

Algebra Summer Packet

For students going into Algebra A, B, or
Honors

For 6th Advanced to 7th Pre-Algebra

The purpose of this packet is to review the concepts you learned in your 6th advanced course and to keep your mathematical mind fresh! Please work on the packet throughout the summer and **not all in one sitting**.

This packet is due on August 31, 2021 and may be submitted electronically or a hard copy. This summer packet will count as a project grade for the 1st quarter. Each day the packet is late, 10 points will be deducted from your score and will not be accepted after August 31. **No Extra-Credit** will be awarded if it is turned-In before the due date.

ORDER OF OPERATIONS

Objective: To evaluate expressions using the order of operations.

Example 1

Simplify $9 \div 3 + 4 \cdot 7 - 20 \div 5$

Solution	$3 + 4 \cdot 7 - 20 \div 5$	Divide 9 by 3.
	$3 + 28 - 20 \div 5$	Multiply 4 and 7.
	$3 + 28 - 4$	Divide 20 by 5.
	$31 - 4$	Add 3 and 28.
	27	Subtract 4 from 31.

Reminder:

Please Excuse
My
Dear Aunt Sally

Example 2

Simplify $8 - [(3 \cdot 4) - 5]$.

Solution	$8 - [12 - 5]$	Simplify the innermost parentheses first.
	$8 - 7$	Then the [] grouping.
	1	Subtract.

Find the value of each expression. Show ALL work.

1. $8 + [(16 - 6) \div 2]$

2. $16 - 3[9 - 2(5 - 3)]$

3. $[(4 + 8) \div 6] \cdot 3$

4. $(8 + 16) \div (12 - 9)$

5. $\frac{30}{3(5 - 3)}$

6. $14 \cdot [(15 - 7) \div 4]$

EVALUATING EXPRESSIONS

Objective: To evaluate an algebraic expression.

Example 1

Evaluate the expression $c + b - 23$ if $c = 25$ and $b = 16$.

Solution

$$\begin{aligned}c + b - 23 &= 25 + 16 - 23 && \text{Substitute the given values for the variables.} \\&= 41 - 23 && \text{Simplify by adding 25 and 16.} \\&= 18 && \text{Subtract 23 from 41.}\end{aligned}$$

Example 2

Evaluate the expression $2x + (3y - z) + 7$ if $x = 5$, $y = 2$, and $z = 4$.

Solution

$$\begin{aligned}2x + (3y - z) + 7 &= 2 \cdot 5 + (3 \cdot 2 - 4) + 7 && \text{Substitute the given values.} \\&= 2 \cdot 5 + (6 - 4) + 7 && \text{Simplify by multiplying inside parentheses first.} \\&= 10 + 2 + 7 && \text{Multiply 2 times 5 and subtract 4 from 6.} \\&= 19 && \text{Add.}\end{aligned}$$

Evaluate each expression if $x = 2$ and $y = -3$. Show ALL work.

1. $2x - y$

2. $3y - (2 - x)$

3. $(7 + x)(y - 1)$

Evaluate each expression if $r = 6$ and $t = 8$. Show ALL work.

4. $(r - 4) + 2t$

5. $[10 - (r \div 3)] + 2t$

6. $[3 \cdot (t + 1)] - r$

COMBINING LIKE TERMS

Objective: To simplify an algebraic expression by combining like terms.

Example 1

Simplify the expression $3x + 5 - 9 - x$.

Solution

$3x - x + 5 - 9$ Rewrite expression so that like terms are together.

$2x - 4$ Combine the like terms.

Example 2

Simplify the expression $6x - 15 - 4x - (-8)$.

Solution

$6x - 4x - 15 - (-8)$ Rewrite expression so that like terms are together.

$2x - 7$ Combine $6x - 4x$ and $-15 - (-8)$.

Simplify each expression. Show ALL work.

1. $7x + 5 + 2x$

2. $6 + 9x - 3$

3. $4y - 7y + 6$

4. $-8m + 3 + 10 + 3m$

5. $-7w - 6k + 4w$

6. $-11g + 8h - 3g - 7h$

7. $-14b + 7y - 5b - 10y$

8. $6x - 15 - 4x - (-8)$

9. $-2m + 9 - 4m - 13$

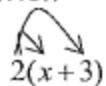
DISTRIBUTIVE PROPERTY

Objective: To simplify an algebraic expression by using the distributive property

Example 1

Simplify the expression $2(x+3)$.

Solution


$$2(x+3)$$

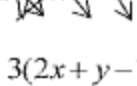
Distribute the 2 by multiplying it by the x and 3.

$$2x+6$$

Example 2

Simplify the expression $3(2x+y-1)$.

