Simple Solutions.

Minutes a Day–Mastery for a Lifetime!

Algebra I

Part A

Help Pages &
“Who Knows?”

Help Pages

Vocabulary

General

absolute value — the distance between a number, x, and zero on a number line; written as $|x|$.
Example: $|5| = 5$ reads "The absolute value of 5 is 5." $|-7| = 7$ reads "The absolute value of -7 is 7."

expression — a mathematical phrase written in symbols. **Example**: $2x + 5$ is an expression.

function — a rule that pairs each number in a given set (the domain) with just one number in another set (the range). **Example**: The function $y = x + 3$ pairs every number with another number that is larger by 3.

greatest common factor (GCF) — the highest factor that 2 numbers have in common.
Example: The factors of 6 are 1, 2, **3**, and 6. The factors of 9 are 1, **3**, and 9. The *GCF* of 6 and 9 is 3.

integers — the set of whole numbers, positive or negative, and zero.

irrational number — a number that cannot be written as the ratio of two whole numbers. The decimal form of an irrational number is neither terminating nor repeating. **Examples:** $\sqrt{2}$ and π.

least common multiple (LCM) — the smallest multiple that 2 numbers have in common.
Example: Multiples of 3 are 3, 6, 9, **12**, 15… Multiples of 4 are 4, 8, **12**, 16… The LCM of 3 and 4 is 12.

matrix — a rectangular arrangement of numbers in rows and columns. Each number in a matrix is an element or entry. The plural of matrix is matrices. **Example**: $\begin{pmatrix} 2 & 3 \\ 0 & -1 \end{pmatrix}$ is a matrix with 4 elements.

rational number — a number that can be written as the ratio of two whole numbers.
Example: 7 is rational; it can be written as $\frac{7}{1}$. 0.25 is rational; it can be written as $\frac{1}{4}$.

slope — the ratio of the *rise* (vertical change) to the *run* (horizontal change) for a non-vertical line.

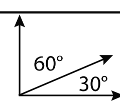
square root — a number that when multiplied by itself gives you another number. The symbol for square root is $\sqrt{x}$. **Example**: $\sqrt{49} = 7$ reads "The square root of 49 is 7."

term — the components of an expression, usually being added to or subtracted from each other.
Example: The expression $2x + 5$ has two terms: $2x$ and 5. The expression $3n^2$ has only one term.

Geometry

acute angle — an angle measuring less than 90°.

complementary angles — two angles whose measures add up to 90°.



congruent — figures with the same shape and the same size.

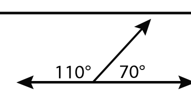
obtuse angle — an angle measuring more than 90°.

right angle — an angle measuring exactly 90°.

similar — figures having the same shape, but different size.

straight angle — an angle measuring exactly 180°.

supplementary angles — two angles whose measures add up to 180°.



surface area — the sum of the areas of all of the faces of a solid figure.

Help Pages

Vocabulary (continued)

Geometry — Circles

circumference — the distance around the outside of a circle.

diameter — the widest distance across a circle. The diameter always passes through the center.

radius — the distance from any point on the circle to the center. The radius is half of the diameter.

Geometry — Polygons

Number of Sides	Name	Number of Sides	Name
3	triangle	7	heptagon
4	quadrilateral	8	octagon
5	pentagon	9	nonagon
6	hexagon	10	decagon

Geometry — Triangles

equilateral — a triangle in which all 3 sides have the same length.

isosceles — a triangle in which 2 sides have the same length.

scalene — a triangle in which no sides are the same length.

Measurement — Relationships

Volume	Distance
3 teaspoons in a tablespoon	36 inches in a yard
2 cups in a pint	1,760 yards in a mile
2 pints in a quart	5,280 feet in a mile
4 quarts in a gallon	100 centimeters in a meter
Weight	1,000 millimeters in a meter
16 ounces in a pound	**Temperature**
2,000 pounds in a ton	0°Celsius – freezing point
Time	100°Celsius – boiling point
10 years in a decade	32°Fahrenheit – freezing point
100 years in a century	212°Fahrenheit – boiling point

Ratio and Proportion

proportion — a statement that two ratios (or fractions) are equal. **Example:** $\frac{1}{2} = \frac{3}{6}$

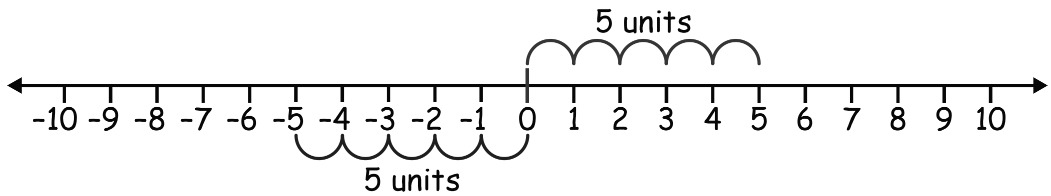
percent (%) —the ratio of any number to 100. **Example:** 14% means 14 out of 100 or $\frac{14}{100}$.

Help Pages

Solved Examples

Absolute Value

The **absolute value** of a number is its distance from zero on a number line. It is always positive.



The absolute value of both -5 and +5 is 5, because both are 5 units away from zero. The symbol for the absolute value of -5 is |-5|. **Examples**: |-3| = 3; |8| = 8.

Equations

An **equation** consists of two expressions separated by an equal sign. You have worked with simple equations for a long time: 2 + 3 = 5. More complicated equations involve variables which replace a number. To solve an equation like this, you must figure out which number the variable stands for. A simple example is when 2 + x = 5. Here, the variable, x, stands for 3.

Sometimes an equation is not so simple. In these cases, there is a process for solving for the variable. No matter how complicated the equation, <u>the goal is to work with the equation until all the numbers are on one side and the variable is alone on the other side</u>. These equations will require only **one step** to solve. To check your answer, put the value of x back into the original equation.

Solving an **equation with a variable on one side**:

Example: Solve for x. $x + 13 = 27$

$$\begin{aligned} x + 13 &= 27 \\ -13 &= -13 \\ \hline x \quad &= 14 \end{aligned}$$

Example: Solve for a. $a - 22 = -53$

$$\begin{aligned} a - 22 &= -53 \\ +22 &= +22 \\ \hline a \quad &= -31 \end{aligned}$$

Check: -31 -22 = -53 ✓ correct!

1. Look at the side of the equation that has the variable on it. If there is a number added to or subtracted from the variable, it must be removed. In the first example, 13 is added to x.
2. To remove 13, add its opposite (-13) to both sides of the equation.
3. Add downward. x plus nothing is x. 13 plus -13 is zero. 27 plus -13 is 14.
4. Once the variable is alone on one side of the equation, the equation is solved. The bottom line tells the value of x. x = 14.

Help Pages

Solved Examples

Equations (continued)

In the next examples, a number is either multiplied or divided by the variable (not added or subtracted).

Example: Solve for *x*. $3x = 39$

$$3x = 39$$
$$\frac{3x}{3} = \frac{39}{3}$$
$$x = 13$$

Check: $3(13) = 39$
$39 = 39$ ✓ correct!

1. Look at the side of the equation that has the variable on it. If there is a number multiplied by or divided into the variable, it must be removed. In the first example, 3 is multiplied by *x*.
2. To remove 3, divide both sides by 3. (You divide because it is the opposite operation from the one in the equation (multiplication).
3. Follow the rules for multiplying or dividing integers. 3*x* divided by 3 is *x*. 39 divided by 3 is thirteen.
4. Once the variable is alone on one side of the equation, the equation is solved. The bottom line tells the value of *x*. $x = 13$.

