

NAME: \_\_\_\_\_ Score \_\_\_\_\_ /100  
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SHOW ALL YOUR WORK IN A NEAT AND ORGANIZED FASHION

2 points each for questions 1 – 25. 5 points each for questions 26 – 35.

Circle T or F, whichever is correct.

1. T **F** The graph of a linear inequality in one variable is a dot on the Real Number Line.
2. **T** F If any expression is added to both sides of an equation the resulting equation is equivalent to the original equation.
3. **T** F If any real number is added to both sides of an equation the resulting equation is equivalent to the original equation.
4. T **F** If both sides of an equation are multiplied by the same expression, the resulting equation is equivalent to the original equation.
5. T **F**  $(3, 5] = \{x | 3 < x < 5\}$ .
6. T **F**  $x^3 + 4x^2 + x$  is an equation.
7. **T** F The solution set for an equation is the set of all solutions for that equation.
8. **T** F The equation  $3x + 2 = -7x + \pi$  is a linear equation in one variable.
9. **T** F A formula must contain an = symbol.
10. T **F**  $-x = 4$  is a simplest equation.

Fill in each of the blanks to make the statements true. Remember what a formula is!

11. The formula for the circumference of a circle with radius  $r$  is  **$C = 2\pi r$** .
12. The formula for the volume of a cone with radius  $r$  and height  $h$  is  **$V = \frac{1}{3}\pi r^2 h$** .
13. The formula for the area of a triangle with base  $b$  and height  $h$  is  **$A = \frac{1}{2}bh$** .
14. **The Distributive Property:** If  $a$ ,  $b$ , and  $c$  are real numbers, then  **$a(b + c) = ab + ac$** .
15. The formula for the perimeter of a rectangle with length  $x$  and width  $y$  is  **$P = 2x + 2y$** .
16. **The Transitive Property:** If  $a$ ,  $b$ , and  $c$  are real numbers such that  $a = b$  and  $b = c$ , then  **$a = c$** .
17. Write the interval  $[-2, 5]$  in set builder notation  **$\{x | -2 \leq x \leq 5\}$** .
18. Write  $\{x | 2 \leq x < 7\}$  in interval notation  **$[2, 7)$** .
19. Show that  $-2$  is a solution of the equation  $x^3 + 4x^2 + x = 6$ .

$$(-2)^3 + 4(-2)^2 + (-2) = -8 + 16 - 2 = 6$$

**Because -2 makes the equation true, it is a solution.**

20.  $\{1, 3, A, c\} \cap \{4, a, c, 2, 1\} = \{1, c\}$ . **Your answer must be written as a set!**
21. The solution set of a compound inequality formed with the word **and** is the **intersection** of the solution sets of the two inequalities.
22. A linear inequality in one variable  $x$  is an inequality which can be written in the form  **$ax + b < 0$** .
23. If  $5x - 9$  is added to both sides of  $5x^{-3} + 2x^3 = 8x - 3$  the resulting equation is **equivalent** to  $5x^{-3} + 2x^3 = 8x - 3$ .
24. The solution set for  $3x + 1 > 7$  is the ray  $(2, \infty)$ . The solution set for  $2x + 5 < -3$  is  $(-\infty, -4)$ . What is the solution set for the compound inequality  $3x + 1 > 7$  OR  $2x - 5 < 3$ ?  **$(-\infty, -4) \cup (2, \infty)$** .
25. The equation  $2x = 7x - 5x$  is an example of an **identity**.
26. A woman earns 15% more than her husband. Together they earn \$69,875 per year. What is the husband's annual salary? You are to answer this question by filling in the blanks in the following solution.

**Solution:**

Let  $x$  be the **husband's salary**.

Then the wife's salary is  **$x + 0.15x = 1.15x$** .

Their combined annual income is **69875**.

Their combined annual income is  **$x + 1.15x$** .

We now have two expressions for the **same** quantity.

Therefore these two expressions are **equal**.

This yields the equation  **$x + 1.15x = 69875$** .

Which can be solved by ordinary means to obtain  $x = 32,500$ .

This leads to the following conclusion:

The **husband's salary** is **\$32,500**.

