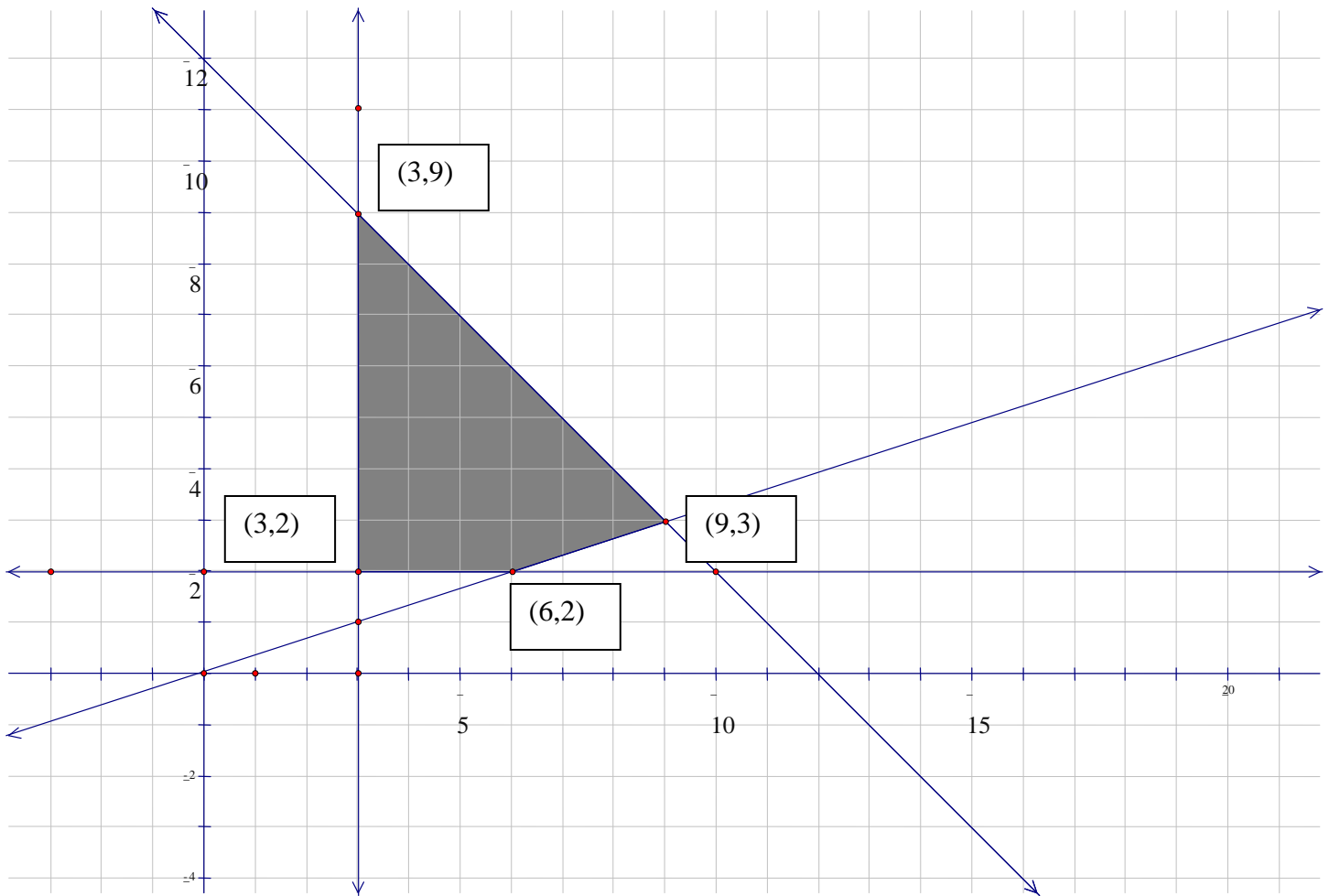
1. Classify the following functions by checking all the boxes that apply.

	Linear	Quadratic	Polynomial	Rational	Radical	Exponential	Logarithmic	Other
a. $p(x) = 5\log_{25} 25^x + 10$	✓		✓	✓				
b. $f(x) = \sqrt[6]{2x^3}$					✓			
c. $g(x) = (1 - x^2)e$		✓	✓	✓				
d. $h(x) = 100^x$						✓		
e. $v(x) = \frac{x^3 - 27}{x - 3}$				✓				

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2. The graph above represents a system of linear inequalities:

a. What are the constraints for this system?

$$\begin{aligned}
 y &\geq \frac{1}{3}x \\
 y &\geq 2 \\
 x &\geq 3 \\
 y &\leq -x + 12
 \end{aligned}$$

b. Suppose the objective function is a Profit function in the following form:

$$P = 6x + 3y$$

What point maximizes the objective function?