Example: Solve for *n*. $\frac{n}{6} = -15$

$$\frac{n}{\cancel{6}}(\cancel{6}) = -15(6)$$
$$n = -90$$

Check: $\frac{-90}{6} = -15$
$-15 = -15$ ✓ correct!

The next set of examples also have a variable on only one side of the equation. These, however, are a bit more complicated, because they will require **two steps** in order to get the variable alone.

Example: Solve for *x*. $2x + 5 = 13$

$$2x + 5 = 13$$
$$-5 = -5$$
$$2x = 8$$
$$\frac{\cancel{2}x}{\cancel{2}} = \frac{8}{2}$$
$$x = 4$$

Check: $2(4) + 5 = 13$
$8 + 5 = 13$
$13 = 13$ ✓ correct!

1. Look at the side of the equation that has the variable on it. There is a number (2) multiplied by the variable, and there is a number added to it (5). Both of these must be removed. Always begin with the addition/subtraction. To remove the 5 we must add its opposite (-5) to both sides.
2. To remove the 2, divide both sides by 2. (You divide because it is the opposite operation from the one in the equation (multiplication).
3. Follow the rules for multiplying or dividing integers. 2*x* divided by 2 is *x*. 8 divided by 2 is four.
4. Once the variable is alone on one side of the equation, the equation is solved. The bottom line tells the value of *x*. $x = 4$.

Example: Solve for *n*.

$$3n - 7 = 32$$
$$+7 = +7$$
$$3n = 39$$
$$\frac{\cancel{3}n}{\cancel{3}} = \frac{39}{3}$$
$$n = 13$$

Check: $3(13) - 7 = 32$
$39 - 7 = 32$
$32 = 32$ ✓ correct!

Help Pages

Solved Examples

Equations (continued)

These multi-step equations also have a variable on only one side. To get the variable alone, though, requires several steps.

Example: Solve for x. $3(2x+3)=21$

$$\frac{\cancel{3}(2x+3)}{\cancel{3}}=\frac{21}{3}$$
$$2x+3=7$$
$$-3=-3$$
$$2x=4$$
$$\frac{\cancel{2}x}{\cancel{2}}=\frac{4}{2}$$
$$x=2$$

Check: $3\big(2(2)+3\big)=21$

$3\big(4+3\big)=21$

$3\big(7\big)=21$

21 = 21 ✓ correct!

1. Look at the side of the equation that has the variable on it. First, the expression ($2x$ + 3) is multiplied by 3; then there is a number (3) added to $2x$, and there is a number (2) multiplied by x. All of these must be removed. To remove the 3 outside the parentheses, divide both sides by 3. (You divide because it is the opposite operation from the one in the equation (multiplication).
2. To remove the 3 inside the parentheses, add its opposite (-3) to both sides.
3. Remove the 2 by dividing both sides by 2.
4. Follow the rules for multiplying or dividing integers. $2x$ divided by 2 is x. 4 divided by 2 is two.
5. Once the variable is alone on one side of the equation, the equation is solved. The bottom line tells the value of x. x = 2.

When solving an **equation with a variable on both sides**, the goals are the same: to get the numbers on one side of the equation and to get the variable alone on the other side.

Example: Solve for x. $2x + 4 = 6x – 4$

$$2x+4=6x-4$$
$$-2x=-2x$$
$$4=4x-4$$
$$+4=+4$$
$$8=4x$$
$$\frac{8}{4}=\frac{\cancel{4}x}{\cancel{4}}$$
$$2=x$$

Check: 2(2) + 4 = 6(2) – 4

4 + 4 = 12 – 4

8 = 8 ✓ correct!

1. Since there are variables on both sides, the first step is to remove the "variable term" from one of the sides by adding its opposite. To remove $2x$ from the left side, add -$2x$ to both sides.
2. There are also numbers added (or subtracted) to both sides. Next, remove the number added to the variable side by adding its opposite. To remove -4 from the right side, add +4 to both sides.
3. The variable still has a number multiplied by it. This number (4) must be removed by dividing both sides by 4.
4. The final line shows that the value of x is 2.

Help Pages

Solved Examples

Equations (continued)

Example: Solve for n. $5n - 3 = 8n + 9$

$$\begin{aligned} 5n - 3 &= 8n + 9 \\ -8n \quad &= -8n \\ \hline -3n - 3 &= 9 \\ +3 &= +3 \\ \hline -3n &= 12 \\ \frac{\cancel{-3}n}{\cancel{-3}} &= \frac{12}{-3} \\ n &= -4 \end{aligned}$$

Check: $5(-4) - 3 = 8(-4) + 9$
$-20 - 3 = -32 + 9$
$-23 = -23$ ✓ correct!

Exponents

An **exponent** is a small number to the upper right of another number (the base). Exponents are used to show that the base is a repeated factor.

Example: 2^4 is read "two to the fourth power."
The base (2) is a factor multiple times.
The exponent (4) tells how many times the base is a factor.
$2^4 = 2 \times 2 \times 2 \times 2 = 16$

base → 2^4 ← **exponent**

Example: 9^3 is read "nine to the third power" and means $9 \times 9 \times 9 = 729$

Expressions

An **expression** is a number, a variable, or any combination of these, along with operation signs $(+, -, \times, \div)$ and grouping symbols. An expression never includes an equal sign.

Five examples of expressions are 5, x, $(x + 5)$, $(3x + 5)$, and $(3x^2 + 5)$.

To **evaluate an expression** means to calculate its value using specific variable values.

Example: Evaluate $2x + 3y + 5$ when $x = 2$ and $y = 3$.

$2(2) + 3(3) + 5 = ?$
$4 + 9 + 5 = ?$
$13 + 5 = 18$

The expression has a value of 18.

1. To evaluate, put the values of x and y into the expression.
2. Use the rules for integers to calculate the value of the expression.

Example: Find the value of $\frac{xy}{3} + 2$ when $x = 6$ and $y = 4$.

$$\frac{6(4)}{3} + 2 = ?$$
$$\frac{24}{3} + 2 = ?$$
$$8 + 2 = 10$$

The expression has a value of 10.

Help Pages

Solved Examples

Expressions (continued)

When evaluating a numerical expression containing multiple operations, use a set of rules called the **Order of Operations**. The Order of Operations determines which operations, and in which order, they should be performed. (Which operation should be done first, second, etc.)

The Order of Operations is as follows:

1. Parentheses
2. Exponents
3. Multiplication/Division (left to right in the order that they occur)
4. Addition/Subtraction (left to right in the order that they occur)

If parentheses are enclosed within other parentheses, work from the inside out.
To remember the order, use the mneumonic device "**P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally."

Use the following examples to help you understand how to use the Order of Operations.

Example: $2 + 6 \cdot 5$

To evaluate this expression, work through the steps using the Order of Operations.

1. Since there are no parentheses or exponents in the expression, skip steps 1 and 2.
2. According to step 3, do multiplication and division. $6 \cdot 5 = 30$
3. Next, step 4 says to do addition and subtraction. $2 + 30 = 32$

The answer is 32.

Example: $42 \div 6 \cdot 3 + 4 - 16 \div 2$

$42 \div 6 \cdot 3 + 4 - 16 \div 2$
$7 \cdot 3 + 4 - 16 \div 2$
$21 + 4 - 16 \div 2$
$21 + 4 - 8$
$25 - 8$
17

1. Do multiplication and division first (in the order they occur).
2. Do addition and subtraction next (in the order they occur).

