

Math 0240 Final Exam Review Questions

1. Simplify:  $24 \div 8 \cdot 3 + 28 \div (-7)$   
 PEMDAS  
 $3 \cdot 3 + 28 \div (-7)$   
 $9 + 28 \div (-7)$   
 $9 + -4$   
 $5$

2. Simplify:  $\frac{11 - (-9) + 6(10 - 4)}{2 + 3 \cdot 4} \rightarrow \frac{11 + 9 + 6(6)}{2 + 3 \cdot 4}$   
 $\frac{11 + 9 + 36}{2 + 12} \rightarrow \frac{20 + 36}{14} \rightarrow \frac{56}{14} \rightarrow \frac{14 \cdot 4}{14}$   
 $4$

3. Simplify:  $-3(-5x + 7) - 3(2 - x) - 8x - 6$   
 $15x - 21 - 6 + 3x - 8x - 6$   
 $10x - 21 - 6 - 6$   
 $10x - 33$

4. Simplify:  $30\left(\frac{1}{5}x - \frac{4}{3}\right) + 30\left(\frac{3}{10}\right)$   
 $30 \cdot \frac{1}{5}x - 30 \cdot \frac{4}{3} + 30 \cdot \frac{3}{10}$   
 $6 \cdot 1x - 10 \cdot 4 + 3 \cdot 3$   
 $6x - 40 + 9 \rightarrow 6x - 31$

In #5 - 11, Simplify the expressions. Each variable should only occur once, and exponents should be positive in your final answer. Evaluate exponents, if applicable.

5.  $3x^{-6}$   
 $3 \cdot x^{-6} \rightarrow \frac{3}{x^6}$

6.  $(3x^3)^{-2}$   
 $3^{-2} \cdot (x^3)^{-2}$   
 $3^{-2} \cdot x^{-6} \rightarrow \frac{1}{3^2 x^6} \rightarrow \frac{1}{9x^6}$

7.  $(3x^{-3})^2$   
 $3^2 \cdot (x^{-3})^2$   
 $3^2 \cdot x^{-6} \rightarrow \frac{3^2}{x^6} \rightarrow \frac{9}{x^6}$

8.  $5^{-3} \rightarrow \frac{1}{5^3} \quad 5 \cdot 5 \cdot 5$   
 $\frac{1}{125}$

9.  $\left(\frac{4}{7}\right)^{-2}$   
 $\frac{4^{-2}}{7^{-2}} \rightarrow \frac{7^2}{4^2} \rightarrow \frac{49}{16}$

10.  $\left(\frac{x^7}{x^2}\right)^3$   
 $(x^5)^3 \rightarrow x^{15}$

11.  $\left(\frac{b^{10}}{b^3}\right)^{-2}$   
 $(b^7)^{-2} \rightarrow b^{-14} \rightarrow \frac{1}{b^{14}}$

12. Evaluate  $x^2 - 4xy - y^2$  when  $x = -2$  and  $y = 3$

$(-2)^2 - 4(-2)(3) - (3)^2$   
 $4 + 24 - 9 \rightarrow 28 - 9$   
 $19$

In #13 and 14, write each of the numbers in decimal notation. Also called standard notation.

13.  $3.113 \times 10^{-5}$   
 5 places  $\leftarrow$   
 $0.00003113$

14.  $1.201 \times 10^9$   
 9 places  $\leftarrow$   
 $1,201,000,000$

In #15 and 16, write each of the numbers in Scientific Notation.

15. 87,000,000  
 $8.7 \times 10^7$

16. 0.000017  
 $1.7 \times 10^{-5}$

In #17 – 19, Solve & check each equation.

