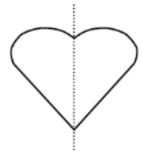
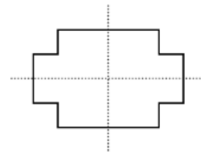
CHAPTER ONE MATH NOTES

LINES OF SYMMETRY (1.1.1)

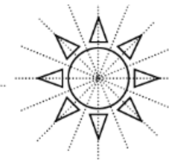
When a graph or picture can be folded so that both sides of the fold will perfectly match, it is said to have **reflective symmetry**. The line where the fold would be is called the **line of symmetry**. Some shapes have more than one line of symmetry. See the examples below.



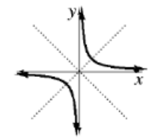
This shape has one line of symmetry.



This shape has two lines of symmetry.



This shape has eight lines of symmetry.

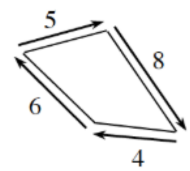


This graph has two lines of symmetry.

This shape has no lines of symmetry.

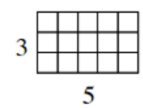
AREA AND PERIMETER (1.1.3)

The **perimeter** of a two-dimensional figure is the distance around its exterior (outside) on a flat surface. It is the total length of the boundary that encloses the interior (inside) region. See the example at right.



Perimeter =

The **area** indicates the number of square units needed to fill up a region on a flat surface. For a rectangle, the area is computed by multiplying its length and width. The rectangle at right has a length of 5 units and a width of 3 units, so the area of the rectangle is 15 square units.



Area =

SOLVING LINEAR EQUATIONS (1.1.4)

In Algebra, you learned how to solve a linear equation. This course will help you apply your algebra skills to solve geometric problems. Review how to solve equations by reading the example below.

Simplify. Combine like terms on each side of the equation whenever possible.

Keep equations balanced. The equal sign in an equation tells you that the expressions on the left and right are balanced. Anything done to the equation must keep that balance.

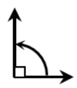
$$
\begin{aligned}
3x-2+4 &= x-6 && \text{Combine like terms}\\
3x+2 &= x-6 \\
-x &= -x && \text{Subtract } x \text{ on both sides}\\
2x+2 &= -6 \\
-2 &= -2 && \text{Subtract 2 on both sides}\\
\frac{2x}{2} &= \frac{-8}{2} && \text{Divide both sides by 2}\\
x &= -4
\end{aligned}
$$

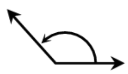
CHAPTER ONE MATH NOTES

TYPES OF ANGLES (1.1.5)

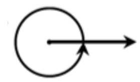
When trying to describe shapes, it is convenient to classify types of angles. An angle is formed by two rays joined at a common endpoint. The measure of an angle represents the number of degrees of rotation from one ray to the other about the vertex. This course will use the following terms to refer to angles:

ACUTE: 

RIGHT: 

OBTUSE: 

STRAIGHT: 

CIRCULAR: 

PROBABILITY VOCABULARY AND DEFINITIONS (1.2.1)

Event: Any outcome, or set of outcomes, from a probabilistic situation. A **successful event** is the set of all outcomes that are of interest in a given situation. For example, rolling a die is a probabilistic situation. Rolling a 5 is an event. If you win a prize for rolling an even number, you can consider the set of three outcomes {2, 4, 6} a successful event.

Sample space: All possible outcomes from a probabilistic situation. For example, the sample space for flipping a coin is heads and tails; rolling a die has a sample space of {1, 2, 3, 4, 5, 6}.

Probability: The likelihood that an event will occur. Probabilities may be written as ratios (fractions), decimals, or percents. An event that is certain to happen has a probability of 1, or 100%. An event that has no chance of happening has a probability of 0, or 0%. Events that "might happen" have probabilities between 0 and 1, or between 0% and 100%. The more likely an event is to happen, the greater its probability.

Experimental probability: The probability based on data collected in experiments.

$$\text{experimental probability} = \frac{\text{number of successful outcomes in the experiment}}{\text{total number of outcomes in the experiment}}$$

Theoretical probability: Probability that is mathematically calculated. When each of the outcomes in the sample space has an *equally likely chance* of occurring, then

$$\text{theoretical probability} = \frac{\text{number of successful outcomes}}{\text{total number of possible outcomes}}$$

For example, to calculate the probability of rolling an even number on a die, first figure out how many possible (equally likely) outcomes there are. Since there are six faces on the number cube, the total number of possible outcomes is 6. Of the six faces, three of the faces are even numbers—there are three successful outcomes. Thus, to find the probability of rolling an even number, you would write:

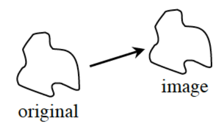
$$P(\text{even}) = \frac{\text{number of ways to roll an even number}}{\text{number of faces on a number cube}} = \frac{3}{6} = 0.5 = 50\%$$

CHAPTER ONE MATH NOTES

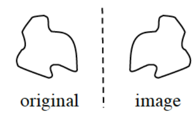
RIGID TRANSFORMATIONS (1.2.2)

A **rigid transformation** maps each point of a figure to a new point, so that the resulting image has the same size and shape of the original. There are three types of rigid transformations, described below.