Example: $5(2+4)+15 \div (9-6)$

$5(2+4)+15 \div (9-6)$
$5(6)+15 \div (3)$
$30+5$
35

1. Do operations inside of parentheses first.
2. Do multiplication and division first (in the order they occur).
3. Do addition and subtraction next (in the order they occur).

Example: $4\left[3+2\left(7+5\right)-7\right]$

$4\left[3+2\left(7+5\right)-7\right]$
$4\left[3+2\left(12\right)-7\right]$
$4\left[3+24-7\right]$
$4\left[27-7\right]$
$4\left[20\right]$
80

1. Brackets are treated as parentheses. Start from the innermost parentheses first.
2. Then work inside the brackets.

Help Pages

Solved Examples

Expressions (continued)

Some expressions can be made more simple. There are a few processes for **simplifying an expression**. Deciding which process or processes to use depends on the expression itself. With practice, you will be able to recognize which of the following processes to use.

The **distributive property** is used when one term is multiplied by (or divided into) an expression that includes either addition or subtraction. $a(b+c)=ab+ac$ or $\dfrac{b+c}{a}=\dfrac{b}{a}+\dfrac{c}{a}$

Example: Simplify. 3(2x + 5)

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

Example: Simplify. 2(7x – 3y + 4)

$$2(7x-3y+4)=$$
$$2(7x)+2(-3y)+2(+4)=$$
$$14x-6y+8$$

1. Since the 3 is multiplied by the expression, $2x + 5$, the 3 must be multiplied by both terms in the expression.
2. Multiply 3 by $2x$ and then multiply 3 by + 5.
3. The result includes both of these: $6x + 15$. Notice that simplifying an expression does not result in a single number answer, only a more simple expression.

Expressions which contain like terms can also be simplified. **Like terms** are those that contain the same variable to the same power. $2x$ and $-4x$ are like terms; $3n^2$ and $8n^2$ are like terms; $5y$ and y are like terms; 3 and 7 are like terms.

An expression sometimes begins with like terms. This process for **simplifying expressions** is called **combining like terms**. When combining like terms, first identify the like terms. Then, simply add the like terms to each other and write the results together to form a new expression.

Example: Simplify. $2x + 5y - 9 + 5x - 3y - 2$

The like terms are $2x$ and $+5x$, $+5y$ and $-3y$, and -9 and -2.

$2x + +5x = \mathbf{+7x}$, $+5y + -3y = \mathbf{+2y}$, and $-9 + -2 = \mathbf{-11}$.

The result is $\mathbf{7x + 2y - 11}$.

The next examples are a bit more complex. It is necessary to use the distributive property first, and then to combine like terms.

Example: Simplify. $2(3x+2y+2)+3(2x+3y+2)$

$$\begin{array}{r} 6x+4y+4 \\ +6x+9y+6 \\ \hline 12x+13y+10 \end{array}$$

Example: Simplify. $4(3x-5y-4)-2(3x-3y+2)$

$$\begin{array}{r} +12x-20y-16 \\ -6x+6y-4 \\ \hline 6x-14y-20 \end{array}$$

1. First, apply the distributive property to each expression. Write the results on top of each other, lining up the like terms with each other. Pay attention to the signs of the terms.
2. Then, add each group of like terms. Remember to follow the rules for integers.

Help Pages

Solved Examples

Expressions (continued)

Other expressions that can be simplified are written as fractions. **Simplifying** these expressions (**algebraic fractions**) is similar to simplifying numerical fractions. It involves cancelling out factors that are common to both the numerator and the denominator.

Simplify. $\dfrac{12x^2yz^4}{16xy^3z^2}$

$$\frac{\overset{3}{\cancel{12}}\,\overset{x}{\cancel{x^2}}\,\cancel{y}\,\overset{z^2}{\cancel{z^4}}}{\underset{4}{\cancel{16}}\,\cancel{x}\,\underset{y^2}{\cancel{y^3}}\,\cancel{z^2}}$$

$$\frac{\cancel{2}\cdot\cancel{2}\cdot 3\cdot\cancel{x}\cdot x\cdot\cancel{y}\cdot\cancel{z}\cdot\cancel{z}\cdot z\cdot z}{\cancel{2}\cdot\cancel{2}\cdot 2\cdot 2\cdot\cancel{x}\cdot\cancel{y}\cdot y\cdot y\cdot\cancel{z}\cdot\cancel{z}}$$

$$\frac{3xz^2}{4y^2}$$

1. Begin by looking at the numerals in both the numerator and denominator (12 and 16). What is the largest number that goes into both evenly? Cancel this factor (4) out of both.
2. Look at the x portion of both numerator and denominator. What is the largest number of x's that can go into both of them? Cancel this factor (x) out of both.
3. Do the same process with y and then z. Cancel out the largest number of each (y and z^2). Write the numbers that remain in the numerator or denominator for your answer.

Often a relationship is described using verbal (English) phrases. In order to work with the relationship, you must first **translate it into an algebraic expression or equation**. In most cases, word clues will be helpful. Some examples of verbal phrases and their corresponding algebraic expressions or equations are written below.

Verbal Phrase	Algebraic Expression
Ten more than a number	$x + 10$
The sum of a number and five	$x + 5$
A number increased by seven	$x + 7$
Six less than a number	$x - 6$
A number decreased by nine	$x - 9$
The difference between a number and four	$x - 4$
The difference between four and a number	$4 - x$
Five times a number	$5x$
Eight times a number, increased by one	$8x + 1$
The product of a number and six is twelve.	$6x = 12$
The quotient of a number and 10	$\frac{x}{10}$
The quotient of a number and two, decreased by five	$\frac{x}{2} - 5$

In most problems, the word "is" tells you to put in an equal sign. When working with fractions and percents, the word "of" generally means multiply. Look at the example below.

One half <u>of</u> a number <u>is</u> fifteen.

You can think of it as "one half <u>times</u> a number <u>equals</u> fifteen."

When written as an algebraic equation, it is $\frac{1}{2}x = 15$.

Help Pages

Solved Examples

Expressions (continued)

At times you need to find the **greatest common factor (GCF) of an algebraic expression**.

Example: Find the GCF of $12x^2yz^3$ and $18xy^3z^2$.

1. First, find the GCF of the numbers (12 and 18). The largest number that is a factor of both is **6**.
2. Now look at the x's. Of the x-terms, which contains fewer x's? Comparing x^2 and x, $\boldsymbol{x}$ has fewer.
3. Now look at the y's and then the z's. Again, of the y-terms, $\boldsymbol{y}$ contains fewer. Of the z-terms, $\boldsymbol{z^2}$ has fewer.
4. The GCF contains all of these. $\boldsymbol{6xyz^2}$

$12x^2yz^3$ and $18xy^3z^2$

The GCF of 12 and 18 is **6**.

Of x^2 and x, the smaller is $\boldsymbol{x}$.

Of y and y^3, the smaller is $\boldsymbol{y}$.

Of z^3 and z^2, the smaller is $\boldsymbol{z^2}$.

The GCF is $6xyz^2$.

At other times you need to know the **least common multiple (LCM) of an algebraic expression**.

Example: Find the LCM of $10a^3b^2c^2$ and $15ab^4c$.

1. First, find the LCM of the numbers (10 and 15). The lowest number that both go into evenly is **30**.
2. Now look at the a-terms. Which more a's? Comparing a^3 and a, $\boldsymbol{a^3}$ has more.
3. Now look at the b's and then the c's. Again, of the b-terms, $\boldsymbol{b^4}$ contains more. Of the c-terms, $\boldsymbol{c^2}$ contains more.
4. The LCM contains all of these. $\boldsymbol{30a^3b^4c^2}$.