17.  $2(x - 3) + 5x = 8(x - 1)$

$$2x - 6 + 5x = 8x - 8$$

$$7x - 6 = 8x - 8$$

$$-7x \quad -7x$$

$$-6 = x - 8$$

$$+8 \quad +8$$

$$2 = x \quad \boxed{x = 2}$$

$$2(2-3) + 5 \cdot 2 = 8(2-1)$$

$$2(-1) + 10 \quad 8(1)$$

$$\frac{-2 + 10}{8} = 8 \checkmark$$

18.  $\left(\frac{2x}{3} + \frac{1}{5}\right) = \left(1 + \frac{3x}{5} - \frac{1}{3}\right)^{15}$

$$15 \cdot \frac{2x}{3} + 15 \cdot \frac{1}{5} = 15 \cdot 1 + 15 \cdot \frac{3x}{5} - 15 \cdot \frac{1}{3}$$

$$10x + 3 = 15 + 9x - 5$$

$$10x + 3 = 9x + 10$$

$$-9x \quad -9x$$

$$1x + 3 = 10$$

$$-3 \quad -3$$

$$\boxed{x = 7}$$

19.  $\frac{x+2}{3} = \frac{x}{6}$

$$6 \cdot \frac{(x+2)}{3} = 6 \cdot \frac{x}{6}$$

$$2(x+2) = x$$

$$2x + 4 = 1x$$

$$-2x \quad -2x$$

$$4 = -1x$$

$$\frac{4}{-1} = \frac{-1x}{-1}$$

$$\boxed{x = -4}$$

For #20 – 25, define a variable in words, write an equation or inequality, solve algebraically, and write your answer in a complete sentence.

20. Seven subtracted from five times a number is 208. Find the number.

Let  $x =$  the number

$$5x - 7 = 208$$

$$+7 \quad +7$$

$$5x = 215$$

$$x = \frac{215}{5}$$

$$\frac{5x}{5} = \frac{215}{5}$$

$$\underline{x = 43}$$

The number is 43.

21. An 87-inch board is cut into three pieces. The longest piece is 10 inches longer than twice the shortest piece and the middle-sized piece is 17 inches longer than the shortest piece. How long are the pieces?



87 inches

$$15 \quad 15+17 \quad 2 \cdot 15+10$$

$$32 \quad 40$$

Let  $x =$  length of short piece (inches)

$$x + (x+17) + (2x+10) = 87$$

$$4x + 27 = 87$$

$$-27 \quad -27$$

$$4x = 60 \quad \frac{4x}{4} = \frac{60}{4} \quad \boxed{x = 15}$$

Shortest piece  $\rightarrow$  15 in  
Middle piece  $\rightarrow$  32 in  
Longest piece  $\rightarrow$  40 in.

22. A landscape architect charged a customer \$971, listing \$350 for plants and the remainder for labor. If the architect charged \$23 per hour, how many hours did the architect work?

Let  $x =$  # of hours

Total Cost = Cost plants + Cost Labor

$$971 = 350 + 23 \cdot x$$

$$-350 \quad -350$$

$$621 = 23x$$

$$\rightarrow \frac{23x}{23} = \frac{621}{23} \quad \boxed{x = 27}$$

The architect worked for 27 hours.

23. A university with 176 people on the faculty wants to maintain a student-to-faculty ratio of 23:2. How many students should they enroll to maintain that ratio?

Proportion

$$\frac{23 \text{ students}}{2 \text{ faculty}} = \frac{x \text{ students}}{176 \text{ faculty}}$$

$$23(176) = 2x$$

$$\frac{23 \cdot 176}{2} = \frac{2x}{2}$$

$$x = 2024$$

The university could enroll 2024 students.

24. To earn a B in a course, a student must have a final average of at least 80%. On the first three examinations, a student has scores of 76%, 74%, and 78%. What must the student earn on the fourth examination to earn a B in the course?

Let  $x =$  score needed on Exam 4

Exam scores: 76, 74, 78,  $x$

Average of 4 scores:  $\frac{76+74+78+x}{4}$   
 $\frac{228+x}{4}$

Average  $\geq 80$   
 $4 \cdot \frac{(228+x)}{4} \geq 80 \cdot 4$   
 $228+x \geq 320$   
 $-228 \quad -228$   
 $x \geq 92$

They must score 92% or better on Exam 4.

