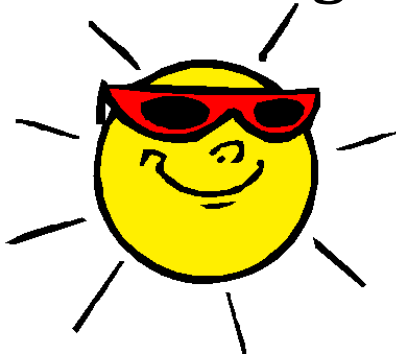


Summer Math Packet

**Number Sense & Pre-Algebra Skills For
Students Entering Algebra**



No Calculators!!

Within the first few days of your Algebra course you will be assessed on the prerequisite skills outlined in this packet. The packet will not be graded; however, you are responsible for the material. **The assessment will count as a full test grade in your first quarter average.**

Materials Required for Algebra:

- 2 graph paper spirals
- a graphing calculator
- a ton of pencils
- a correcting utensil

Topics Covered

- 1.** Central Tendencies
- 2.** Greatest Common Factor/Least Common Multiple
- 3.** Fractions
- 4.** Order of Operations
- 5.** Working with Integers
- 6.** Evaluation Algebraic Expressions and Formulas
- 7.** Properties of Operations
- 8.** Solving Multi-Step Equations
- 9.** Solving Multi-Step Inequalities
- 10.** Linear Functions
- 11.** Polynomials

Central Tendencies

(Mean, Median, Mode, and Range)

Mean is the sum of the values in a set of data divided by the number of values.

Median is the middle value of a set of data written in ascending order. If there are two middle values, the median is the mean of those values.

Mode is the most frequent value in a set of data.

Range is the difference between the greatest and least value in a set of data.

Exercises:

Find the mean, median, mode, and range of each set of data.

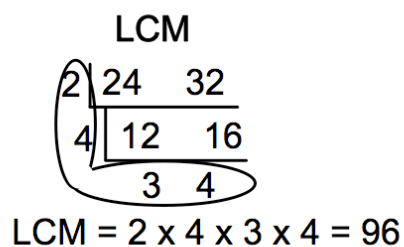
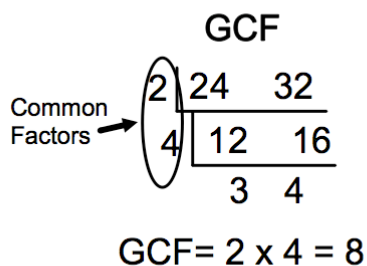
1. 108, 93, 426, 766, 518, 210

2. 21.5, 35.5, 49.5, 16.3, 35.5

GCF & LCM

Example:

Find the Greatest Common Factor (GCF) and Least Common Multiple (LCM) of 24 and 32.



Exercises:

Find the GCF.

1. 42, 60

2. $24xy^2$, $42xy$

3. $27x^2y^2$, $45x^2$

4. 11, 21

Find the LCM

5. 27, 18

6. $15x$, $18xy$

7. $9x^2y$, $15xy^2$

8. 64, 48

Fractions

(Addition, Subtraction, Multiplication, and Division)

Miscellaneous

Write the fractions in lowest terms.

1. $\frac{8}{24}$

2. $\frac{18}{24}$

3. $\frac{15x^2y}{20xy}$

4. $\frac{36abc^4}{45a^3bc^2}$

Solve for x .

5. $\frac{16}{48} = \frac{x}{12}$

6. $\frac{12}{42} = \frac{4}{x}$

7. $\frac{20}{32} = \frac{x}{16}$

8. $\frac{6}{9} = \frac{12}{x}$

Write as improper fractions.

9. $2\frac{1}{3}$

10. $-4\frac{6}{7}$

Write as mixed numbers.

11. $-\frac{9}{4}$

12. $\frac{38}{3}$

Addition and Subtraction

Find each sum or difference. Write your answer in simplest form.

13. $-\frac{2}{3} + \frac{1}{4}$

14. $3\frac{5}{9} + 2\frac{1}{6}$

15. $\frac{3}{10} - \frac{4}{5}$

16. $6\frac{7}{10} + \left(-1\frac{1}{5}\right)$

17. $5\frac{4}{11} - 2\frac{2}{3}$

18. $2\frac{7}{12} - 9\frac{2}{3}$

Multiplication and Division

Find each product or quotient. Write your answer in simplest form.

