

Important Concepts . . .

# Preview Review



**Mathematics    Grade 6    TEACHER KEY**

**W2 - Lesson 5: Working with Angles  
and Drawing Objects and Shapes**

## Important Concepts of Grade 6 Mathematics

W1 - Lesson 1 .....	Basic Facts, Basic Operations, and Integers
W1 - Lesson 2 .....	Place Value, Whole Numbers, Decimals, and Common Fractions
W1 - Lesson 3 .....	Improper Fractions and Mixed Numbers
W1 - Lesson 4 .....	Ratios and Percents
W1 - Lesson 5 .....	Number Operations with Decimals
W1 - Quiz	
W2 - Lesson 1 .....	Factors, Multiples, and Prime Factorizations
W2 - Lesson 2 .....	Metric Measurement
W2 - Lesson 3 .....	Perimeter and Area
W2 - Lesson 4 .....	Surface Area and Volume
W2 - Lesson 5 .....	Working with Angles and Drawing Objects and Shapes
W2 - Quiz	
W3 - Lesson 1 .....	Transformations
W3 - Lesson 2 .....	Bar Graphs, Line Graphs, and Circle Graphs
W3 - Lesson 3 .....	Collecting and Analyzing Data
W3 - Lesson 4 .....	Number Patterns, Magic Squares, and Problem Solving
W3 - Lesson 5 .....	Probability and Outcomes
W3 - Quiz	

**Materials Required: A textbook is not needed. This is a stand-alone course.**

Mathematics Grade 6

Version 5

Preview/Review W2 - Lesson 5 TEACHER KEY

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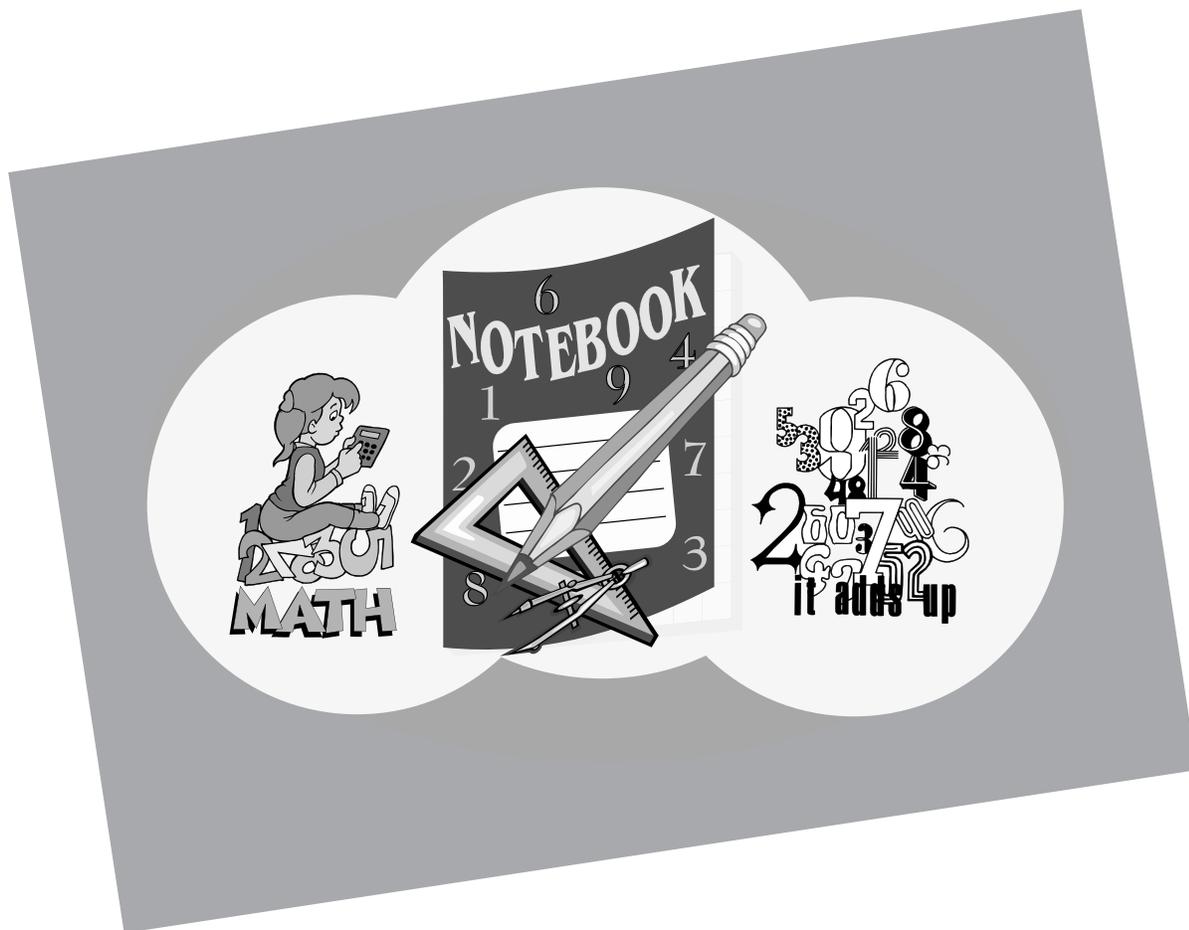
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# Preview/Review Concepts for Grade Six Mathematics

