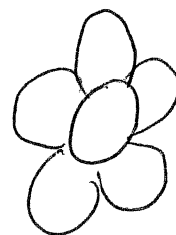
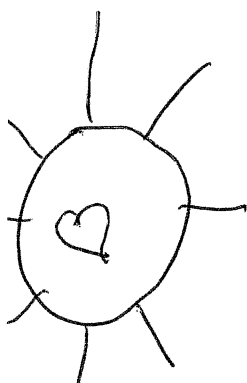


Grade 7



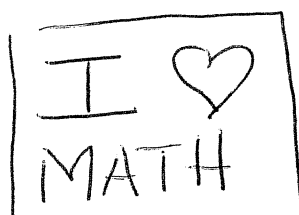
Summer Math
Packet



Return to your
8th grade math
teacher in Sept.

* Show all work neatly.

You may use separate
sheets of paper if needed.



Using proportions to solve problems

Ratios, Proportions, and Percents

The most important point to remember when using proportions to help solve problems is to be sure to have the same unit in both numerators, as well as the same unit in both denominators. Once the proportion is set up, simply solve as usual. Look at the following examples:

1. Out of 10 girls, 4 were chosen to go to the state competition. At this rate, how many girls would be chosen out of 50?

$$\frac{4}{10} = \frac{x}{50} \quad \begin{array}{l} \text{girls in competition} \\ \text{total girls} \end{array}$$

Set up initial proportion. Be sure units match in the numerators and the units match in the denominators.

$$4 \cdot 50 = 10 \cdot x$$

Multiply cross products.

$$\frac{200}{10} = \frac{10x}{10}$$

Divide both sides by 10.

$$x = 20$$

Thus, 20 girls would be chosen out of 50.

2. If a 9-lb. turkey takes 180 minutes to cook, how long would a 6-lb. turkey take to cook?

$$\frac{9}{180} = \frac{6}{x} \quad \begin{array}{l} \text{lb.} \\ \text{minutes} \end{array}$$

Set up initial proportion.

$$9 \cdot x = 6 \cdot 180$$

Multiply cross products.

$$\frac{9x}{9} = \frac{1080}{9}$$

Divide both sides by 9.

$$x = 120$$

Thus, it would take a 6-lb. turkey 120 minutes to cook.

Set up a proportion to represent each problem and solve.

- There are 220 calories in 4 ounces of beef. How many calories are there in 5 ounces?
- If John can buy 8 liters of soft drinks at the store for \$6.40, how much does it cost him to buy 12 liters?
- Sherri bought a package of pens that contained 15 pens. How many packages should she buy if she needs 240 pens?
- Steve won his election by a margin of 7 to 2. His opponent had 3,492 votes. How many votes did Steve have?
- A car traveled 325 miles in 5 hours. How far did the car travel in 9 hours?
- A recipe asks for $1\frac{1}{2}$ cups of chocolate chips for 60 cookies. How many cups would be needed for 36 cookies?

Symbol translation

Basics of Algebra

Often it is essential to translate words into symbols in order to solve a mathematical problem. Below is a chart with some commonly-used mathematical words and phrases with their possible meanings.

+	-	x	÷
add	subtract	multiply	divide
plus	minus	times	divided by
more than	less than	product of	divided into
sum of	difference	twice	quotient
increased by	decreased by	multiplied by	
added to	subtracted from		

Also, a number can be represented by any variable. It is important to be very careful when arranging the order of terms.

Translate the following phrases into symbols:

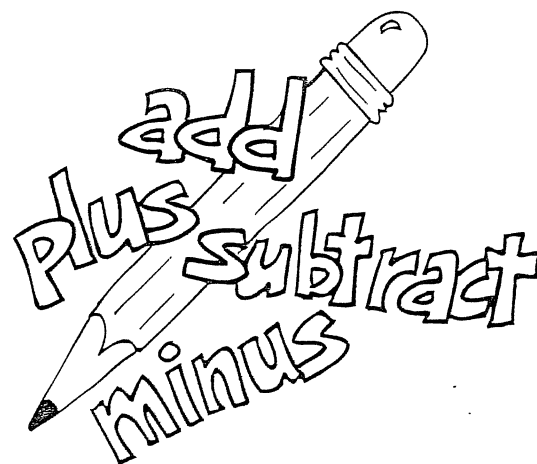
- | | |
|---|-------------------|
| 1. four more than a number | $x + 4$ |
| 2. five subtracted from a number | $x - 5$ |
| 3. subtract a number from nine | $9 - x$ |
| 4. eight divided by the sum of a number and ten | $8 \div (x + 10)$ |

Translate each phrase into an algebraic expression.

- | | |
|--|--|
| 1. a number divided by nine | 2. five less than a number |
| 3. the sum of a number and ten | 4. the product of three and a number |
| 5. twice a number | 6. three times a number decreased by two |
| 7. the difference of twelve and a number | 8. four more than five times a number |

Write a verbal phrase for each algebraic expression.

- | | |
|--------------|----------------|
| 9. $x + 7$ | 10. $b \div 9$ |
| 11. $13 - a$ | 12. $2(y + 4)$ |
| 13. $8n$ | 14. $4z - 6$ |



Variables and expressions

Basics of Algebra

An expression that contains a combination of variables, numbers, and at least one operation is called an algebraic expression. A variable is any symbol, such as x , y , or a , that may be replaced with numbers. An algebraic expression can be evaluated by simply replacing the variables in the expression with their assigned values and then finding the numerical value of the expression.

Evaluate each expression if $x = 2$ and $y = 5$.

