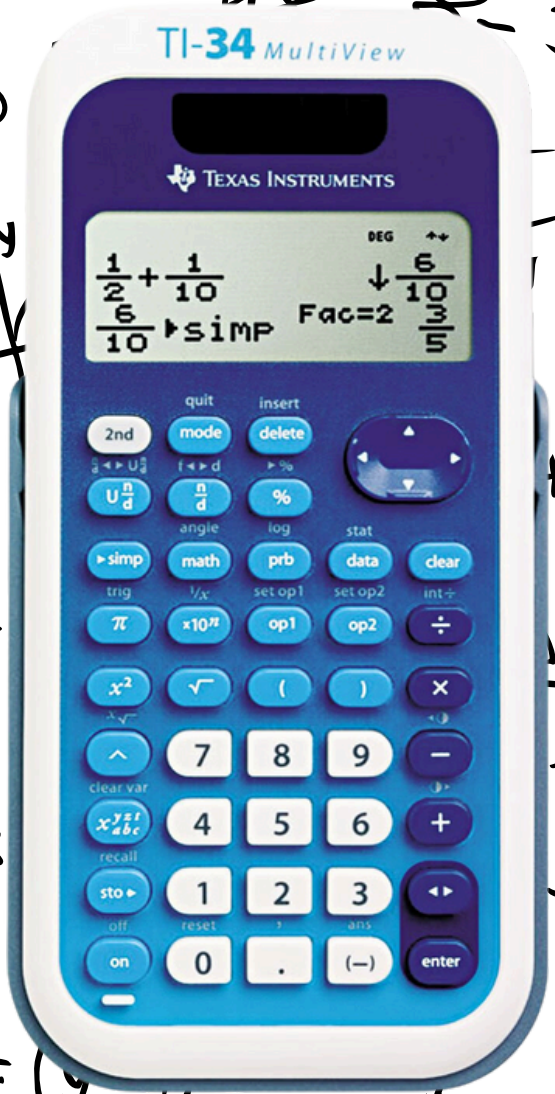
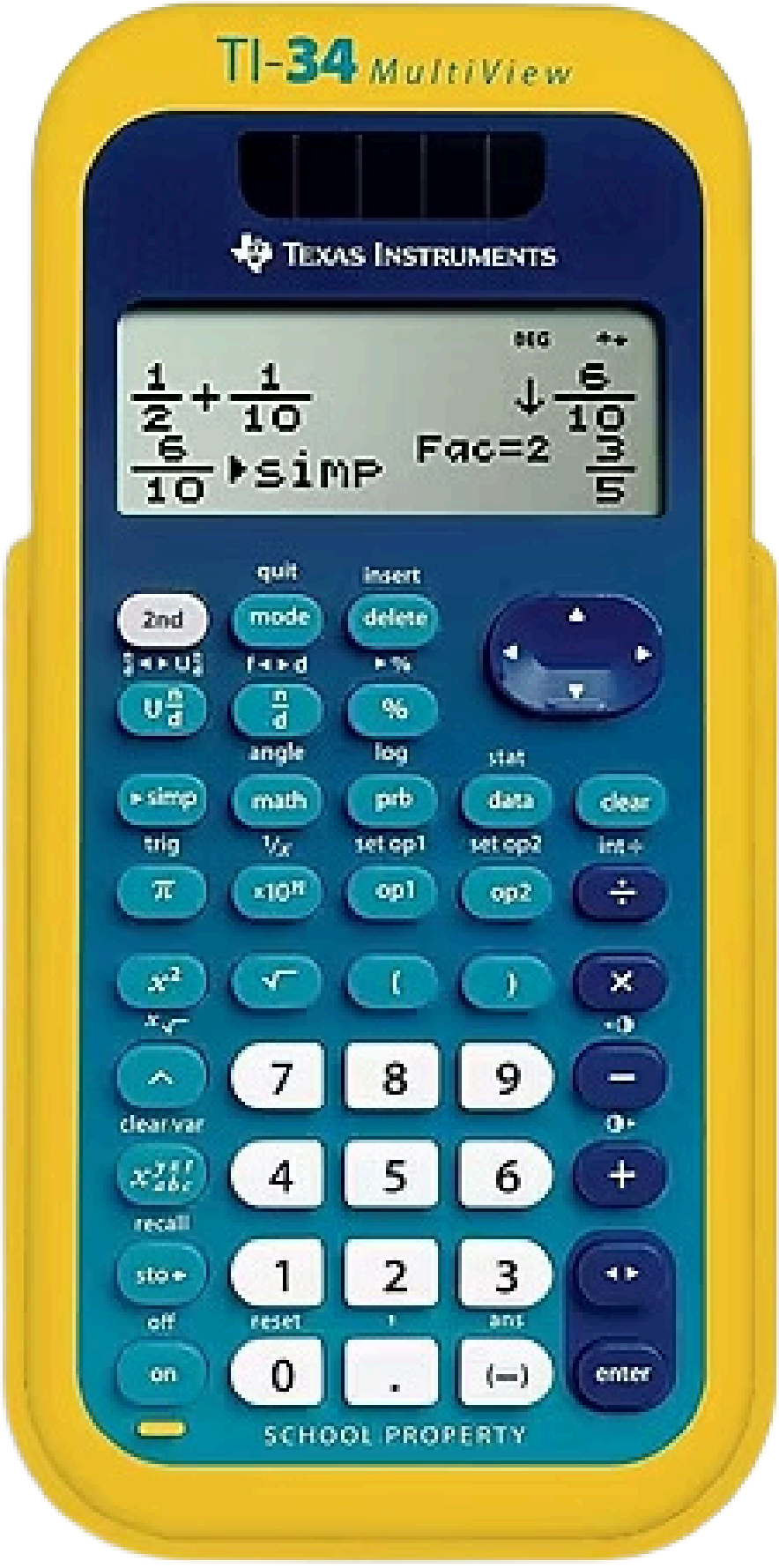
ANCHOR CHARTS



MR. HOPKINS GRADE 8 MATH

TI-34 CALCULATOR



SIGN RULES
FOR ADDING & SUBTRACTING INTEGERS

If both signs are positive.

Rule: The final sign stays the same when the numbers are added	Example
	4 + 8 = 12

If both signs are negative.

Rule: The final sign stays the same when the numbers are added	Example
	(–4) + (–8) = –12

If both signs are different.

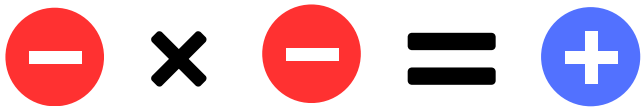
Rule: The final sign takes the sign of the larger absolute value number.	Example
	8 + (–4) = 4
	(–8) + 4 = –4

SIGN RULES
FOR MULTIPLYING INTEGERS

If both signs are positive.

Rule: The final sign is positive when both signs are positive.	Example
	8 x 4 = 32

If both signs are negative.

Rule: The final sign becomes positive when both signs are negative.	Example
	(–8) x (–4) = 32

If both signs are different.

Rule: The final sign becomes negative when both signs are different.	Example
	8 x (–4) = –32
	(–8) x 4 = –32

SIGN RULES
FOR DIVIDING INTEGERS

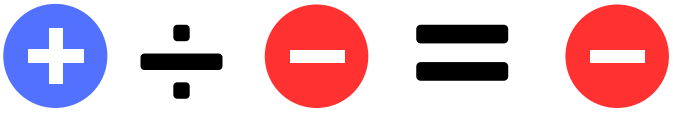
If both signs are positive.

