Intro to Solving Equations

An equation is like a balance. Each side is equal to the other.
In order for an equation to remain balanced, **what you do to one side you must also do to the other**.

Animals (seals, aardvarks, woodchucks and a couple elephants) are playing on the see-saws at the playground. Wow!

You notice the following animals balanced perfectly on each of the see-saws (forget about see-saw physics and animal behavior for a moment).

Group 1

Left side:	Right side:
1 Elephant, 6 seals	23 seals

1. How many seals equal one **Elephant**?

Group 2

Left side:	Right side:
4 Aardvarks, 7 Woodchucks	31 Woodchucks

2. How many woodchucks equal one **Aardvark**?

Group 3

Left side:	Right side:
13 Seals, 20 woodchucks	1 Elephant

3. How many **woodchucks** equal the weight of one **seal**?

4. Which weighs more - a **seal** or an **aardvark**?

Practice: Solve the following one-step equations.

1. $-2x = 14$

2. $a - 3 = -5$

3. $\dfrac{x}{3} = -9$

4. $\dfrac{3}{5}x = -12$

Solving Multi-Step Equations Algebra 2.2

Some Equations require more than one step to solve.
When solving **Multi-Step Equations**, work in **Reverse Order of Operations** to solve for the variable. This means you must **undo** addition and subtraction, then multiplication and division followed by what is left in parenthesis (or other grouped operations).

We will deal with exponents later.

Examples:

1. $2x + 4 = 18$
2. $5 + 3a = -19$
3. $\dfrac{-4b - 2}{7} = 2$

Practice:

1. $-3x + 5 = -7$
2. $7 - 3a = -5$
3. $\dfrac{3 - 7b}{8} = 3$

More Difficult Practice:

1. $\dfrac{3}{4}x - 5 = 1$
2. $-2(y - 3) = -12$
3. $\dfrac{a + 3}{4} - 2 = -7$

Writing and solving equations:
Define a variable, write an equation, and solve it:

Example:
Martin is seven years older than half Maria's age. If Martin is 15, how old is Maria?

Practice:
1. Phillip has three more than twice as many teeth as his grandpa. If Phillip has 27 teeth, how many does grandpa have?

2. In 2007, Joey Chestnut ate 12 less than twice as many hot dogs as Sonya Thomas in the Nathans Famous hot dog eating contest. Joey ate 66, how many did Sonya eat?

Variable on Both Sides

When solving an Equation with the Variable on Both Sides, you must move the variable so that it is only on one side of the equation.

Examples:

1. $2x + 8 = 5x - 19$

2. $5 - 3a = 9 + a$

Practice:

1. $5x = x - 8$

2. $3 - 4y = 2y + 9$

3. $2x - 5 = x - 11$

4. $\dfrac{x - 33}{2} = 6x$

Some equations require some work before you can move the variable.

More Difficult Examples:

1. $-3(2x - 6) = -15x$

2. $\dfrac{5 + a}{2} - 6 = a$

More Difficult Practice:

1. $2(5x - 4) = x + 1$

2. $\dfrac{21 - x}{2} = 7x$

3. $\dfrac{3x}{5} - 7 = x + 1$

4. $\dfrac{2x - 3}{7} = x + 1$

Solving Equations

Two Steps Practice. Solve for x.

1. $3x + 5 = 32$

2. $15 - 11x = -18$

3. $18 = 24 - 3x$

4. $\dfrac{x}{-6} + 4 = 7$

5. $20 = \dfrac{x - 15}{-3}$

6. $-\dfrac{3}{4}x + 10 = 16$

Both Sides Practice: Solve for x.

1. $5x - 7 = x + 1$

2. $\dfrac{1}{2}x + 3 = \dfrac{4}{5}x$

3. $\dfrac{3x + 12}{5} = x$

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

Two Steps Word Problem Practice.
Define a variable, <u>write an equation</u> and solve:

1. A rental company rents big-screen televisions for $22 down plus $4 a day. If the final bill is $46, how many days did you rent the television for?

2. At a factory, you can make 14 widgets per hour. If you already have fifteen widgets made, how many hours will it take you get up to 71 widgets?

3. You are buying a pair of jeans and several shirts at the store. If the jeans cost $40, and the shirts are $11 each, how many shirts can you buy if the total is $106?

Removing Fractions & Decimals   Algebra   2.2

Most students hate fractions.
Good news! They are easy to get rid of before you begin solving an equation!

Examples:

1. $\dfrac{2}{3}x + \dfrac{1}{2} = \dfrac{5}{12}x - \dfrac{1}{4}$ 2. $\dfrac{1}{5}x = \dfrac{2}{3}x - 2$

Practice:

1. $\dfrac{1}{4}x + \dfrac{1}{2} = \dfrac{3}{4}x - \dfrac{1}{8}$ 2. $\dfrac{2}{9}x - 2 = \dfrac{2}{3}x - \dfrac{1}{6}$

The same can be done with decimals!
This is not as common or necessary, but decimals can be removed as well with some simple multiplication.

Examples:

1. $2.1x + 4.35 = 4.5x - 2.85$ 2. $2x + 0.54 = 2.9x - 2.16$

Practice:

1. $3.5x + 1.5 = 2.1x - 2.7$ 2. $0.55 - 0.03x = 0.08x - 0.44$

Equations Review (5/7)

Easier Practice.
Solve for x. Check your work. Simplify Fractional Answers. **NO CALCULATOR. SHOW ALL WORK.**

1. $\dfrac{2}{7}x = -4$

2. $2.2x - 3.8 = 4.1x$

3. $3 - 2x = 7x$

4. $2.8x = 1.2x + 4.8$

5. $\dfrac{-2x}{3} - 4 = 8$

6. $1.3 - 1.1x = 4.6$

7. $\dfrac{3}{4}x + \dfrac{3}{4} = \dfrac{1}{4}x - 1$

8. $\dfrac{x-3}{2} = 5x$

9. $-3(5 - 2x) = 9$

10. $x + 17 = 4(x - 1)$

Equations Review (4)

Practice.
Solve for x. Check your work. Simplify Fractional Answers. **NO CALCULATOR. SHOW ALL WORK.**

11. $\dfrac{2}{5}x - 3 = 6$

12. $0.2x - 3.1 = 4.5$

13. $\dfrac{2x - 5}{3} = x$

14. $2.1(1.5x - 3) = 15.75$

15. $\dfrac{2x}{3} - 8 = 2x$

16. $1.1 - 2.3x = 5.7x + 1.9$

17. $\dfrac{x - 1}{3} = 2x - 7$

18. $\dfrac{1}{2}x - \dfrac{2}{3} = 3x + \dfrac{1}{12}$

19. $\dfrac{1}{2}x - 8 = \dfrac{2}{5}x - 4$

20. $\dfrac{x + 3}{2} = 4(x - 1)$

Equations Review (5/7)

Practice.
Solve for x.

11. $\dfrac{2x}{3} - 8 = 2x$

12. $1.1 - 2.3x = 5.7x + 1.9$

13. $\dfrac{x-1}{3} = 2x - 7$

14. $\dfrac{1}{2}x - \dfrac{2}{3} = 3x + \dfrac{1}{12}$

15. $\dfrac{1}{2}x - 8 = \dfrac{2}{5}x - 4$

16. $\dfrac{x+3}{2} = 4(x-1)$

17. $\dfrac{x-y}{a} = w$

18. $a(x-c) = d$

19. $\dfrac{cx-d}{g} = f$

20. $x(a+b) = y - z$

Equations Review

Solve for x:

1. $x - 12 = 2x + 4$

2. $x + 6 = 5x - 2$

3. $2(x - 9) = 5x$

4. $x - 7 = 5 - x$

5. $-2x + 3 = 4x - 9$

6. $-2(x - 8) = 2x$

7. $\dfrac{2}{3}x + 4 = -\dfrac{1}{3}x - 3$

8. $\dfrac{3x + 15}{2} = 5x$

9. $-5(x - 7) = -3(x - 1)$

10. $\dfrac{x - 2}{3} = x + 4$

11. $\dfrac{1}{4}x - 7 = \dfrac{2}{3}x + \dfrac{1}{2}$

12. $\dfrac{2}{9}a - \dfrac{2}{3} = 3 - \dfrac{1}{5}a$

Equations Review

Write an equation and solve:

13. Five more than twice a number is 11. What is the number?

14. Twice the sum of a number and six is equal to the product of the number and three.

15. Three more than four times a number is equal to nine less than twice the same number?

16. Four times the greater of two consecutive integers is equal to three times the lesser. Find the two integers.

Hint: If two numbers are consecutive and the first is 'x', then the second would be 'x+1'.

Solving Formulas

By now, you should be able to recognize the steps to take toward solving simple equations.

Examples:
What steps (in the correct order) would you take to solve for x?

1. $\dfrac{-2x+8}{5} = -91$

2. $-4(x-1)+7 = -38$

a. Multiply both sides by _____.
b. Subtract _____.
c. Divide by _____.

a. _____
b. _____
c. _____

You can apply similar steps to solve formulas.

Examples:
What steps (in the correct order) would you take to solve for x?

1. $\dfrac{ax + y}{b} = c$

2. $a(x - c) + b = y$

a. Multiply both sides by _____.
b. Subtract _____.
c. Divide by _____.

a. _____
b. _____
c. _____

Practice: Solve for x.

1. $ax - b = c$

2. $\dfrac{x}{a} - c = f$

3. $\dfrac{a - x}{w} = v$

4. $\dfrac{b + x}{cd} - a = y$

Solving Formulas

Solve for x:

1. $\dfrac{x-y}{c}=a$

2. $a(x-c)=d$

3. $\dfrac{bx}{y}-d=a$

4. $\dfrac{a}{b}(x-c)=y$

5. $\dfrac{a-x}{c+y}=d$

6. $ax-c=d-c$

7. $2x-y=x-ab$

Challenge: $\dfrac{ax-ab}{g}=d$

Solving Proportions

Practice:
Determine whether each pair of fractions are equal by making their denominators equal. Fill the blank with a >, < or =.

1. $\dfrac{4}{5} \underline{\hspace{1em}} \dfrac{5}{7}$

2. $\dfrac{6}{7} \underline{\hspace{1em}} \dfrac{7}{9}$

3. $\dfrac{8}{12} \underline{\hspace{1em}} \dfrac{6}{9}$

**If two fractions are congruent,
their cross products will always be equal.**

Practice:
In the following proportions, use cross-products to solve for the variable.
Simplify fractional answers.

1. $\dfrac{x}{15} = \dfrac{2}{5}$

2. $\dfrac{2x}{3} = \dfrac{3}{4}$

3. $\dfrac{x-1}{4} = \dfrac{1}{3}$

Example: Solve for x.

1. $\dfrac{2}{x-9} = \dfrac{5}{3x-1}$

Practice: Solve for x.

1. $\dfrac{1}{9} = \dfrac{x}{4}$

2. $\dfrac{5}{7} = \dfrac{3x}{2}$

3. $\dfrac{2+x}{7} = \dfrac{x-4}{5}$

More Difficult Practice. Solve for x. Simplify fractional answers.

1. $\dfrac{2.2}{x} = \dfrac{1.5}{x-1}$

2. $\dfrac{5}{7-2x} = \dfrac{10}{-4x-1}$

3. $4 = \dfrac{x}{3x-1}$

4. $\dfrac{7}{x-4} = 2\dfrac{1}{3}$

Proportion Equations Review Algebra 2.6+

Solve for x. Show all your work. Use Cross-Products and simplify fractional answers.

1. $\dfrac{3}{9} = \dfrac{x}{15}$

2. $\dfrac{3x}{8} = \dfrac{9}{12}$

3. $\dfrac{-5}{x} = \dfrac{1}{3}$

4. $\dfrac{10}{7} = \dfrac{5x}{14}$

5. $\dfrac{5}{9} = \dfrac{10}{x}$

6. $\dfrac{3x}{10} = \dfrac{12}{5}$

7. $\dfrac{-5x}{15} = \dfrac{1}{9}$

8. $\dfrac{-6x+1}{12} = 1\dfrac{1}{2}$

9. $5 = \dfrac{3x+1}{5}$

10. $\dfrac{14}{x+10} = -2$

11. $\dfrac{2}{5} = \dfrac{-3x-3}{30}$

12. $\dfrac{13}{4} = \dfrac{2x-15}{x}$

Proportion Equations Review

Write an equation, then solve. Show all your work.

1. The quotient of a number and 28 is ¾. What is the number?

2. Thirty divided by 4 is equal to the quotient of a number and eight. What is the number?

3. 24 divided by a number is equal to two-thirds. What is the number?

4. The product of 31 and x is equal to the sum of x and 150. Solve for x.

Solving Square Root Equations

Use **Inverse Operations** to solve equations.
Undo Addition with Subtraction.
Undo Multiplication with Division.
Undo a Square Root by Squaring.

Examples: Solve for x.

$$\sqrt{x}=11 \qquad\qquad \sqrt{x-1}=5 \qquad\qquad \sqrt{x}+6=10$$

Before you can square both sides, you must **Isolate the Radical**.
The radical sign is another grouping symbol. Undo everything else before squaring both sides.

More Examples: Solve for x.

1. $\sqrt{x}+2=10$ 　　　2. $\sqrt{x-7}=16$

3. $-\sqrt{11x-5}=-7$ 　　4. $5\sqrt{3x}=45$

Practice: Solve for x.

1. $\sqrt{5x-7}=16$ 　　　2. $2\sqrt{x}+5=11$

3. $-\sqrt{\dfrac{1}{3}x-5}=-2$ 　　4. $-5\sqrt{18x}+4=-11$

Challenge: Solve for x.

1. $\dfrac{3\sqrt{x}-2}{5}=2$ 　　　2. $\dfrac{2}{9}=\dfrac{6}{\sqrt{x}+2}$

Square Root Equations Review Algebra   2.7+

Solve: Isolate the radical. Square Both Sides. Solve.

1. $\sqrt{x} = 12$

2. $\sqrt{2x} = 5$

3. $\sqrt{x+7} = 9$

4. $\sqrt{4x} + 2 = 10$

5. $2\sqrt{3x} = 12$

6. $-2\sqrt{x+6} = -12$

7. $\dfrac{2}{3}\sqrt{9x} = 8$

8. $\dfrac{\sqrt{9x}}{3} = 5$

9. $\sqrt{16x} - 7 = 13$

10. $-5\sqrt{-20a} + 7 = -43$

11. $7\sqrt{-3x} = 42$

12. $\dfrac{2}{5}\sqrt{x+3} = 8$

13. $\dfrac{\sqrt{4x}}{15} = \dfrac{2}{5}$

14. $\dfrac{\sqrt{-4x}}{8} = \dfrac{3}{6}$

Square Root Equations Review   Algebra   2.7+

Write an equation and solve:

15. Five more than the square root of a number is 11. What is the number?

16. Five times the greater of two consecutive integers is equal to 21 more than the lesser. Find the two integers.

Hint: If two numbers are consecutive and the first is 'x', then the second would be 'x+1'.

17. The shortest side of a triangle is 7 inches shorter than the longest side. The middle side is twice as long as the short side. Find the length of all three sides if the perimeter is 31 inches.

18. Four times the square root of a number is 18. What is the number?

Absolute Value Equations

Examples: Solve for x.

$$|x| = 5$$ There are two solutions: 5 and -5

Name the two solutions to each equation (or write NO SOLUTION):

$$|x| = 11 \qquad |x| = 13 \qquad |x| = -3 \qquad |x| + 2 = 6$$

As in square root equations, you must **Isolate the Absolute Value** before giving two solutions:

More Examples: Solve for x.
Name the solutions to each equation:

$$|x| + 5 = 11 \qquad -3|x| = -30 \qquad 5|x| - 9 = 1$$

Sometimes you need to finish AFTER setting up two equations:
More Examples: Solve for x.
Name the solutions to each equation:

$$|x + 3| + 5 = 11 \qquad -3|2x| = -30 \qquad 5\left|\frac{x-1}{2}\right| - 9 = 1$$

Practice: Solve for x.

1. $|2x - 3| = 15$ 2. $-3|x + 2| = -24$ 3. $-5\left|\frac{x-11}{5}\right| + 7 = -23$

Absolute Value Equations

Algebra   2.7+

Solve: Each problem (#1-12) will have two solutions.

1. $|x| = 12$

2. $|2x| = 5$

3. $|x - 7| = 9$

4. $|2x - 3| = 15$

5. $2|x + 1| = 20$

6. $-2|4x - 2| = -12$

7. $\dfrac{2}{5}|5 - x| = 8$

8. $\dfrac{|9x|}{3} = 12$

9. $|-2x| - 7 = 13$

10. $-5|3x| + 5 = -35$

11. $\dfrac{4}{2|x - 2|} = \dfrac{2}{9}$

12. $\dfrac{5 - |x|}{2} = \dfrac{3}{5}$

Challenge. $|x + 3| = 2x$

Quiz Review

Basic Equations:

Practice. Solve for x.

100. $9 - 3x = x + 1$

200. $a - d = \dfrac{x - y}{c}$

300. $\dfrac{1}{2}x + 2 = \dfrac{2}{3}x - 5$

500. $\dfrac{x + 2}{2x - 3} = 1\dfrac{1}{4}$

Square Roots Equations:

Practice. Solve for x.

100. $2\sqrt{x - 1} = 14$

200. $\dfrac{\sqrt{2x - 5}}{3} = 3$

300. $\dfrac{-2\sqrt{x} + 5}{3} = -5$

500. $a\sqrt{x + c} - b = d$

Absolute Value Equations:

Practice. Solve for x.

100. $2|x| = 12$

200. $3|2x + 6| = 12$

300. $\dfrac{|2 - x| - 5}{2} = 1$

500. $-2\left|\dfrac{1}{5}x + \dfrac{2}{3}\right| + 9 = 3$

Practice Quiz : Concepts

Algebra   2.7+

Solve for x: SIMPLIFY all fractional answers. WRITE INFINITE OR NO SOLUTIONS where applicable.

1. $\dfrac{x-1}{2} = -3$

1. x=_____

2. $3x - 5 = 7 + x$

2. x=_____

3. $\dfrac{2x}{3} = \dfrac{3x-1}{5}$

3. x=_____

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

4. x=_____

5. $-17 = 2x - 11$

5. x=_____

6. $-3(2x-6) = -2(3x-9)$

6. x=_____

7. $\dfrac{2}{7} = \dfrac{3}{x-2}$

7. x=_____

8. $3 - (x-12) = 3x$

8. x=_____

Practice Quiz : Concepts

**Solve for x: SIMPLIFY all fractional answers. WRITE INFINITE OR NO SOLUTIONS
where applicable.**

9. $\dfrac{x - c}{b} = y$

9. x=_____

10. $xy + a = c$

10. x=_____

11. $9 = \sqrt{x - 3} + 5$

11. x=_____

12. $-2\sqrt{8 - 2x} = -12$

12. x=_____

13. $3|x| - 5 = 9$

13. x=_____or_____

14. $2|x - 3| = 8$

14. x=_____or_____

15. $\dfrac{|x - 3|}{2} - 3 = 8$
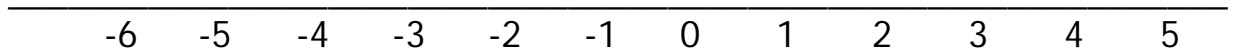
15. x=_____or_____

Solving Simple Inequalities

Solve Inequalities just as you would Equations.
There is ONE DIFFERENCE you must remember:
Whenever you MULTIPLY or DIVIDE both sides by a negative,
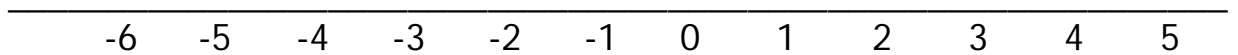REVERSE THE DIRECTION OF THE > or <.
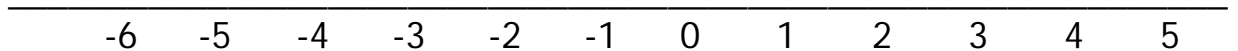
Examples:

1. $6 \le -2x - 2$

2. $\dfrac{11-x}{3} > 5$

3. $-\dfrac{3}{4}x > 9$

```
_____
   -6    -5    -4    -3    -2    -1    0    1    2    3    4    5
```

Practice:

1. $4 \le x + 10$

2. $\dfrac{-5x+1}{3} \le 7$

3. $2(12 - 3x) > -6$

```
_____
   -6    -5    -4    -3    -2    -1    0    1    2    3    4    5
```

Practice: Fractions.

1. $4 \le \dfrac{1}{2}x$

2. $2\dfrac{5}{6} \le x + \dfrac{1}{3}$

3. $4 \ge \dfrac{1}{2} - \dfrac{2}{3}x$

```
_____
   -6    -5    -4    -3    -2    -1    0    1    2    3    4    5
```

Challenge: Proportions. $\dfrac{2x+1}{3x} < \dfrac{5}{9}$ Check your answer <, >.

Solving Compound Inequalities

Compound Inequalities:

Ex.

$15 > 3x > -6$ In this compound inequality, 3x is less than 15 but greater than -6. Solve each separately.
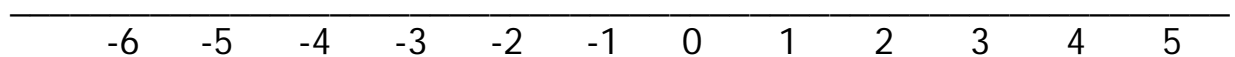
$$15 > 3x \qquad\qquad 3x > -6$$

The answer is written: $5 > x > -2$

AND/OR Compound Inequalities.
Graph each of the following on a number line (separately).

1. $5 > x > -2$ 2. $5 < x \le -2$

-6	-5	-4	-3	-2	-1	0	1	2	3	4	5

The word **AND** is used to show where two graphs overlap (where both parts are true).
The word **OR** is generally used when there is no overlap (two parts can't both be true).

Examples: Solve and graph.

1. $9 > \dfrac{2}{3}x + 1 \ge -5$ 2. $x > 2x - 2$ **or** $2x - 3 > 7$

Practice:

1. $7 > 2x - 3 \ge -5$ 2. $2x > x + 2 < 2$

3. $-6 > -2x$ **or** $x - 5 < -7$ 4. $\dfrac{x+4}{3} > 8$ **or** $-2(x-1) > x - 1$

Absolute Value Inequalities

Absolute Value Inequalities
Like equations, absolute value inequalities have two solutions.

Ex.

$|x| > 8$ Think of some possible values for x that make this true.

               x is either _____ than 8 or _____ than _____.

$|x| \leq 3$ Think of some possible values for x that make this true.

               Write the solution set: _____

Ex.

$|3x| > 6$ In this inequality, 3x could be greater than 6 OR
               3x could be less than -6. (If you don't see why, ASK!)

               Setup two inequalities. $3x > 6$ $3x < -6$

               Write the answer as a compound inequality.

ISOLATE THE ABSOLUTE VALUE FIRST then setup 2 inequalities.
Examples:

1. $-8|x-1| + 2 > -30$ 2. $\dfrac{|2x-4|}{3} \leq 2$

Practice:

1. $-3|2x-3| \geq -9$ 2. $-3|2x| + 5 > 2$

3. $-6 > |-2x| - 11$ 4. $2\left|\dfrac{x+4}{3}\right| + 3 > 17$

Solving Inequalities Review

Simple Inequalities:

Practice. Solve. Sketch a graph for each.

