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Unit 2 Study Guide: Rational Numbers

Vocabulary:

1) **Absolute Value**: The distance between a number and zero on the number line. The symbol for absolute value is shown in this equation |8|=8

2) **Integers**: The set of whole numbers and their opposites {…-3, -2, -1, 0, 1, 2, 3…}

3) **Natural Numbers**: The set of numbers {1, 2, 3, 4,…}. Natural numbers can also be called counting numbers.

4) **Negative Numbers**: The set of numbers less than zero.

5) **Opposites**: Two different numbers that have the same absolute value. Example: 4 and -4 are opposite numbers because both have an absolute value of 4.

6) **Positive Numbers**: The set of numbers greater than zero.

7) **Rational Numbers**: The set of numbers that can be written in the form a/b where a and b are integers and b ≠0.

8) **Sign**: a symbol that indicates whether a number is positive or negative. Example: in -4, the (-) sign shows this number is read "negative four".

9) **Whole Numbers**: The set of all natural numbers and the number zero.

10) **Coordinates**: An ordered pair, (x, y), that locates a point in the plane.

11) **Quadrant**: One of the four regions on a Coordinate plane formed by the intersection of the x-axis and the y-axis. Quadrants are named counterclockwise I, II, III, IV

12) **Origin**: The point of intersection of the vertical and horizontal axes of a Cartesian plane. The coordinates of the origin are (0, 0).

13) **Zero Pair**: Pair of numbers whose sum is zero.

Part A:

Write an integer to represent the situation.

14. a jet climbing to an altitude of 20,000 feet   **20,000**

15. taking $15 out of the bank   **-15**

16. 7 degrees below zero   **-7**

17. spending $34   **-34**

18. 300 feet below sea level   **-300**

19. When the Jaguar football team passed the football, they gained 25 yards   **25**

What is the opposite of each integer?

20.   35 __**-35**_____   21.   -52 ___**52**_____   22.   0 ___**0**_____

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What is the absolute value of each integer?

23. 10 ___10_____   24.   - 71 ____71____   25.   0 ___0_____

26. A football play lost 8 yards. Write an integer to represent the situation. Then find the absolute value of that integer, and describe what it represents in the situation. **-8 and 8; the football play gained 8 yards**

Evaluate each.

27. - (- 7) __7_____   28. $|$ - 8 $|$ __8_____   29.   - $|$ 3 $|$ ___-3____

30. - $|$ -2 $|$ ___-2____   31. $|$ - (- 5) $|$ ___5_____   32.   - (- (-13)) ___-13_____

Compare each using <, >, or =.

33)   -36   **<**   -25   34)   0   **>**   -91   35) 0.3   **>**   0.297

36)   - $\dfrac{1}{4}$ **>**   - $\dfrac{1}{2}$ 37) $\dfrac{5}{8}$ **<**   0.63   38) - $\dfrac{3}{7}$ **<**   - $\dfrac{1}{3}$

39) The table below shows how some elevation samples compare to the level of the road:

Elevation Sample	G	H	I	J	K	L
Elevation (from the road)	3.1	-0.5	2.2	1.3	-4.5	-0.9

Write the values in the table in order from least to greatest.
-4.5 -0.9 -0.5 1.3 2.2 3.1

Order the numbers from least to greatest.

40.   42, -50, -48, -1, 51, -40, 0, 46   41. $|$ -37 $|$, 14, $|$ 11 $|$, - 3, $|$ -6 $|$, - 9

_-50, -48, -40, -1, 0, 42, 46, 51___   **_-9, -3, $|-6|$, $|11|$, 14, $|-37|$ _____**

42. $\dfrac{5}{6}, \dfrac{5}{9}, \dfrac{2}{3}, \dfrac{1}{2}, \dfrac{2}{9}$,   43.   0.23, 0.213, 0.023, 1.203, 0.03,

