2025 Summer Math Packet

8^{th} Grade Algebra

This is the summer math packet for all students entering into the 8th grade Algebra. It was designed to give extra practice in the skills they will need for 8th grade Algebra. It is recommended that a portion of the packet be completed each week. This is due by the 1st week of the 2025-26 school year.

I have listed websites below that can be used as resources or extra practice.

I hope everyone has a wonderful summer full of fun and rest!

Many Blessings,

Mrs. Wendi O'Brien

Websites:

www.khanacademy.org

www.studentguide.org

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2025 Summer Math Packet

Algebra 1

Name____________________

Score____________________

Computation with Fractions

Perform each operation. All answers must be simplified.

1.) $\frac{1}{2} \times 1\frac{1}{3} =$

2.) $3\frac{1}{16} \times \frac{1}{5} =$

3.) $18 \times \frac{1}{2} =$

4.) $16 \times 2\frac{1}{8} =$

5.) $6\frac{3}{8} \times 1\frac{3}{5} =$

6.) $2\frac{2}{3} \times 4\frac{3}{8} =$

7.) $4\frac{4}{9} \times 4\frac{2}{4} =$

8.) $3\frac{1}{8} \times 2\frac{2}{5} =$

9.) $1\frac{1}{4} \div 1\frac{1}{2} =$

10.) $3\frac{1}{2} \div 5 =$

11.) $6\frac{1}{4} \div 2\frac{1}{2}$

12.) $5\frac{1}{3} \div 2\frac{2}{3} =$

13.) $\frac{3}{8} + \frac{7}{8} =$

14.) $\frac{2}{3} + \frac{3}{4} =$

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Rates and ratios

Using Rules of Algebra

If a and b are two quantities measured in *different* units, then the average *rate* of a per b is $\frac{a}{b}$. For example, if a car was driven a distance of 200 miles and it used 10 gallons of gas, the average gas mileage would be:

$$\frac{200 \text{ miles}}{10 \text{ gallons}} = \frac{200}{10} \frac{\text{miles}}{\text{gallons}} = 20 \text{ miles per gallon}$$

If a and b are two quantities measured in the *same* units, then the *ratio* of a to b is $\frac{a}{b}$. For example, if the baseball team won 12 out of its last 14 games, the win to loss ratio would be:

$$\text{win-loss ratio} = \frac{\text{games won}}{\text{games lost}} = \frac{12 \text{ games}}{2 \text{ games}} = \frac{12}{2}$$

Usually ratios are left in fraction form.

Note: The difference between rates and ratios is that rates compare two quantities measured in different units and ratios compare two quantities measured in the same unit.

1. Explain the difference between a rate and a ratio.

Tell whether each of the following are describing a **rate** or a **ratio**. Write each unit in fraction form.

2. miles per hour

3. comparing areas of two rooms

4. hourly wage

5. comparing price of a single scoop of ice cream versus the whole container of ice cream

Solve.

6. A car uses 8 gallons of gas to travel 236 miles. Find the average number of miles per gallon.

7. You get paid $105 for working 20 hours. Find your hourly rate of pay.

8. You drove 245 miles in $3\frac{1}{2}$ hours. What was the average speed?

9. During a golf game, you scored an 84 on an 18-hole course. What was your average score per hole?

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Mixed operations

Using Rules of Algebra

When simplifying problems using all the rules for operating with real numbers, be very careful not to confuse the rules.

$-2 + (-8) = -10$

$-2 - (-8) = -2 + 8$
$= 6$

$-2 \bullet -8 = 16$

$-2 \div (-8) = -2 \bullet -\frac{1}{8}$
$= \frac{1}{4}$

Remember:

1. The sum of two negative numbers is negative.
2. The difference between two negative numbers has the sign of the number with the greater absolute value.
3. The product of two negative numbers is positive.
4. The quotient of two negative numbers is positive.

Simplify.

1. $-3 + 4 \bullet -9$

2. $6 - 8^2$

3. $6^2 - (-1)^2$

4. $-4 \bullet 7 - 5$

5. $-2 + (-10)^2$

6. $11 - (-3)^3$

Evaluate each problem given each variable value.