Rule: The final sign is positive when both signs are positive.	Example
	$8 \div 4 = 2$

If both signs are negative.

Rule: The final sign becomes positive when both signs are negative.	Example
	$(-8) \div (-4) = 2$

If both signs are different.

Rule: The final sign becomes negative when both signs are different.	Example
	$8 \div (-4) = -2$
	$(-8) \div 4 = -2$

ORDER OF OPERATIONS

PEMDAS

We use the order of operations to understand and remember how to evaluate expressions involving two or more operations.

P **() parentheses or grouping symbols**

E **a^n exponents**

M **× multiply**

D **÷ divide**

We multiply and divide from left to right.

A **+ add**

S **− subtract**

Then we add and subtract from left to right.

LET'S EVALUATE THIS EXPRESSION!

$4^3 - 36 \div 6 + 2\,(9 + 12)$

$9 + 12 = 21$

$4^3 - 36 \div 6 + 2 \times 21$

$4^3 = 4 \times 4 \times 4 = 64$

From left to right, we first divide and then we multiply.

$64 - 36 \div 6 + 2 \times 21$

$36 \div 6 = 6$

$64 - 6 + 2 \times 21$

$2 \times 21 = 42$

$64 - 6 + 42$

$64 - 6 = 58$

From left to right, we subtract first, and lastly, we add.

$58 + 42$

100

This is the final answer!

EXPONENT RULES

Zero Exponent

$$a^0 = 1$$

A base with an exponent of 0 is always equal to 1.

Exponent of One

$$a^1 = a$$

Any number raised to an exponent of 1 is equal to itself.

Product Rule

$$a^x \times a^y = a^{x+y}$$

When multiplying exponential terms with the same base, add the powers.

Quotient Rule

$$\frac{a^x}{a^y} = a^{x-y}$$

When dividing exponential terms with the same base, subtract the powers.

Power Rule

$$(a^x)^y = a^{xy}$$

When a power is raised to another power, multiply the exponents.

Power of a Product Rule

$$(ab)^x = a^x b^x$$

When a product is raised to a power, multiply the exponents of each.

Negative Exponent

$$a^{-n} = \frac{1}{a^n}$$

When a number is raised to a negative power, divide 1 by the base raised to the positive exponent.

Power of a Fraction Rule

$$\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$$

When a number is raised to a negative power, divide 1 by the base raised to the positive exponent.

STEPS FOR SOLVING EQUATIONS

START HERE

1. **DISTRIBUTIVE PROPERTY**
   - **Distribute**
   - get rid of the parenthesis
2. **COMBINE LIKE TERMS**
   - Combine Like Terms or the ones with the "Same Name"
3. **GET VARIABLE ON ONE SIDE**
   - Are there variables on both sides? Get rid of the one on the right side.
4. **UNDO ADDITION OR SUBTRACTION**
   - Undo addition or subtraction to get the number by itself
5. **UNDO MULTIPLICATION OR DIVISION**
   - Undo multiplication or division to get the variable alone

SPECIAL EQUATIONS

IDENTITY

Infinite Solutions:

When you solve an equation with variables on both sides and eliminate the variables completely, leaving a true statement, the equation has an infinite number of solutions.

For Example:

$$8x - 6 = 2(4x - 3)$$
$$8x - 6 = 8x - 6$$
$$-8x \qquad -8x$$
$$-6 = -6$$

-6 does equal -6, therefore there are an infinite number of solutions to this equation.

INCONSISTENT

No Solution:

When you solve an equation with variables on both sides and eliminate the variables completely, leaving an untrue statement, the equation has no solutions.

For Example:

$$8x - 6 = 2(4x + 5)$$
$$8x - 6 = 8x + 10$$
$$-8x \qquad -8x$$
$$-6 = 10$$

-6 does not equal 10, therefore there are no solutions to this equation.

EXAMPLE	TERM	WHAT TO LOOK FOR
$4x + 7 = 4x + 7$ $7 = 7$ (True)	**Infinitely Many Solutions** Aka- Identity	Same variable Same constant
$2x + 2 = 2x - 6$ $2 = -6$ (False)	**No Solutions** Aka- Inconsistent	Same variable Different constant
$6x + 5 = 3x + 2$ $x = -1$	**One Solution**	Different variable

RATIONAL NUMBERS

Numbers that can be expressed as a ratio of two integers

$3 = \frac{3}{1}$	$0.333... = \frac{1}{3}$	$0.8 = \frac{4}{5}$	$-8 = -\frac{8}{1}$	$25\% = \frac{25}{100}$
Whole Numbers	**Decimals that repeat**	**Decimals that end**	**Negative integers**	**Percentages**

Rational Numbers include fractions when the denominator is not zero.