## *TEACHER KEY*



*W2 - Lesson 5: Working  
with Angles and Drawing  
Objects and Shapes*

# OBJECTIVES

By the end of this lesson, you should

- use a protractor
- draw and measure various angles
- name various types of angles
- construct various figures

## GLOSSARY

**acute angle** - angle less than  $90^\circ$

**angle** - formed by two rays sharing an endpoint

**degree** - the unit of measurement used to measure the size of angles

**equilateral triangle** - triangle with three equal sides and angles

**isosceles triangle** - triangle with two equal sides and two equal angles

**obtuse angle** - angle greater than  $90^\circ$  but less than  $180^\circ$

**obtuse triangle** - triangle with one angle greater than  $90^\circ$

**parallelogram** - a four-sided closed figure with two pairs of equal angles and sides

**pentagon** - a five-sided closed figure

**protractor** - a semi-circular tool used to measure the size of angles

**quadrilateral** - any closed figure of four sides

**ray** - a line that starts at an endpoint and continues in one direction

**reflex angle** - an angle greater than  $180^\circ$

**right angle** - angle of  $90^\circ$

**right-angle triangle** - triangle with one angle of  $90^\circ$

**scalene triangle** - triangle with all sides and angles different

**straight line or straight angle** - angle of  $180^\circ$

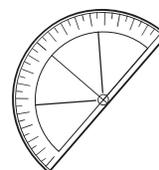
**vertex** - the end point of the rays that join to make an angle

## W2 - Lesson 5: Working with Angles and Drawing Objects and Shapes

Welcome to W2 - Lesson 5! This lesson is about surface area and volume. You will use your skills in metric measurement to find volumes and total areas. The lesson has three topics:

- Drawing and Measuring Angles
- Types of Triangles
- Drawing Polygons and Measuring Angles

Have you seen any interesting figures lately?



### Drawing and Measuring Angles

For this lesson, you need a **protractor** to measure the size of angles.

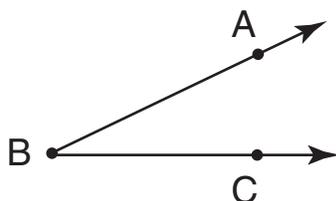
The unit of measurement used to measure the size of an angle is a **degree**. The symbol for degree is  $^{\circ}$ . A twenty degree angle is written  $20^{\circ}$ .

A **ray** is a line that starts at an endpoint and continues on in one direction.



and continues in this direction for ever!

An **angle** is formed by two rays that share an endpoint. The endpoint is called the **vertex**. In the drawing below, B is the vertex. An angle is named by labeling three points on the rays: one on each ray and one on the vertex. Capital letters are used when naming angles. The letter for the vertex must be the middle letter. The symbol used to represent an angle is  $\angle$ . Below is  $\angle ABC$ . This angle can also be named  $\angle B$ .

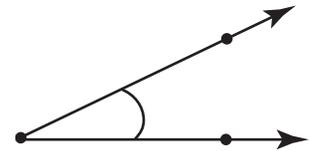


### The Names of Different Angles

A **right angle** is an angle that forms a square corner. It is exactly  $90^\circ$ . The small square connecting the rays is a symbol for a right angle.



An **acute angle** is less than  $90^\circ$ . An acute angle is between  $0^\circ$  and  $90^\circ$ .