100. $8 - 2x \geq x - 4$

200. $-9 < \dfrac{2}{3}x - 4$

300. $\dfrac{1}{2}x + 2 < \dfrac{2}{3}x - \dfrac{1}{5}$

500. $\dfrac{x + 2}{2x - 6} > \dfrac{1}{4}$

Absolute Value Inequalities:

Practice. Solve. Write answers using AND or OR.

100. $\left| -3x \right| > 9$

200. $\left| \dfrac{2}{3}x \right| \leq 6$

300. $-\dfrac{\left| 6 - x \right|}{2} \geq -4$

500. $\dfrac{\left| -2x + 1 \right|}{2} \geq 1\dfrac{1}{3}$

Compound Inequalities:

Practice. Solve. Sketch a graph for each.

100. $2x \geq 12$ or $-2x + 6 > 4$

200. $-4 < 2x + 6 \leq 10$

300. $x + 4 \geq 2 - x < 12$

500. $-2 < \dfrac{2}{3}x + \dfrac{1}{4} > 2x$

Practice Quiz (4)

Solve for x: Solve the following EQUATIONS.

1. $\dfrac{3x - 3}{5x} = \dfrac{2}{3}$

1. x=_____

2. $2x - 5 = 2$

2. x=_____

3. $15 = 5\sqrt{2x + 1}$

3. x=_____

4. $-2\sqrt{x + 7} = -4$

4. x=_____

5. $-3|x - 2| + 8 = -4$
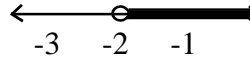
5. x=_____or_____

6. $2|x - 3| = 8$

6. x=_____or_____

7. $\dfrac{5(x - 2)}{4} = 10$

7. x=_____

Practice Quiz (4)

**Solve for x: Solve the following INEQUALITIES.
WRITE AND GRAPH YOUR ANSWER. ex: x>-2**

$$-3 \quad -2 \quad -1$$

CIRCLE AND or OR for #11-14

8. $\dfrac{x-3}{2} > -5$

8. _____ _____

9. $-3x+7<-5$

9. _____ _____

10. $-3 \le \dfrac{5-x}{2}$

10. _____ _____

Use a separate sheet for work:

11. $x < 2x - 6 \le 4$

11. _____ and/or _____ _____

12. $2x \le \dfrac{x-3}{2} > 5$

12. _____ and/or _____ _____

13. $-3 > x + 7$ or $5x > 12 - x$

13. _____ and/or _____ _____

14. $x < -2(x-1) \ge 2$

14. _____ and/or _____ _____

Practice Quiz (5,7)

Solve for x: Solve the following EQUATIONS.

1. $\dfrac{3x-3}{5x} = \dfrac{2}{3}$

1. x=_____

2. $ax - b = d$

2. x=_____

3. $15 = 5\sqrt{2x+1}$

3. x=_____

4. $-2\sqrt{x+7} = -4$

4. x=_____

5. $-3|x-2| + 8 = -4$

5. x=_____or_____

6. $\dfrac{2|x-3|}{3} = 8$

6. x=_____or_____

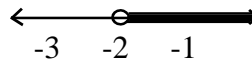7. $\dfrac{x(b-c)}{d} = a$

7. x=_____

Practice Quiz (5,7)

Solve for x: Solve the following INEQUALITIES.
WRITE AND GRAPH YOUR ANSWER. ex: x>-2

-3   -2   -1

CIRCLE AND or OR for #11-14

8. $\dfrac{x-3}{2} > -5$

8. _____ _____

9. $-3x+7<-5$

9. _____ _____

10. $-3 \le \dfrac{5-x}{2}$

10. _____ _____

Use a separate sheet for work:

11. $|x|-5<3$

11. _____ and/or _____ _____

12. $2x \le \dfrac{x-3}{2} > 5$

12. _____ and/or _____ _____

13. $-3 > x+7$ or $5x > 12-x$

13. _____ and/or _____ _____

14. $-2|x-1|+10 \ge 2$

14. _____ and/or _____ _____

Geometric Word Problems

Triangles and their angles.
Use to solve the following: The sum of the angles in a triangle will always equal 180 degrees.

Ex: The measure of the smallest angle in a triangle is half the measure of the largest angle. The largest angle is 15 degrees greater than the medium angle. List the measures of all three angles.

Practice:
1. A triangle's smallest angle is 55 degrees smaller than its largest angle. The middle angle is 5 degrees larger than the smallest angle. What are the measures of all three angles?

2. Of the two smaller angles in a right triangle, one measures twice as large as the other. What are the three angle measures?

3. The smallest angle in a triangle is only one-third as large as the middle angle. The largest angle is eight times the sum of the two smaller angles. Find all three measures.

Area and Perimeter Problems.
Perimeter is the distance around a figure (add all sides).
Area of a rectangle equals base times height (length times width).

Ex. The length of a rectangle is five inches greater than its width. The perimeter of the rectangle is 38 inches. What is the area of the same rectangle?

Practice:
1. What is the area of a rectangle whose length is three inches more than twice its width if the perimeter is 36 inches?

2. What is the area of a rectangle if the width is five centimeters less than half the length, and the perimeter is 32 centimeters?

3. In a scalene triangle, the short side is half the longest side and the middle side is two inches longer than the shortest side. Find the lengths of all three sides if the perimeter is 22 inches.

Challenge: An equilateral triangle and a rectangle have the same perimeter. The width of the rectangle is three inches longer than the sides of the triangle. If the rectangle is 8 inches tall, what is its area?

Geometry Word Problems

Algebra   2.5+

Sketch, write an equation, and solve:

1. The smallest angle in a triangle is ten degrees smaller than the medium angle, and the largest angle is ten degrees more than twice the medium angle. What are the angle measures in the triangle?

equation:_____

solutions:_____ _____ _____

2. Two congruent angles in an isosceles triangle are nine degrees smaller than the larger angle. What is the measure of the two congruent angles?

equation:_____

solution:_____

3. In a pentagon, the sum of the angles is 540°. If all five angles are congruent, what is the measure of each angle?

equation:_____

solution: _____

4. The largest angle in an obtuse scalene triangle is three degrees greater than three times the smallest angle. If the medium angle is 57°, what are the measures of the other two angles?

equation:_____

solutions: _____ _____

5. The largest angle in a pentagon is 4 degrees greater than the next largest, which is 3 degrees greater than the next largest, which is 2 degrees larger than the next, which is one degree larger than the smallest angle. What are the five angles? (See #3 for more info.)

equation:_____

solutions: _____ _____ _____ _____ _____

Geometry Word Problems

Sketch, <u>write an equation</u>, and solve:

6. A rectangle's length is 19 inches greater than its width. If the perimeter is 50 inches, what is the area of the rectangle?

equation:_____

solution:_____

7. The perimeter of a rectangle is 52cm. If the width is 1cm less than twice the length, what is the length of the short side of the rectangle?

equation:_____

solution:_____

8. The perimeter of a pentagon is 58 inches. If three of its sides measure 9 inches, and one of the remaining two sides is five inches longer than the other, what is the length of its longest side?

equation:_____

solution:_____

9. The height of a rectangle is nine inches less than its perimeter and the width of the same rectangle is 6 inches less than its perimeter. What is the area af the rectangle?

equation:_____

solution:_____

10. A square and a rectangle share the same perimeter. If the height of the rectangle is twice the height of the square, and the length of the rectangle is three inches less than half the length of the square, what is the area of the square?

equation:_____

solution:_____

Word Problems

Numbers and 'Consecutive Integer' Problems:
Define a variable and solve:

Ex: The sum of two consecutive integers is 79.
What are the two integers?

Ex: The sum of two integers is 44. The difference of the same
integers is 18. What are the integers?

Practice:
1. The sum of two consecutive integers is 51.
What are the integers?

2. The sum of two consecutive **odd** integers is 24.
What is the product of the same two integers?

3. I am thinking of three numbers whose sum is 31. The first number
is three less than the second and the third number is twice the first.
What are the three numbers?

Equal Amounts:
You can write an equation comparing two values that are equal.

Ex: John and Marge both paid the same amount for their taxi rides, but
John went 2 miles farther than Marge. John's taxi charged a $2 fee plus
$.50 per mile, and Marge's taxi charged a $5 fee plus $.25 a mile. How
far did Marge ride in her taxi?

Ex: Nora flies her plane from NY to Chicago into the wind at 160mph,
then flies back with a tailwind at 200mph. If it took an hour longer to go
than to come back, how far apart are NY and Chicago? (hint: d=rt)

Practice: THINK! Set-up two equations that are equal.

1. Julia can run 2mph faster than Nikhita. Nikhita takes 2 hours to finish
the race, while Julia finishes in 90 minutes. (hint: Units matter.)
a. How fast does Julia run?   b. How far did they run?

2. Mark and Robert are both driving to Orlando. Mark leaves at 9am and
averages 60mph, while Robert leaves an hour later but drives 70mph.
a. At what time does Robert pass Mark on the highway.
b. How many miles have each driven when Robert passes Mark?

Two Numbers Word Problems   `Algebra    2.5+`

Write an equation and solve:

1. The sum of two numbers is 9 and their difference is 7.
    What are the two numbers?

equation:_____

solutions:_____ _____

2. The sum of two consecutive integers is 55. What is the smaller of the two numbers?

equation:_____

solution:_____

3. One number is equal to six more than five times another number. If the sum of the two numbers is twelve, what it the product of the two numbers?

equation:_____

solution:_____

4. The sum of three consecutive odd integers is -3. What are the integers?

equation:_____

solutions: _____ _____ _____

5. Challenge. I am thinking of two numbers. The first number is 19 less than three times the second. The second number is 8 more than twice the first. What are the two numbers?

equations:_____

_____

solutions: _____ _____

Equal Amounts Word Problems   Algebra   2.5+

Write an equation and solve:

6. Kelly and Kate each spent the same amount buying fruit. Kelly bought five pears and an apple, while Kate bought two pears and three apples. If apples cost $0.45, how much do pears cost?

equation:_____

solution: _____

7. Hannah and Rachel scored the same number of points on a test. Hannah got 5 of the 10-point questions right and 3 of the other questions correct. Rachel got just one of the 10-point questions right, but 11 of the other questions correct. How much were the other questions worth?

equation:_____

solution:_____

For the last three problems, use the formule d=rt (distance equals rate x time). Rate means 'speed'. In each problem, find two distance equations that are equal.

8. Deepthi and Austin were in a race. Deepthi gave Austin a 3-second head start, and they crossed the finish line at the same time. If Deepthi runs 8 meters per second and Austin runs 7 meters per second, how many meters long was the race?

equation:_____

solution:_____

9. Demetri rode his bike to Caleb's house. On the way there, he went up a lot of hills and averaged only 12 miles per hour. On his way home it was mostly downhill and he averaged 18 miles per hour. If it took a half hour longer to go than to come back, how far is it from Demetri's house to Caleb's house?

equation:_____

solution: _____

10. Allison and Mason each leave Ligon at the same time to walk to El Rodeo restaurant. Allison walks 3 miles an hour and arrives 15 minutes before Mason, who walked 2 miles an hour. How far away is El Rodeo?

hint: distance = speed(time) ... d=rt

equation:_____

solution:_____

Word problems: Inequalities.
Simple:
Ex: The Ligon Student Council is organizing a fundraiser to raise money for Cancer research. There are 58 homerooms, and they have already received a contribution of $1,000 from the PTA. How much money does each homeroom have to collect in order to guarantee a total of <u>at least</u> $8,250?

Compound:
Ex. Robert has $5 more than twice as much in his wallet as David has. If Robert has between $7 and $15, how much does David have?