$10a^3b^2c^2$ and $15ab^4c$

The LCM of 10 and 15 is **30**.

Of a^3 and a, the larger is $\boldsymbol{a^3}$.

Of b^2 and b^4, the larger is $\boldsymbol{b^4}$.

Of c^2 and c, the larger is $\boldsymbol{c^2}$.

The LCM is $30a^3b^4c^2$.

Functions

A **function** is a rule that pairs each number in a given set (the domain) with just one number in another set (the range). A function performs one or more operations on an input-number which results in an output-number. The set of all input-numbers is called the **domain** of the function. The set of all output-numbers is called the **range** of the function. Often, a function table is used to help organize your thinking.

Example: For the function, $y = 3x$, find the missing numbers in the function table.

x	y
2	?
-1	?
?	15

The function is $y = 3x$. This function multiplies every x-value by 3.

When we input $x = 2$, we get $y = 3(2)$ or $y = 6$.

When we use $x = -1$, we get $y = 3(-1)$ or $y = -3$.

When we use $y = 15$, we get $15 = 3x$, so $\frac{15}{3} = x$ or $5 = x$.

x	y
2	?
-1	?
?	15

The set of all inputs is the domain. For this function table, the domain is {2, -1, 5}

The set of all outputs is the range. For this function table, the range is {6, -3, 15}.

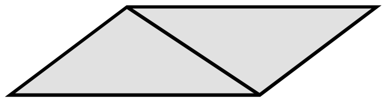
Help Pages

Solved Examples

Geometry

To find the **area of a triangle**, first recognize that any triangle is exactly half of a parallelogram.

The whole figure is a parallelogram.

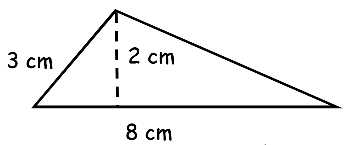


Half of the whole figure is a triangle.

So, the triangle's area is equal to half of the product of the base and the height.

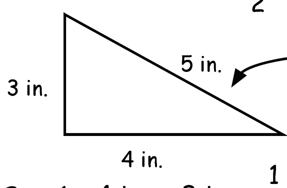
Area of triangle = $\frac{1}{2}$(base $\times$ height) or $A = \frac{1}{2}bh$

Examples: Find the area of the triangles below.



So, A = 8 cm $\times$ 2 cm $\times$ $\frac{1}{2}$ = **8 cm^2**

1. Find the length of the base. (8 cm)
2. Find the height. (It is 2 cm. The height is always straight up and down – never slanted.)
3. Multiply them together and divide by 2 to find the area. (8 cm^2)



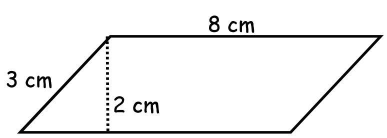
So, A = 4 in. x 3 in. x $\frac{1}{2}$ = **6 in^2**.

The base of this triangle is 4 inches long. Its height is 3 inches. (Remember the height is always straight up and down!)

Finding the **area of a parallelogram** is similar to finding the area of any other quadrilateral. The area of the figure is equal to the length of its base multiplied by the height of the figure.

Area of parallelogram = base $\times$ height or $A = b \times h$

Example: Find the area of the parallelogram below.



1. Find the length of the base. (8 cm)
2. Find the height. (It is 2 cm. The height is always straight up and down – never slanted.)
3. Multiply to find the area. (16 cm^2)

So, A = 8 cm $\times$ 2 cm = **16 cm^2**.

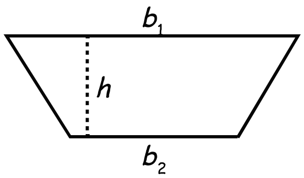
Help Pages

Solved Examples

Geometry (continued)

Finding the **area of a trapezoid** is a little different than the other quadrilaterals that we have seen. Trapezoids have 2 bases of unequal length. To find the area, first find the average of the lengths of the 2 bases. Then, multiply that average by the height.

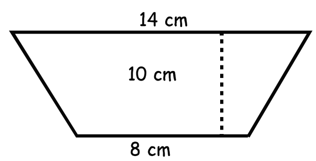
Area of trapezoid = $\frac{\text{base}_1 + \text{base}_2}{2} \times \text{height}$ or $A = (\frac{b_1 + b_2}{2})h$



The bases are labeled b_1 and b_2.
The height, h, is the distance between the bases.

Example: Find the area of the trapezoid below.

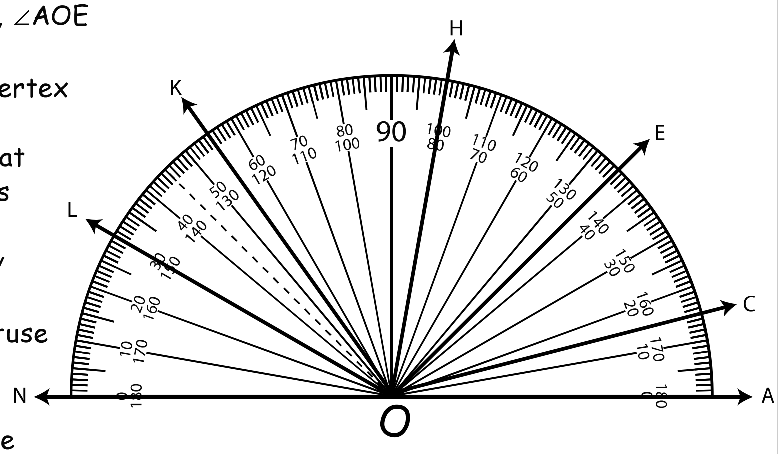
1. Add the lengths of the two bases. (22 cm)
2. Divide the sum by 2. (11 cm)
3. Multiply that result by the height to find the area. (110 cm^2)



$\frac{14 \text{ cm} + 8 \text{ cm}}{2} = \frac{22 \text{ cm}}{2} = 11 \text{ cm}$

$11 \text{ cm} \times 10 \text{ cm} = \mathbf{110 \text{ cm}^2}$ = Area

To **find the measure of an angle**, a protractor is used. The symbol for angle is ∠. On the diagram, ∠AOE has a measure less than 90°, so it is acute. With the center of the protractor on the vertex of the angle (where the 2 rays meet), place one ray ($\overrightarrow{OA}$) on one of the "0" lines. Look at the number that the other ray ($\overrightarrow{OE}$) passes through. Since the angle is acute, use the lower set of numbers. Since $\overrightarrow{OE}$ is halfway between the 40 and the 50, the measure of ∠AOE is 45°. (If it were an obtuse angle, the higher set of numbers would be used.)



Look at ∠NOH. It is an obtuse angle, so the higher set of numbers will be used. Notice that $\overrightarrow{ON}$ is on the "0" line. $\overrightarrow{OH}$ passes through the 100 mark. So the measure of ∠NOH is 100°.

Help Pages

Solved Examples

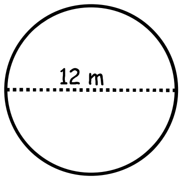
Geometry (continued)

The **circumference of a circle** is the distance around the outside of the circle. Before you can find the circumference of a circle you must know either its radius or its diameter. Also, you must know the value of the constant, pi (π). $\pi = 3.14$ (rounded to the nearest hundredth)

Once you have this information, the circumference can be found by multiplying the diameter by pi.

$$\text{Circumference} = \pi \times \text{diameter} \quad \text{or} \quad C = \pi d$$

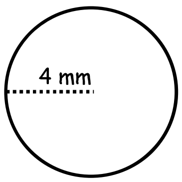
Examples: Find the circumference of the circles below.