19. $-\frac{5}{6} \cdot \frac{6}{15}$

20. $-\frac{3}{4} \div \left(-\frac{9}{16}\right)$

21. $2\frac{2}{5} \cdot \left(-3\frac{3}{4}\right)$

22. $-3\frac{3}{4} \div 4\frac{2}{3}$

23. $\frac{2}{9} \cdot \frac{3}{16} \cdot \frac{3}{6}$

24. $6\frac{3}{4} \div 4$

Order of Operations

When several operations are indicated in a numerical expression, proceed in the following order: work within the parentheses, expand each power, multiply and divide (whichever comes first), and finally, add or subtract (whichever comes first).

PEMDAS (“**P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally”) is an acronym that provides a good way to remember your order of operation.

P: Parentheses

E: Exponents

MD: Multiply or Divide, whichever comes first

AS: Add or Subtract, whichever comes first

Simplify.

1. $2^4 - 3(3^2 - 8)$

2. $(4^2 + 10)4 - 10(5^2 - 20)$

3. $4^2 - 4(5^2 - 32 \div 8 \cdot 4)$

4. $(8 \cdot 5 \div 10 + 2)(2^5 - 8^2 \div 2)$

5. $5^2 - 3[6 + (-2)(20 + (-15))]$

6. $[4^3 + (-10)(30 - 8 \cdot 5)]$

7. $[15 - 3(4^2 - 10) + 25 \div 5 \cdot 15]$

8. $\{10 - 5[20 - 2(3^2 + 1)]\}$

9. $|-32| + 32$

10. $\frac{48 - 24 \div 2^3}{3 + 2 \cdot 6}$

Working with Integers

Adding and Subtracting:

1st: Rewrite all subtraction as addition then...

- If the integers have the same signs, add their absolute values. The sum will have the same sign of the addends.
- If the integers have different signs, subtract their absolute values. The sum has the sign of the addend with the greater absolute value.

Multiplying and Dividing:

- The product or quotient of two integers having the same sign is positive.
- The product or quotient of two integers having different signs is negative.

Find each sum, difference, product, or quotient.

- | | | |
|-----------------|--------------------|----------------------|
| 1. $-13 + 19$ | 2. $37 + (-13)$ | 3. $-18 + (-29)$ |
| 4. $-27 - 93$ | 5. $-46 - (-32)$ | 6. $9 - 83$ |
| 7. $-45 \div 9$ | 8. $-84 \div -12$ | 9. $\frac{132}{-11}$ |
| 10. $8(-17)$ | 11. $-24 \cdot -6$ | 12. $-62(8)$ |

13. There is a 6° drop in temperature over the past hour. If it is 55° now, what was the temperature an hour ago?
14. It is -9° now. The temperature will drop 5° in two hours. What will the temperature be in two hours?

Evaluating Expressions and Formulas

To evaluate an expression, first replace the variable by a given value. Then simplify the resulting numerical expression.

Evaluate the expression when $x = -2$ and $y = 5$.

1. $x + y$

2. $x^2 + y^3$

3. $2x - y$

4. $-2(y - 2x)$

5. $\frac{3x-y}{11}$

6. $\frac{x}{3-y}$

Properties of Operations

Commutative Property of Addition:

$$a + b = b + a$$

Commutative Property of Multiplication:

$$a \times b = b \times a$$

Associative Property of Addition:

$$(a + b) + c = a + (b + c)$$

Associative Property of Multiplication:

$$(a \times b) \times c = a \times (b \times c)$$

Identity Property of Addition:

$$a + 0 = a$$

Identity Property of Multiplication:

$$a \times 1 = a$$

Name the property illustrated by each expression.

1. $8 \times 12 = 12 \times 8$

2. $3 \times (2 \times 5) = (3 \times 2) \times 5$

3. $2 + 5 + 12 = 5 + 2 + 12$

4. $xy + 0 = xy$

5. $1x = x$

6. $5 + 7 = 7 + 5$

7. $3 + (4 + 5) = 3 + (5 + 4)$

8. $3xy = 3xy(1)$

9. $(4 + 8) + 5 = 4 + (8 + 5)$

10. $5 \times 6 \times 8 = 8 \times 5 \times 6$

Solving Multi-Step Equations

Procedure: To solve multi-step equations...

1. Fully simplify both sides of the equation
2. Get all variables to one side of the equation.
3. Use inverse operations to isolate the variable
undo addition and subtraction first

Ex.

$$\begin{array}{r}
 2x + 3 = 7 \\
 \underline{-3 \quad -3} \\
 2x = 4 \\
 \underline{\div 2 \quad \div 2} \\
 \boxed{x = 2}
 \end{array}$$

Ex.

$$\begin{array}{r}
 2(x + 5) = 3x - 5 \\
 2x + 10 = 3x - 5 \\
 \underline{-2x \quad -2x} \\
 10 = x - 5 \\
 \underline{+5 \quad +5} \\
 \boxed{x = 15}
 \end{array}$$

Exercises

Solve and check each equation.

1. $-2x + 7 = 25$

2. $3 - 8x = -141$

3. $15 - 2(w + 5) = 11$

4. $12 - 4r = 6r + 2$

5. $-4(n + 5) = -32$

6. $12 - 2x + 5 = -1$

7. $3 - 2x = 15$

8. $\frac{z}{2} - 7 = 12$

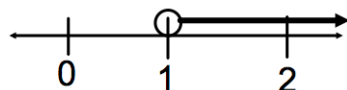
9. $17 + 3x = 4x - 9$

10. $-3(6f - 12) = 36 - 18f$

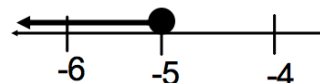
Solving Multi-Step Inequalities

Note: Solve a multi-step inequality just like you would solve a multi-step equation. However, if you multiply or divide both sides of an inequality by a negative number, then the inequality sign reverses.

Ex.

$$\begin{array}{r}
 2x + 5 > 7 \\
 \underline{-5 \quad -5} \\
 2x > 2 \\
 \underline{\div 2 \quad \div 2} \\
 \boxed{x > 1}
 \end{array}$$


Ex.

$$\begin{array}{r}
 10 \leq -2(x - 4) \\
 10 \leq -2x + 8 \\
 \underline{-8 \quad -8} \\
 10 \leq -2x \\
 \underline{\div -2 \quad \div -2} \\
 \boxed{-5 \geq x \text{ or } x \leq -5}
 \end{array}$$


Exercises

Find and graph the solution set of each inequality.

1. $3x + 8 > 17$

2. $-6y + 3 > 9 - 7y$

3. $2v + 7 \geq 11$

4. $7 > 3 + \frac{b}{3}$

5. $\frac{c-2}{3} \leq 4$

6. $4b + 4 < 4(5 - 3b)$

7. $2z - 5 < -21 - 2z$

8. $8b - 10 \geq 6(3 - a)$

9. $3x - 5 > 6x + 13$

1. $7(y + 5) - 10 \leq 2y$

Linear Functions

Exercises

Tell whether each ordered pair is a solution of the equation.

1. $3x + y = -11, (-4, 1)$

2. $2x - y = 4, (3, -2)$

Find the intercepts of the equations graph.

3. $3x - 4y = -12$

4. $y = -2x - 8$

Find the slope through the given points.

5. $(4, 7), (-3, 6)$

6. $(-5, 7), (-5, -14)$

Identify the slope and y-intercept of the line with the given equation.

7. $y = 2x - 12$

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

Write an equation of the line that is parallel to the given line and passes through the given point.

9. $y = -2x - 6, (0, -4)$

10. $-2x + 3y = 12, (3, 2)$

Graph the equation using any method.

11. $y = 2x - 3$

12. $-2x - 3y = 12$

Polynomials

Examples

A polynomial is in **Standard Form** if it is simplified and the terms are arranged so the degree of each term increases (or stays the same) from left to right.

Find the difference:

$$(6x^2 - 5x + 2) - (-3x^2 - 8x + 3)$$

First: Turn the expression into an addition problem by distributing the negative to the second expression.

$$(6x^2 - 5x + 2) + (3x^2 + 8x - 3)$$

Then: Combine like terms

$$(6x^2 + 3x^2) + (-5x + 8x) + (2 + -3) = 9x^2 + 3x - 1$$

Find the product:

$$3x(2x^2 - 5) = 3x(2x^2) + 3x(-5) = 6x^3 - 15x$$

Find the quotient:

$$\frac{8r^4 + 4r^2 - 6r}{2r} = \frac{8r^4}{2r} + \frac{4r^2}{2r} + \frac{-6r}{2r} = 4r^3 + 2r - 3$$

Find the product using the F.O.I.L. method (F: first, O: outer, I: inner, L: last):

$$(2x - 3)(x + 5) = 2x(x) + 2x(5) - 3(x) - 3(5) = 2x^2 + 7x - 15$$

Exercises

Write the expression in standard form.