$-\dfrac{2}{9}, \dfrac{1}{2}, \dfrac{5}{9}, \dfrac{2}{3}, \dfrac{5}{6}$ _____   **_0.023, 0.03, 0.213, 0.23, 1.203_____**

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Part B:
Adding/Subtracting Integers

44. -8 + (-3) **-11**

45. -1 – (-3) **2**

46. 4 + (-15) **-11**

47. 2 – (-2) **4**

48. -207 + (-320) **-527**

49. 12 – 12 **0**

50. -15 + 25 **10**

51. -8 – 7 **-15**

52. 40 + 36 **76**

53. -9 – (-8) **-1**

54. -10 + (-68) **-78**

55. -4 – 9 **-13**

Part C:
Multiplying/Dividing Integers

56. -5 • 4 **-20**

57. 7 • (-3) **-21**

58. -40 ÷(-10) **4**

59. 18 ÷ 6 **3**

60. 2 •(-8) **-16**

61. -8 • (-4) **32**

62. -45 ÷9 **-5**

63. -30 ÷ 5 **-6**

64. -6 • 3 **-18**

65. -9 • (-9) **81**

66. 32 ÷ (-8) **-4**

67. -24 ÷ (-6) **4**

Part D:
Word Problems

68. A penguin dove to 130 feet below the water's surface. Then it swam up 48 feet toward the water's surface. Which integer represents where the penguin swam to? **-130 + 48 = -82 or 82 feet below sea level**

69. Emma and her friends were playing a game. Before her third turn, Emma had –2 points. During her third turn, Emma got 8 points. During her fourth turn, she lost 10 points and during her fifth turn, she got 5 points. How many points did Emma have at the end of her fifth turn? **-2 + 8 – 10 + 5 = 1 point**

70. A sunken ship is 12 m below the sea level. A search plane flies 35 m above the sunken ship. How far above the sea is the plane? **23m**   **-12 + 35 =**

71. A sunken treasure chest is 33 m below the sea level. A search plane flies 54 m above the sunken treasure chest. How far above the sea is the plane? **21m**   **-33 + 54 =**

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72. At midnight on a winter night, the temperature was –12°F. By 10 A.M. the temperature had risen 42°F. What was the new temperature?   **30˚ F**   **-12 + 42 =**

73. The peak of Mt. Everest is approximately 26,544 ft above sea level. The shore of the Dead Sea is about 1,200 ft below sea level. How much higher is the peak of Mt. Everest than the shore of the Dead Sea? **27744 ft**   **26,544 –(-1200) =**

74. Kim was walking down a rocky path. For 4 minutes, the elevation dropped steadily. Altogether it dropped 8 feet. What was the change in elevation per minute for the 4 minutes?
2ft per minute   8 ÷ 4 =

75. A scuba diver is swimming at a depth of -12 feet in the Flower Garden Banks National Marine Sanctuary. She dives down to a coral reef that is at fives times this depth. What is the depth of the coral reef?   **-60 ft**   **-12 x 5 =**

76. Eric's watch is water resistant up to -15 feet. Mike's watch is water resistant up to 8 times the depth of Eric's watch. Mike's watch is water resistant to what maximum depth?
-120 ft   **-15 x 8 =**

77. As a front passed, the temperature changed steadily over 6 hours. Altogether it changed -18 degrees. What was the change in temperature per hour for the 6 hours? **-3 degrees   18 ÷ 6 =**

Part E:
Coordinate Plane

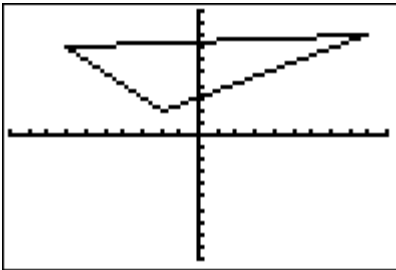78. Sketch a coordinate plane, include labels for the quadrants.
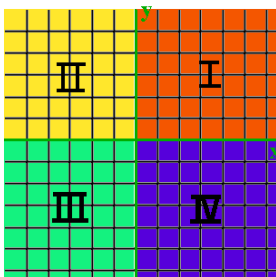
79. Who is the French mathematician that the Cartesian plane is named after? **Rene Descartes**

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80. Plot the following points on a coordinate plane.
   (9,8)   (-2, 2)   (-7, 7)   **What shape do these points make if you connect them?**

Triangle

In which quadrant or on what axis is each point located?