7. $x^3 - 5,\ x = -4$

8. $-8 - 7t^2,\ t = -3$

9. $8 - 4y,\ y = 6$

10. $\frac{a + 6b}{-2a}$, $a = -2,\ b = 5$

Simplify. Then evaluate when $x = -2$, $y = -3$, and $z = 4$.

11. $3[4x + 2(8y - 7)]$

12. $6x \div [2(6 + 4y)] - 3$

13. $-3x + 5[4z + 2(4 + 3y)]$

14. $(2y - 3z) \div (-2x + 5)$

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Combination of like terms

Connecting with Algebra

The expression $3x^2 + 2x + 1$ has three terms, $3x^2$, $2x$, and 1. The definition of terms in an expression is those parts of the expression connected by addition. A term in an expression without a variable is called a constant, as 1 is above. For terms to be considered "like" terms, they must have the same variable and corresponding variables must have the same exponents. All constant terms are considered "like" terms.

like terms	unlike terms
$3x$ and $8x$	$9y$ and $10z$
$2x^2y$ and $3x^2y$	$3ab$ and $4ac$

In the example, $3x$ and $8x$ are like terms with numerical coefficients of 3 and 8. A numerical coefficient of a term is simply the number before its corresponding variable. When combining like terms, simply keep the variable the same and combine the numerical coefficients.

$4y + 10y = 14y$ $\quad$ $6b + 9b - 5b = 10b$

$10x - 3x = 8x$ $\quad$ $12x^2y - 10x^2y + 2x^2y = 4x^2y$

Identify the like terms in each problem.

1. $7c + 12c - 2$
2. $19y - 10$
3. $12rt - 10r + 18t$
4. $5r - 10r + 8rs$
5. $5t + 7t - 1$
6. $q + 9 + 2q + 5q$

Simplify. If not possible, write **already simplified**.

7. $8m - 3m$
8. $8y + 12y + 3y$
9. $3s + 4(7s - 2)$
10. $2 + 10k$
11. $8q + 10q + 14$
12. $4 + 8x + 11y$
13. $5a + 6a - 9a$
14. $t + 8m + 4t - 4m$
15. $4(5w + 2) + w$

Simplify. Then evaluate given the value of the variable.

16. $6(3a + 4) + 5(4a - 2)$, $a = 5$
17. $5(b + 7) + 2b - 14 + (b + 10)$, $b = 8$

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Solving Equations - Variables on Both Sides

$$5x + 6 = 2x + 5$$
$$5x - 2x + 6 = 2x - 2x + 15$$
$$3x + 6 - 6 = 15 - 6$$
$$\frac{3x}{3} = \frac{9}{3}$$
$$x = 3$$

1. $20y + 5 = 5y + 65$

2. $13 - t = t - 7$

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

4. $^-9r = 20 + r$

5. $6m - 2\frac{1}{2} = m + 12\frac{1}{2}$

6. $18 + 4.5p = 6p + 12$

7. $5x - \frac{1}{4} = 3x - \frac{5}{4}$

8. $-x - 2 = 1 - 2x$

9. $3k + 10 = 2k - 21$

10. $8y - 6 = 5y + 12$

11. $-t + 10 = t + 4$

12. $4m - 9 = 5m + 7$

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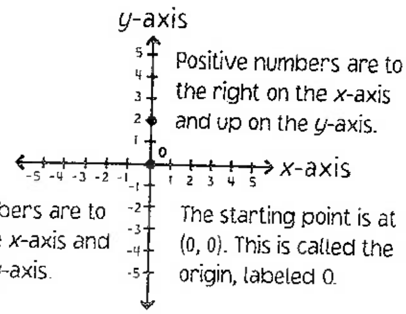
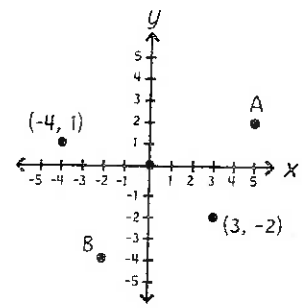
Integers and the coordinate system

Graphing

Integers are graphed on a number line. Ordered pairs of integers are graphed on two number lines, called axes. The horizontal number line is called the x-axis, and the vertical number line is called the y-axis. Look at the coordinate system to the right with important parts labeled.



To graph an ordered pair of integers, starting at the origin, move right (x is positive) or left (x is negative), then up (y is positive) or down (y is negative). For example, graph (3, -2) and (-4, 1) on the graph below.



The numbers of an ordered pair are called coordinates. To name the coordinates of a point, state the ordered pair of numbers that corresponds to the point. For example, on the graph, find the coordinates of A and B.

The coordinates of A: (5, 2).

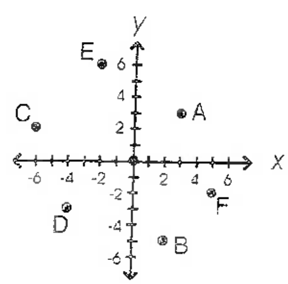
The coordinates of B: (-2, -4).

1. Which direction are the positive numbers on the x-axis?
2. Which direction are the negative numbers on the y-axis?

State the moves that would be made to graph each ordered pair.

3. (3, -2) 4. (7, 6) 5. (0, -3)
6. (-1, 4) 7. (-4, -5) 8. (7, 0)

Name the coordinates of each point.



9. A 10. B
11. C 12. D
13. E 14. F

15. On graph paper, draw and label a pair of axes. Then graph each point below, labeling each point with its letter.

A (-1, 5), B (3, -4), C (0, -2), D (6, 3), E (-4, -1), F (-5, 0)

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Skill: Variables, Tables, and Graphs

Complete each table given the rule.

1. Rule: Output = Input · 5

Input	1	2	3	4	5
Output	5	10	15		

2. Rule: Output = Input · 2

Input	10	20	30	40	50
Output	20	40	60		

3. Rule: Output = Input + 3

Input	3	4	5	6	7
Output	6	7	8		

Graph the data in each table.

4.

Hours	Wages
1	$15
2	$30
3	$45
4	$60

5.

Gallons	Quarts
1	4
2	8
3	12
4	16

6. A parking garage charges $3.50 per hour to park. The equation $c = 3.5h$ shows how the number of hours h relates to the parking charge c. Graph this relationship.

Use the expression to complete each table.

7.

x	$x + 7$
2	9
5	12
8	
11	
	21

8.

x	$5x$
3	
6	
9	
12	
	75

9.

x	$125 - x$
15	
30	
45	
60	
	50

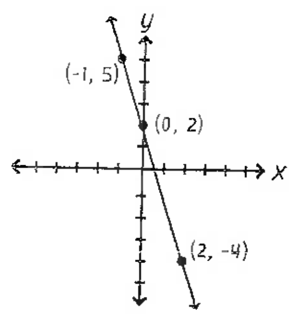
Graphing linear equations

Remember, to solve an equation means to find a solution that creates a true sentence. The solutions of an equation with two variables are ordered pairs. To find a solution of such an equation, pick any value for x, substitute it into original equation, and solve for the corresponding value of y.

Find three solutions to the equation $y = -3x + 2$.
Choose three values for x.
Use a table to help organize the information.
Do each computation to solve for y.
Thus, the three solutions are (-1, 5), (0, 2), and (2, -4).

x	$-3x + 2$	y
-1	$-3(-1) + 2$	5
0	$-3(0) + 2$	2
2	$(-3)(2) + 2$	-4

Now, graph the equation $y = -3x + 2$.
Use the ordered pairs (points) found in the table and graph each on the coordinate system below.
Draw a line to connect the points.
Notice, if an ordered pair is a solution to an equation of a line, it will be a point on the line.



Thus, an equation like $y = -3x + 2$ is a linear equation because its graph is a straight line. An equation like this will have an infinite number of solutions because a line can go in either direction forever.

1. Give a definition of a linear equation.

2. State the steps to use to graph $y = x + 5$.

Find four solutions to each equation. Be sure to write each solution as an ordered pair.

3. $y = 3x$

4. $y = -x$

5. $y - x = 4$

6. $y = 4x + 8$

7. $x + y = 2$

8. $y = x - 5$

On graph paper, graph each equation using a table to find points on the line.

9. $y = x$

10. $y = 2x$

11. $x - y = 5$

12. $y = -x + 2$

13. $x + y = 1$

14. $2x + y = 4$

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Slope-intercept form of linear equations

Writing Linear Equations

Linear equations are equations of lines. A linear equation written in slope-intercept form is $y = mx + b$, where m is the slope of the line and b is the y-intercept. The y-intercept is the point at which the line crosses the y-axis.

move
M = slope
growth
b = begin
zero
figure

$y = 3x + 2$	$y = -5x + 1$	$y = x - 7$	$y = -8x - 10$
$m = 3$, y-int. $= 2$	$m = -5$, y-int. $= 1$	$m = 1$, y-int. $= -7$	$m = -8$, y-int. $= -10$

Equations written in standard form can be put in slope-intercept form simply by adding or subtracting terms from either side of the equations.

$$3x + y = 12$$
$$3x - 3x + y = 12 - 3x$$
$$y = -3x + 12$$

$$-7x - y = 4$$
$$-7x + 7x - y = 4 + 7x$$
$$-y = 7x + 4$$
$$(-1)\text{-}y = (-1)(7x + 4)$$
$$y = -7x - 4$$

$$6x - 2y = 10$$
$$6x - 6x - 2y = 10 - 6x$$
$$\frac{-2y}{-2} = \frac{10}{-2} - \frac{6x}{-2}$$
$$y = -5 + 3x$$
$$y = 3x - 5$$

1. Write the slope-intercept form of the equation of a line. $y = mx + b$

State the slope and the y-intercept of each line.

2. $y = 2x + 5$
3. $y = x - 10$
4. $y = -x + 4$
5. $y = -3x + 7$
6. $y = -5x$
7. $y = 5$

Put each equation in slope-intercept form.

8. $3x + y = 10$
9. $7x - y = -12$
10. $-7x - y = -5$
11. $-3y = 12 + 3x$
12. $4y = 4x + 8$
13. $x + 2y = 16$
14. $-2x + 8y = -8$
15. $-12y = 24x + 12$

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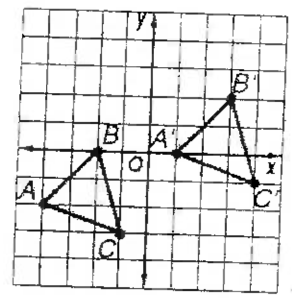
Translations

A **translation** is the movement of a geometric figure in some direction without turning the figure. When translating a figure, every point of the original figure is moved the same distance and in the same direction. To graph a translation of a figure, move each vertex of the figure in the given direction. Then connect the new vertices.

Example: Triangle **ABC** has vertices **A**(- 4, - 2), **B**(- 2, 0), and **C**(- 1, - 3). Find the vertices of triangle **A'B'C'** after a translation of 5 units right and 2 units up.

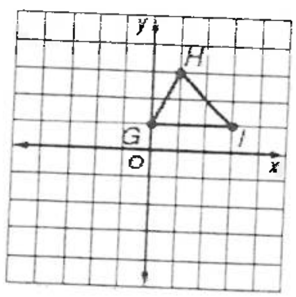
Add 5 to each x-coordinate | Add 2 to each y-coordinate

Vertices of ΔABC	$(x + 5, y + 2)$	Vertices of $\Delta A'B'C'$
$A(-4, -2)$	$(-4 + 5, -2 + 2)$	$A'(1, 0)$
$B(-2, 0)$	$(-2 + 5, 0 + 2)$	$B'(3, 2)$
$C(-1, -3)$	$(-1 + 5, -3 + 2)$	$C'(4, -1)$

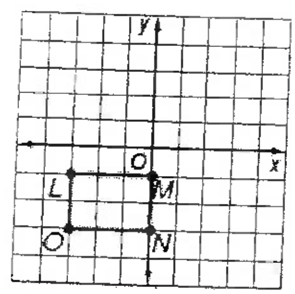


The coordinates of the vertices of Δ A'B'C' are A'(1, 0), B'(3, 2), and C'(4, - 1).