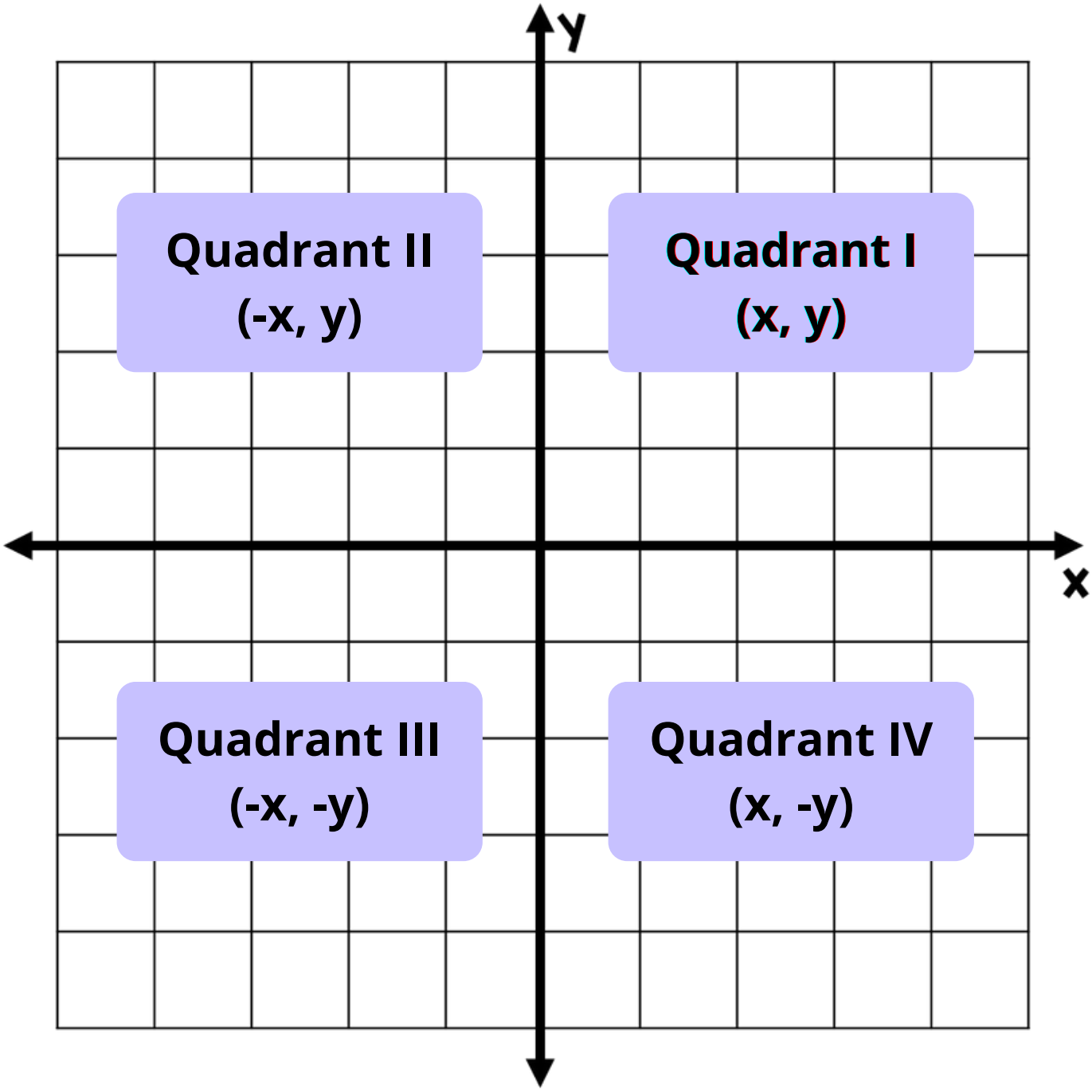
IRRATIONAL NUMBERS

Numbers that <u>cannot</u> be expressed as a ratio of two integers

$\pi = 3.14...$	0.1434...	$\sqrt{2}$
pi	**Non-terminating and non-repeating decimals**	**Square root of non-perfect square**

The Coordinate Plane

The coordinate plane is composed of the x-axis (horizontal line), the y-axis (vertical line), and 4 quadrants as shown in the diagram.



GEOMETRY

point

- a position or location in space.

ray

- part of a line
- has 1 endpoint
- goes forever in one direction

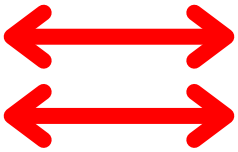
line

- never ends
- has two arrows
- goes forever in both directions

line segment

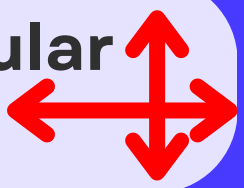
- part of a line
- has 2 endpoints

parallel lines



- do not cross
- same distace apart

perpendicular lines

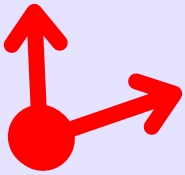


- lines that cross form square corners and right angles

intersecting lines

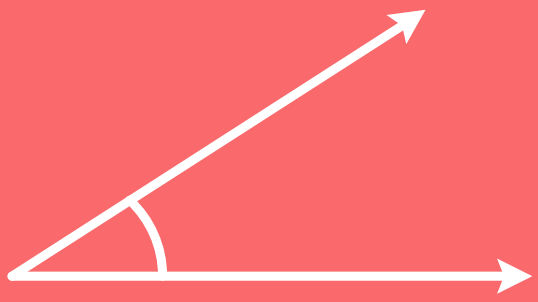
- lines that cross at 1 point

angle



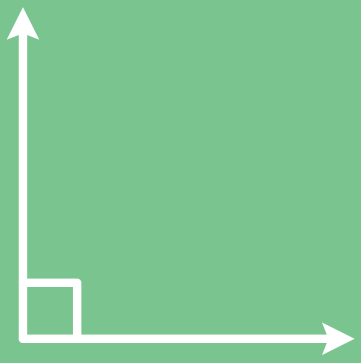
- a figure formed from 2 rays that share a common endpoint

TYPES OF ANGLES



Acute Angle
measures less than 90°

Obtuse Angle
measures more than 90°
but less than 180°



Right Angle
measures exactly 90°

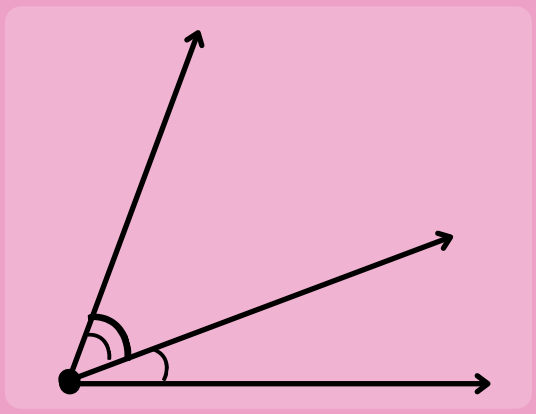
Straight Angle
measures exactly 180°

ANGLE RELATIONSHIPS

Relationships between two angles can be determined by their interactions or measurements.

Adjacent Angles

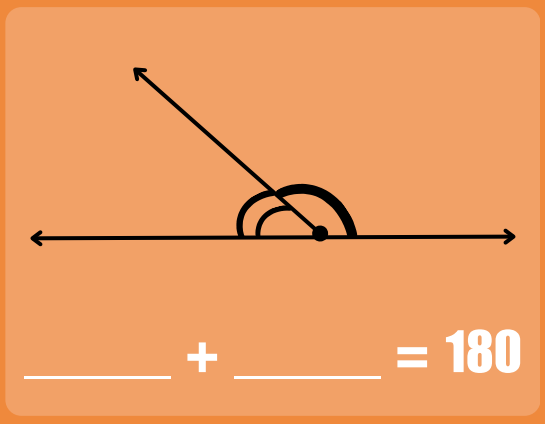
Two nonoverlapping angles sharing a common side or vertex



Adjacent angles are always side-by-side without any common interior point.

Supplementary Angles

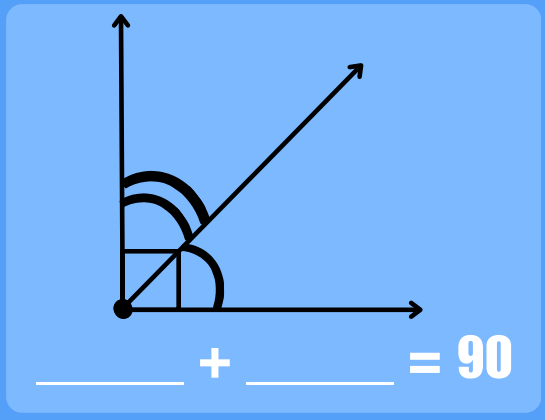
Two angles whose measures add up to 180 degrees



Supplementary angles form a straight angle.

Complementary Angles

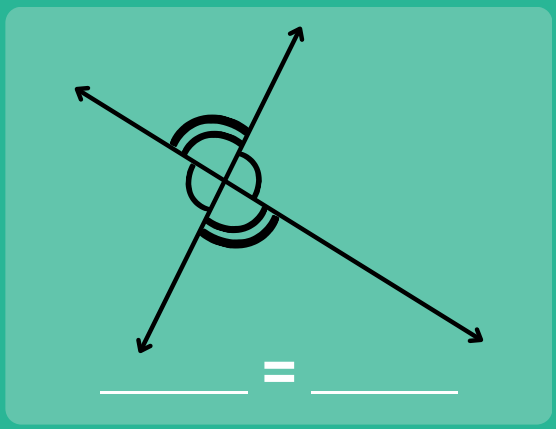
Two angles whose measures add up to 90 degrees



Complementary angles form a right angle.