81. (-5, 5)   __II____   82.   (-15, -90)   __III__

83. (x < 0, y < 0)   __III____   84.   (x > 0, y = 0)   __x-axis___

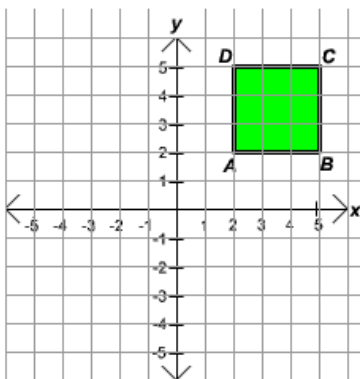85. (x = 0, y > 0)   __y-axis__   86.   (x > 0, y < 0)   _IV___

Use the coordinate plane below for #'s 87 – 88.

87. How far is point A from point B? _3 units___

88. Give the new coordinates of square ABCD if it were reflected across the x and y axes.

   Reflected x axis: **A_(2,-2)_ B_(5,-2)_ C_(5,-5)__ D_(2,-5)__**
   Reflected y axis: **A_(-2,2)_ B_(-5,2)_ C_(-5,5)__ D_(-2,5)__**


89.
   a. An ordered pair has coordinates that have the same sign. In which quadrant(s) could the point lie? Explain. **Quadrant I: both coordinates are positive and in Quadrant III: both coordinates are negative**

   b. Another ordered pair has coordinates that are opposites. In which quadrant(s) could the point lie? Explain. **Quadrant II: the x-coordinate is negative and the y-coordinate in postive Quadrant IV: the x-coordinate is positive and the y-coordinate in negative**

90. How are the ordered pairs (4,9) and (4,-9) similar, and how are they different? Are the two points related by a reflection over an axis in the coordinate plane? If so, indicate which axis is the line of symmetry between the points. If they are not related by a reflection over an axis in the coordinate plane, explain how you know. **They are a reflection over the x-axis. I know this because the x-coordinate values are the same and the y-coordinate values are opposites of each other.**

91. Kayleigh has made a scale drawing of a vegetable garden she plans to make in her backyard. She needs to determine the perimeter and area to know how much fencing and dirt to purchase. Determine both the perimeter and area. **Perimeter = 42 units   Area = 76 square units**
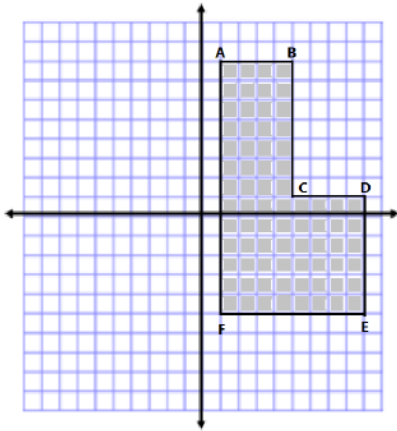
Use the graph paper below to answer questions 92 – 94.

92. Maria plotted points on the coordinate plane at (1, 1),(-1, 1), (-1, -1), and (1, -1). What shape can Maria draw using these four points as its corners? **square**

93. John plots points at (4, 0), (4, 3), and (-1, 3). If John wants to draw a rectangle, where should she plot the last point? **(-1,0)**

94. Emily plots a triangle at (-2, -1), (4, -1), and (1, 6). What is the height and width of the triangle? **Width = 6 units and height = 7 units**

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