Solution


$$3(2x+y-1)$$

Distribute the 3 by multiplying it by $2x$, y , and -1 .

$$6x+3y-3$$

Simplify each expression. Show ALL work.

1. $2(x+4)$

2. $-3(x+5)$

3. $2(3x-6)$

4. $8(5-4x)$

5. $-7(1+4x)$

6. $5(3x-10)$

7. $-4(x+y-8)$

8. $2(-x+2y-11)$

9. $\frac{1}{2}(x+4)$

SOLVING ONE STEP EQUATIONS

Objective: To solve equations using one transformation.

Example 1

a. Solve for x .

$$x + 7 = 10$$

$$x + 7 = 10 \quad (\text{Isolate } x, \text{ think opposite of } +7)$$

$$-7 = -7 \quad (\text{Subtract 7 from both sides})$$

$$x = 3$$

b. Solve for x .

$$\frac{x}{7} = 3$$

$$\frac{x}{7} = 3 \quad (\text{Isolate } x, \text{ think opposite of } \div 7)$$

$$(7)\frac{x}{7} = 3(7) \quad (\text{Multiply both sides by 7})$$

$$x = 21$$

Solve for x . Circle your final answer. Show ALL work.

1. $x + 2 = 13$

2. $4x = 48$

3. $x + 9 = 8$

4. $x - 5 = -5$

5. $\frac{x}{4} = -2$

6. $x + 14 = 7$

7. $x - 10 = 23$

8. $-6 = \frac{x}{3}$

9. $-6 + x = -13$

10. $\frac{2}{3}x = 8$

11. $5x = 35$

12. $18 = -3x$

SOLVING TWO STEP EQUATIONS

Objective: To solve equations using two transformations.

Example 1

a. Solve for x .

$$2x + 8 = 14$$

$$2x + 8 - 8 = 14 - 8 \quad \text{Subtract 8 from both sides}$$

$$2x = 6$$

$$\frac{2x}{2} = \frac{6}{2} \quad \text{Divide by 2 on both sides}$$

$$x = 3$$

b. Solve for x .

$$\frac{x}{5} - 3 = -6$$

$$\frac{x}{5} - 3 + 3 = -6 + 3 \quad \text{Add 3 to both sides}$$

$$\frac{x}{5} = -3$$

$$5 \cdot \frac{x}{5} = -3 \cdot 5 \quad \text{Multiply by 5 on both sides}$$

$$x = -15$$

Solve for x . Circle your final answer. Show ALL work.

1. $2x + 4 = 12$

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

3. $15 = -x - 7$

4. $5x - 4 = 21$

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

6. $\frac{x}{5} - 3 = 10$

7. $\frac{x}{4} + 5 = 16$

8. $6x + 8 = 5$

9. $\frac{2}{3}x - 1 = 11$

ONE STEP INEQUALITIES AND GRAPHING

Objective: To solve an inequality and graph the solution on a number line.

Example 1

Solve for $x + 4 > 9$ and graph the solution on a number line.

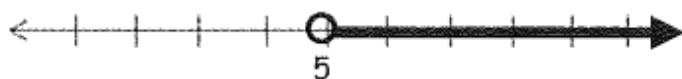
Solution

$$\begin{array}{r} x + 4 > 9 \\ -4 \quad -4 \end{array}$$

Subtract 4 from both sides.

$$x > 5$$

Plot an open dot on 5 and shade everything greater than 5 or to the right of 5.



Reminder:

$\leq \geq$ use a solid dot.

$< >$ use an open dot.

Example 2

Solve for $4 \leq \frac{x}{-3}$ and graph the solution on a number line.

Solution

$$-3 \cdot 4 \leq \frac{x}{-3} \cdot -3 \quad \text{Multiply } -3 \text{ by both sides}$$

$$-12 \geq x$$

When you multiply or divide by a negative you must reverse the inequality symbol



Plot a solid dot on -12 and shade everything less than -12 or to the left of -12.

Solve for x and graph the solution on the number line. Show ALL work.

1. $\frac{x}{5} \leq 3$

2. $-3x < 21$

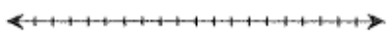
3. $-10 \leq x - 6$



4. $x + 3 < 11$

5. $-14 > 7x$

6. $-9 \leq 5 + x$



TWO STEP INEQUALITIES AND GRAPHING

Objective: To solve an inequality and graph the solution on a number line.

Example 1

Solve for $3x+6 \leq 15$ and graph the solution on a number line.