25. A motorcycle traveling at 50 mph overtakes a car traveling at 30 mph that had a three-hour head start. How far from the starting point are the two vehicles? (Distance = Rate\*Time)

In #26 – 28, solve each inequality. Write the solution in interval notation and graph it on a number line.

26.  $10 < -2x + 4$

Interval Notation: \_\_\_\_\_



27.  $33x + 33 \geq 3(4x + 3)$

Interval Notation: \_\_\_\_\_



28.  $-24 < 3x - 6 \leq -15$

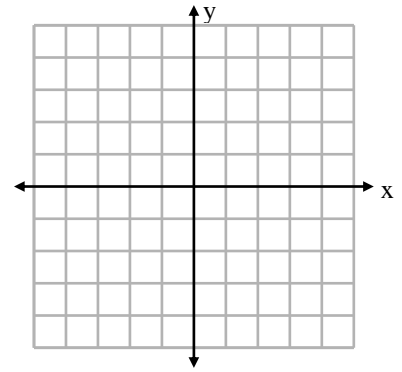
Interval Notation: \_\_\_\_\_



29. Graph the line  $5x + 4y = 20$  by finding its  $x$ - and  $y$ - intercepts. Write your intercepts as ordered pairs.

$x$ -intercept: \_\_\_\_\_

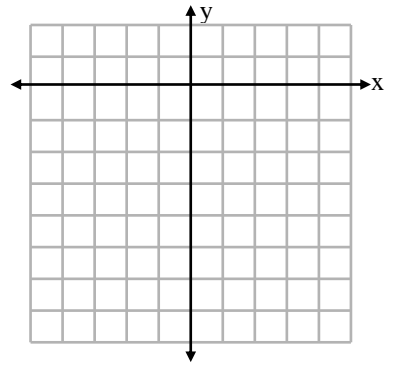
$y$ -intercept: \_\_\_\_\_



30. Graph the line  $y = 3x - 6$  by finding its  $x$ - and  $y$ - intercepts. Write your intercepts as ordered pairs.

$x$ -intercept: \_\_\_\_\_

$y$ -intercept: \_\_\_\_\_



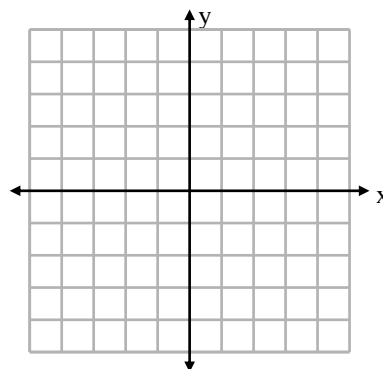
In #31 – 33, solve each linear equation for  $y$ , then determine the slope and  $y$ -intercept of the line.

31.  $4x + 3y = 6$

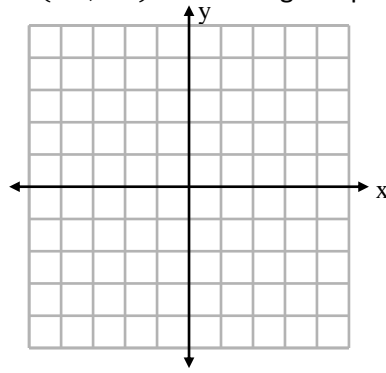
32.  $3x - 2y = 5$

33.  $5y - 8x = 30$

34. Use the slope and  $y$ -intercept to sketch  $y = -\frac{1}{2}x + 3$ .



35. Sketch the line with slope,  $m = \frac{2}{3}$ , that contains the point  $(-1, -3)$ . Label the given point and at least 2 other points on the line.