Vertical Angles

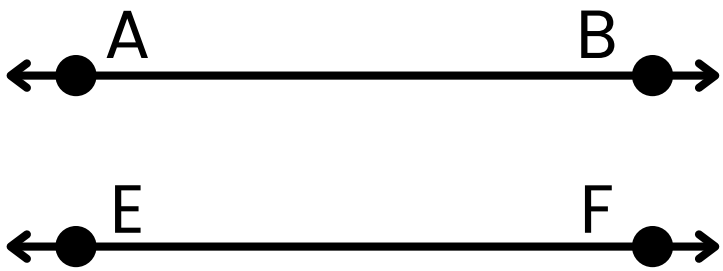
Two nonadjacent angles formed by intersecting lines



Vertical angles have equal measures.

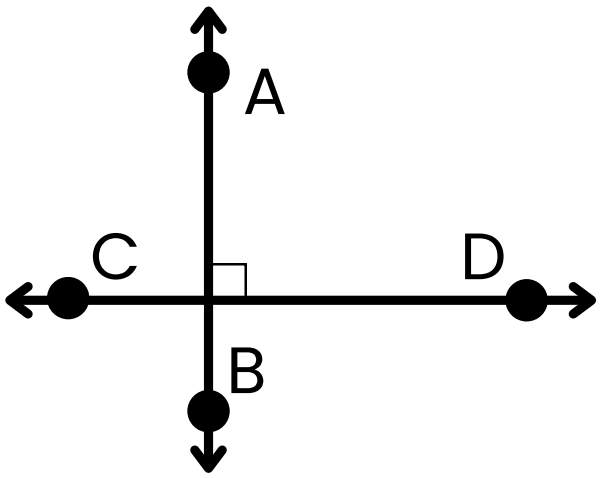
PARALLEL & PERPENDICULAR LINES

Parallel lines are two or more lines that are always the same distance apart and never intersect no matter how far the lines contine.



$\overleftrightarrow{AB}$ and $\overleftrightarrow{EF}$ are Parallel Lines.

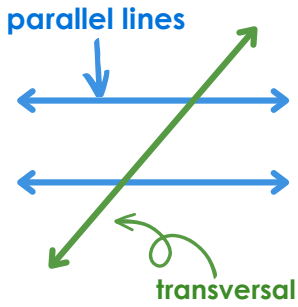
Perpendicular lines are two or more lines that cross at a 90° angle.



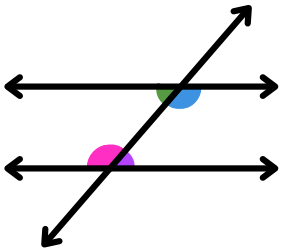
$\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are Perpendicular Lines.

PARALLEL LINES & ANGLES

Parallel Lines cut by a Transversal

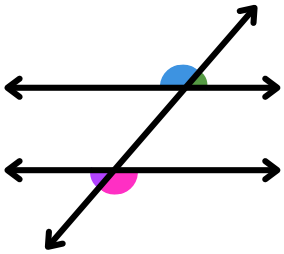


Interior Angles



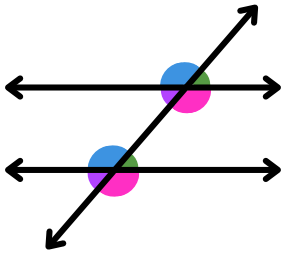
inside parallel lines

Exterior Angles



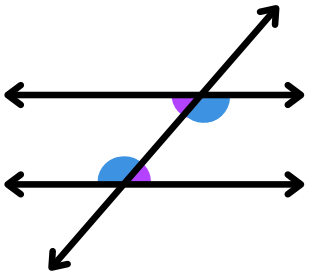
outside parallel lines

Corresponding Angles



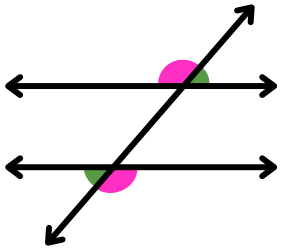
in the same position & are equal to each other

Alternate Interior Angles



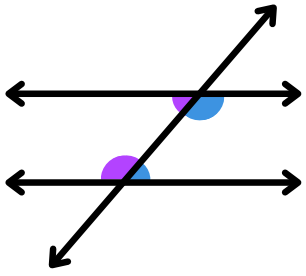
opposite sides of transversal & equal to each other

Alternate Exterior Angles



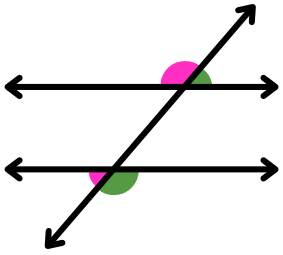
opposite sides of transversal & equal to each other

Same-Side Interior Angles



same-side of transversal & add to 180

Same-Side Exterior Angles



same-side of transversal & add to 180

SAME

___ = ___

DIFFERENT

___ + ___ = ___

Vertical Angles

___ = ___

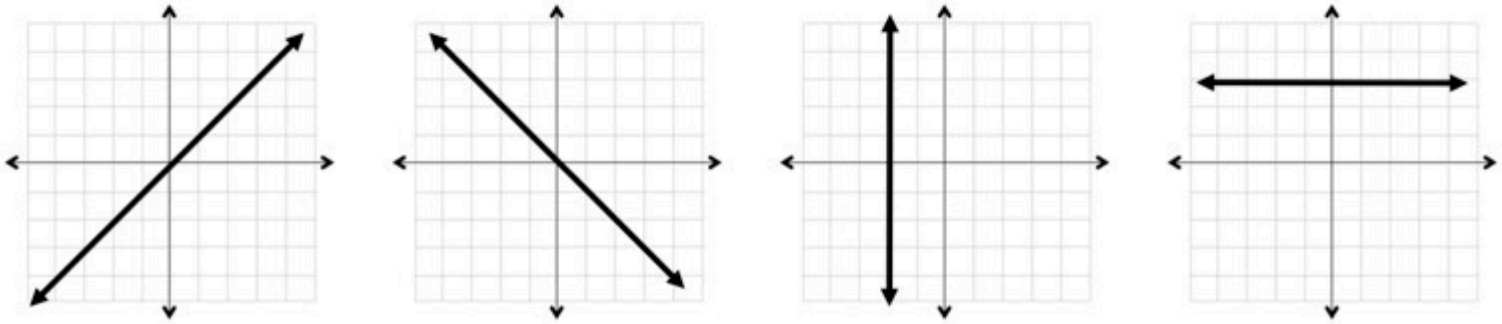
SLOPE OF A LINE

$$y = mx + b$$

m=slope b=y-intercept

m: "move" b: "begin"

types of slope



formulas

"change in" ↓ ... ↑ "change in"

use for negative slopes ↓

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\text{rise}}{\text{run}} = \frac{\text{fall}}{\text{crawl}}$$