1. Find the length of the diameter. (12 m)
2. Multiply the diameter by π. (12 m × 3.14)
3. The product is the circumference. (37.68 m)

So, C = 12 m × 3.14 = **37.68 m**.

Sometimes the radius of a circle is given instead of the diameter. Remember, the radius of any circle is exactly half of the diameter. If a circle has a radius of 3 feet, its diameter is 6 feet.



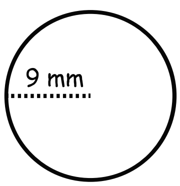
1. Since the radius is 4 mm, the diameter must be 8 mm.
2. Multiply the diameter by π. (8 mm × 3.14)
3. The product is the circumference. (25.12 mm)

So, C = 8 mm × 3.14 = **25.12 mm**.

When finding the **area of a circle**, the length of the radius is squared (multiplied by itself), and then that answer is multiplied by the constant, pi (π). π = 3.14 (rounded to the nearest hundredth).

$$\text{Area} = \pi \times \text{radius} \times \text{radius} \text{ or } A = \pi r^2$$

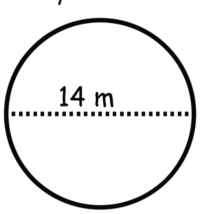
Examples: Find the area of the circles below.



So, A = 9 mm x 9 mm x 3.14 = **254.34 mm**^{2}.

1. Find the length of the radius. (9 mm)
2. Multiply the radius by itself. (9 mm x 9 mm)
3. Multiply the product by pi. (81 mm^2 x 3.14)
4. The result is the area. (254.34 mm^2)

Sometimes the diameter of a circle is given instead of the radius. Remember, the diameter of any circle is exactly twice the radius. If a circle has a diameter of 6 feet, its radius is 3 feet.



1. Since the diameter is 14 m, the radius must be 7 m.
2. Square the radius. (7 m x 7 m)
3. Multiply that result by π. (49 m^2 × 3.14).
4. The product is the area. (153.86 m^2)

So, A = (7 m)^2 x 3.14 = **153.86 m**^{2}.

Help Pages

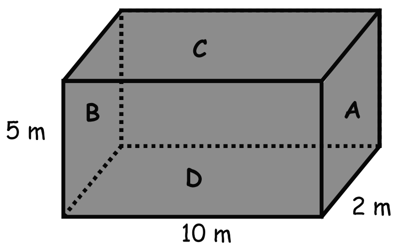
Solved Examples

Geometry (continued)

To find the **surface area** of a solid figure, it is necessary to first count the total number of faces. Then, find the area of each of the faces; finally, add the areas of each face. That sum is the surface area of the figure.

Here, the focus will be on finding the **surface area of a rectangular prism**. A rectangular prism has 6 faces. Actually, the opposite faces are identical, so this figure has 3 pairs of faces. Also, a prism has only 3 dimensions: length, width, and height.

This prism has identical left & right sides (A & B), identical top and bottom (C & D), and identical front and back (unlabeled).



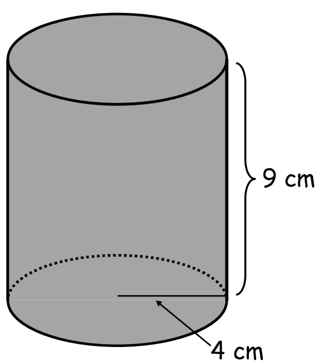
1. Find the area of the front: $l \times w$. (10 m × 5 m = 50 m^2) Since the back is identical, its area is the same.
2. Find the area of the top (C): $l \times h$. (10 m × 2 m = 20 m^2) Since the bottom (D) is identical, its area is the same.
3. Find the area of side A: $w \times h$. (2 m × 5 m = 10 m^2) Since side B is identical, its area is the same.
4. Add up the areas of all 6 faces. (10 m^2 + 10 m^2 + 20 m^2 + 20 m^2 + 50 m^2 + 50 m^2 = 160 m^2)

The formula is Surface Area = 2(length x width) + 2(length x height) + 2(width x height)
or $SA = 2lw + 2lh + 2wh$

To find the volume of a solid figure, it is necessary to determine the area one face and multiply that by the height of the figure. Volume of a solid is measured in cubic units (cm^3, in^3, ft^3, etc.).

Here the focus will be on finding the **volume of a cylinder**. As shown below, a cylinder has two identical circular faces.

Example: Find the volume of the cylinder below.



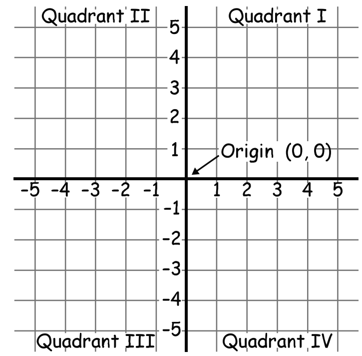
1. To find the area of one of the circular faces, multiply the constant, π (3.14), by the square of the radius (4 cm). Area = 3.14 × $(4 \text{ cm})^2$ = 50.24 cm^2
2. The height of this cylinder is 9 cm. Multiply the height by the area calculated in Step 1.
3. Volume = 50.24 cm^2 × 9 cm = 452.16 cm^3

Help Pages

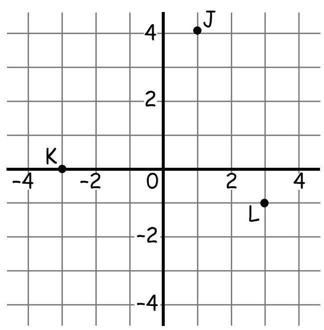
Solved Examples

Graphing

A **coordinate plane** is formed by the intersection of a horizontal number line, called the ***x*-axis**, and a vertical number line, called the ***y*-axis**. The axes meet at the point (0, 0), called the **origin**, and divide the coordinate plane into four **quadrants**.



Points are represented by **ordered pairs** of numbers, (x, y). The first number in an ordered pair is the x-coordinate; the second number is the y-coordinate. In the point (-4, 1), -4 is the x-coordinate and 1 is the y-coordinate.



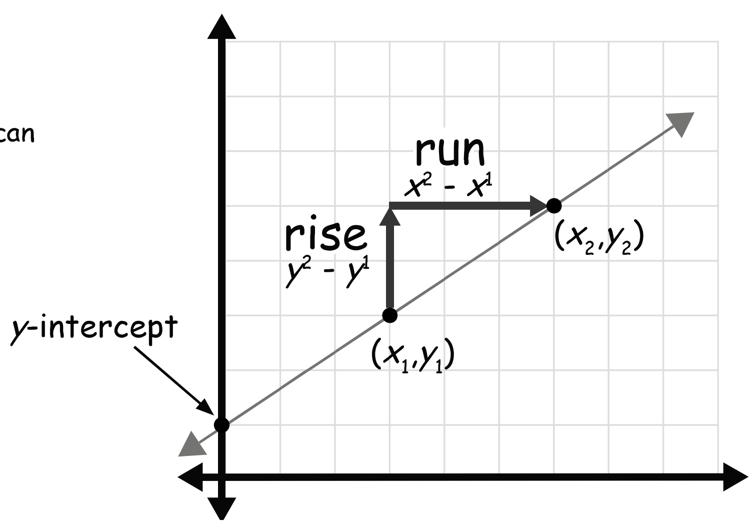
When graphing on a coordinate plane, always move on the x-axis first (right or left), and then move on the y-axis (up or down).

- The coordinates of point J are (1, 4).
- The coordinates of point K are (-3, 0).
- The coordinates of point L are (3, -1).