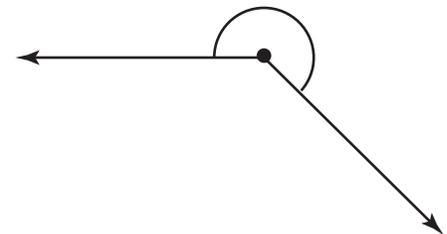
An **obtuse angle** is more than  $90^\circ$  but less than a straight line. An obtuse angle is between  $90^\circ$  and  $180^\circ$ .



A **straight line** is an angle that is exactly  $180^\circ$ .



A **reflex angle** is an angle that is greater than a straight line. A reflex angle is between  $180^\circ$  and  $360^\circ$ .



### Drawing Angles

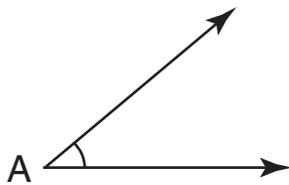
Place the protractor on the ray so the centre of the protractor is on the vertex and the base line is on the ray. For a  $70^\circ$  angle, place the protractor on the ray, find the band of numbers that start at  $0^\circ$ , and move to  $70^\circ$ . Make a mark at  $70^\circ$ . Remove the protractor and draw a straight line from the vertex to your mark.

On this protractor use the inside band of numbers when the ray points to the right. Use the outside numbers when the ray points to the left.

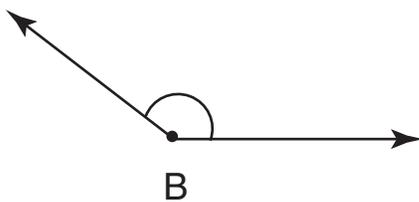
### Questions

1. Use a protractor to measure the following angles. Your answer should be within  $1^\circ$  of the correct answer. Also, name the type of angle in each drawing: right  $\angle$ , acute  $\angle$ , obtuse  $\angle$ , reflex  $\angle$ , or straight line. Write your measurement inside the angle.

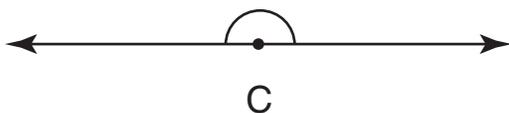
**Example:**



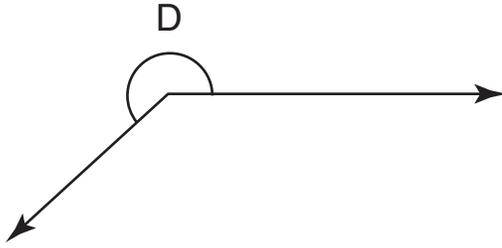
- a. Type of Angle: *acute = 40°*



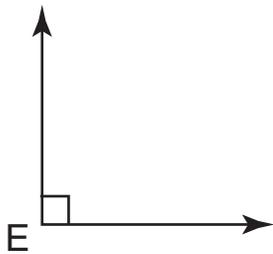
- b. Type of Angle: *obtuse = 142°*



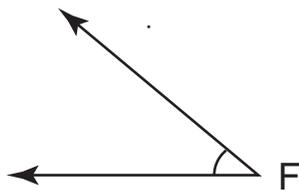
- c. Type of Angle: *straight = 180°*



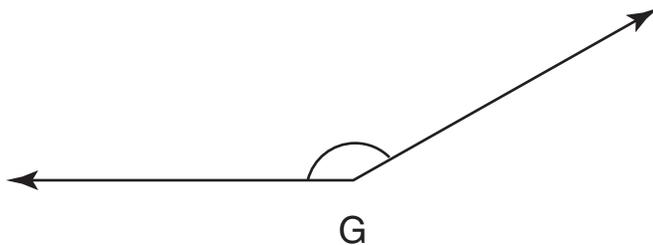
d. Type of Angle:  *reflex = 222°*



e. Type of Angle:  *right = 90°*



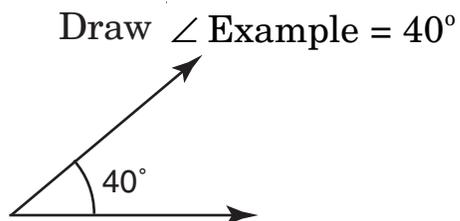
f. Type of Angle:  *acute = 40°*



g. Type of Angle:  *obtuse = 150°*

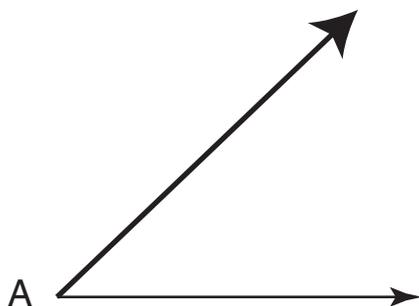
2. Use the rays that are provided and draw angles as instructed. Your answers should be within  $1^\circ$  of the correct measurement. Write your measurement inside the angle.

