Meramec Intermediate Algebra TEST 1 Solution Spring 2010

Explanations are in blue. Minimum proper response from student is in red.

NAME: _____ Score _____/100

Please print

SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION

Circle T or F, whichever is correct. (2 pts each)

1. T F $5(-4) = 1$. False because 5(-4) is the product of 5 and negative 4 not the difference 5 minus 4.

2. T F **$Q \subset Z$.** This is false because $\frac{3}{4}$ is a rational number which is not an integer.

3. T F $\{x \mid x \in R \text{ and } 7 \le x \le 12\} = (7,12)$ This is false because the set $\{x \mid x \in R \text{ and } 7 \le x \le 12\}$ the interval from 7 to 12 including the endpoints 7 and 12 whereas (7, 12) is the interval from 7 to 12 excluding the endpoints 7 and 12.

4. T F $\sqrt{5}$ is not a real number. False because $\sqrt{5}$ is an irrational number and therefore is a real number.

5. T F $5 - (-2 - 7) = 5 + (2 - 7)$. This is false because $5 - (-2 - 7) = 5 - (-9) = 5 + 9 = 14$ while $5 + (2 - 7) = 5 + (-5) = 0$.

6. T F The opposite of $\frac{5}{13}$ is $-\frac{13}{5}$. This is false becaue the opposite of $\frac{5}{13}$ is $-\frac{5}{13}$

7. T F If x represents a negative number, then the absolute value of x is the opposite of x. This is true because it is the "second line" of the definition of absolute value.

8. T F [6, 4) is acceptable interval notation. This is false because 6 is not less than 4. The leftmost number in interval notation must be the left endpoint of the interval on the number line.

9. T F If x is a real number, then $-x$ is negative. False because if $x = -5$, the absolute value of x is the opposite of –5 which is positive 5. So in this case the absolute value of x is positive not negative.

10. T F $-5^3 = (-5)^3 = -125$. -5^3 =True because $-(5)(5)(5) = -125$ and $(-5)^3 = (-5)(-5)(-5) = -125$.

11. **(3 pts)** Check each of the following which are equal to the interval [4, 7).

[4, 7) is the interval from 4 to 7 including 4 but excluding 7.

☐ $\{x \mid 4 < x < 7\}$ ☒ $\{x \mid 4 \le x < 7\}$ ☐ $\{4,5,6\}$

$\{x \mid 4 < x < 7\}$ is the interval from 4 to 7 excluding both endpoints so is different from [4, 7).

$\{x \mid 4 \le x < 7\}$ is the interval from 4 to 7 including 4 but excluding 7 so is the same as [4, 7).

{4, 5, 6} is the set containing the three numbers 4, 5, and 6. It is not an interval so is different from [4, 7).

☐ $\{x \mid 4 < x \le 7\}$ ☐ $\{x \mid 4 \le x \le 7\}$ ☐ $\{5,6,7\}$

$\{x \mid 4 < x \le 7\}$ is the interval from 4 to 7 excluding 4 and including 7 so is different from [4,7).

$\{x \mid 4 \le x \le 7\}$ is the interval from 4 to 7 including both endpoints 4 and 7 so is different from [4, 7).

{ 5, 6, 7} is the set containing the three numbers 5, 6, and 7. It is not an interval so is different from [4, 7).

☐ $(7,4]$ ☐ $[4,6]$ ☐ $\{x \mid x \in N \text{ and } 4 \le x < 7\}$

$(7,4]$ is a meanigless collection of symbols so is different from [4, 7).

$[4,6]$ is the interval from 4 to 6 including both endpoints 4 and 6 so is different from [4, 7).

$\{x \mid x \in N \text{ and } 4 \le x < 7\}$ is the set containing 4, 5, and 6 which is different from [4,7).

12. **(3 pts)** Check each of the following which are equal to the opposite of the fraction $\frac{x}{y}$.

The opposite of $\frac{x}{y}$ is $-\frac{x}{y}$ Anything with two sign changes in $-\frac{x}{y}$ will be equal to the opposite.

