

Algebra 1 Summer Packet

Name: _____ Score: _____ /45

To get full credit, you must show work. Staple your work to the back of the packet when you turn it in. This is all review material from your previous math class. If you do not remember how to solve a problem, it is your responsibility to do some research and figure out how. These are all concepts that will be built upon in Algebra 1 and will continue to show up in future math courses as well.

Each student should be prepared to have the summer packet completed and ready to be checked during the first full day of school. Over the course of the first few weeks of the beginning of the school year, the packet will be reviewed, and a final packet assessment will be given as the first test grade of the new school year.

Below are some helpful resources for you to refer to:

<http://www.purplemath.com/modules/index.htm>

<https://www.khanacademy.org/math/algebra>

<https://www.mathway.com/Algebra>

<http://www.sosmath.com/>

<https://photomath.net/en/>

<http://www.livemath.com/>

<https://sites.google.com/a/epsne.org/mr-smith/how-to-study-math>

Order of Operations

To avoid having different results for the same problem, mathematicians have agreed on an order of operations when simplifying expressions that contain multiple operations.

1. Perform any operation(s) inside grouping symbols. (Parentheses, brackets above or below a fraction bar)
2. Simplify any term with exponents.
3. Multiply and divide in order from left to right.
4. Add and subtract in order from left to right.

One easy way to remember the order of operations process is to remember the acronym PEMDAS or the old saying, "**P**lease **E**xercise **M**y **D**ear **A**unt **S**ally."

P - Perform operations in grouping symbols

E - Simplify exponents

M - Perform multiplication and division in order from left to right

D

A - Perform addition and subtraction in order from left to right

S

Example 1

$$\begin{aligned} &2 - 3^2 + (6 + 3 \times 2) \\ &2 - 3^2 + (6 + 6) \\ &2 - 3^2 + 12 \\ &2 - 9 + 12 \\ &-7 + 12 \\ &= 5 \end{aligned}$$

Example 2

$$\begin{aligned} &-7 + 4 + (2^3 - 8 \div -4) \\ &-7 + 4 + (8 - 8 \div -4) \\ &-7 + 4 + (8 - -2) \\ &-7 + 4 + 10 \\ &-3 + 10 \\ &= 7 \end{aligned}$$

Order of Operations

1. $6 + 4 - 2 \cdot 3$

2. $(-2) \cdot 3 + 5 - 7$

3. $18 - 4^2 + 7$

4. $16 \div 2 \cdot 5 \cdot 3 \div 6$

5. $32 \div [16 \div (8 \div 2)]$

6. $\frac{3[10-(27 \div 9)]}{4-7}$

7. $3(2 + 7) - 9 \cdot 7$

8. $10 \cdot (3 - 6^2) + 8 \div 2$

Operations with Signed Numbers

Adding and Subtracting Signed Numbers

Adding Signed Numbers

Like Signs	Different Signs
Add the numbers & carry the sign	Subtract the numbers & carry the sign of the larger number
$(+) + (+) = +$ $(+3) + (+4) = +7$	$(+) + (-) = ?$ $(+3) + (-2) = +1$
$(-) + (-) = -$ $(-2) + (-3) = (-5)$	$(-) + (+) = ?$ $(-5) + (+3) = -2$

Subtracting Signed Numbers

Don't subtract! Change the problem to **addition** and change the sign of the **second** number. Then use the addition rules.

$(+9) - (+12) = (+9) + (-12)$	$(+4) - (-3) = (+4) + (+3)$
$(-5) - (+3) = (-5) + (-3)$	$(-1) - (-5) = (-1) + (+5)$

Multiplying and Dividing Signed Numbers

If the signs are the same,
the answer is *positive*

If the signs are different,
the answer is *negative*

Like Signs	Different Signs
$(+)(+) = +$ $(+3)(+4) = +12$	$(+)(-) = -$ $(+2)(-3) = -6$
$(-)(-) = +$ $(-5)(-3) = +15$	$(-)(+) = -$ $(-7)(+1) = -7$
$(+) / (+) = +$ $(+3) / (+4) = +12$	$(+) / (-) = -$ $(+2) / (-3) = -6$
$(-) / (-) = +$ $(-3) / (-4) = +12$	$(-) / (+) = -$ $(-7) / (+1) = -7$

Operations with Signed Numbers

9. $-4 + 8$

10. $-2 + (-7)$

11. $5 - (-13)$

12. $-16 - (-9)$

13. $5 - 9$

14. $(-5)(12)$

15. -9^2

16. $(-9)^2$

Evaluating Expressions

Example

Evaluate the following expression when $x = 5$

Rewrite the expression substituting 5 for the x and simplify.

- | | |
|----------------|----------------------------|
| a. $5x =$ | $5(5) = 25$ |
| b. $-2x =$ | $-2(5) = -10$ |
| c. $x + 25 =$ | $5 + 25 = 30$ |
| d. $5x - 15 =$ | $5(5) - 15 = 25 - 15 = 10$ |
| e. $3x + 4 =$ | $3(5) + 4 = 19$ |

Evaluating Expressions

Evaluate each expression given that $x = 5$, $y = -4$, $z = 6$

17. $3x$

18. $y + 4$

19. $2x^2$

20. $5z - 6$

21. $3x^2 + y$

22. $xy + z$

23. $2(x + z) - y$

24. $2x + 3y - z$

Combining Like Terms

What is a **term**?

The parts of an algebraic expression that are separated by an addition or subtraction sign are called **terms**.
The expression $4x + 2y - 3$ has 3 terms.

What are **like terms**?

Terms with the same variable factors are called **like terms**.
 $2n$ and $3n$ are like terms, but $4x$ and $3y$ are not like terms because their variable factors x and y are different.

To simplify an expression, you must combine the like terms.

Examples:

Simplify

1. $5x + 8x$
 $5x + 8x = (5 + 8)x = 13x$

2. $3y - 6y$
 $3y - 6y = (3 - 6)y = -3y$

3. $3x + 4 - 2x + 3$
 $3x - 2x + 4 + 3 = (3 - 2)x + 4 + 3 = x + 7$

4. $2b + 5c + 3b - 6c$
 $2b + 3b + 5c - 6c = (2 + 3)b + (5 - 6)c = 5b - c$

Combining Like Terms

25. $6n + 5n$ 26. $x - 5x$

27. $2k + 4 - 8k - 1$ 28. $4r + 3r + 6y - 2y$

Solving Equations

To solve an equation means to **find the value** of the variable. We solve equations by isolating the variable using opposite operations.

Example:
Solve.

$$\begin{array}{rcl} 3x - 2 & = & 10 \\ + 2 & + 2 & \end{array}$$

Isolate $3x$ by adding 2 to each side.

$$\frac{3x}{3} = \frac{12}{3}$$

Simplify
Isolate x by dividing each side by 3.

$$x = 4$$

Simplify

Check your answer.

$$\begin{array}{rcl} 3(4) - 2 & = & 10 \\ 12 - 2 & = & 10 \\ 10 & = & 10 \end{array}$$

Substitute the value in for the variable.
Simplify
Is the equation true? If yes, you solved it correctly!

Opposite Operations:
Addition (+) & Subtraction (-)
Multiplication (x) & Division (÷)

Please remember...
to do the same step on
each side of the equation.

**Always check your
work by substitution!**

Solving Equations

29. $x - 6 = 13$

30. $5x - 2 = 8$

31. $\frac{x}{8} = 2$

32. $-4x = 48$

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

34. $6x + 3(x + 4) = 6 - 12$

35. $3b + 5 = 10$

Examples:

- A) Translate into a mathematical expression: 3 less than 5 times some number

3	less than	5	times	some number
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to subtract from	multiply	use a variable
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Translation: $5n - 3$

- B) Translate into a mathematical statement: 3 less than 5 times some number is 22

3	less than	5	times	some number	is	22
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to subtract from	multiply	use a variable	=
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Translation: $5n - 3 = 22$

- C) Translate into a mathematical statement: the quotient of a number and -4, less 8 is -42

The quotient of a number and -4,	less 8	is	-42
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Divide a variable and a number	subtract	=
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Translation: $\frac{n}{-4} - 8 = -42$

- D) Translate into a mathematical statement: four plus three times a number is less than or equal to 18

four	plus	three	times	a number	is less than or equal to	18
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add	multiply	use a variable	\leq
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Translation: $4 + 3n \leq 18$ **Algebraic Translations**

36. a number decreased by 7

37. Twenty-seven is one-third of a number

38. Six decreased by a number results in 3

39. The sum of three times a number and five is fifty.

Word Problems

Translate each word problem into an algebraic equation, using x for the unknown, and solve. Write a "**let $x =$** " for each unknown; write an equation; solve the equation; substitute the value for x into the let statements(s) to answer the question.

For Example:

Kara is going to Maui on vacation. She paid \$325 for her plane ticket and is spending \$125 each night for the hotel. How many nights can she stay in Maui if she has \$1200?

Step 1: What are you asked to find? Let variables represent what you are asked to find.

How many nights can Kara stay in Maui?

Let $x =$ The number of nights Kara can stay in Maui

Step 2: Write an equation to represent the relationship in the problem.

$$325 + 125x = 1200$$

Step 3: Solve the equation for the unknown

$$\begin{array}{r} 325 + 125x = 1200 \\ -325 \quad \quad -325 \end{array}$$

$$125x = 875$$

$$x = 7$$

Kara can spend 7 nights in Maui

40. A video store charges a one-time membership fee of \$12.00 plus \$1.50 per video rental. How many videos can Stewart rent if he spends \$21?

42. Bicycle city makes custom bicycles. They charge \$160 plus \$80 for each day that it takes to build the bicycle. If you have \$480 to spend on your new bicycle, how many days can you take it to Bicycle City to build the bike?

43. Darel went to the mall and spent \$41. He bought several t-shirts that each cost \$12 and he bought 1 pair of socks for \$5. How many t-shirts did Darel buy?

44. Janet weighs 20 pounds more than Anna. If the sum of their weight is 250 pounds, how much does each girl weigh?

45. The school lunch prices are changing next year. The cost of a hot lunch will increase by \$0.45 from the current price. If next year's price is \$2.60, what did a hot lunch cost this year?