27. Label, by circling the correct word, each of the following as an expression, equation, or inequality.

- a)  $\frac{1}{3}x - 5$  (**expression** equation inequality)
- b)  $2(x - 3) = 7$  (expression **equation** inequality)
- c)  $x > 4x^3 - 1$  (expression equation **inequality**)
- c)  $\frac{5}{9}x + \frac{1}{3} = \frac{2}{9} - \sqrt{17}x$  (expression **equation** inequality)
- d)  $\frac{5}{9}x - \frac{2}{3} + \frac{2}{9} - \sqrt{17}x^2$  (**expression** equation inequality)

28. Label, by circling the correct word, each of the following as an identity, a conditional equation, or a contradiction.

- a)  $2x + 3 = 2x + 3$  (**identity** conditional contradiction)
- b)  $2x + 1 = 2x + 3$  (identity conditional **contradiction**)
- c)  $5x - 2 = -7 + 5x$  (identity conditional **contradiction**)
- d)  $5x - 3 = 6$  (identity **conditional** contradiction)
- e)  $x^2 = x$  (identity **conditional** contradiction)

29. Which of the following are linear equations in one variable. Indicate your answer by circling YES or NO.

a)  $2x - 4 = 7$  (YES NO)

b)  $\frac{3}{x} = 5$  (YES NO)

c)  $2x + 3y = 12$  (YES NO)

d)  $\sqrt{3}x + \pi = \frac{15}{4}x - 2$  (YES NO)

e)  $x = 2$  (YES NO)

**Show your work on exercises 30 – 35 inclusive. All your work and answers must be exact!**  
**No work –No Credit Be neat!**

30. Solve  $T = 3vk - 4wk + 5vw$  for  $k$

**Solution:**

$$T = 3vk - 4wk + 5vw$$

$$T - 5vw = 3vk - 4wk$$

$$T - 5vw = (3v - 4w)k$$

$$\frac{T - 5vw}{3v - 4w} = k$$

31. Solve the equation  $5x - 7 = 11x + 2$ . Reduce all fractions in your answer. Don't use mixed numbers. Don't use decimals. Improper fractions are just fine.

**Solution:**

$$5x - 7 = 11x + 2$$

$$-6x - 7 = 2$$

$$-6x = 9$$

$$x = \frac{9}{6}$$

$$x = \frac{3}{2}$$

32. Solve the equation  $3x + \sqrt{3} = x - 1$ . Reduce all fractions in your answer. Don't use mixed numbers. Don't use decimals. Improper fractions are just fine.

**Solution:**

$$3x + \sqrt{3} = x - 1$$

$$2x + \sqrt{3} = -1$$

$$2x = -1 - \sqrt{3}$$

$$x = \frac{-1 - \sqrt{3}}{2}$$

33. Solve the inequality  $5x - 7 < 11x + 2$ . Write the solution set in set builder notation. Reduce all fractions in your answer. Don't use mixed numbers. Don't use decimals. Improper fractions are just fine.

**Solution:**

$$5x - 7 < 11x + 2$$

$$-6x - 7 < 2$$

$$-6x < 9$$

$$x > -\frac{9}{6}$$

$$x > -\frac{3}{2}$$

The solution set is  $\left\{x \mid x > -\frac{3}{2}\right\}$

34. Solve and graph the inequality  $3x - 4 > 5x + 2$ . Reduce all fractions in your answer. Don't use mixed numbers. Don't use decimals. Improper fractions are just fine.

**Solution:**

$$3x - 4 > 5x + 2$$

$$-4 > 2x + 2$$

$$-6 > 2x$$

$$-3 > x$$



35. Solve the compound inequality  $-2 < \frac{-2x - 1}{3} < 2$ . Write the solution set in interval notation. Reduce all fractions in your answer. Don't use mixed numbers. Don't use decimals. Improper fractions are just fine.

**Solution:**

$$-2 < \frac{-2x - 1}{3} < 2$$

$$-6 < -2x - 1 < 6$$

$$-5 < -2x < 7$$

$$\frac{5}{2} > x > -\frac{7}{2}$$

$\left(-\frac{7}{2}, \frac{5}{2}\right)$  is the solution set