On a coordinate plane, any 2 points can be connected to form a line. The line, however, is made up of many points – in fact, every place on the line is another point. One of the properties of a line is its slope (or steepness). The **slope** of a non-vertical line is the ratio of its vertical change (rise) to its horizontal change (run) between any two points on the line. The slope of a line is represented by the letter m. Another property of a line is the ***y*-intercept**. This is the point where the line intersects the y-axis. A line has only one y-intercept, which is represented by the letter b.

Slope of a line $= \dfrac{\text{change in } y}{\text{change in } x} = \dfrac{\text{rise}}{\text{run}}$

The rise-over-run method can be used to find the slope if you're looking at the graph.



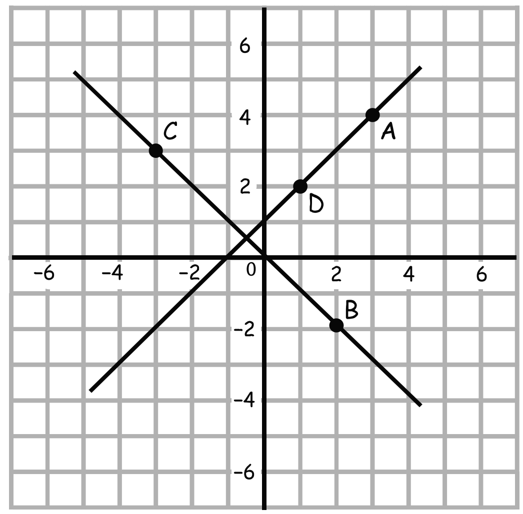
Help Pages

Solved Examples

Graphing

Another way to find the slope of a line is to use the formula. The formula for slope is $m = \frac{y_2 - y_1}{x_2 - x_1}$, where the two points are (x_1, y_1) and (x_2, y_2).

Example: What is the slope of $\overline{AD}$?



Point *A* with coordinates (3, 4) and Point *D* with coordinates (1, 2) are both on this line.

For Point *A*, x_2 is 3 and y_2 is 4.
For Point *B*, x_1 is 1 and y_1 is 2.

slope = $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4-2}{3-1} = \frac{2}{2} = 1$

The slope of $\overline{AD}$ is 1.

Use the formula to find the slope of $\overline{CB}$.

Point *C* is (-3, 3) and Point *B* is (2, -2).

slope = $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-3}{2-(-3)} = \frac{-5}{5} = -1$

The slope of $\overline{CB}$ is -1.

Every line has an equation which describes it, called a linear equation. We will focus on one particular form of linear equation – **slope-intercept form**. To write the slope-intercept equation of a line, you must know the slope and the *y*-intercept.

A linear equation in slope-intercept form is always in the form $y = mx + b$, where *m* is the slope, *b* is the *y*-intercept, and (*x*, *y*) is any point on the line.

Example: A line has the equation $y = 2x + 5$. What is the slope? What is the *y*-intercept?

$y = 2x + 5$
↑ ↑
$y = mx + b$

The slope, *m*, is 2. The *y*-intercept, *b*, is 5.

Example: A line has a slope of 6 and a *y*-intercept of -3. Write the equation for the line.

The slope is 6, so *m* = 6. The *y*-intercept is -3, so *b* = -3.
Put those values into the slope-intercept form. $y = 6x - 3$

Example: Write the equation of a line that passes through points (3, 2) and (6, 4).

Only 2 things are needed to write the equation of a line: slope and *y*-intercept.

First, find the slope. $m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4-2}{6-3} = \frac{2}{3}$

Then, find the *y*-intercept. Choose either point. Let's use (6, 4). The *x*-value of this point is 6 and the *y*-value is 4. Put these values along with the slope into the equation and solve for *b*.

$y = mx + b$ $\quad 4 = \frac{2}{3}(6) + b$ $\quad 4 = \frac{12}{3} + b$ $\quad 4 = 4 + b$ $\quad 0 = b$

So the slope = $\frac{2}{3}$ and the *y*-intercept = 0. The equation of the line is $y = \frac{2}{3}x + 0$.

Help Pages

Solved Examples

Inequalities

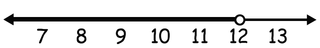
An inequality is a statement that one quantity is different than another (usually larger or smaller). The symbols showing inequality are <, >, ≤, and ≥ (less than, greater than, less than or equal to, and greater than or equal to.) An inequality is formed by placing one of the inequality symbols between two expressions. The solution of an inequality is the set of numbers that can be substituted for the variable to make the statement true.

A simple inequality is $x \le 4$. The solution set, {..., 2, 3, 4}, includes all numbers that are either less than four or equal to four.

Some inequalities are solved using only addition or subtraction. The approach to solving them is similar to that used when solving equations. The goal is to get the variable alone on one side of the inequality and the numbers on the other side.

Examples: Solve. $x - 4 < 8$

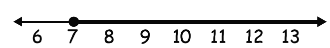
$$x - 4 < 8$$
$$\underline{\ \ +4 \quad +4}$$
$$x < 12$$



1. To get the variable alone, add the opposite of the number that is with it to both sides.
2. Simplify both sides of the inequality.
3. Graph the solution on a number line. For < and >, use an open circle; for ≤ and ≥ , use a closed circle.

Solve. $y + 3 \ge 10$

$$y + 3 \ge 10$$
$$\underline{\ \ -3 \quad -3}$$
$$y \ge 7$$

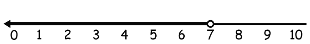


Some inequalities are solved using only multiplication or division. The approach to solving them is also similar to that used when solving equations. Here, too, the goal is to get the variable alone on one side of the inequality and the numbers on the other side.

The one difference that you must remember is this: If, when solving a problem you multiply or divide by a negative number, you must flip the inequality symbol.

Examples: Solve. $8n < 56$

$$\frac{8n}{8} < \frac{56}{8}$$
$$n < 7$$

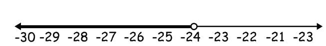


1. Check to see if the variable is being multiplied or divided by a number.
2. Use the same number, but do the opposite operation on both sides.
3. Simplify both sides of the inequality.
4. Graph the solution on a number line. For < and >, use an open circle; for ≤ and ≥ , use a closed circle.

Solve. $\frac{x}{-6} > 4$

$$\frac{x}{-6} > 4$$
$$(-6)\frac{x}{-6} < 4(-6)$$
$$x < -24$$

Notice that during the 2nd step, when multiplying by -6, the sign "flipped" from greater than to less than.



REMEMBER: When multiplying or dividing an inequality by a negative number, the inequality symbol must be flipped!

Help Pages

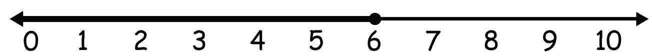
Solved Examples

Inequalities (continued)

Some inequalities must be solved using both addition/subtraction and multiplication/division. In these problems, the addition/subtraction is always done first.

Example: $2x - 6 \leq 6$

$$\begin{aligned} 2x - 6 &\leq 6 \\ +6 \quad &\quad +6 \\ 2x &\leq 12 \\ \frac{2x}{2} &\leq \frac{12}{2} \\ x &\leq 6 \end{aligned}$$

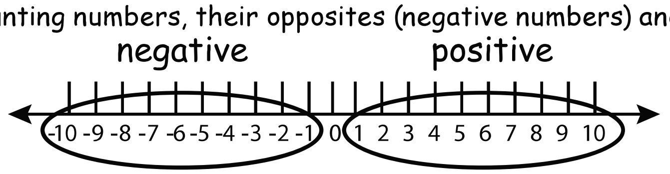


A compound inequality is a statement comparing one quantity (in the middle) with two other quantities (on either side).