36. Write the equation for the line which passes through  $(-2, 5)$ , and is parallel to the line  $y = 3x - 2$ .

37. Write the equation for the line which passes through the points  $(3, -4)$  and  $(5, 0)$ .

38. Write the equation for the line with undefined slope which passes through the point  $(-7, 2)$ .

39. Find an equation for the line which is parallel to the line  $y = -2$ , and passes through the point  $(3, -1)$ .

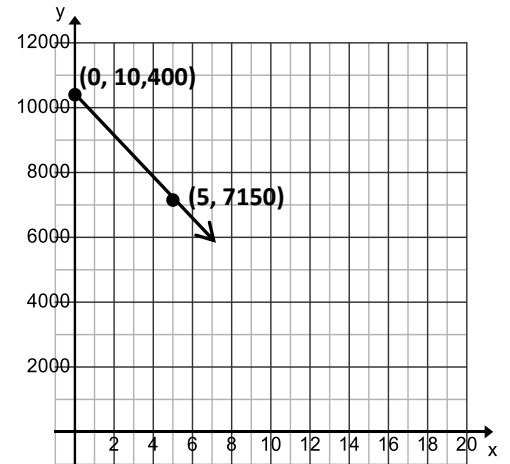
40. Sunny had \$10,400 in her bank account that she used just for her monthly rent. After five months, she had \$7150 in her account.

a. Give the slope of the given line, including units.

b. What does the slope mean as a rate of change for Sunny's account?

c. Write an equation for the line that models the amount in Sunny's account.

d. Assuming she never adds any more money into the account, when will she run out of money?



In #41 – 46, perform the indicated operation(s) and simplify the result.

41.  $(-2x^2y + 9xy + xy^2 + 21) + (-4xy + 3xy^2 - 11)$

42.  $(9x^2 - 8x + 5) - (6x^2 - 7x - 1)$

43.  $(3a + 7)(2a - 5)$

44.  $(2x + 7y)^2$

45.  $3x(x + 4)(x - 4)$

46.  $(x + 3)^2 + (x + 3)(x - 3)$

In #47 – 52, completely factor each polynomial, including factoring out the Greatest Common Factor. If not factorable, state that it is PRIME.

47.  $t^2 + 2t - 15$

48.  $m^2 - 12m + 36$

49.  $9p^2 - 100$

50.  $4x^2 + 36$

51.  $r^2 + r + 2$

52.  $2x^3 + 8x^2 + 6x$

53. Simplify each expression. Leave your answer in the form of a simplified radical, if necessary.

a.  $\sqrt{6} \cdot \sqrt{54}$

b.  $\sqrt{6} + \sqrt{54}$

c.  $\sqrt{25 - 16}$

d.  $\sqrt{25} - \sqrt{16}$

54. Use rules for square roots to simplify the expression. Do not use a calculator to approximate an answer.

a.  $\sqrt{72}$

b.  $\sqrt{900a^{10}b^4}$

c.  $\sqrt{40x^5y^8}$

d.  $\frac{\sqrt{45h^7}}{\sqrt{5h^3}}$

55. Use factoring to solve each equation.

a.  $9x^2 - 25 = 0$

b.  $x(x - 3) = 10$

c.  $2x^3 + 10x^2 + 12x = 0$

56. Use the Square Root Property to solve each equation. Give exact, simplified solutions.

a.  $9x^2 - 25 = 0$

b.  $(x - 2)^2 = 16$

c.  $2(x + 5)^2 = 6$

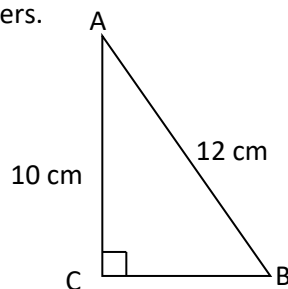
57. Use the Quadratic Formula to solve each equation. Give exact, simplified solutions.

a.  $6x^2 - x - 1 = 0$

b.  $t^2 = t + 4$

58. The length of a rectangular garden is 4 feet longer than the width. If the area of the garden is 140 sq. feet, find the dimensions of the garden.

59. Use the Pythagorean Theorem to find the length of side BC on the right triangle below. Leave your answers in simplified radical form. Assume all units are in centimeters.





60. Solve the following problem by

A)defining a variable, B)writing an equation, C)solving the equation and D) answering the question in context.