finding slope from two points

1. label your points
2. plug the values into the formula
3. simplify

$(-2,8)$ $(4,-1)$

x_1 y_1 x_2 y_2

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 8}{4 - (-2)}$$

$$\boxed{m = -\frac{3}{2}}$$

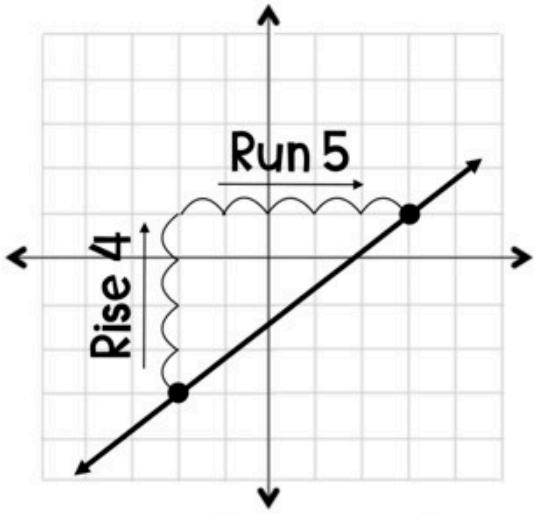
SLOPE OF A LINE

finding slope from a graph

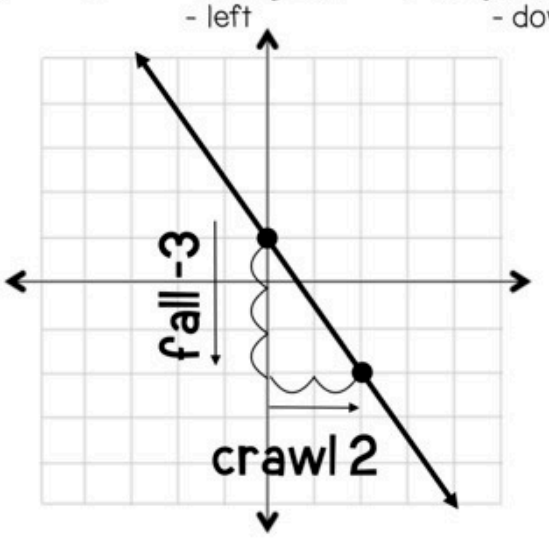
(x , y)

+ right
- left

+ up
- down



$$m = \frac{\text{rise}}{\text{run}} = \frac{4}{5}$$



$$m = \frac{\text{fall}}{\text{crawl}} = -\frac{3}{2}$$

finding slope from a table

$$m = \frac{\Delta y}{\Delta x} = -\frac{5}{4}$$

x	y
-8	8
-4	3
0	-2
4	7

4 < | > -5

4 < | > -5

4 < | > -5

finding slope from an equation

slope-intercept form

$y = mx + b$ — slope

$y = -3x + b$ — m=-3

point-slope form

$y - y_1 = m(x - x_1)$ — slope

$y - 3 = \frac{4}{5}(x + 3)$ — $m = \frac{4}{5}$

standard form

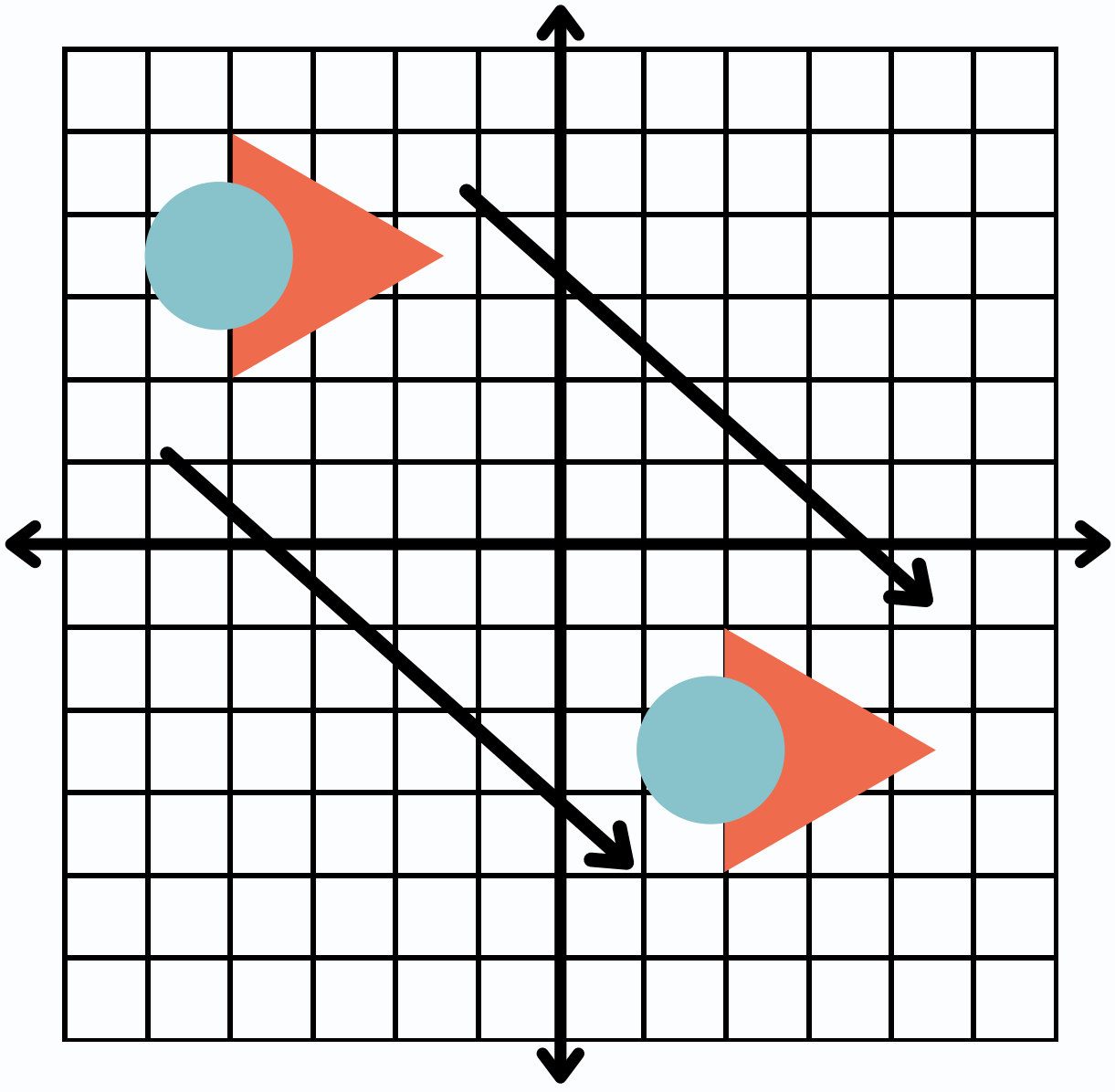
$Ax + By = C$

$3x - 4y = 2$

$\text{slope} = -\left(\frac{A}{B}\right)$ $\quad m = -\left(\frac{3}{-4}\right) = \frac{3}{4}$

TRANSLATION

Changes every point the same distance and direction; a move or slide of the pre-image