**Example:**

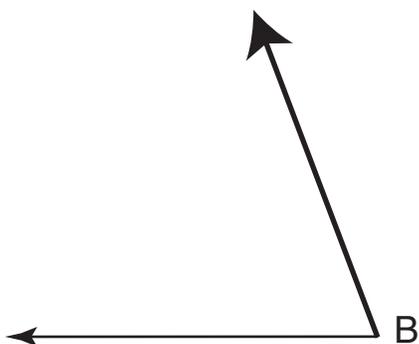


*\* Measure to ensure accuracy.*

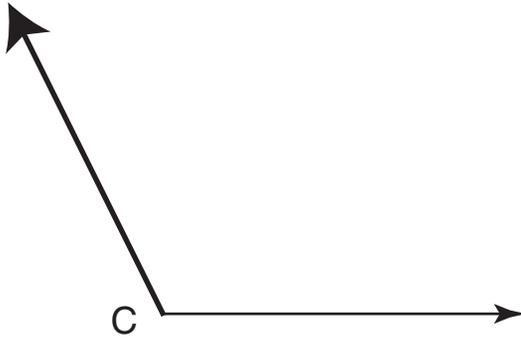
- a. Draw  $\angle A = 45^\circ$



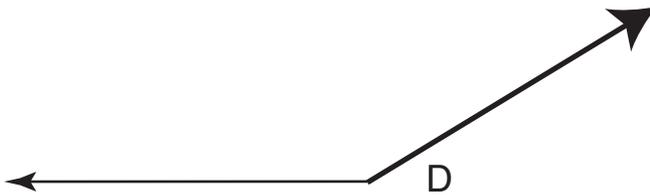
- b. Draw  $\angle B = 72^\circ$



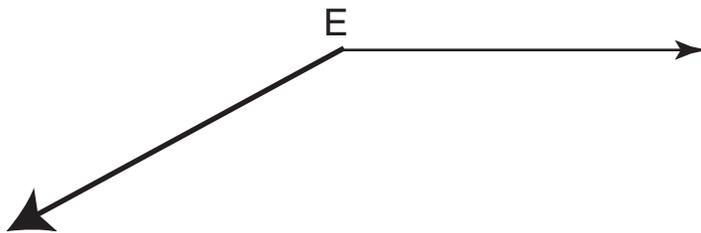
c. Draw  $\angle C = 115^\circ$



d. Draw  $\angle D = 148^\circ$



e. Draw  $\angle E = 200^\circ$



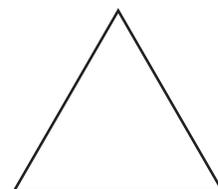
***All answers must be measured.***

## Types of Triangles

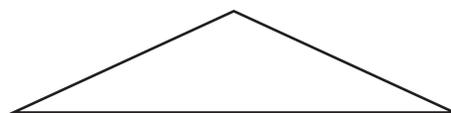
A **triangle** is a three-sided polygon. The sum of three angles of a triangle is always  $180^\circ$ . The symbol for a triangle is  $\Delta$ .

### Types of Triangles

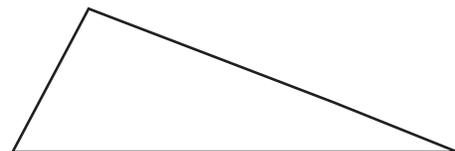
**Equilateral triangle** has three sides that are the same length. This triangle also has three angles that are equal. Each angle is  $60^\circ$ .



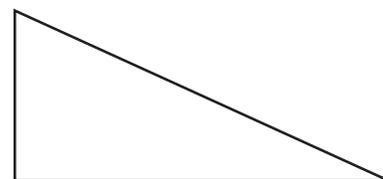
**Isosceles triangle** has two sides that are the same length. This triangle has two angles that are equal in size.