$-2 < y < 1$ This can be read "y is greater than -2, but less than 1."

Integers

Integers include the counting numbers, their opposites (negative numbers) and zero.



The negative numbers are to the left of zero. The positive numbers are to the right of zero.

When ordering integers, they are being arranged either from least to greatest or from greatest to least. The further a number is to the right, the greater its value. For example, 9 is further to the right than 2, so 9 is greater than 2.

In the same way, -1 is further to the right than -7, so -1 is greater than -7.

Examples: Order these integers from **least to greatest**. -10, 9, -25, 36, 0

Remember, the smallest number will be the one farthest to the left on the number line, -25, then -10, then 0. Next will be 9, and finally 36.

Answer: -25, -10, 0, 9, 36

Put these integers in order from **greatest to least**. -94, -6, -24, -70, -14
Now the greatest value (farthest to the right) will come first and the smallest value (farthest to the left) will come last.

Answer: -6, -14, -24, -70, -94

Help Pages

Solved Examples

Integers (continued)

The rules for performing operations $(+,-,\times,\div)$ on integers are very important and must be memorized.

The Addition Rules for Integers:

1. When the signs are the same, add the numbers and keep the sign.

$$\begin{array}{r} +33 \\ +\ +19 \\ \hline +52 \end{array} \qquad \begin{array}{r} -33 \\ +\ -19 \\ \hline -52 \end{array}$$

2. When the signs are different, subtract the numbers and use the sign of the larger number.

$$\begin{array}{r} +33 \\ +\ -19 \\ \hline +14 \end{array} \qquad \begin{array}{r} -55 \\ +\ +27 \\ \hline -28 \end{array}$$

The Subtraction Rule for Integers:

Change the sign of the second number and add (follow the Addition Rule for Integers above).

$$\begin{array}{r} +56 \\ -\ -26 \\ \hline \end{array} \xrightarrow{\text{apply rule}} \begin{array}{r} +56 \\ +\ +26 \\ \hline +82 \end{array} \qquad \begin{array}{r} +48 \\ -\ +23 \\ \hline \end{array} \xrightarrow{\text{apply rule}} \begin{array}{r} +48 \\ +\ -23 \\ \hline +25 \end{array}$$

Notice that every subtraction problem becomes an addition problem, using this rule!

The Multiplication and Division Rule for Integers:

1. When the signs are the same, the answer is positive (+).

$+7 \times +3 = +21$ $\qquad -7 \times -3 = +21$

$+18 \div +6 = +3$ $\qquad -18 \div -6 = +3$

2. When the signs are different, the answer is negative (–).

$+7 \times -3 = -21$ $\qquad -7 \times +3 = -21$

$-18 \div +6 = -3$ $\qquad +18 \div -6 = -3$

The chart to the right contains a helpful summary of this rule.

+	×	+	=	+
–	×	–	=	+
+	×	–	=	–
–	×	+	=	–
+	÷	+	=	+
–	÷	–	=	+
+	÷	–	=	–
–	÷	+	=	–

Matrix, Matrices

A **matrix** is a rectangular arrangement of numbers in rows and columns. Each number in a matrix is an element or entry. The plural of matrix is **matrices**.

$$\begin{pmatrix} 0 & 4 & -1 \\ -3 & 2 & 5 \end{pmatrix}$$

The matrix to the right has 2 rows and 3 columns. It has 6 elements.

In order to be added or subtracted, matrices must have the same number of rows and columns. If they don't have the same dimensions, they cannot be added or subtracted.

When **adding matrices**, simply add corresponding elements.

Example:

$$\begin{pmatrix} 0 & 4 & -1 \\ -3 & 2 & 5 \end{pmatrix} + \begin{pmatrix} 2 & 1 & 3 \\ -2 & -6 & 4 \end{pmatrix} = \begin{pmatrix} (0+2) & (4+1) & (-1+3) \\ (-3+(-2)) & (2+(-6)) & (5+4) \end{pmatrix} = \begin{pmatrix} 2 & 5 & 2 \\ -5 & -4 & 9 \end{pmatrix}$$

When subtracting matrices, remember the subtraction rule for integers. A simple way to subtract matrices is to change the signs of every element of the second matrix. Then change the operation to addition and follow the rule for addition of integers (as shown in the previous example).

Example:

First change all signs, then add.

$$\begin{pmatrix} -10 & 2 \\ 3 & -7 \end{pmatrix} - \begin{pmatrix} 5 & -3 \\ 6 & -1 \end{pmatrix} = \begin{pmatrix} -10 & 2 \\ 3 & -7 \end{pmatrix} + \begin{pmatrix} -5 & +3 \\ -6 & +1 \end{pmatrix} = \begin{pmatrix} (-10+(-5)) & (2+3) \\ (3+(-6)) & (-7+1) \end{pmatrix} = \begin{pmatrix} -15 & +5 \\ -3 & -6 \end{pmatrix}$$

Help Pages

Solved Examples

Proportion

A **proportion** is a statement that two ratios are equal to each other. There are two ways to solve a proportion when a number is missing.

1. One way to solve a proportion is already familiar to you. You can use the equivalent fraction method.

$$\frac{5}{8} = \frac{n}{64} \quad (\times 8)$$

$n = 40$

So, $\frac{5}{8} = \frac{40}{64}$.

To use Cross-Products:

1. Multiply downward on each diagonal.
2. Make the product of each diagonal equal to each other.
3. Solve for the missing variable.

2. Another way to solve a proportion is by using cross-products.

$$\frac{14}{20} = \frac{21}{n}$$

$20 \times 21 = 14 \times n$

$420 = 14n$

$\frac{420}{14} = \frac{14n}{14}$

$30 = n$

So, $\frac{14}{20} = \frac{21}{30}$.

Percent

When changing from a fraction to a percent, a decimal to a percent, or from a percent to either a fraction or a decimal, it is very helpful to use an FDP chart (Fraction, Decimal, Percent).

To change a **fraction to a percent and/or decimal**, first find an equivalent fraction with 100 in the denominator. Once you have found that equivalent fraction, it can easily be written as a decimal. To change that decimal to a percent, move the decimal point 2 places to the right and add a % sign.

Example: Change $\frac{2}{5}$ to a percent and then to a decimal.

1. Find an equivalent fraction with 100 in the denominator.
2. From the equivalent fraction above, the decimal can easily be found. Say the name of the fraction: "forty hundredths." Write this as a decimal. 0.40.
3. To change 0.40 to a percent, move the decimal two places to the right. Add a % sign. 40%

$$\frac{2}{5} = \frac{?}{100} \quad (\times 20)$$

$? = 40$

$\frac{2}{5} = \frac{40}{100} = 0.40$

$0.40 = 40\%$

When changing from a **percent to a decimal or a fraction**, the process is similar to the one used above. Begin with the percent. Write it as a fraction with a denominator of 100; reduce this fraction. Return to the percent, move the decimal point 2 places to the left. This is the decimal.

Example: Write 45% as a fraction and then as a decimal.

1. Begin with the percent. (45%)Write a fraction where the denominator is 100 and the numerator is the "percent." $\frac{45}{100}$
2. This fraction must be reduced.The reduced fraction is $\frac{9}{20}$.
3. Go back to the percent. Move the decimal point two places to the left to change it to a decimal.

$45\% = \frac{45}{100}$

$\frac{45(\div 5)}{100(\div 5)} = \frac{9}{20}$

$45\% = .45$

Decimal point goes here.

Help Pages

Solved Examples

Percent (continued)

When changing from a **decimal to a percent or a fraction**, again, the process is similar to the one used on the previous page. Begin with the decimal. Move the decimal point 2 places to the right and add a % sign. Return to the decimal. Write it as a fraction and reduce.

Example: Write 0.12 as a percent and then as a fraction.

1. Begin with the decimal. (0.12) Move the decimal point two places to the right to change it to a percent.
2. Go back to the decimal and write it as a fraction. Reduce this fraction.

$0.12 = 12\%$

0.12 = twelve hundredths

$$\frac{12}{100} = \frac{12(\div 4)}{100(\div 4)} = \frac{3}{25}$$

Percent of change shows how much a quantity has increased or decreased from its original amount. When the new amount is greater than the original amount, the percent of change is called the **percent of increase**. When the new amount is less than the original amount, the percent of change is called the **percent of decrease**. Both of these are found in the same way. The difference between the new amount and the original amount is divided by the original amount. The result is multiplied by 100 to get the percent of change.

Formula: $$\%\text{ of change} = \frac{\text{amount of increase or decrease}}{\text{original amount}} \times 100$$

Example: A sapling measured 23 inches tall when it was planted. Two years later the sapling was 36 inches tall. What was the percent of increase? Round your answer to a whole number.

$$\left(\frac{36-23}{23}\right) \times 100 =$$

$$\left(\frac{13}{23}\right) \times 100 = 0.565$$

$0.565 \times 100 = 57\%$ The sapling's height increased by 57% over the 2 years.

Compound Probability

The **probability of two or more independent events** occurring together can be determined by multiplying the individual probabilities together. The product is called the compound probability.

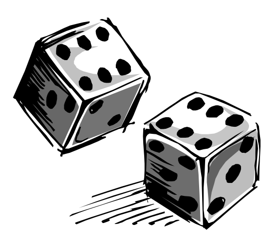
Probability of A and B = (Probability of A) x (Probability of B)

or P(A and B) = P(A) x P(B)

Example: What is the probability of rolling a 6 and then a 2 on two rolls of a die [P(6 and 2)]?

A) First, find the probability of rolling a 6 [P(6)]. Since there are 6 numbers on a die and only one of them is a 6, the probability of getting a 6 is $\frac{1}{6}$.

B) Then find the probability of rolling a 2 [P(2)]. Since there are 6 numbers on a die and only one of them is a 2, the probability of getting a 2 is $\frac{1}{6}$.



So, P(6 and 2) = P(6) x P(2) = $\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$.

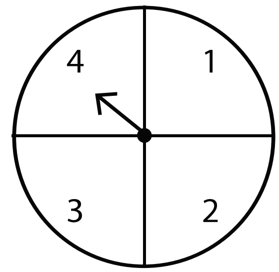
There is a 1 to 36 chance of getting a 6 and then a 2 on two rolls of a die.

Help Pages

Solved Examples

Compound Probability

Example: What is the probability of getting a 4 and then a number greater than 2 on two spins of this spinner [P(4 and greater than 2)]?



A) First, find the probability of getting a 4 [P(4)]. Since there are 4 numbers on the spinner and only one of them is a 4, the probability of getting a 4 is $\frac{1}{4}$.

B) Then find the probability of getting a number greater than 2 [P(greater than 2)]. Since there are 4 numbers on the spinner and two of them are greater than 2, the probability of getting a 2 is $\frac{2}{4}$.

So, P(2 and greater than 2) = P(2) x P(greater than 2) = $\frac{1}{4} \times \frac{2}{4} = \frac{2}{16} = \frac{1}{8}$

There is a 1 to 8 chance of getting a 4 and then a number greater than 2 on two spins of a spinner.

Example: On three flips of a coin, what is the probability of getting heads, tails, heads [P(H,T,H)]?

A) First, find the probability of getting heads [P(H)]. Since there are only 2 sides on a coin and only one of them is heads, the probability of getting heads is $\frac{1}{2}$.

B) Then find the probability of getting tails [P(T)]. Again, there are only 2 sides on a coin and only one of them is tails. The probability of getting tails is also $\frac{1}{2}$.

So, P(H,T,H) = P(H) x P(T) x P(H) = $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} = \frac{1}{8}$

There is a 1 to 8 chance of getting heads, tails and then heads on 3 flips of a coin.

Scientific Notation

Scientific notation is a shorthand method for representing numbers that are either very large or very small – numbers that have many zeroes and are tedious to write out.

For example, 5,000,000,000 and 0.000000023 have so many zeroes that it is not convenient to write them this way. Scientific notation removes the "placeholder" zeroes and represents them as powers of 10. Numbers in scientific notation always have the form $c \times 10^n$ where $1 \leq c < 10$ and n is an integer.

Examples: 5,000,000,000 = 5×10^9 0.000000023 = 2.3×10^{-8}

5,000,000,000

5.000,000,000.

5×10^9

The decimal point was moved 9 places to the left, so the exponent is +9.

1. First locate the decimal point. Remember, if the decimal point isn't shown, it is after the last digit on the right.
2. Move the decimal point (either left or right) until the number is at least 1 and less than 10.
3. Count the number of places you moved the decimal point. This is the exponent.
4. If you moved the decimal to the right, the exponent will be negative; if you moved it to the left, the exponent will be positive.
5. Write the number times 10 to the power of the exponent that you found.

0.000000023

0.00000002.3

2.3×10^{-8}

The decimal point was moved 8 places to the right, so the exponent is -8.

Who Knows???

Degrees in a right angle? ....(90)

A straight angle? ....(180)

Angle greater than 90°? .... (obtuse)

Less than 90°? ....(acute)

Sides in a quadrilateral? ....(4)

Sides in an octagon?............................ (8)

Sides in a hexagon? ....(6)

Sides in a pentagon? .... (5)

Sides in a heptagon? ....(7)

Sides in a nonagon? .... (9)

Sides in a decagon? .... (10)

Inches in a yard? ....(36)

Yards in a mile? ....(1,760)

Feet in a mile? ....(5,280)

Centimeters in a meter? ....(100)

Teaspoons in a tablespoon? .... (3)

Ounces in a pound? ....(16)

Pounds in a ton?............................(2,000)

Cups in a pint? .... (2)

Pints in a quart? .... (2)

Quarts in a gallon? ....(4)

Millimeters in a meter? .... (1,000)

Years in a century? ....(100)

Years in a decade? ....(10)

Celsius freezing? ....(0°C)

Celsius boiling? ....(100°C)

Fahrenheit freezing? ....(32°F)

Fahrenheit boiling? ....(212°F)

Number with only 2 factors? .... (prime)

Perimeter? ....(add the sides)

Area? ....(length x width)

Volume? .... (length x width x height)

Area of parallelogram?............................ .... (base x height)

Area of triangle? ....($\frac{1}{2}$ base x height)

Area of trapezoid?................................... ....($\frac{\text{base} + \text{base}}{2} \times$ height)

Surface area of a rectangular prism? ....2(lw) + 2(wh) + 2(lh)

Area of a circle? ....(πr^2)

Circumference of a circle? ....(πd)

Triangle with no sides equal? .... (scalene)

Triangle with 3 sides equal?................... ....(equilateral)

Triangle with 2 sides equal? .... (isosceles)

Distance across the middle of a circle? .... (diameter)

Half of the diameter? .... (radius)

Figures with the same size and shape? ....(congruent)

Figures with same shape, different sizes? ....(similar)

Number occurring most often? ....(mode)

Middle number? ....(median)

Answer in addition? ....(sum)

Answer in division? ....(quotient)

Answer in multiplication? .... (product)

Answer in subtraction? ......(difference)