Name: **Course:** **Math Fundamentals**

The concepts below are fundamental to all algebra-based courses in high school and college. **Do not use a calculator.**

1. Reduce a fraction.

Divide the fraction by $\frac{n}{n}$, where *n* is a number that divides evenly into the numerator and the denominator. Repeat, if possible.

$\frac{84}{24} =$

2. Multiply or divide by a power of 10.

A number of the form 1____ or .____1, with any number of zeros in the blank, is a power of 10. The power is the number of zeros before the decimal point or the number of digits after the decimal point. Move the decimal one place for each power of ten by moving it right when multiplying by more than 1 and left when dividing by more than 1, and the reverse when dividing.

$340 \div .01 =$

3. Subtract a fraction from a whole number.

Get a common denominator by multiplying the whole number by $\frac{n}{n}$, where *n* is the denominator of the fraction. Then subtract the numerators.

$2 - \frac{9}{7} =$

4. Multiply a fraction by a whole number.

Multiply the fraction by $\frac{n}{1}$, where *n* is the whole number.

$\frac{9}{7} \times 2 =$

5. Divide a fraction by a whole number.

Multiply the fraction by $\frac{1}{n}$, where *n* is the whole number.

$\frac{9}{7} \div 2 =$

6. Divide zero or by zero.

Any number divided by zero is undefined. Zero divided by any other number is zero.

$\frac{9}{0} =$

7. Subtract, multiply, or divide by a negative.

Subtracting *-n* is the same as adding *n*. Multiplying or dividing by a negative changes the sign (positive or negative) of the number.

$12 \div -2 =$

8. Find a percentage of a whole number.

n% is $\frac{n}{100}$.

2% of 18 =

9. Apply order of operations for basic arithmetic and powers.

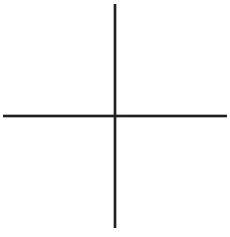
First, do any calculations within parentheses, then apply exponents, then do multiplication and division from left to right, and then do addition and subtraction from left to right.

$10 + 5(4 - 1)^2 =$

10. Estimate coordinates on a graph.

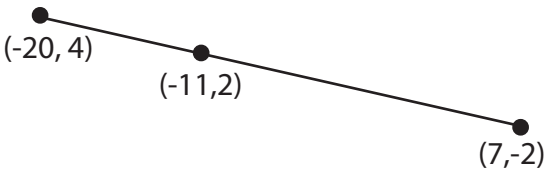
The first coordinate, *x*, is to the right of the origin if positive or to the left if negative. The second coordinate, *y*, is above the origin if positive or below if negative.

Plot the points (-3, 3), (-3, -2), and (5, -3).



11. Find the slope of a graphed line.

Slope = $\frac{y_2 - y_1}{x_2 - x_1}$, where (x_1, y_1) and (x_2, y_2) are any two points on the line.



12. Solve a two-step linear equation.

Use reverse order of operations: Start by adding or subtracting a number from each side, then divide each side by the coefficient.

$2x + 5 = 12$

13. Solve a one-step linear equation with a fractional coefficient.

Multiply each side of the equation by the denominator (to cancel it), and divide each side of the equation by the numerator (to cancel it).

$\frac{2}{3}x = 9$

14. Solve a one-step linear equation with negative and/or decimal constants.

Add or subtract the constant from each side (to cancel it).

$x - 1.2 = -5$

15. Express a scenario as a linear equation.

Write an equation that shows what is being totaled and what the total is. Use variables for unknown quantities.

Some \$9 sandwiches and some \$3 drinks were purchased for a total of \$120.

16. Identify whether or not a graph represents a function.

A function cannot have more than one *y*-value for a single *x*-value, such as if a vertical line intersects a graph at more than one point.

Explain why a line can be the graph of a function but a rectangle cannot.

17. Identify an equation.

An equation has an equals sign. An expression does not.

Write an equation with one variable.

18. Subtract a decimal percentage from a whle number.

Move the decimal two places to the left to get rid of the % sign, then subtract.

$1 - 2.99\% =$

19. Apply order of operations for negatives and parentheses.

A negative number to an even power, such as $(-2)^8$, is positive. But without parentheses, such as -2^8, the negative is applied last, so the value is negative no matter what the power is.

Is $(-3)^6$ positive or negative?

20. Simplify a power of a power.

Multiply the exponents.

$(x^3)^5 =$

21. Multiply powers.

Add exponents. A variable with no written exponent has an exponent of 1.

$x(x^4)(x^5) =$

22. Divide powers.

Subtract exponents (and see above).

$\frac{a}{a^{-6}} =$

23. Apply the negative exponent property to a factor.

The factor with the negative exponent (but nothing else) can be moved from the numerator to the denominator or vice versa to make the exponent positive.

$\frac{ab^{-3}}{4e^{-1}f} =$

24. Distribute a monomial.

Multiply each term by the monomial.

$10x(7x^2 - x - 9) =$

25. Multiply two binomials.

Multiply each term of the first binomial by each term of the second binomial, and then combine like terms.

$(4x - 5)(x + 3) =$

26. Square a binomial.

This is multiplying two binomials (above) where the two binomials are the same. Make sure not to leave out the middle term!

$(2x + 5)^2 =$

27. Multiply a factored expression by a monomial.

Multiply all of the terms of one factor by the monomial.

Multiply $(4x + 11)(13x - 21)$ by 7.

28. Add fractions with unlike, variable denominators.

As with numerical denominators, choose two expressions *n* and *m* such that multiplying the first fraction by $\frac{n}{n}$ and the second fraction by $\frac{m}{m}$ will result in the same denominator. *n* and *m* can be the denominators of the opposite fractions. Multiply, and then add the numerators.

$\frac{7}{4a} + \frac{5}{6a} =$

29. Reduce a rational expression with three or more terms.

Divide each term by the largest factor that divides into each term evenly. Make sure to divide every term one time, regardless of how many factors it has.

$\frac{10 + (2x)(4y)}{10 + 2x + 4y} =$

30. Apply unwritten parentheses.

When subsituting a negative value for a variable, it is never wrong to put parentheses around it, and sometimes it is wrong not to do so. Likewise, numerators and denominators always have parentheses around them, whether written or not.

Evaluate $-a^2 + b^2$ when $a = 3$ and $b = -5$.

31. Use function notation.

Substitute the value or expression in parentheses for each instance of the variable represented.

Given $f(x) = x + 5$ and $g(x) = x^2 - x$, evaluate $f(3) + g(4)$.

32. Distinguish between factors and terms.

Factors are multiplied together, and terms are added together. A factor can consist of more than one term, such as $(x + 3)$, and a term can consist of more than one factor, such as $8x$.

List the terms of the expression $4x(3y) - (2x + 5)$.