Solve the following equations for x.

1. $2x - 5 = -43$

$2x = -38$

$\boxed{x = -19}$

2. $-5(x+2) = 3 - x$

$-5x - 10 = 3 - x$
$+5x \qquad\qquad +5x$
$\qquad -10 = 3 + 4x$
$\qquad -13 = 4x$

$\boxed{\dfrac{-13}{4} = x}$

3. $\dfrac{x}{5} = \dfrac{x+6}{10}$

$10x = 5(x+6)$

$10x = 5x + 30$
$-5x \quad -5x$

$5x = 30$
$\boxed{x = 6}$

4. $-93 = 2(6x+1) + 1$

$-93 = 12x + 2 + 1$

$-93 = 12x + 3$
$-3 \qquad\qquad -3$

$-96 = 12x$
$\boxed{-8 = x}$

5. $\dfrac{x-1}{x+5} = \dfrac{2}{7}$ $\qquad x \neq -5$

$7(x-1) = 2(x+5)$

$7x - 7 = 2x + 10$
$-2x \qquad -2x$

$5x - 7 = 10$
$\quad +7 \quad +7$

$5x = 17$
$\boxed{x = \dfrac{17}{5}}$

6. $\dfrac{-x+4}{x-4} = 3$ $\qquad x \neq 4$

$-x + 4 = 3(x-4)$

$-x + 4 = 3x - 12$
$+x \qquad +x$

$\quad 4 = 4x - 12$
$+12 \qquad\quad +12$

$\dfrac{16}{4} = \dfrac{4x}{4}$

$\boxed{4 = x}$ but $x \neq 4$ $\boxed{\text{No solution}}$

7. $\dfrac{\overset{3}{\cancel{15}}x}{\cancel{5}} - \dfrac{2x \cdot \overset{5}{\cancel{15}}}{\cancel{3}} = 4 \cdot 15$

$15 \cdot \dfrac{x}{5} - \dfrac{2x \cdot 15}{3} = 4 \cdot 15$

$3x - 10x = 60$

$-7x = 60$

$\boxed{x = -\dfrac{60}{7}}$

8. $5[2 - 3(4+2x)] = -2(x-3)$

$5[2 - 12 - 6x] = -2x + 6$

$5[-10 - 6x] = -2x + 6$

$-50 - 30x = -2x + 6$
$\quad +30x \qquad +30x$

$-50 = 28x + 6$

$-56 = 28x$

$\boxed{-2 = x}$

Solve the following absolute value equations.

9. $|-8 + n| = 16$

$-8 + n = 16 \qquad -8 + n = -16$

$n = 24 \quad$ or $\quad n = -8$

10. $2|x + 7| - 3 = -9$
$\qquad\qquad +3 \quad\; +3$

$2|x + 7| = -6$

$|x + 7| = -3$

No solution ϕ

11. $9\left|\dfrac{p}{6}\right| = 3$

$\left|\dfrac{p}{6}\right| = \dfrac{3}{9}$

$\left|\dfrac{p}{6}\right| = \dfrac{1}{3}$

$\dfrac{p}{6} = \dfrac{1}{3} \quad$ or $\quad \dfrac{p}{6} = \dfrac{-1}{3}$

$p = 2$ or $p = -2$

12. $4|3 - 2y| = 52$

$|3 - 2y| = 13$

$3 - 2y = 13 \qquad$ or $\qquad 3 - 2y = -13$

$-2y = 10 \qquad\qquad\qquad -2y = -16$

$y = -5 \qquad\qquad\qquad\quad y = 8$

Solve and write your answer in _interval notation_. Then graph your solution.
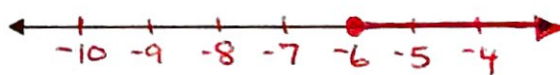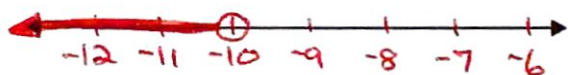
13. $x + 7 < -3$

$x < -10$

$(-\infty, -10)$

14. $-3(x + 4) \leq 6$

$x + 4 \geq -2$

$x \geq -6$

$[-6, \infty)$

15. $3x + 5 \neq 2$

$3x \neq -3$

$x \neq -1$

$(-\infty, -1) \cup (-1, \infty)$

16. $7 \leq x - 4 \leq -3$
$\quad +4 \qquad +4 \quad +4$

$11 \leq x \leq 1$

Not possible
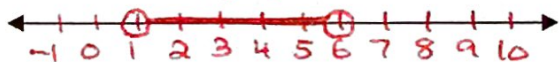
No solution.