Vertex	Objective Function	Result
(3,2)	$6(3) + 3(2) =$	24
(6,2)	$6(6) + 3(2) =$	42
(3,9)	$6(3) + 3(9) =$	45
<b>(9,3)</b>	<b><math>6(9) + 3(3) =</math></b>	<b>63</b>



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3. A car rental company charges \$50 a week plus \$.03 /mile to drive a rental car.
- a. Write a linear equation to represent the relationship between weekly cost,  $y$ , to rent a car from this company and the number of miles driven in a week  $x$ .

$$y = .03x + 50$$

- b. Amy paid \$53.75 to rent a car for 1 week. How many miles did she drive during that week?

$$\$53.75 = .03x + 50$$

$$\$3.75 = .03x$$

$$x = 3.75 / .03 = 125$$

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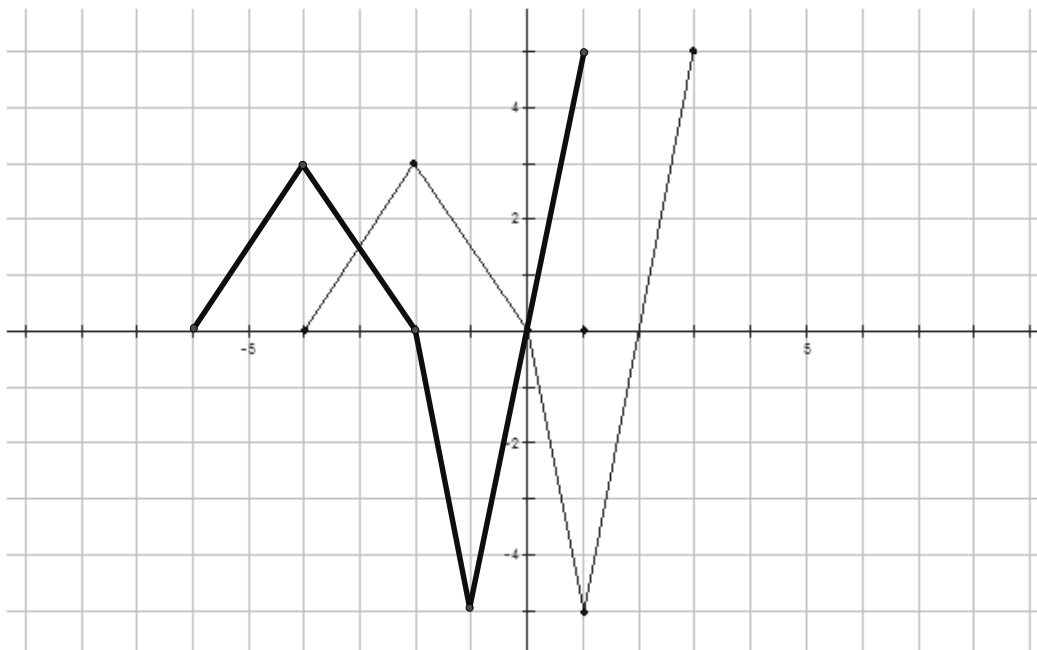
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4. Here are 3 functions:

$$f(x) = x^2 - 1$$

$$h(x) = \frac{1}{x-2}$$

$g(x)$  is graphed below



a. What is the domain and range of  $f(x)$ ?

Domain: All Real Numbers

Range: All Real Numbers  $\geq -1$

b. Find the inverse of  $f(x)$ . Is the inverse of  $f(x)$  a function?

To find the inverse, switch  $x$  and  $y$  and isolate  $y$ :

$$x = y^2 - 1$$

$$x + 1 = y^2$$

$$\pm\sqrt{x+1} = y$$

$f^{-1}(x)$  is not a function

c. Find:  $h \circ f$

$$h(f(x)) = h(x^2 - 1) = \frac{1}{(x^2 - 1) - 2} = \frac{1}{x^2 - 3}$$

d. On the same set of axis, sketch  $g(x + 2)$  – THICK line in the graph above

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5. A triangle has 3 interior angles. The angles are A, B and C. The sum of the measures of the interior angles of a triangle will always add up to  $180^\circ$ . The measure of the triangle's largest angle A is 6 times the measure of the smallest angle C. The measure of the largest angle A is also twice the sum of the measures of the other 2 angles B & C.