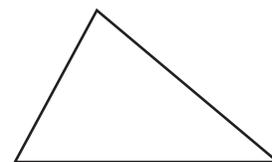
**Scalene triangle** has no sides the same length. Also, none of the angles of this triangle are equal.



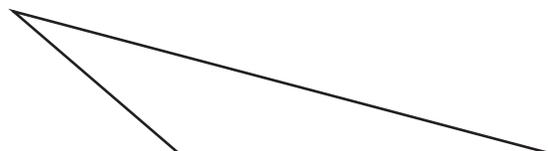
**Right-angle triangle** is a triangle with one angle that is  $90^\circ$ .



**Acute triangle** is a triangle with all 3 angles less than  $90^\circ$ .

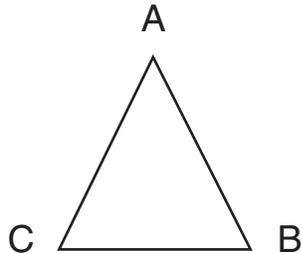


**Obtuse triangle** is a triangle that has one angle greater than  $90^\circ$ .



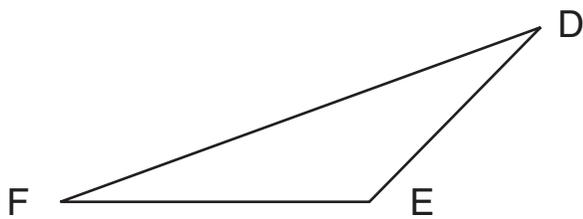
### Identifying Triangles

Each triangle can be identified two ways. It is one of the following three types: equilateral, isosceles, or scalene. It is also one of the following three types: right-angle, acute, or obtuse.



$\Delta ABC$  is an equilateral triangle and an acute triangle.

$\angle A = 60^\circ$ ,  $\angle B = 60^\circ$ , and  $\angle C = 60^\circ$   
The sum of the three angles is  $180^\circ$ .



$\Delta DEF$  is a scalene triangle and an obtuse triangle.

$\angle D = 42^\circ$ ,  $\angle E = 123^\circ$  and  $\angle F = 15^\circ$   
The sum of the three angles is  $180^\circ$ .

### Questions

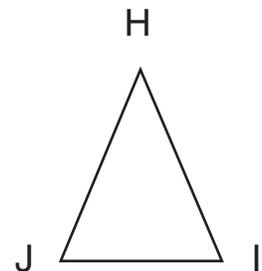
- Identify each of the following triangles two ways. Pick one name from each category. Category I (equilateral, isosceles, or scalene). Category II (acute, obtuse, or right-angle). Measure each angle and record the number of degrees in the space provided. Find the total number of degrees of each triangle.