17. $-2 < 3(x-1) - 2 < 13$

$-2 < 3x - 3 - 2 < 13$

$-2 < 3x - 5 < 13$
$+5 \qquad +5 \quad +5$

$\frac{3}{3} < \frac{3x}{3} < \frac{18}{3}$

$1 < x < 6$
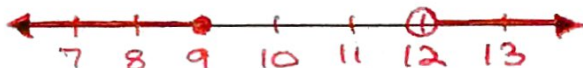
$(1, 6)$

18. $x - 4 \le 5$ or $3x > 36$

$x \le 9$ or $x > 12$

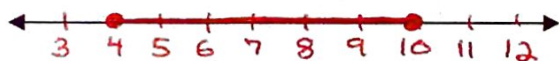$(-\infty, 9] \cup (12, \infty)$

Solve each absolute value inequality and write your answer in _interval notation_. Then graph your solution.

19. $|x - 7| \le 3$

$x - 7 \le 3$ and $x - 7 \ge -3$

$x \le 10 \qquad\qquad x \ge 4$

$[4, 10]$

20. $|n - 1| - 2 < -10$

$|n - 1| < -8$

No solution

21. $|n - 7| + 3 < 11$
$\; -3 \;\; -3$

$|n - 7| < 8$

$|n - 7| < 8$

$n - 7 < 8$ and $n - 7 > -8$

$n < 15 \qquad\qquad n > -1$

$(-1, 15)$
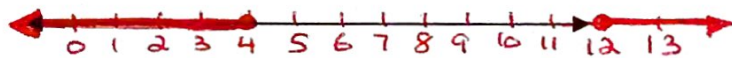

22. $\frac{|x-8|}{4} + 1 \ge 2$

$\frac{|x-8|}{4} \ge 1$

$|x - 8| \ge 4$

$x - 8 \ge 4$ or $x - 8 \le -4$

$x \ge 12 \qquad\qquad x \le 4$

$(-\infty, 4] \cup [12, \infty)$

23. Shaunna solved the math problem below, and wrote her answer in interval notation. Is Shaunna correct? Why or why not?

Her work is correct but her interval notation is not.

$x < 3$ or $-7x - 3 > 11$

$-7x > 14$

$x < -2 \qquad$ Answer: $(-\infty, -2) \cup (3, \infty)$

$x < -2 \qquad x < 3$ should be $(-\infty, 3)$

24. Solve for **h** and fill in the reasons (justify) for each step.

$$3(3h - 1) = 4(h + 3)$$ Original Statement

$$9h - 3 = 4h + 12$$ Distributive property

$$5h - 3 = 12$$ Subtraction prop of equality

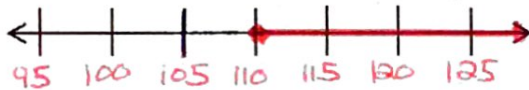$$5h = 15$$ Addition prop of equality

$$h = 3$$ Division prop of equality

25. *Tracie was really hot at her softball practice. She yelled, "It has got to be at least 110 degrees outside today!!!" First* **specify a variable**, *then* **write and graph** *an inequality to model this situation.*
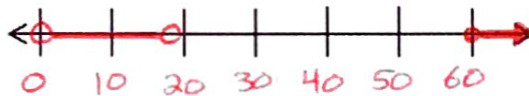
$x =$ outside temperature

Inequality: $X \geq 110$ $[110, \infty)$

95 100 105 110 115 120 125

26. *The football team is selling raffle tickets. To motivate more students to buy them, they're giving a discount to anyone who is under 18. They also want to give a discount to anyone 60 and older. First* **specify a variable**, *then* **write and graph** *an inequality to model this situation.*

$x =$ age of the buyer

$(0, 18)$ $[60, \infty)$

Inequality: $0 < x < 18$ or $x \geq 60$

0 10 20 30 40 50 60

27. *What are the excluded values for the equation below? Do not solve the problem.*

$$\frac{4}{x - 7} = \frac{8}{x + 11}$$

$x \neq 7, -11$

28. Simplify the expression by combining like terms:

$$-2x^2y + 14x^2 - 2y + 5x^2y - 6y - 3x^2 + y - 4x^2 + 3$$

$$3x^2y + 7x^2 - 7y + 3$$