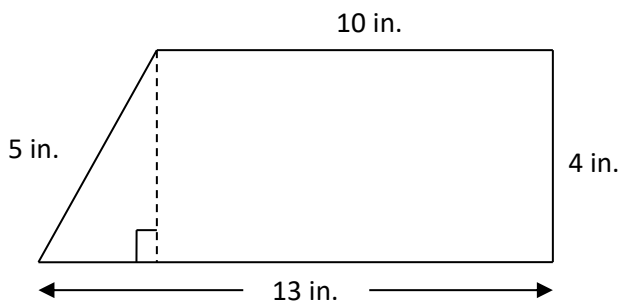
*A 13-foot ladder, leaning against a wall, is set with the bottom of the ladder 5 feet from the base of the wall. How far up the wall will the ladder reach?*

61. Solve each formula for the given variable.

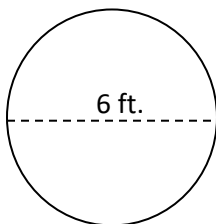
a. Solve for  $w$ :  $P = 2l + 2w$

b. Solve for  $h$ :  $A = \frac{1}{2}bh$

62. Find the area and perimeter of the figure.

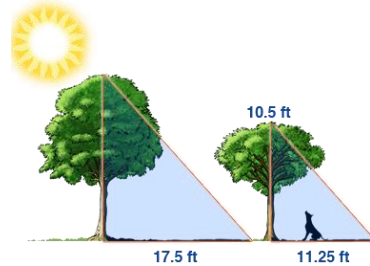


63. Find the circumference and area of the following circle. Leave your answer in terms of  $\pi$ .  $A = \pi r^2, C = 2\pi r$



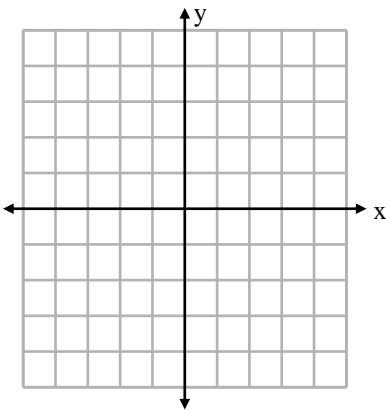
64. Solve the proportion:  $\frac{a}{a+12} = \frac{4}{7}$

65. Given the lengths of the shadows of each tree as well as the height of the smaller tree, find the height of the taller tree.

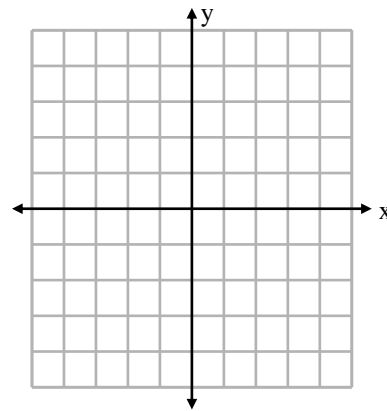


66. Solve each system of equations by graphing.

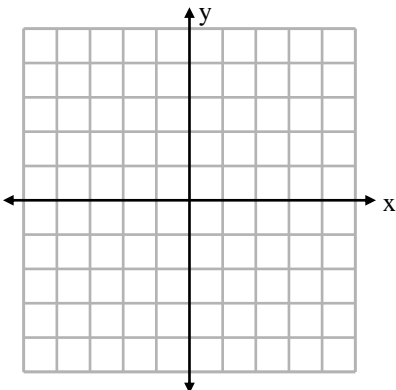
a.  $\begin{cases} y = x + 3 \\ 2x + y = -3 \end{cases}$