Solution

$$3x+6 \leq 15$$

$$\begin{array}{r} -6 \\ -6 \end{array}$$

Subtract 6 from both sides.

$$\frac{3x}{3} \leq \frac{9}{3}$$

Divide both sides by 3.

$$x \leq 3$$

Plot a solid dot on 3 and shade everything less than 3 or to the left of 3.



Reminder:

$\leq \geq$ use a solid dot.

$< >$ use an open dot.

Example 2

Solve for $-3x-2 < 10$ and graph the solution on a number line.

Solution

$$-3x-2 < 10$$

$$\begin{array}{r} +2 \\ +2 \end{array}$$

Add 2 to both sides.

$$-3x < 12$$

Divide both sides by 3.

$$\frac{-3x}{-3} > \frac{12}{-3}$$

When you multiply or divide by a negative you must reverse the inequality symbol

$$x > -4$$

Plot an open dot on -4 and shade everything greater than -4 or to the right of -4.

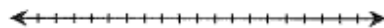


Solve for x and graph the solution on the number line. Show ALL work.

1. $\frac{x}{4} - 3 \leq 2$

2. $2 - 2x < -2$

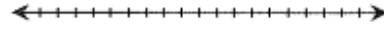
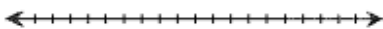
3. $2x + 17 > 25$



4. $4 < 3x - 2$

5. $-5 - x \geq -3$

6. $-4 > \frac{x}{-3} + 1$



SOLVING PROPORTIONS

Objective: To solve a proportion using cross-multiplication.

Example 1
Solve for x .

$$\frac{x}{4} = \frac{21}{7}$$

$$\frac{x}{4} \times \frac{21}{7}$$

(Cross-multiply)

$$7x = 82$$

$$\frac{7x}{7} = \frac{82}{7}$$

(Divide both sides by 7)

$$x = 12$$

Reminder:

Cross-multiplying creates an equation that you already know.

Solve each proportion for x using cross multiplication. Circle your final answer. Show ALL work.

1. $\frac{x}{9} = \frac{4}{12}$

2. $\frac{5}{x} = \frac{9}{27}$

3. $\frac{7}{16} = \frac{x}{32}$

4. $\frac{x}{35} = \frac{2}{5}$

5. $\frac{1}{3} = \frac{2x}{18}$

6. $\frac{20}{12} = \frac{5}{3x}$

PYTHAGOREAN THEOREM

Objective: To find the missing side in a right triangle using Pythagorean Theorem

Steps: (Solving for a missing side in a right triangle)

1. Identify the legs and hypotenuse of the right triangle
2. Substitute the values into the formula $a^2 + b^2 = c^2$
3. Solve the equation for the missing side.

Example: (Finding a leg)

$$a^2 + 24^2 = 26^2$$

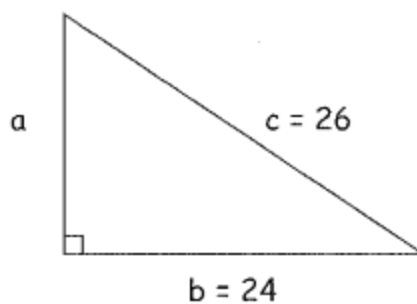
$$a^2 + 576 = 676$$

$$a^2 = 676 - 576$$

$$a^2 = 100$$

$$a = \sqrt{100}$$

$$a = 10$$



Example: (Finding the hypotenuse)

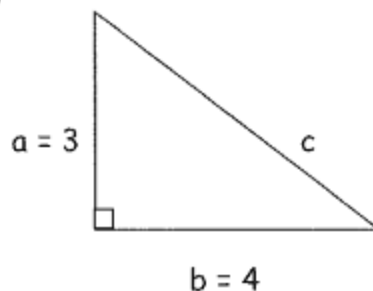
$$3^2 + 4^2 = c^2$$

$$9 + 16 = c^2$$

$$25 = c^2$$

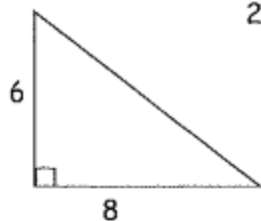
$$\sqrt{25} = c$$

$$5 = c$$

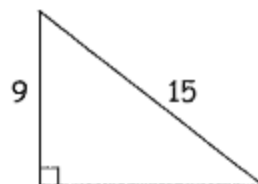


Find the missing side in each of the following right triangles.

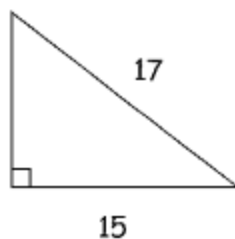
1.)