- $6x - 2y$
 $6(2) - 2(5)$
 $12 - 10$
 2
 Notice, $6x$ means 6 times x and $2y$ means 2 times y .
 Replace variables with assigned values. Multiply.
 Subtract.
 Final answer.
- $4x + (5 + 3y) - 13$
 $4(2) + (5 + 3(5)) - 13$
 $8 + (5 + 15) - 13$
 $8 + 20 - 13$
 $28 - 13$
 15
 Remember, evaluate within grouping symbols first.
 Replace variables with assigned values.
 Multiply.
 Simplify by adding within grouping symbols first. Add.
 Subtract.
 Final answer.

Evaluate each expression given the value of its variable.

- $y + 2; y = 4$
- $\frac{6a}{3}; a = 3$
- $\frac{10d}{4} - 8; d = 6$
- $x - 7; x = 12$
- $2c - 4; c = 5$
- $12 - 5z; z = 2$

Evaluate each expression if $x = 5$, $y = 2$, and $z = 8$.

- $2z - 3x$
- $\frac{6x}{y+z}$
- $2z - xy$
- $10x - (4y + z)$
- $4x - (y + z)$
- $\frac{7z}{x+y}$
- $6z + 7y - 3x$
- $2z + 3x + 4y$



Solving addition and subtraction equations

Integer Exploration

To find a solution to an equation, the equation must be solved. To solve addition and subtraction equations you must isolate the variable. Simply subtract if it is an addition problem and add if it is a subtraction problem to get the given variable by itself. Remember the following two properties of equality:

1. If the same number is subtracted from each side of an equation, the two sides remain equal.

Solve $r + 12 = 67$

$$r + 12 - 12 = 67 - 12 \quad \text{Subtract 12 from each side of equation.}$$

$$r = 55 \quad \text{Solve for } r.$$

2. If the same number is added to each side of an equation, the two sides remain equal.

Solve $x - 16 = 32$

$$x - 16 + 16 = 32 + 16 \quad \text{Add 16 to each side of equation.}$$

$$x = 48 \quad \text{Solve for } x.$$

Note: It is always a good idea to check each solution by putting it back into the original equation and making sure it creates a true sentence.

State the operation to be used to solve each equation.

1. $x + 7 = 12$

2. $b - 14 = 51$

3. $24 = h + 3$

4. $6 + a = 15$

5. $36 = d - 13$

6. $21 + y = 15$

Solve each equation and check your solution.

7. $n + 10 = 14$

8. $x - 28 = 72$

9. $11 = x - 1$

10. $-600 = c - (-400)$

11. $y - 8 = 8$

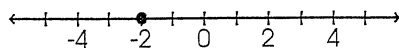
12. $64 + h = 36$

13. $-13 = z + 7$

14. $a - 15 = -21$



15. Write an equation whose solution is represented by the number line.



Solving multiplication and division equations

Integer Exploration

To solve multiplication and division equations, simply divide or multiply on each side of the equation to get the given variable by itself. Remember the following two properties of equality:

1. If you divide each side of an equation by the same nonzero number, the two sides remain equal.

Solve $4x = 84$

$$\frac{4x}{4} = \frac{84}{4}$$

$$x = 21$$

Divide each side by 4 to isolate x .

Solve for x .

2. If you multiply each side of an equation by the same number, the two sides remain equal.

Solve $\frac{x}{21} = 2$

$$\frac{x}{21} \times 21 = 2 \times 21$$

$$x = 42$$

Multiply each side by 21 to isolate x .

Solve for x .

Note: It is always a good idea to check each solution by putting it back into the original equation and making sure it creates a true sentence.

1. Explain in your own words the steps you would use to solve $\frac{x}{5} = -7$.
2. Write two equations of the forms $ax = b$ and $\frac{x}{b} = a$, each with a solution of 3.

Solve each equation using the inverse operation.

3. $9x = 63$

4. $-96b = 96$

5. $\frac{a}{-6} = 2$

6. $4t = -36$

7. $-64 = -16y$

8. $-25x = -125$

9. $\frac{b}{40} = -3$

10. $\frac{r}{15} = 20$

11. Write a word problem that can be solved using the equation $3x = 21$.

Solving Equations with Two Operations

$$2y - 7 = -29$$

$$2y - 7 + 7 = -29 + 7$$

$$2y = -22$$

$$\frac{2y}{2} = \frac{-22}{2}$$

$$y = -11$$

1. $13 + -3p = -2$

7. $-7r - 8 = -14$

2. $\frac{-5a}{2} = 75$

8. $\frac{4y}{3} = 8$

3. $6x - 4 = -10$

9. $16 + \frac{x}{3} = -10$

4. $9 = 2y + 9$

10. $\frac{-4z}{5} = -12$

5. $-10 + \frac{a}{4} = 9$

11. $-22 = 3s - 8$

6. $17 = 5 - x$

12. $-\frac{a}{6} - 31 = 64$

Mixed Practice

1. $4x - 7 = 2x + 15$

11. $6a + 9 = -4a + 29$

2. $-4 = -4(f - 7)$

12. $-22 = 11(2c + 8)$

3. $5x - 17 = 4x + 36$

13. $10p - 14 = 9p + 17$

4. $3(k + 5) = -18$

14. $-45 = 5\left(\frac{2a}{5} + -3\right)$

5. $y + 3 = 7y - 21$

15. $16z - 15 = 13z$

6. $-3(m - 2) = 12$

16. $36 + 19b = 24b + 6$

7. $18 + 4p = 6p + 12$

17. $144 = -16(3 + 3a)$

8. $-8\left(\frac{a}{8} - 2\right) = 26$

18. $11h - 14 = 7 + 14h$

9. $-3k + 10 = k + 2$

19. $-3\left(\frac{2j}{3} - 6\right) = 32$

10. $22 = 2(b + 3)$

20. $-43 - 3z = 2 - 6z$