- a. Setup a system of equations to solve for the 3 interior angles.

(Equation 1)  $A + B + C = 180^\circ$

(Equation 2)  $A = 6C$

(Equation 3)  $A = 2B + 2C$

Substitute 2 into 1:  $6C + B + C = 180^\circ$

Substitute 2 into 3:  $6C = 2B + 2C$

$4C = 2B$

$2C = B$

Substitute into 1:  $6C + 2C + C = 180^\circ$

$9C = 180^\circ$

$C = 20^\circ$

$B = 2C = 40^\circ$

$A = 6C = 120^\circ$

- b. What are the measures of A, B and C?

A =	<u>120°</u>
B =	<u>40°</u>
C =	<u>20°</u>

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6. By completing the square, find the vertex form of  $g(x)$ . State the vertex and determine whether it is a maximum or a minimum?

$$g(x) = 2x^2 - 12x + 26$$

$$g(x) = 2(x^2 - 6x + 9) + 26 - 18$$

$$\text{Vertex Form: } g(x) = 2(x - 3)^2 + 8$$

$a = 2$ , therefore the parabola points up. THERE IS A MINIMUM at  $(3, 8)$

7. Write the 4<sup>th</sup> degree polynomial function  $f(x)$  that fits the criteria below. Express  $f(x)$  in factored form.

$f(x)$  has a zero of 3, with multiplicity 2.

$f(x)$  has a zero of  $3 + 4i$ .

$f(0) = 900$ .

Given the zeros, one can write the function in factored form.

$$f(x) = a(x - 3)^2(x - (3 + 4i))(x - (3 - 4i))$$

$$f(x) = a(x - 3)^2(x - 3 - 4i)(x - 3 + 4i)$$

Solve for  $a$  by using  $f(0) = 900$ :

$$900 = f(0) = a(-3)^2(-3 - 4i)(-3 + 4i)$$

$$900 = a(9)(9 + 16) = a(9)(25)$$

$$a = 900 / [(9)(25)]$$

$$a = 4$$

$$f(x) = 4(x - 3)^2(x - 3 - 4i)(x - 3 + 4i)$$

$$f(x) = 4(x - 3)^2(x^2 - 6x + 25)$$

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8. On the planet Blorg, an object is falling due to the force of gravity. Its height is recorded at three times during the fall:

Time t (in seconds)	2	4	6
Height h (in meters)	196	164	100

- a. Using any method of your choice, determine the quadratic function that models this data. Express the function in standard form.

Can use quadratic regression on calculator OR setup matrix equations to solve for a, b & c of the standard form of the quadratic. If using matrices, the equation is:

$$\begin{bmatrix} 4 & 2 & 1 \\ 16 & 4 & 1 \\ 36 & 6 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 196 \\ 164 \\ 100 \end{bmatrix}$$

$$f(t) = -4t^2 + 8t + 196$$

or

$$f(t) = -4(t^2 - 2t - 49)$$

- b. At what time (to the nearest second) will the object hit the ground? Use any method of your choice.

$$\begin{aligned} t &= \frac{2 \pm \sqrt{4 - 4(-49)}}{2} \\ &= \frac{2 \pm \sqrt{200}}{2} \\ &= -6.07, 8.04 \end{aligned}$$

About 8 seconds.

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9. For the following function:

$$f(x) = \frac{x^2 + 7x + 10}{x^2 - 6x} \div \frac{x^3 - 4x}{x^2 - 8x + 12}$$

a. Simplify  $f(x)$

$$\begin{aligned} & \frac{x^2 + 7x + 10}{x^2 - 6x} \div \frac{x^3 - 4x}{x^2 - 8x + 12} = \\ & = \frac{(x+5)(x+2)}{x(x-6)} \left( \frac{(x-6)(x-2)}{x(x-2)(x+2)} \right) \\ & = \frac{x+5}{x^2} \end{aligned}$$

b. Identify any vertical & horizontal asymptotes and holes.