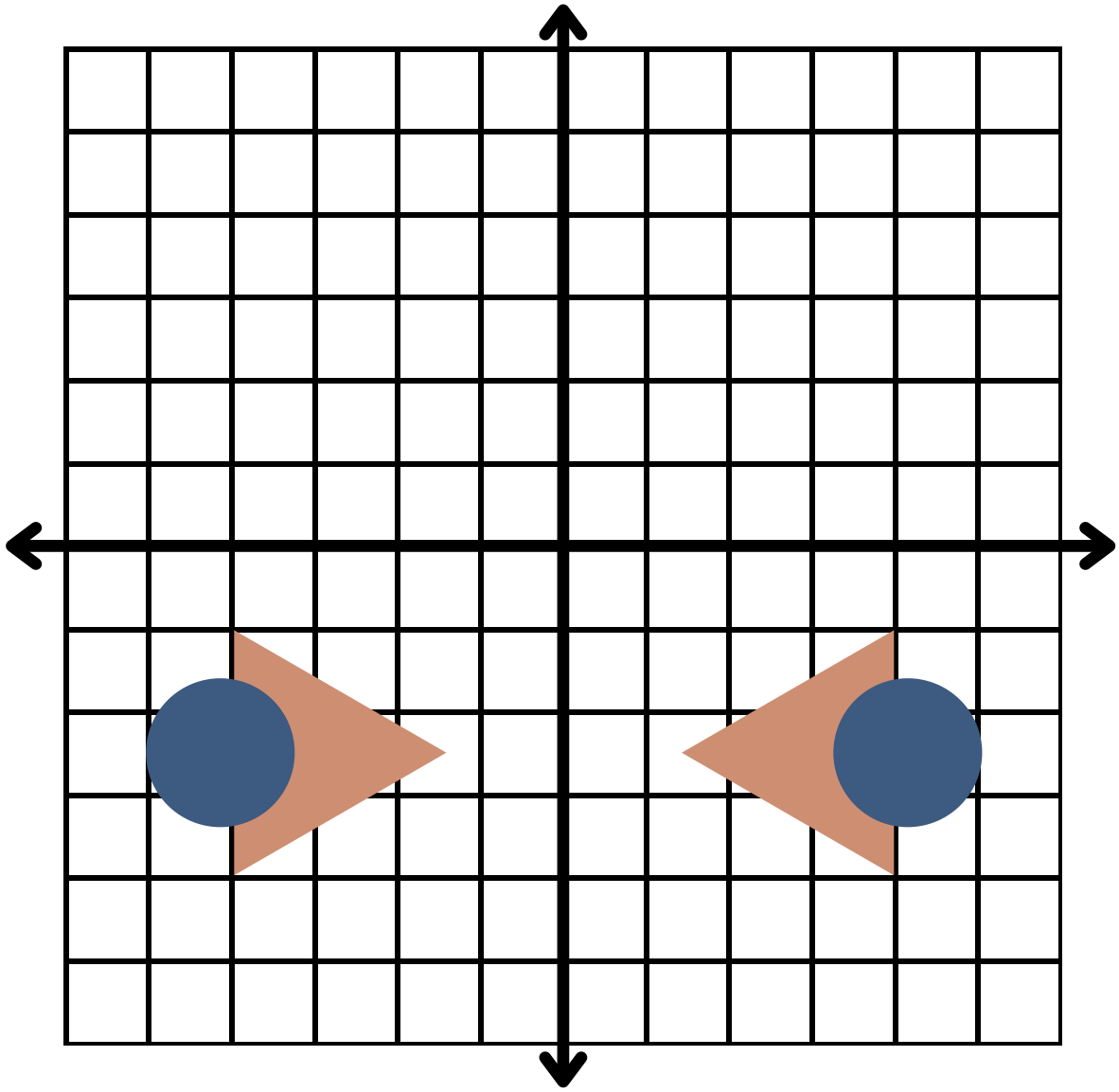


$(x, y) \rightarrow (x + \_\_, y + \_\_)$

Preserves: Size, Shape, Orientation

REFLECTION

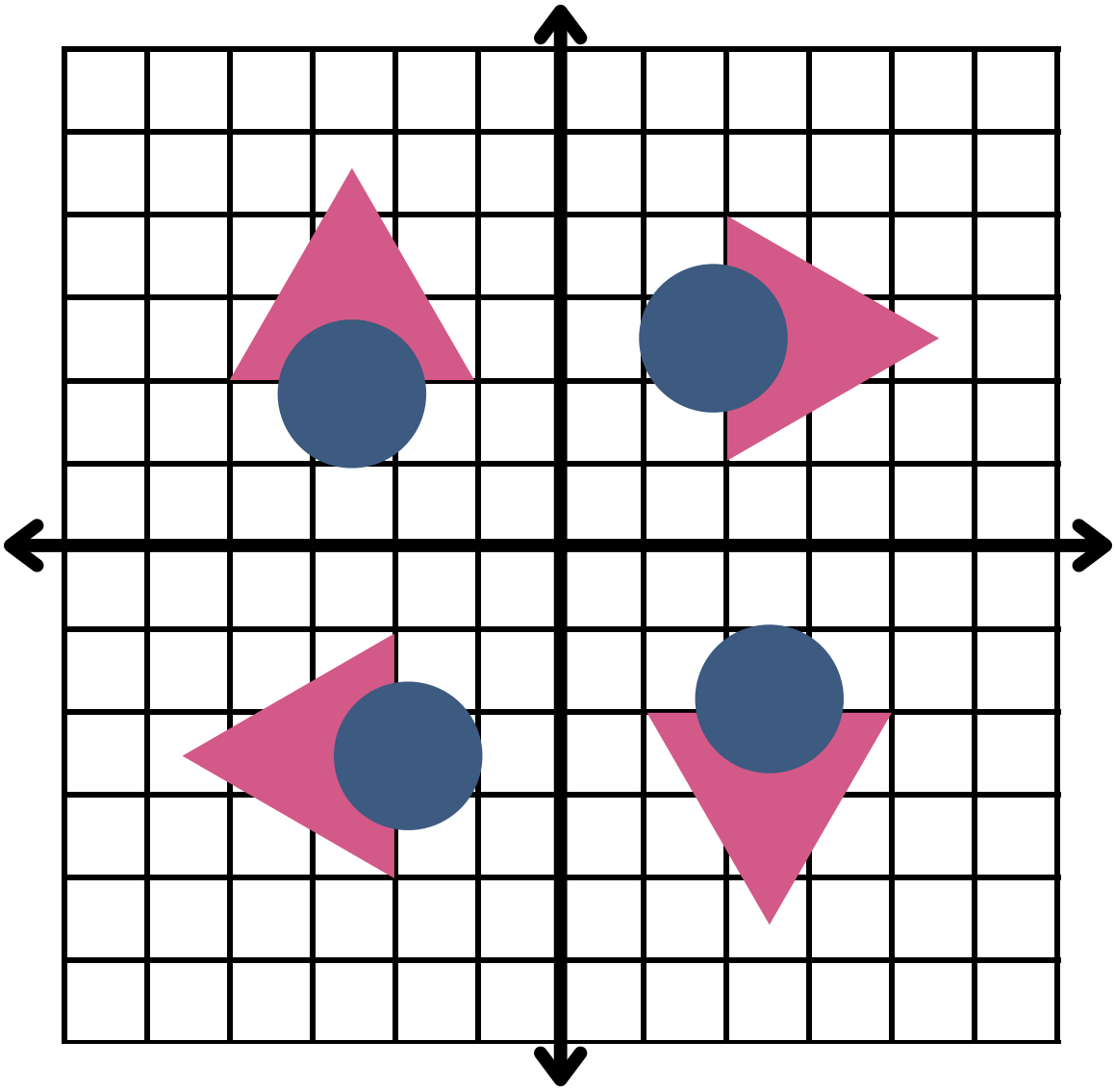
Flips a point or figure over the line of reflection; mirrors pre-image



Over x-axis: (x, y) → (x, -y)
Over y-axis: (x, y) → (-x, y)
Preserves: Size, Shape