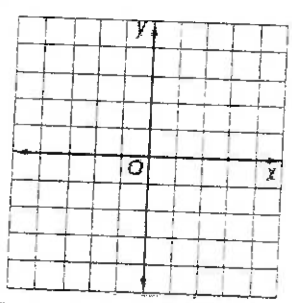
1.) Translate **ΔGHI** 1 unit left and 5 units down.



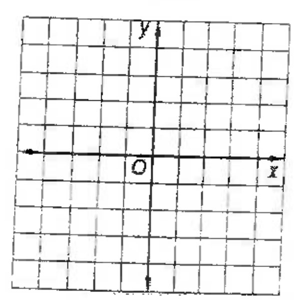
2.) Translate rectangle **LMNO** 3 units up and 4 units right.



3.) **ΔXYZ** has vertices **X**(- 4, 5), **Y**(- 1, 3), and **Z**(- 2, 0). Find the vertices of **ΔX'Y'Z** after a translation of 4 units right and 3 units down. Then graph the figure and its translated image.



4.) Parallelogram **RSTU** has vertices **R**(- 1, - 3), **S**(0, - 1), **T**(4, -1), and **U**(3, - 3). Find the vertices of **R'S'T'U'** after a translation of 3 units left and 3 units up. Then graph the figure and its translated image.



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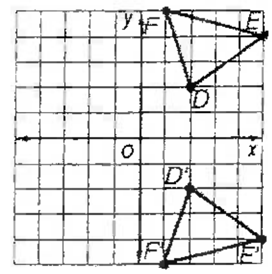
Reflections

A type of transformation where a figure is flipped over a line of symmetry is a **reflection**. To draw the reflection of a polygon, find the distance from each vertex of the polygon to the line of symmetry. Plot the new vertices the same distance from the line of symmetry but on the other side of the line. Then connect the new vertices to complete the reflected image.

- To reflect a point over the x-axis, use the same x-coordinate and multiply the y-coordinate by -1.
- To reflect a point over the y-axis, use the same y-coordinate and multiply the x-coordinate by -1.

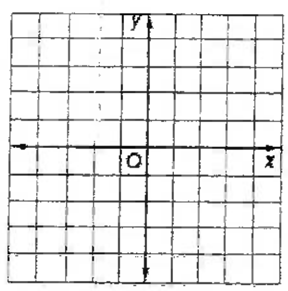
Example: Triangle DEF has vertices D(2, 2), E(5, 4), and F(1, 5). Find the coordinates of the vertices of DEF after a reflection over the x-axis. Then graph the figure and its reflected image.

Vertices of ΔDEF	Distance from x-axis	Vertices of $\Delta D'E'F'$
$D(2, 2)$	2	$D'(2, -2)$
$E(5, 4)$	4	$E'(5, -4)$
$F(1, 5)$	5	$F'(1, -5)$

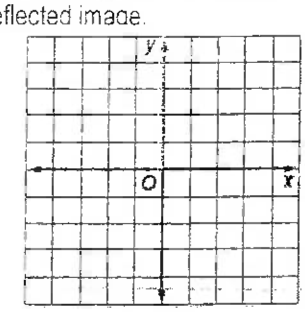


Plot the vertices and connect them to form ΔDEF. The x-axis is the line of symmetry. The distance from a point on ΔDEF to the line of symmetry is the same as the distance from the line of symmetry to the reflected image.

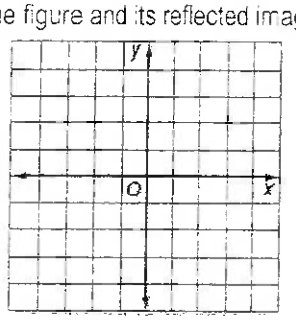
1.) ΔABC has vertices A(0, 4), B(2, 1), and C(4, 3). Find the coordinates of the vertices of ABC after a reflection over the **x**-axis. Then graph the figure and its reflected image.