Vertical Asymptote:  $x = 0$

Horizontal Asymptote:  $y = 0$

Holes:  $x = 6$   $(6, 11/36)$

$x = 2$   $(2, 7/4)$

$x = -2$   $(-2, 3/4)$

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10. If  $f(x) = \sqrt{2x-6} + 5$

a. State the domain

$$2x - 6 \geq 0$$

$$x - 3 \geq 0$$

$$x \geq 3$$

All real numbers greater than or equal to 3.

b. Find the coordinates for the point(s) of intersection of  $f(x)$  and  $g(x)$   
given  $g(x) = x - 2$

$$\sqrt{2x-6} + 5 = x - 2$$

$$\sqrt{2x-6} = x - 7$$

$$2x - 6 = (x - 7)^2$$

$$2x - 6 = x^2 - 14x + 49$$

$$0 = x^2 - 16x + 55$$

$$0 = (x - 11)(x - 5)$$

$$x = 11 \text{ or } 5$$

5 is extraneous

$$x = 11$$

The coordinates for the intersection are (11, 9)

c. Write the equation of the function  $h(x)$  such that  $f(x)$  is reflected over the  $x$  axis and translated down 6 units.

$$h(x) = -(\sqrt{2x-6} + 5) - 6$$

$$h(x) = -\sqrt{2x-6} - 11$$

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11. Use algebra to solve for x: If  $3^{x+y} = 1$  and  $7^{3x-y} = 49$ , then determine the values of x and y.

$$3^{x+y} = 1 = 3^0$$

$$x+y = 0$$

$$7^{3x-y} = 7^2$$

$$3x - y = 2$$

$$x = -y$$

$$-3y - y = 2$$

$$y = -\frac{1}{2}$$

$$x = \frac{1}{2}$$

12. If you were to invest \$5,000.00 for a 20-year period, how much difference in the final balance would there be between receiving 6% interest compounded monthly and receiving 6% interest compounded continuously?

$$\begin{aligned} 5000e^{(.06)(20)} & - 5000 (1 + .06/12)^{240} = \\ 16600.58 & - 16551.02 = \\ 49.56 & \end{aligned}$$

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13. The data below was collected by geologists studying the magnitude of California earthquakes, as measured on the Richter scale. This scale, which is based on

14.og 10, increases exponentially, so that a 2 is ten times as strong as 1 and so on.

1.0	8.3	3.1	1.1	5.1
1.2	1.0	4.1	1.1	4.0
2.0	1.9	6.3	1.4	1.3
3.3	2.2	2.3	2.1	2.1
1.4	2.7	2.4	3.0	4.1
5.0	1.4	1.2	7.7	1.5

a. Construct a stem and leaf plot for the data

	<b>Legend: 1   6 = 16</b>
<b>1</b>	<b>0, 0, 1, 1, 2, 2, 3, 4, 4, 4, 5, 9</b>
<b>2</b>	<b>0, 1, 1, 2, 3, 4, 7</b>
<b>3</b>	<b>0, 1, 3</b>
<b>4</b>	<b>0, 1, 1</b>
<b>5</b>	<b>0, 1</b>
<b>6</b>	<b>3</b>
<b>7</b>	<b>7</b>
<b>8</b>	<b>3</b>

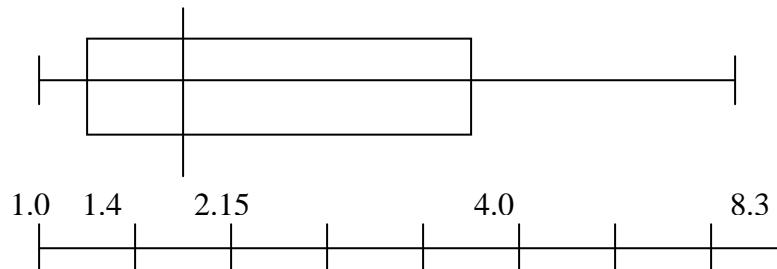
b. State the mean, median and mode (to the nearest  $10^{\text{th}}$ ) for this set of data.

Mean = 2.8

Mode = 1.4

Median = 2.15

c. Create a box and whisker plot. Make sure to label the minimum, maximum, median,  $1^{\text{st}}$  quartile and  $3^{\text{rd}}$  quartile. All labels should be to the nearest  $10^{\text{th}}$ .



Thanks for a great year and have an AWESOME summer!!!!