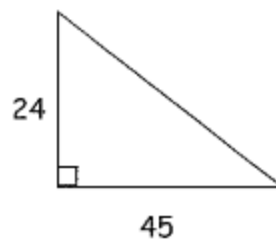
2.)



3.)



4.)



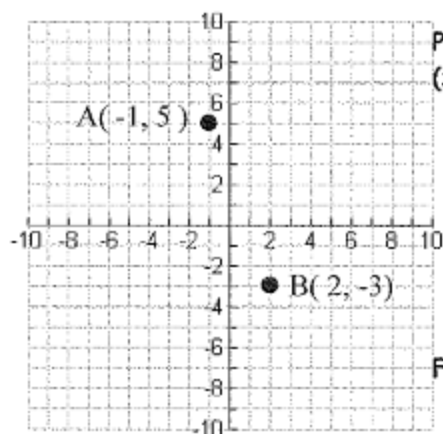
PLOTTING POINTS ON THE COORDINATE PLANE

Objective: To plot points on a coordinate plane.

Example 1

Plot the points $A(-1, 5)$ and $B(2, -3)$ on the coordinate plane.

Label the points using their coordinates.



Points can be located on the plane using an ordered pair (x, y) .

$(x\text{-coordinate}, y\text{-coordinate})$

left or right, up or down

$(-)$ $(+)$ $(+)$ $(-)$

For $(-1, 5)$ you must travel LEFT 1 (-1) and UP 5.

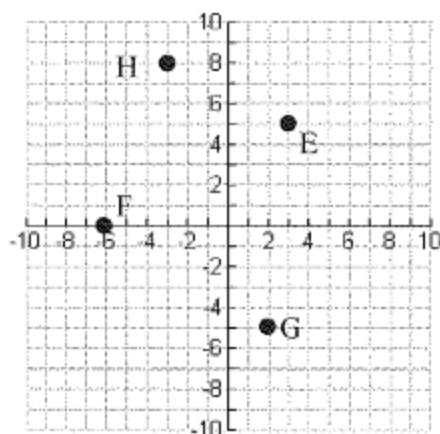
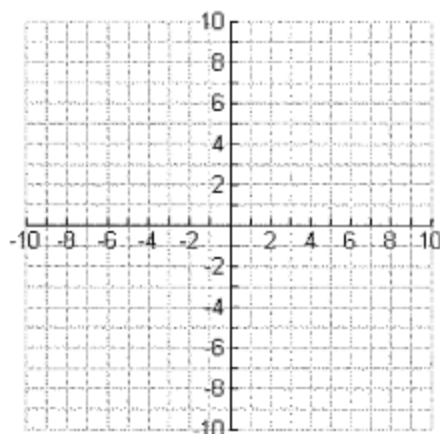
For $(2, -3)$ you must travel RIGHT 2 and DOWN 3 (-3) .

Plot the points on the coordinate plane and label them.

1. $A(4, 5)$
2. $B(-3, -2)$
3. $C(0, -4)$
4. $D(1, -5)$

Name the ordered pair where each point is located.

5. E
6. F
7. G
8. H



Ratios and Rates

Express each ratio as a fraction in the simplest form.

1) 35 blue cars out of 70 cars _____

2) 7 quarts to 63 quarts _____

3) 5 pennies to 35 pennies _____

4) 8 beetles out of 24 insects _____

5) 44 cups to 48 cups _____

6) 45 gallons to 60 gallons _____

7) 10 dimes to 35 dimes _____

8) 21 miles out of 27 miles _____

Express each phrase as a rate and unit rate.
(Round your answer to the nearest hundredth.)

Rate

Unit Rate

9) 8 dollars for 3 cans of tuna

10) 6 calculators cost \$140.00

11) 23 dollars for 4 books

12) 2 inches of snow in 7 hours

13) 6 pencils for 9 dollars

14) 11 chocolate bars cost 22 dollars

15) 11 batteries cost 19 dollars

16) 85 miles on 4 gallons of gas

Write each proportion.

1 48 is to 32 as 3 is to 2.

2 6 adults is to 10 children as 18 adults is to 30 children.

3 If 12 pens cost \$4, then 33 pens will cost \$11.

Determine if each proportion is true or false:

4 $\frac{2}{3} = \frac{7}{16}$

5 $\frac{48 \text{ acres}}{144 \text{ bags seed}} = \frac{5 \text{ acres}}{15 \text{ bags seed}}$

6 $\frac{12}{28} = \frac{18}{42}$

Solve each proportion to find the value of "x".