Practice: Write an inequality for the following.
1. In order to make the state track finals, Connor has to beat his time from last year by at least 6 seconds. Last year he ran the quarter-mile in 67 seconds. Write and solve a simple inequality to represent the time he needs to run this year.

2. The width of a rectangle is three inches greater than half the length. Write a compound inequality to represent the length if the width is between 8 and 11 inches.

Challenge: Write a compound inequality to represent both the area (a)
        and perimeter (p) of the rectangle described above.

Real-life absolute value inequalities.

Ex: Write an equation for the following: Mapquest states that the drive from here to Orlando will take 11½ hours, give or take an hour. Write an inequality for this using absolute value.
This is saying that the POSITIVE difference between your drive time and 11.5 hrs is < 1 hr.

Practice: Write an absolute value inequality for the following.
1. Tomorrow's high temperature will be within three degrees of 68°.

2. The governor's favor ability rating is 57%. The margin of error in the poll is +/- 3%.

Challenge: Between 60% and 80% of Americans stink at writing absolute value inequalities. (Hint: Think of this as a margin of error problem like the one above.)

Inequality Word Problems

Algebra 2.5+

Simple Inequalities
Write an inequality and solve:

6. Anna needs to save at least $200 in the next 8 months so that she can have enough to spend on her trip to Europe. She has $48 saved already. How much does she need to save each month to make sure that she will have enough spending money?

inequality:_____

solution: _____

7. Carly is driving to Baltimore. She leaves at noon and needs to arrive before 8pm. If the entire trip is 416 miles, how fast must she average on the way there?

inequality:_____

solution: _____

8. Nicole is getting married and needs to figure out how many people she can afford to invite. The cost per guest is $40 including dinner, and the location she has picked out costss $1,250 to rent. If she wants to spend no more than $4,800 on her wedding, how many guests can she afford to invite?

inequality:_____

solution: _____

9. Tyreese is the quarterback on his football team and needs to pass for at least 2,250 yards to break the record for his league. So far he has thrown for 1,410 yards. If there are 6 games left in the season, how many yards does he need to throw for in each game to guarantee he will break the record?

inequality:_____

solution: _____

10. Parker is 19 months old and growing really fast. He now weighs 28 pounds. His parents don't want him to be obese, so he should weigh less than 31 pounds at age 2. How many pounds can he gain per month?

inequality:_____

solution: _____

Inequality Word Problems   Algebra   2.5+

Simple Inequalities
Write an inequality and solve:

1. Between 14 and 20 percent of Americans surveyed have blue eyes. This number is only three percent more than half what it was 100 years ago. What percent of Americans had blue eyes 100 years ago?

compound inequality:_____

solution: _____

2. The human body contains about 18 times as many bacteria cells as human cells. If estimates range from 540 to 900 trillion bacterial cells in the body, how many human cells are in a typical person (in trillions)?

compound inequality:_____

solution: _____

3. Zach is learning to ride a bicycle. When his parents decide to help him buy a bike, they offer to pay $100 towards the purchase, plus they will match whatever amount he spends of his own money. The bikes Ethan like all cost between $230 and $450. How much will Ethan need to spend of his own money to buy a bike he wants?

compound inequality:_____

solution: _____

4. Every week, Taha does between 875 and 1,050 pushups. If he does the same number of pushups each day every week, how many does he do each day?

compound inequality:_____

solution: _____

5. To convert from Celsius degrees to Fahrenheit, you multiply the Celsius temperature by nine-fifths and then add 32. If the high temperature for tomorrow is going to be greater than 68 but less than 77 degrees Fahrenheit, what will the temperature be in Celsius?

compound inequality:_____

solution: _____

Test Review (5, 7)

Solve:

1. The largest angle in a triangle is twice the measure of the smallest, and the medium angle is twenty-five degrees smaller than the largest angle. What is the measure of the middle angle?

equation:_____

solution: _____

2. The length of a rectangle is six inches less than half its height. If its perimeter is 36 inches, what is its area?

equation:_____

solution: _____

3. Danica's last five math scores have all been at least 84 but no more than 96. Ashley's scores have always been ten points more than twice Paula's scores. Write and solve a compound inequality to represent Paula's scores.

compound inequality:_____

solution: _____

4. One number is three more than half another number. The sum of the numbers is 15. Find their product.

equation:_____

solution: _____

5. The gas tank in Mr. Batterson's car is three gallons larger than the tank in his wife's hybrid SUV. The car gets 24 miles per gallon, but the SUV gets 30 miles per gallon. If the two vehicless can go the same distance on a tank of gas, how many miles can each go on a full tank?

equation:_____

solution: _____

6. Jack spends all of his allowance every week on candy. Last week he bought 3 candy bars and spent the remaining $2.75 on gum. This week he bought five candy bars and had $1.25 left for a big bag of Skittles. How much allowance does Jack get every week?

equation:_____

solution: _____

Test Review (5, 7)

Algebra   2.5+

Mixed Review: Solve the following. Simplify Fraction answers.

Absolute Value Equations:

7. $-2|x-7|-1=-7$

8. $2-3|-3x|=-7$

Absolute Value Inequalities: Graph each answer on a number line.

9. $\dfrac{|x-7|}{3}>9$

10. $2+5|x-1|\le 12$

Radical Equations: Graph each answer on a number line.

11. $-2\sqrt{3x-7}=-16$

12. $\dfrac{4\sqrt{x-1}}{3}=8$

Proportions:

13. $\dfrac{-x-7}{5}=\dfrac{-2x+4}{4}$

14. $4=\dfrac{3}{x-2}$

Formulas:

15. $a^2=\dfrac{cx+b}{d}$

16. $a(x+b)=c$

Compound Inequalities: Graph each answer on a number line.

17. $7>\dfrac{12-x}{5}\ge x$

18. $\dfrac{2}{3}<\dfrac{1}{2}x-\dfrac{5}{6}<\dfrac{4}{5}$

Test Review (4)

Solve:

1. The largest angle in a triangle is twice the measure of the smallest, and the medium angle is twenty-five degrees smaller than the largest angle. What is the measure of the middle angle?

equation:_____

solution: _____

2. The length of a rectangle is six inches less than half its height. If its perimeter is 36 inches, what is its area?

equation:_____

solution: _____

3. Paul could lift a lot more before he hurt his leg. Now he can only lift 20 pounds more than half of what he used to lift. If he can lift 150 pounds now, how much could he lift before he injured himself?

inequality:_____

solution: _____

4. One number is three more than half another number. The sum of the numbers is 15. Find their product.

equation:_____

solution: _____

5. Jasmine needs to collect $40 to buy the costume accessories she wants for Hallow-een. She has collected $12 so far. If she sells candy corn for $0.70 a bag, how many bags does she need to sell if she wants to raise enough money for Haloween?

equation:_____

solution: _____

6. Julian spends all of his allowance every week on candy. Last week he bought 3 candy bars and spent the remaining $2.75 on gum. This week he bought five candy bars and had $1.25 left for a big bag of Skittles. How much allowance does Julian0
3.
 get every week?

equation:_____

solution: _____

Test Review (4)

Mixed Review: Solve the following. Simplify Fractional answers.

Multi-Step:

7. $\dfrac{x-2}{5} = 14$

8. $2(5-x) = -12$

Absolute Value Equations:

9. $-2|x-7|-1 = -7$

10. $2 - 3|-3x| = -7$

Radical Equations:

11. $-2\sqrt{3x-7} = -16$

12. $\dfrac{4\sqrt{x-1}}{3} = 8$

Proportions:

13. $\dfrac{-x-7}{5} = \dfrac{-2x+4}{4}$

14. $4 = \dfrac{3}{x-2}$

Compound Inequalities: Graph each answer on a number line.

15. $7 > \dfrac{12-x}{5} \geq x$

16. $\dfrac{2}{3} < \dfrac{1}{2}x - \dfrac{5}{6} < \dfrac{4}{5}$

Both Sides:

17. $3x-5 = 5x-11$

18. $3 - x = x - 15$

Practice Test (5, 7)

Solve for x: Simplify fractional answers.

1. $\dfrac{2x-3}{5} = -3$

1. x=_____

2. $5x-3=x+7$

2. x=_____

3. $\dfrac{5}{6} = \dfrac{x-5}{3x}$

3. x=_____

4. $2\sqrt{x-11}=4$

4. x=_____

5. $-2|x+2|+8 = -4$

5. x=_____or_____

6. $\dfrac{y+cx}{d} = a$

6. x=_____

Solve for x: graph your answer on the number line..

7. $-4(x-3) > 5x$

7. _____

8. $2|-5x| - 8 \le 12$

8. _____

9. $-12 < \dfrac{x-9}{2} > 5x$

9. _____

Practice Test (5, 7)

Write an equation/inequality and solve:

10. The sum of two integers is 45 and the difference between the same two numbers is 11. What is the greater of these two integers?

equation:_____

solution: _____

11. In the morning Alexis rides the bus to school averaging 30mph but on the way home (along the same route) in traffic and with stops the bus averages just 20mph. If it takes a half-hour longer to ride home than to ride to school, how far does she ride on the bus each way to school?
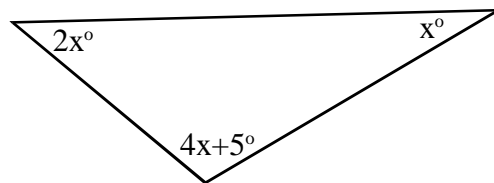
equation:_____

solution:_____

12. The perimeter of a rectangle is 62cm. If the height is two inches less than twice the width, what is the area of the rectangle?

equation:_____

solution:_____

13. What is the measure of the largest angle in the triangle below?

$2x°$ $x°$

$4x+5°$

equation:_____

solution:_____

14. Mr. Lyons runs between 21 and 35 miles every week (7 days) along the same paths. If he changes his route so that every day he runs an extra mile, how many miles will he run every **day**. Both the equation and the solution should be in the form of a compound inequality. (ex. _-7<2x+3<25_ and -5<x<11)

equation:_____

solution:_____

Practice Test (4)

Solve for x: Simplify fractional answers.

1. $3 - x = 14$

1. x=_____

2. $5x = 2x - 21$

2. x=_____

3. $\dfrac{2x - 3}{5} = -3$

3. x=_____

4. $5x - 3 = x + 7$

4. x=_____

5. $\dfrac{5}{6} = \dfrac{x - 5}{3x}$

5. x=_____

6. $2\sqrt{x - 11} = 4$

6. x=_____

7. $-2|x + 2| + 8 = -4$

7. x=_____or_____

8. $\dfrac{2 - 3x}{5} = x$

8. x=_____

Solve for x: graph your answer on the number line.

9. $4(x - 3) > 5x$

9. _____

10. $\dfrac{3 - x}{2} \le 7$

10. _____

Practice Test (4)

Write an equation/inequality and solve:

10. The sum of two integers is 45 and the difference between the same two numbers is 11. What is the greater of these two integers?

equation:_____

solution: _____

11. The sum of consecutive odd integers is -28. What is the greater of these two integers?
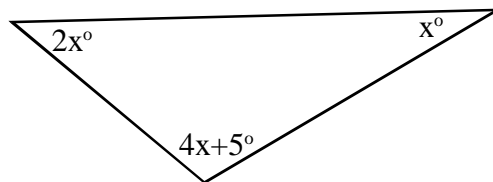
equation:_____

solution:_____

12. The perimeter of a rectangle is 62cm. If the height is two inches less than twice the width, what is the area of the rectangle?

equation:_____

solution:_____

13. What is the measure of the largest angle in the triangle below?

equation:_____

solution:_____

14. Cameron is saving to buy his favorite video game system. He has saved $120 so far. If he saves $15 a week, how many weeks will it take before he has enough to buy the $300 game system?

equation:_____

solution:_____