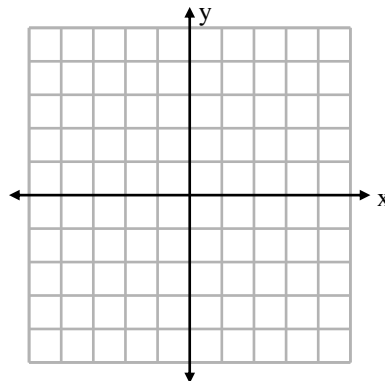
b.  $\begin{cases} y = 3x + 2 \\ 3x - 2y = 6 \end{cases}$



c.  $\begin{cases} 3x - y = -3 \\ y - 3x = 3 \end{cases}$



d.  $\begin{cases} y = -3 \\ x = 4 \end{cases}$



In #67 – 70, Solve each system using the substitution method. If there is *No Solution*, or *Infinitely Many Solutions*, so state.

$$67. \begin{cases} 3x + 2y = 3 \\ y = 2x - 16 \end{cases}$$

$$68. \begin{cases} 2x - y = -4 \\ 2y = 4x - 6 \end{cases}$$

$$69. \begin{cases} 3x + y = -7 \\ x + 2y = -9 \end{cases}$$

$$70. \begin{cases} x + 3y = 6 \\ y = -\frac{1}{3}x + 2 \end{cases}$$

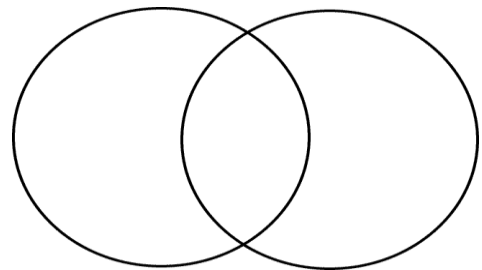
71. Given the sets  $A = \{m, a, t, h\}$ ,  $B = \{m, y, t, h\}$ ,  $C = \{f, u, n\}$ , find the following:

a.  $A \cup B =$

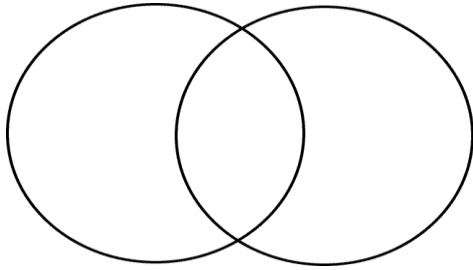
b.  $A \cap B =$

c.  $A \cap C =$

d. Fill in the Venn Diagram using  $A$  and  $B$



72. We have information for the number of students at ARCC taking a college level math class, and the number of students at ARCC taking a science course. Use a Venn diagram to illustrate the number that are in each region. We know 850 students are taking a college level math class, 1100 students are taking a science course, and 625 students are taking both a college level math class and a science course.



- The number of people taking a college level math class, but not a science course is \_\_\_\_\_.
- Suppose we want to mail scholarship information to all of the individuals who are taking a college level math course or taking a science course or both but we don't want anyone to receive two mailings. How many mailings do we need to send so that each person receives only one mailing?

73. A class was polled on their favorite season of the year. Use the following table to finish the pie chart (title, percentages, label each portion)