7 $\frac{3}{6} = \frac{x}{8}$

8 $\frac{52}{x} = \frac{4}{1}$

9 $\frac{15}{12} = \frac{10}{x}$

10 $\frac{18}{x} = \frac{2.4}{28}$

11 $\frac{3}{4} = \frac{x}{3.8}$

12 $\frac{x}{12} = \frac{2\frac{1}{3}}{5}$

Write each percent as a fraction or mixed number. Simplify.

1 21%

2 5%

3 14%

4 130%

5 $12\frac{1}{2}\%$

Write each percent as a decimal.

6 47%

7 26.3%

8 219%

9 .02%

10 $3\frac{1}{2}\%$

Write each decimal as a percent.

11 0.33

12 0.04

13 2.51

14 6.8

15 3

Write each fraction as a percent.

16 $\frac{3}{4}$

17 $\frac{2}{5}$

18 $\frac{1}{10}$

19 $\frac{1}{8}$

20 $2\frac{3}{5}$

Solve.

- 1 What is 35% of 200?
- 2 15% of what amount is 6?
- 3 30 is what percent of 20?
- 4 Find 102% of 2000.
- 5 What percent of 80 is 60?
- 6 14 is 70% of what number?
- 7 What is 0.5% of 3.2?
- 8 2.5 is what percent of 4?
- 9 5 is what percent of 15?
- 10 12.5% of 32 is what number?
- 11 What percent of 8.7 is 17.4?
- 12 What is 3.1% of 60?

Evaluate each expression.

1 Let $n = 3$ $12 + n$

2 Let $S = 16$ $3S$

3 Let $x = -7$ $-x + x$

4 Let $p = -2$ p^3

5 Let $m = 500$ $\frac{m}{100}$

6 Let $q = 47$ $q \div 0$

Evaluate. Let $x = -2$ and $y = -3$

7 $x - y$

11 $2x^2y$

8 xy

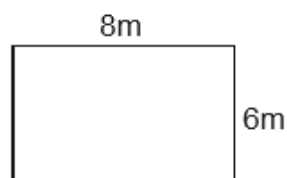
12 $-xy$

9 $x^4 + y^3$

13 $(2xy)^2$

10 $\frac{x + y}{y - x}$

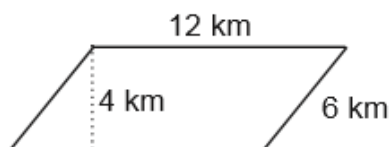
14 $\frac{4}{x + y - 1}$



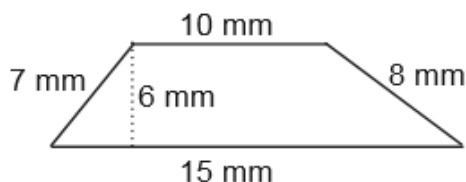
- 1 Find the perimeter of the rectangle.
 - 2 Find the area of the rectangle.
-



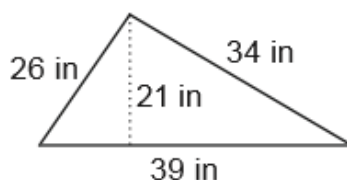
- 3 Find the perimeter of the square.
 - 4 Find the area of the square.
-



- 5 Find the perimeter of the parallelogram.
 - 6 Find the area of the parallelogram.
-

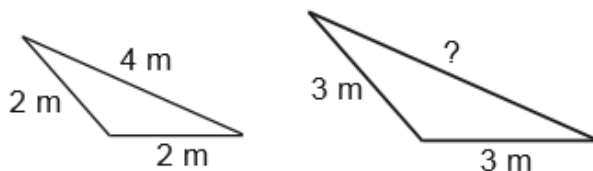


- 7 Find the perimeter of the trapezoid.
 - 8 Find the area of the trapezoid.
-



1 Find the perimeter of the triangle.

2 Find the area of the triangle.



3 Find the missing side to the similar triangles.

4 What is the sum of the angles of a triangle?

Identify the type of each triangle according to its description.

5 2 equal sides, 2 equal angles

6 3 acute angles

7 1 right angle

8 3 equal sides, 3 equal angles

9 no equal sides, no equal angles

10 1 obtuse angle

- 1 A circle has a diameter of 48 km. What is the radius?
- 2 Find the diameter of a circle whose radius is 10 miles.
- 3 What is the value of π , rounded to the hundredths place?
- 4 Find the circumference of a circle whose diameter is 19 m.
- 5 Find the circumference of a circle whose radius is 2.5 ft.
- 6 Find the area of a circle whose radius is 7 mm.
- 7 Find the area of a circle whose diameter is 18 yd.
- 8 Find the area of a semicircle whose radius is 5 cm.