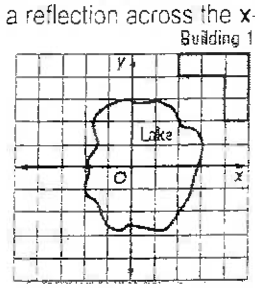
2.) Rectangle MNOP has vertices M(- 2, - 4), N(- 2, - 1), O(3, - 1), and P(3, - 4). Find the coordinates of the vertices of MNOP after a reflection over the **x**-axis. Then graph the figure and its reflected image.



3.) Trapezoid WXYZ has vertices W(-1, 3), X(-1, -4), Y(-5, -4), and Z(-3, 3).). Find the coordinates of the vertices of WXYZ after a reflection over the y-axis. Then graph the figure and its reflected image.



4.) A corporate plaza is to be built around a small lake. Building 1 has already been built. Suppose there are axes through the lake as shown. Show where Building 2 should be built if it will be a reflection of Building 1 across the y-axis followed by a reflection across the x-axis.



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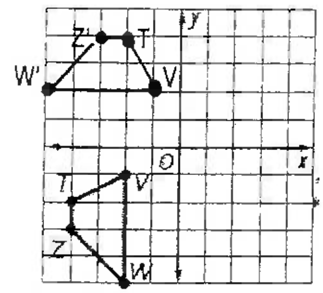
Rotations

A type of transformation where a figure is turned around a fixed point is called a **rotation**. The figure can be rotated 90° clockwise, 90° counterclockwise, or 180° about the origin.

- To rotate a figure 90° clockwise, switch the coordinates of each point and multiply the new second coordinate by -1.
- To rotate a figure 90° counterclockwise, switch the coordinates of each point and multiply the new first coordinate by -1.
- To rotate a figure 180°, multiply both coordinates of each point by -1.

Example: Graph the image of the figure after a rotation of 90° clockwise.

T (- 4, - 2) → T'(- 2, 4)
V(- 2, - 1) → V'(- 1, 2)
W(- 2, - 5) → W'(- 5, 2)
Z(- 4, - 3) → Z'(- 3, 4)



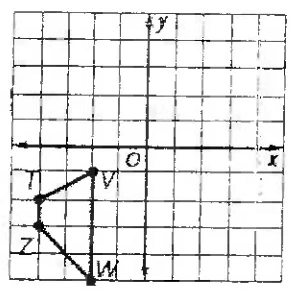
1.) Graph the image of the figure after a rotation of 90° counterclockwise.

T(- 4, - 2) T'(___, ___)

V(- 2, - 1) V'(___, ___)

W(- 2, - 5) W'(___, ___)

Z(- 4, - 3) Z'(___, ___)



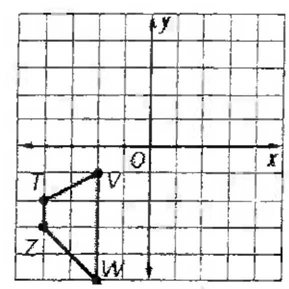
2.) Graph the image of the figure after a rotation of 180°.

T(- 4, - 2) T'(___, ___)

V(- 2, - 1) V'(___, ___)

W(- 2, - 5) W'(___, ___)

Z(- 4, - 3) Z'(___, ___)



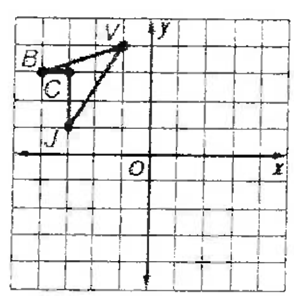
3.) Graph the image of the figure after a rotation of 90° clockwise.

B(___,___) B'(___, ___)

C(___,___) C'(___, ___)

J(___,___) J'(___, ___)

V(___,___) V'(___, ___)



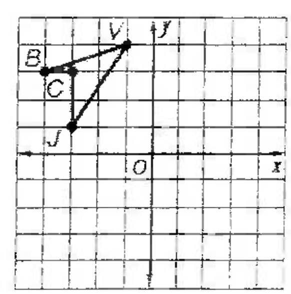
4.) Graph the image of the figure after a rotation of 180°.