Winter	Spring	Summer	Fall
4	3	12	6

Title: \_\_\_\_\_

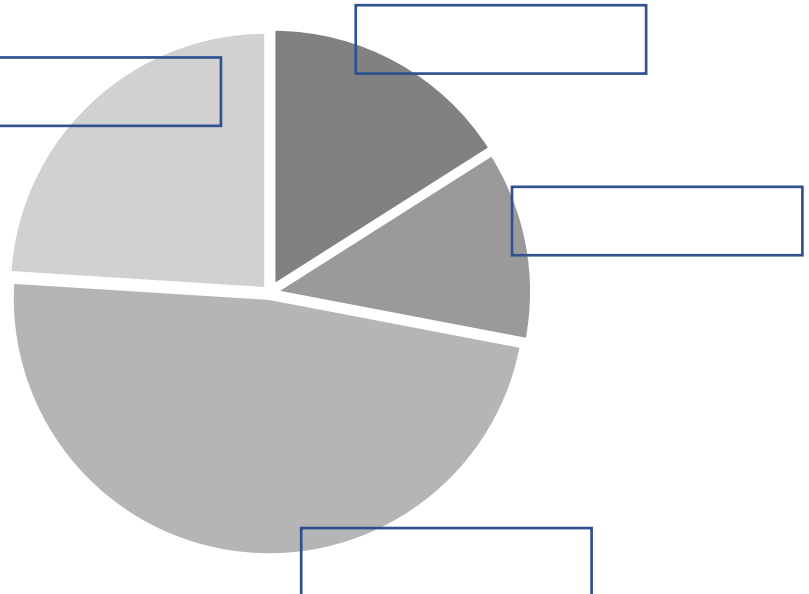
Total Number of Students: \_\_\_\_\_

% Winter: \_\_\_\_\_

% Spring: \_\_\_\_\_

% Summer: \_\_\_\_\_

% Fall: \_\_\_\_\_



74. Twelve car salespersons were asked how many cars they sold in the last month. Here were their answers:

3, 3, 4, 6, 6, 6, 8, 8, 10, 11, 12, 24

a. Find the range, mean, median of the number of cars sold

Range  
 $24 - 3$   
21 cars

Mean  
 $\frac{3+3+4+6+6+6+8+8+10+11+12+24}{12}$   
 $\frac{124}{12}$

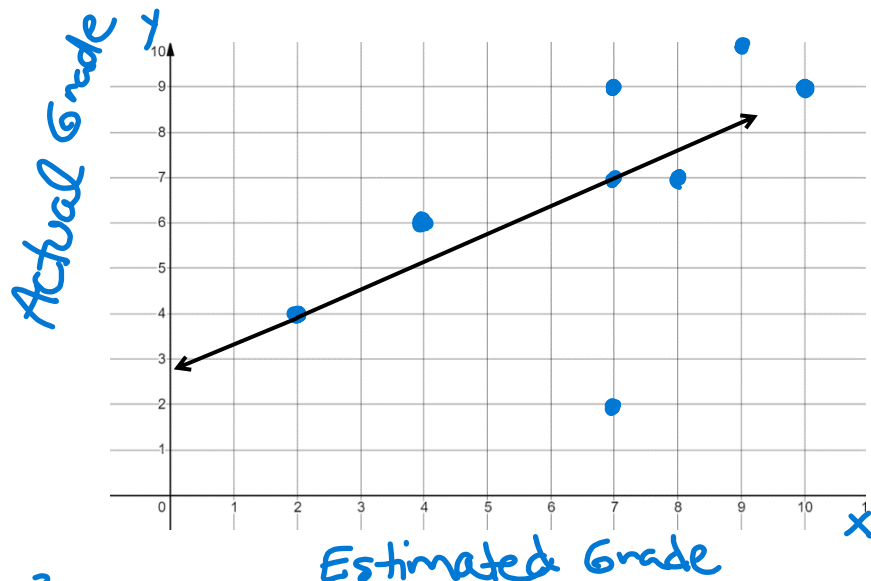
b. Give the 5-number summary:

Min. value:                       $Q_1$ :                      Median,  $Q_2$ :                       $Q_3$ :                      Max. value:

c. Draw the box plot

75. Eight students were asked to estimate their score on a 10-point quiz. Their estimated and actual scores are given in the table. Draw a scatter plot of the data, then use two convenient points to draw a line of best fit. Give the equation for your line.  $y = mx + b$

Estimated $x$	Actual $y$
4	6
7	7
7	2
8	7
7	9
9	10
10	9
<b>2</b>	<b>4</b>



I will use (2, 4) and (7, 7).

① Find  $m$   $m = \frac{7-4}{7-2} = \frac{3}{5}$

② Find  $b$ .  $y = \frac{3}{5}x + b$   
 $4 = \frac{3}{5} \cdot 2 + b$   
 $4 - \frac{6}{5} = b$   
 $b = \frac{14}{5}$

$y = \frac{3}{5}x + \frac{14}{5}$

Answers may vary if you use different points.