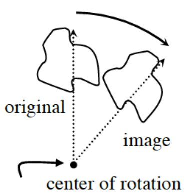
Translation:



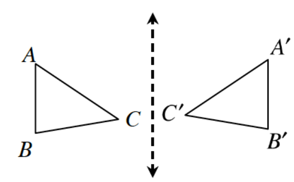
Reflection:



Rotation:



When labeling a transformation, the new figure (image) is often labeled with **prime notation.** For example, if ΔABC is reflected across the vertical dashed line, its image can be labeled $\Delta A'B'C'$ to show exactly how the new points correspond to the points in the original shape. We also say that ΔABC is **mapped** to $\Delta A'B'C'$.

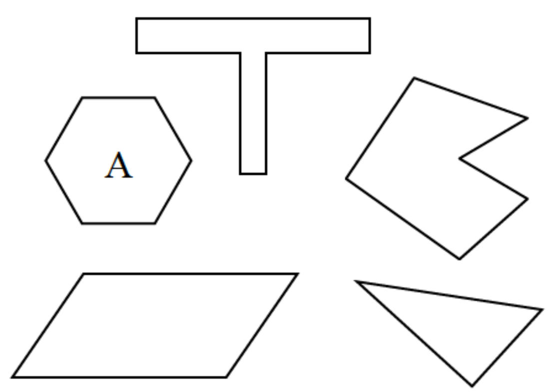


POLYGONS (1.2.5)

A **polygon** is defined as a two-dimensional closed figure made up of straight line segments connected end-to-end. These segments may not cross (intersect) at any other points.

At right are some examples of polygons.

Shape A above is an example of a **regular polygon** because…

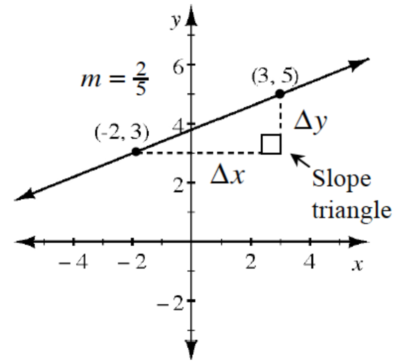


Polygons are named according to the number of sides that they have. Polygons that have 3 sides are **triangles**, those with 4 sides are **quadrilaterals**, polygons with 5 sides are **pentagons**, polygons with 6 sides are **hexagons**, polygons with 8 sides are **octagons**, polygons with 10 sides are **decagons**. For most other polygons, people simply name the number of sides, such as “11-gon” to indicate a polygon with 11 sides.

CHAPTER ONE MATH NOTES

SLOPE OF A LINE AND PARALLEL AND PERPENDICULAR SLOPES (1.2.6)

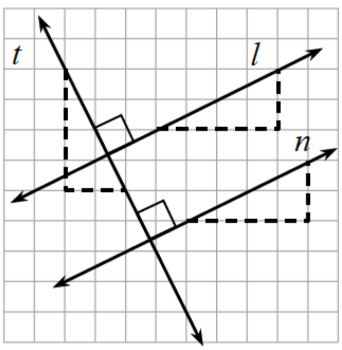
$$\text{slope} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\Delta y}{\Delta x}$$



During this course, you will use your algebra tools to learn more about shapes. One of your algebraic tools that can be used to learn about the relationship of lines is slope. Review what you know about slope below.

The **slope** of a line is the ratio of the change in y (Δy) to the change in x (Δx) between any two points on the line. It indicates both how steep the line is and its direction, upward or downward, left to right.

Lines that point upward from left to right have positive slope, while lines that point downward from left to right have negative slope. A horizontal line has zero slope, while a vertical line has undefined slope. The slope of a line is denoted by the letter m when using the $y = mx + b$ equation of a line.



One way to calculate the slope of a line is to pick two points on the line, draw a slope triangle (as shown in the example above), determine Δy and Δx, and then write the slope ratio. Be sure to verify that your slope correctly resulted in a negative or positive value based on its direction.

Parallel lines lie in the same plane (a flat surface) and never intersect. They have the same steepness, and therefore they grow at the same rate. Lines l and n below are examples of parallel lines.

On the other hand, **perpendicular** lines are lines that intersect at a right angle. For example, lines m and n above are perpendicular, as are lines m and l. Note that the small square drawn at the point of intersection indicates a right angle.

The **slopes of parallel lines** are the same. In general, the slope of a line parallel to a line with slope m is m.

The **slopes of perpendicular lines** are opposite reciprocals. For example, if one line has slope $\frac{4}{5}$, then any line perpendicular to it has slope $-\frac{5}{4}$. If a line has slope -3, then any line perpendicular to it has slope $\frac{1}{3}$. In general, the slope of a line perpendicular to a line with slope m is $-\frac{1}{m}$.

VENN DIAGRAMS (1.3.1)

A Venn diagram is a tool used to classify objects. It is usually composed of two or more circles that represent different conditions. An item is placed or represented in the Venn diagram in the appropriate position based on the conditions it meets. See the example below: