

UNIT 2: Solving and Operations

Concepts:

- Linear equations and inequalities
- Absolute value equations and inequalities
- Rational exponents
- Radical equations
- Add, Subtract, Multiply, Divide Functions
- Composition of Functions
- Inverses

Solve each equation.

1. $4(x+2) - 7 = 13$
 $4x + 8 - 7 = 13$
 $4x + 1 = 13$
 $4x = 12$
 $x = 3$
2. $\frac{3x-6}{8} + 9 = 6$
 $\frac{3x-6}{8} = 3$
 $3x-6 = 24$
 $3x = 30$
 $x = 10$
3. $7x + 8 = 71 - 2x$
 $9x = 63$
 $x = 7$

4. (a) Write the formula for the perimeter of a rectangle: $P = 2l + 2w$

(b) Re-arrange the formula and solve for w (width): $w = \frac{P-2l}{2}$ or $w = \frac{1}{2}P - l$

Solve each inequality.

5. $\frac{8x+10}{-7} > 2$
 $8x+10 < -14$
 $8x < -24$
 $x < -3$
6. $-24 < 3x - 9 \leq 12$
 $-15 < 3x \leq 21$
 $-5 < x \leq 7$
7. $7x - 12 \leq 24 - 2x$
 $9x \leq 36$
 $x \leq 4$

Solve each absolute value equation or inequality. (Make sure to check for extraneous solutions)

8. $|-4 + 5x| = 16$
 $-4 + 5x = 16$ $-4 + 5x = -16$
 $5x = 20$ $5x = -12$
 $x = 4$ $x = -\frac{12}{5}$
 Check: $|-4 + 20| = 16$ $|-4 + (-\frac{12}{5})| = 16$
 $|16| = 16 \checkmark$ $|-16| = 16 \checkmark$
9. $3|-8x| + 8 = 80$
 $|-8x| = 24$
 $-8x = 24$ $-8x = -24$
 $x = -3$ $x = 3$
 Check: $3|24| + 8 = 80$ $3|-24| + 8 = 80$
 $72 + 8 = 80 \checkmark$ $72 + 8 = 80 \checkmark$
10. $\frac{|7x+4|}{8} = 3$
 $|7x+4| = 24$
 $7x+4 = 24$ $7x+4 = -24$
 $7x = 20$ $7x = -28$
 $x = \frac{20}{7}$ $x = -4$
 Check: $\frac{|20+4|}{8} = 3$ $\frac{|-28+4|}{8} = 3$
 $\frac{24}{8} = 3 \checkmark$ $\frac{-24}{8} = -3 \checkmark$
11. $|x-2| < 8$
 $x-2 < 8$ and $x-2 > -8$
 $x < 10$ and $x > -6$
 $-6 < x < 10$
12. $|x+5| - 6 \leq -5$
 $|x+5| \leq 1$
 $x+5 \leq 1$ and $x+5 \geq -1$
 $x \leq -4$ and $x \geq -6$
 $-6 \leq x \leq -4$
13. $9|3x-2| + 6 > 51$
 $|3x-2| > 5$
 $3x-2 > 5$ or $3x-2 < -5$
 $3x > 7$ $3x < -3$
 $x > \frac{7}{3}$ or $x < -1$

Simplify using the properties of exponents.

$$14. (x^2 x^4)^{\frac{1}{2}} \\ = (x^6)^{\frac{1}{2}} \\ = x^3$$

$$15. (2^3 3)^2 \\ = (8 \cdot 3)^2 \\ = 24^2 \\ = 576$$

$$16. \frac{x^{\frac{2}{3}}}{x^4} = x^{\frac{2}{3} - \frac{12}{3}} = x^{-\frac{10}{3}}$$

Re-write the following expressions using rational exponents.

$$17. \sqrt[5]{10} = 10^{\frac{1}{5}}$$

$$18. \sqrt[4]{x^7} = x^{\frac{7}{4}}$$

Write the expression in simplest form.

$$19. \sqrt{48} = 4\sqrt{3}$$

$$20. \sqrt[3]{27x^4} = 3x\sqrt[3]{x}$$

$$21. \sqrt{72x^2} = 6x\sqrt{2}$$

$$22. 4\sqrt[6]{7} - \sqrt[6]{7} = 3\sqrt[6]{7}$$

$$23. \sqrt[4]{32} \cdot \sqrt[4]{8} \\ = 2\sqrt[4]{2} \cdot \sqrt[4]{8} \\ = 2\sqrt[4]{16} \\ = 4$$

Solve each radical equation. Check for extraneous solutions.

$$24. 10 + \sqrt{10m-1} = 13 \\ \sqrt{10m-1} = 3 \\ 10m-1 = 9 \\ 10m = 10 \\ m = 1 \\ \text{check: } 10 + \sqrt{10-1} = 13 \\ 10 + \sqrt{9} = 13 \\ 13 = 13$$

$$25. 1 = \sqrt{x-5} \\ 1 = x-5 \\ 6 = x \\ \text{check: } 1 = \sqrt{6-5} \\ 1 = \sqrt{1} \\ 1 = 1$$

$$26. \sqrt[3]{x^2-1} = 2 \\ x^2-1 = 8 \\ x^2 = 9 \\ x = \pm 3 \\ \text{check: } x=3 \quad \sqrt[3]{9-1} = 2 \\ \sqrt[3]{8} = 2 \checkmark \\ x=-3 \quad \sqrt[3]{9-1} = 2 \\ \sqrt[3]{8} = 2 \checkmark$$

$$27. x = \sqrt{-70+17x} \\ x^2 = -70+17x \\ x^2-17x+70 = 0 \\ (x-10)(x-7) = 0 \\ x = 10, 7 \\ \text{check: } x=10 \quad 10 = \sqrt{-70+170} \\ 10 = \sqrt{100} \\ 10 = 10 \checkmark \\ x=7 \quad 7 = \sqrt{-70+119} \\ 7 = \sqrt{49} \\ 7 = 7 \checkmark$$

28. Find the inverse of the function $y=3x-2$.

$$x = 3y-2 \\ x+2 = 3y \\ y = \frac{x+2}{3}$$

$$19. \text{ Let } f(x)=4x-2 \text{ and } g(x) = \frac{x+2}{4} \\ f(g(x)) = 4\left(\frac{x+2}{4}\right) - 2 \\ = x+2-2 \\ = x \\ g(f(x)) = \frac{4x-2+2}{4} \\ = \frac{4x}{4} = x \\ \text{Are } f(x) \text{ and } g(x) \text{ inverses of each other?} \\ \text{Yes}$$