- ☐ $\frac{-x}{-y}$ three sign changes
- ☒ $-\frac{-x}{-y}$ two sign changes
- ☐ $-\frac{x}{-y}$ one sign change
- ☒ $-\frac{x}{y}$ two sign changes
- ☐ $-\frac{-x}{y}$ one sign change
- ☒ $\frac{-x}{y}$ two sign changes
- ☒ $\frac{x}{-y}$ two sign changes
- ☐ $\frac{y}{x}$ one sign change

Fill in each of the blanks to make the statements true. (2 pts each)

13. A **set** is a collection of objects.
14. The formula for the area of a rectangle with lengh x and width y is **A = xy** . It must be an equation
15. $\frac{7}{0}$ is **undefined**.
16. In the expression 3^5, 3 is the **base** and 5 is the **exponent**.
17. Give an example of a binary relation: **equal** (or less than or greater than).
18. The product of two real numbers with different signs is **negative**.
19. The transitive property of equality states that if a = b and b = c, then **a = b**.
20. A real number which is not rational is **irrational**.
21. On the number line the symbol > means "to the **right** of".
22. Absolute value is defined by $|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$
23. Complete the statement of the Law of Trichotomy.

    If a and b are real numbers, then one and only one of the following is true:

    i) **a < b**

    ii) **a = b**

    iii) **a > b**

24. If a and b are real numbers and ab = 0, then **a = 0** or **b = 0**.
25. The property of the real numbers which justifies 3(x + 2y) = 3x + 6y is the **distributive** property.
26. $\frac{0}{-3} =$ 0 Because (–3)(0) = 0 The definition of division. $\frac{0}{-3} = 0 \div (-3) = (0)\left(-\frac{1}{3}\right) = 0$
27. $(-2)^4 =$ 16 $(-2)^4 = (-2)(-2)(-2)(-2) = (4)(4) = 16$
28. $-7^2 =$ –49 $-7^2 = -(7)(7) = -49$
29. $-7 - (-12) =$ 5 $-7 - (-12) = -7 + 12 = 5$

30. $2(2-6)^2 = 32$ $2(2-6)^2 = 2(-4)^2 = 2(16) = 32$

31. A formula must be an **equation**

32. $\{x \in W \mid x > 8\}$ is an example of **set-builder** notation for a set.

33. [3, 5) is an example of **interval** notation.

34. In the expression a – b, a is called the **minuend**, b is called the **subtrahend** and a – b is called the **difference**.

Show your work on exercises 35 – 40 inclusive (5 pts each). No work –No Credit Be neat!

35. $25-[(3-5)+(14-18)]^2 = 25-[(-2)+(-4)]^2 = 25-[-6]^2 = 25-36 = -11.$

36. Simplify the expression 3x – 2(x – 5) + x
3x – 2(x – 5) + x = 3x – 2x +10 + x = 2x + 10

37. Simplify $\dfrac{\left(\frac{1}{5}\right)(20)-6}{10+\left(\frac{1}{4}\right)(12)}$

$$\frac{\left(\frac{1}{5}\right)(20)-6}{10+\left(\frac{1}{4}\right)(12)} = \frac{4-6}{10+3} = \frac{-2}{13}$$

38. Calculate the area of a trapezoid whose height is 3 and its bases are B = 11 and b = 5. State the formula and then use the formula.

Use the formula $A = \frac{1}{2}(B+b)h$

$A = \frac{1}{2}(11+5)3 = \frac{1}{2}(16) = 24$

39. Complete the following diagram to convert the subtraction problem to an equivalent addition problem. **(I do not want you to compute the differece.) No work required.**

$$\begin{array}{ccc} -5 & - & (-8) \\ \downarrow & \downarrow & \downarrow \\ -5 & + & 8 \end{array}$$

40. Complete the following diagram to convert the division problem to an equivalent multiplication problem. **(I do not want you to compute the quotient.) No work required.**

$$\begin{array}{ccc} -\frac{3}{5} & \div & \left(-\frac{4}{7}\right) \\ \downarrow & \downarrow & \downarrow \\ -\frac{3}{5} & \bullet & -\frac{7}{4} \end{array}$$