ROTATION

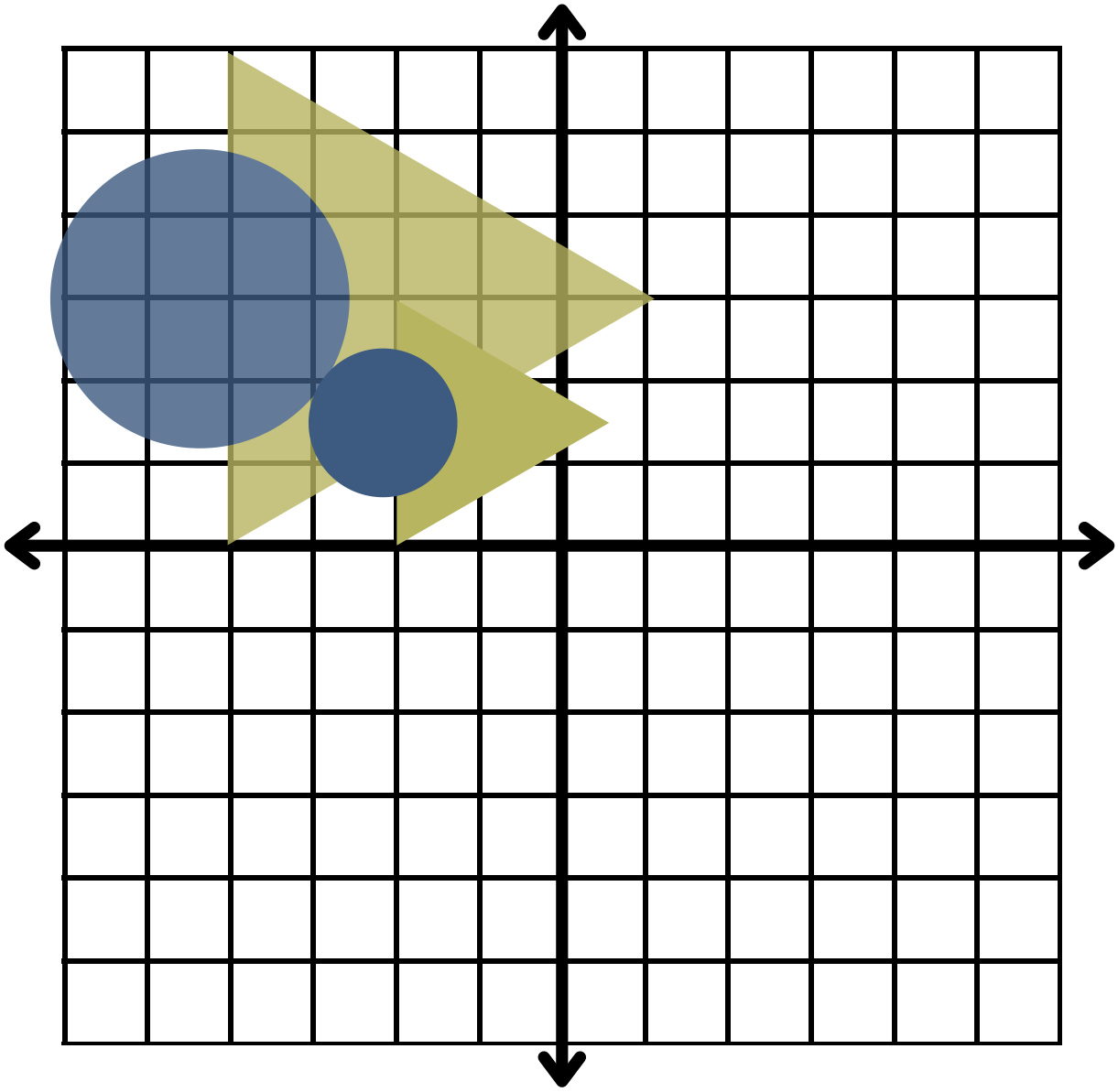
Turns a figure around a central point



90° Rotation CW: (x, y) → (y, -x)
180° Rotation: (x, y) → (-x, -y)
270° Rotation CW: (x, y) → (-y, x)
Preserves: Size, Shape

DILATION

Shrinks or enlarges a figure depending on the scale factor.