B(___,___) B'(___, ___)

C(___,___) C'(___, ___)

J(___,___) J'(___, ___)

V(___,___) V'(___, ___)



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Multiplying and dividing monomials

Properties Used in Algebra

Remember the parts that make up a power. For example, 4^2 is a power, where 4 is the base and 2 is the exponent. In mathematics, powers that have the same base can be multiplied simply by adding their exponents.

$4^5 \bullet 4^3 = 4^{5+3} = 4^8$ The base is 4 and remains unchanged. Add the exponents.

$n^2 \bullet n^7 = n^{2+7} = n^9$ The base is n and remains unchanged. Add the exponents.

Find the product of $(4x^5)(-3x^7)$.

$-12x^{5+7}$ Multiply 4 and -3. The base x remains unchanged.

$= -12x^{12}$ Add the exponents.

Powers that have the same base can also be divided by simply subtracting the exponents.

$\frac{10^4}{10^2} = 10^{4-2} = 10^2$ The base is 10. Subtract exponents.

Divide $\frac{-9ab^7}{3b^5}$

$= -3ab^{7-5}$ Divide -9 and 3.

$= -3ab^2$ Subtract exponents of base b.

1. Write a division and a multiplication problem, each with a solution of 5^4.

2. Explain the relationship between multiplying and dividing powers.

Find each product or quotient. Leave each answer in exponential form.

3. $11^6 \bullet 11^7$

4. $b^9 \bullet b^4$

5. $\frac{z^9y^5}{z^3y^3}$

6. $x^3 \bullet x^8$

7. $\frac{3^7}{3^2}$

8. $\frac{-12x^{12}}{3x^7}$

9. $4^5 \bullet 4^2$

10. $\frac{10^{12}}{10^8}$

11. $4c^4d \bullet -5cd^3$

Find each missing exponent.

12. $(6^?)(6^4) = 6^{12}$

13. $\frac{r^?}{r^5} = r^8$

14. $a(a^3)(a^5) = a^?$

15. $\frac{13^7}{13^?} = 1$

A

Percents

Examples:

- **SALES TAX is a percent of the purchase price and is an amount paid in addition to the purchase price.**

Determine the total price of a $17.55 soccer ball if the sales tax is 6%.

Determine the sales tax by changing % to a decimal and multiply. 17.55 x 0.06 = 1.07 (TAX)

Add price and tax to determine the total price. 17.55 + 1.07 = 18.82

- **COMMISSION is the amount a salesman/woman makes for selling items. To determine the amount of commission, change the % to a decimal and multiply by the total amount sold.**

Determine the commission for a RV salesman, whose sales for the month of March totaled $149,000. The salesman earns a 4% commission.

Change 4% to a decimal. 4% = 0.04 Multiply decimal and total sold. 0.04 x 149,000 = 5960

The RV salesman/woman will make a total commission of $5,960 for the month of March.

- **SIMPLE INTEREST the amount of money paid or earned for the use of money. To determine simple interest I, use the formula I = prt. Principal p is the amount of money deposited or invested. Rate r is the annual interest rate written as a decimal. Time t is the amount of time the money is invested in years.**

Determine the simple interest earned in a savings account where $136 is deposited for 2 years if the interest rate is 7.5% per year.

I = prt I = 136 • 0.075 • 2 I = 20.40 The simple interest earned is $20.40

1.) Jeremy wants to buy a skateboard but does not know if he has enough money. The price of the skateboard is $85 and the sales tax is 6%. What will be the total cost of the skateboard?	2.) Blake bought two magazines for $4.95 each. If the sales tax was 6.75%, what was the total amount that he paid for the magazines?
3.) How much interest will Hannah earn in 4 years if she deposits $630 in a savings account at 6.5% simple interest?	4.) You are a real estate agent. For every house you sell you earn 3.8% commission. This month you sold 2 houses that had a combined total of $560,950. How much commission will you earn?
5.) When Melissa was born, her parents put $8,000 into a college fund account that earned 9% simple interest. Determine the total amount in the account after 18 years.	6.) A car salesman earns 7% commission on his total sales this month. If he sells 2 cars at $15,670 each, and a truck at $25,995, how much commission will he earn? (hint: You need to find the total amount of sales first)