1. $13 - 4x + 3x^3$

2. $4y^3 - 2(2y - 3) + y$

Find the sum or difference.

3. $(3x^2 - 5x + 2) + (5x^2 + 9x - 5)$

4. $(8y^2 + 2y - 6) - (3y^2 - 5y + 2)$

Find the product or quotient.

5. $3x(x^2 - 5)$

6. $(4z^3 - 5z + 2)6z$

7. $\frac{8y^3 - 4y^2 + 6y}{2y}$

8. $\frac{18z^6 - 9z^4 - 3z^2}{-3z^2}$

9. $(x + 2)(x + 3)$

10. $(y - 3)(y + 10)$

Answers

Central Tendencies

1. Mean: 353.5
Median: 318
Mode: none
Range: 673
2. Mean: 31.66
Median: 35.5
Mode: 35.5
Range: 33.2

GCF & LCM

1. 6
2. $6xy$
3. $9x^2$
4. 1
5. 54
6. $90xy$
7. $45x^2y^2$
8. 192

Fractions

1. $\frac{1}{3}$
2. $\frac{3}{4}$
3. $\frac{3x}{4}$
4. $\frac{4c^2}{5a^2}$
5. 4
6. 14
7. 10
8. 18
9. $\frac{7}{3}$
10. $-\frac{34}{7}$
11. $-2\frac{1}{4}$
12. $12\frac{2}{3}$
13. $-\frac{5}{12}$
14. $5\frac{13}{18}$
15. $-\frac{1}{2}$
16. $5\frac{1}{2}$
17. $2\frac{23}{33}$

18. $-7\frac{1}{12}$
19. $-\frac{1}{3}$
20. $\frac{4}{3}$ or $1\frac{1}{3}$
21. -9
22. $-\frac{45}{56}$
23. $\frac{1}{48}$
24. $\frac{27}{16}$ or $1\frac{11}{16}$

Order of Operations

1. 13
2. 54
3. -20
4. 0
5. 37
6. 164
7. 72
8. 10
9. 64
10. 3

Working with Integers

1. 6
2. 24
3. -47
4. -120
5. -14
6. -74
7. -5
8. 7
9. -12
10. -136
11. 144
12. -496
13. 61°
14. -14°

Evaluating Expressions and Formulas

1. 3
2. 129
3. -9
4. -18
5. -1
6. 1

Properties of Operations

1. commutative prop of mult
2. associative prop of mult
3. commutative prop of add
4. identity property of add
5. identity property of mult
6. commutative prop of add
7. commutative prop of add
8. identity property of mult
9. associative prop of add
10. commutative prop of mult

Solving Multi-Step Equations

1. $x = -9$
2. $x = 18$
3. $w = -3$
4. $r = 1$
5. $n = 3$
6. $x = 9$
7. $x = -6$
8. $z = 38$
9. $x = 26$
10. All real numbers

Solving Multi-Step Inequalities

1. $x > 3$

2. $y > 6$

3. $v \geq 2$

4. $b < 12$

5. $c \leq 14$

6. $.b < 1$

7. $z < -4$

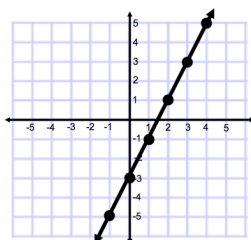
8. $b \geq 2$

9. $x < -6$

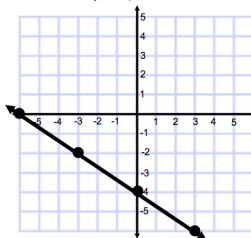
10. $y \leq -5$

Linear Functions

1. solution
2. not a solution
3. x-int: -4
y-int: 3
4. x-int: -4
y-int: -8
5. $\frac{1}{7}$
6. undefined
(can't divide by 0)
7. slope: 2
y-int: -12
8. slope: $\frac{2}{3}$
y-int: 2
9. $y = -2x - 4$
10. $y = \frac{2}{3}x$
- 11.



12.



Polynomials

1. $3x^3 - 4x + 13$
2. $4y^3 - 3y + 6$
3. $8x^2 + 4x - 3$
4. $5y^2 + 7y - 8$
5. $3x^3 - 15x$
6. $24z^4 - 30z^2 + 12z$
7. $4y^2 - 2y + 3$
8. $-6z^4 + 3z^2 + 1$
9. $x^2 + 5x + 6$
10. $y^2 + 7y - 30$