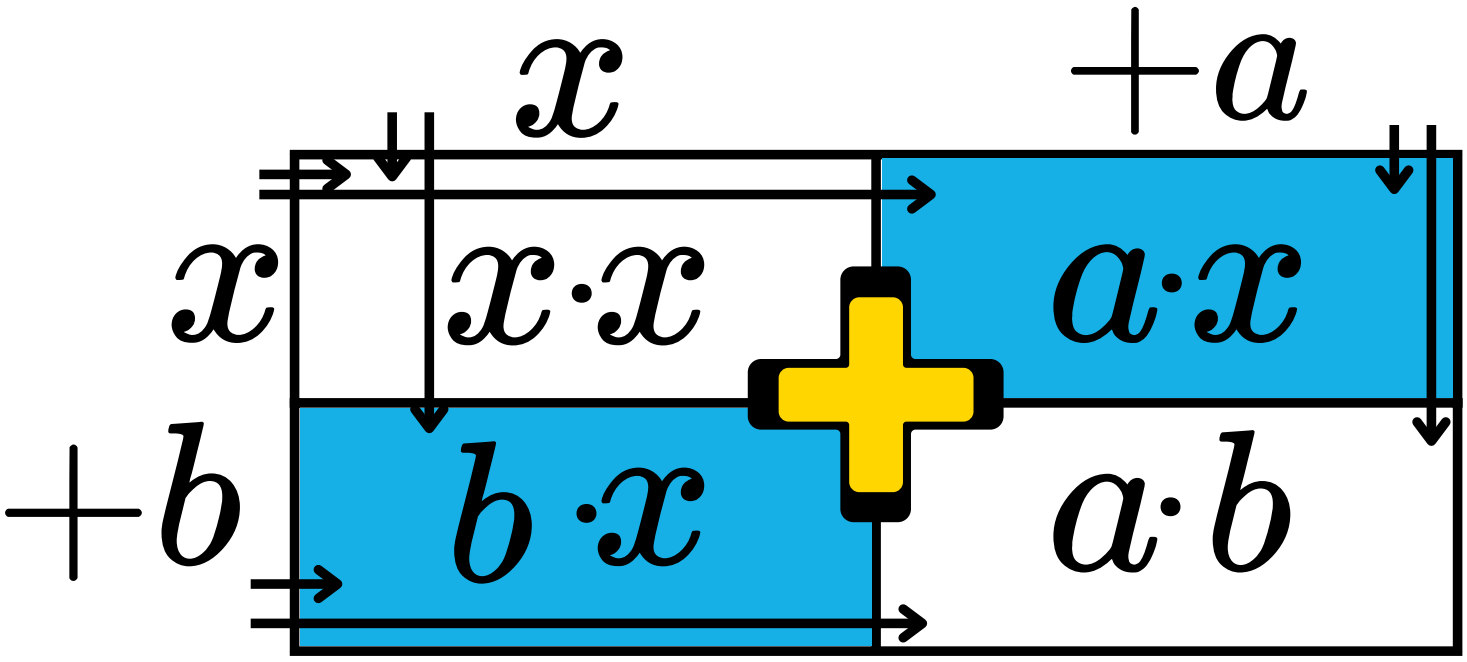


$(x, y) \rightarrow (kx, ky)$
k= scale factor
Preserves: Shape, Orientation

MULTIPLYING BINOMIALS THE BOX METHOD

$$(x + a)(x + b)$$

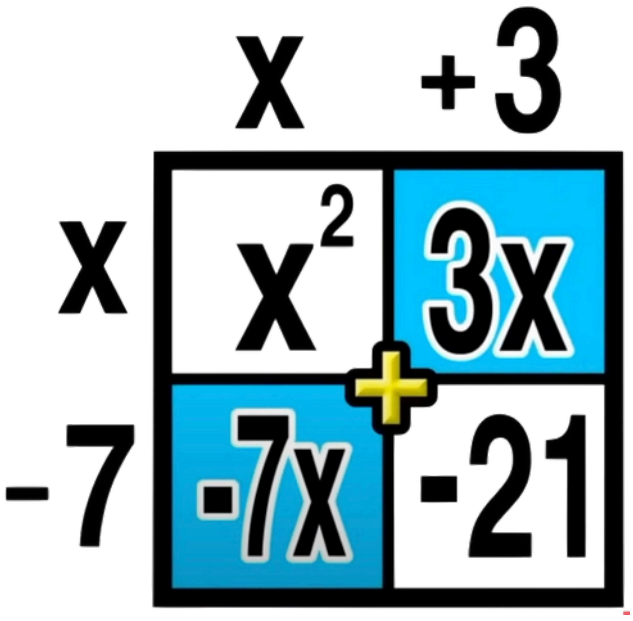
The general form of a binomial where *a* and *b* are constant and neither *a* or *b* are zero.



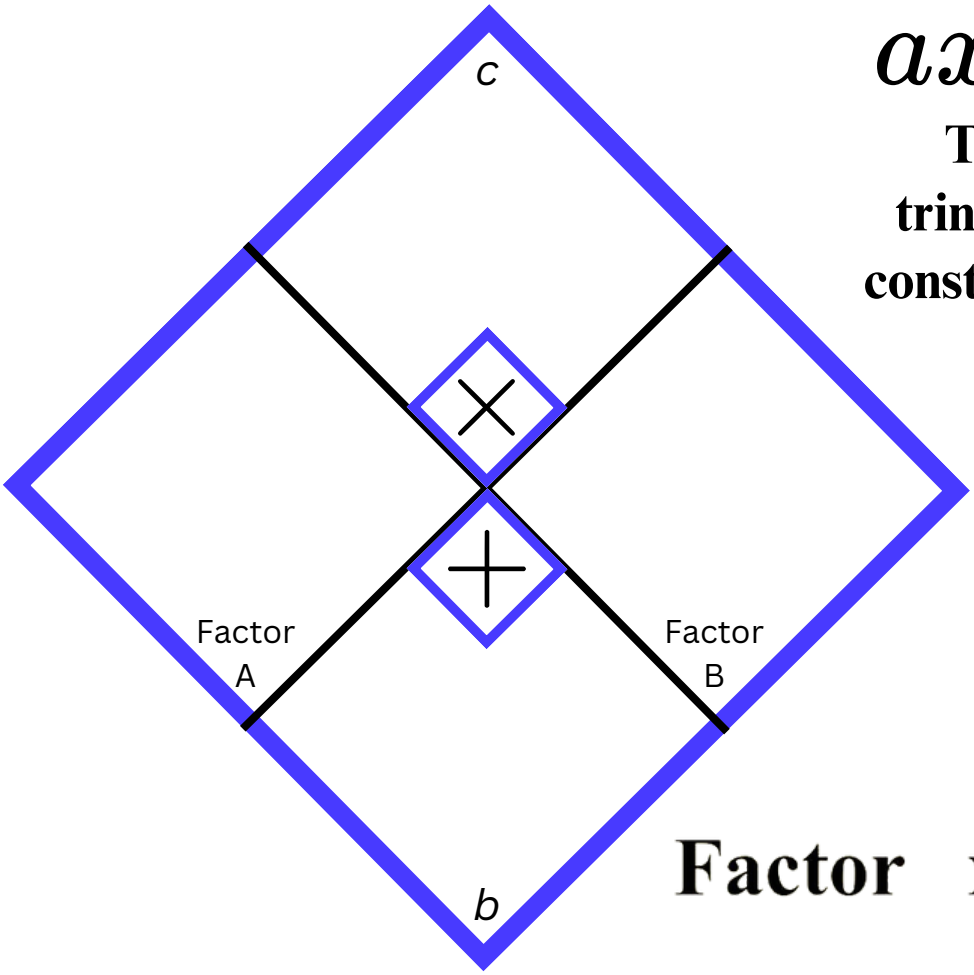
Write the product in expanded form:

$$(x+3)(x-7)$$

$$x^2 + 3x - 7x - 21$$



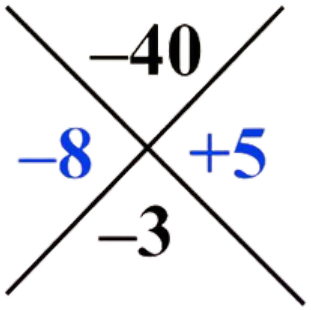
DIAMOND METHOD FACOTRING



$$ax^2 + bx + c$$

The general form of a trinomial where *a*, *b*, *c* are constant terms and neither *a*, *b*, or *c* is zero.

Factor $x^2 - 3x - 40$



The factors are **$(x - 8)(x + 5)$**

Grade 8 Mathematics Reference Sheet

CONVERSIONS

1 yard = 3 feet
1 mile = 5,280 feet

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts

1 pound = 16 ounces
1 ton = 2,000 pounds

CONVERSIONS ACROSS MEASUREMENT SYSTEMS

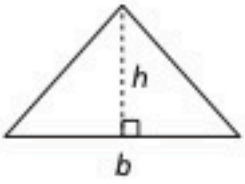
1 inch = 2.54 centimeters
1 meter = 39.37 inches
1 mile = 1.609 kilometers
1 kilometer = 0.6214 mile

1 gallon = 3.785 liters
1 liter = 0.2642 gallon

1 pound = 0.454 kilogram
1 kilogram = 2.2 pounds

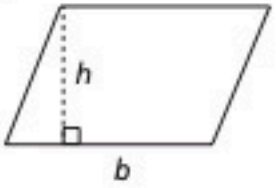
FORMULAS AND FIGURES

Triangle



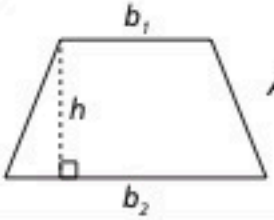
$A = \frac{1}{2}bh$

Parallelogram



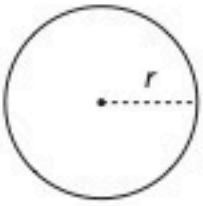
$A = bh$

Trapezoid



$A = \frac{1}{2}h(b_1 + b_2)$

Circle

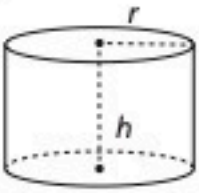


$C = 2\pi r$
$C = \pi d$
$A = \pi r^2$

General Prism

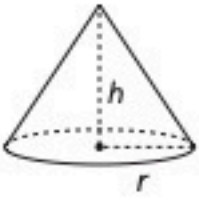
$V = Bh$

Right Cylinder



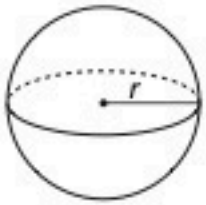
$V = \pi r^2 h$

Right Cone



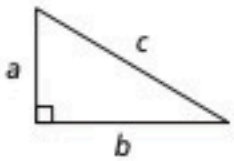
$V = \frac{1}{3}\pi r^2 h$

Sphere



$V = \frac{4}{3}\pi r^3$

Pythagorean Theorem



$c^2 = a^2 + b^2$