a.  $\angle H = \underline{52^\circ}$  Category I: *Isosceles*

$\angle I = \underline{64^\circ}$  Category II: *Acute*

$\angle J = \underline{64^\circ}$

Total =  $180^\circ$

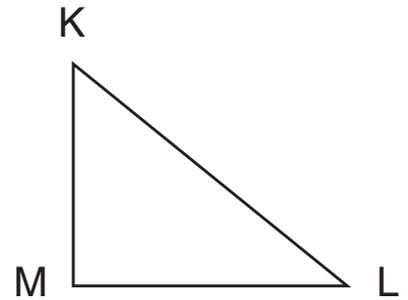


b.  $\angle K = \underline{50^\circ}$  Category I: *scalene*

$\angle L = \underline{40^\circ}$  Category II: *right-angle*

$\angle M = \underline{90^\circ}$

Total = *180^\circ*

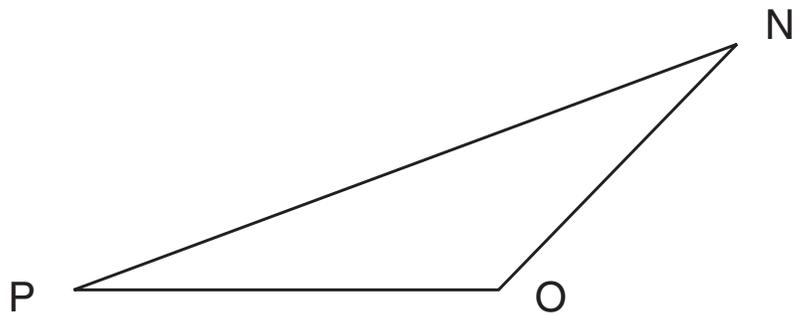


c.  $\angle N = \underline{25^\circ}$  Category I: *scalene*

$\angle O = \underline{134^\circ}$  Category II: *obtuse*

$\angle P = \underline{21^\circ}$

Total = *180^\circ*

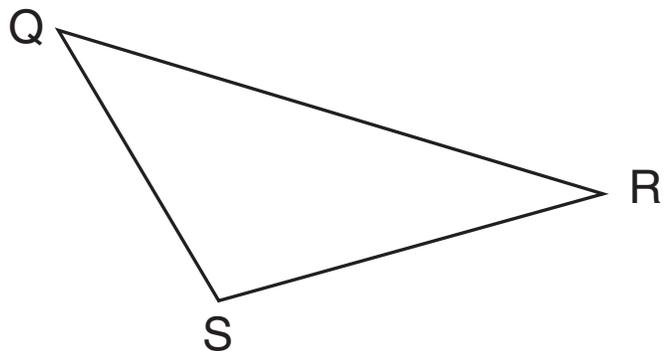


d.  $\angle Q = \underline{43^\circ}$  Category I: *scalene*

$\angle R = \underline{32^\circ}$  Category II: *obtuse*

$\angle S = \underline{105^\circ}$

Total = *180^\circ*

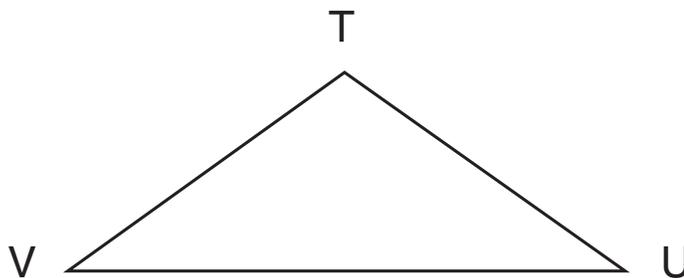


e.  $\angle T = \underline{108^\circ}$  Category I: *isosceles*

$\angle U = \underline{36^\circ}$  Category II: *obtuse*

$\angle V = \underline{36^\circ}$

Total =  $180^\circ$

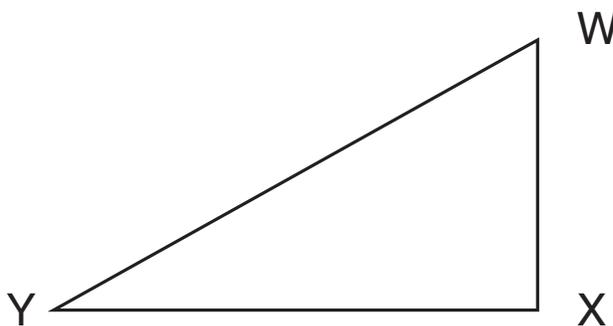


f.  $\angle W = \underline{61^\circ}$  Category I: *scalene*

$\angle X = \underline{90^\circ}$  Category II: *right-angle*

$\angle Y = \underline{29^\circ}$

Total =  $180^\circ$



2. Use a ruler and protractor to draw triangles to fit the descriptions given below. For each question a named line segment is given. You must add to the line segment to make a triangle.

a. Draw a right-angle triangle ( $\triangle ABC$ ).  $\angle A = 90^\circ$  and  $\angle B = 35^\circ$

Is this triangle equilateral, isosceles, or scalene? *Scalene*

How large is  $\angle C$ ? *55^\circ*

*\* Measure for accuracy*

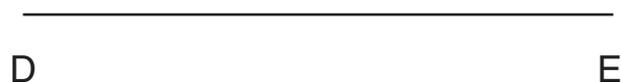


b. Draw an acute triangle ( $\triangle DEF$ ).  $\angle D = 65^\circ$  and  $\angle E = 45^\circ$

Is this triangle equilateral, isosceles, or scalene? *Scalene*

How large is  $\angle F$ ? *70^\circ*

*\* Measure student work for accuracy*



c. Draw an obtuse triangle ( $\triangle GHI$ ).  $\angle G = 120^\circ$  and  $\angle H = 25^\circ$

Is this triangle equilateral, isosceles, or scalene? **Scalene**

How large is  $\angle I$ ?  **$35^\circ$**

*\* Measure for accuracy*



d. Draw an acute triangle ( $\triangle JKL$ ).  $\angle J = 55^\circ$  and  $\angle K = 55^\circ$

Is this triangle equilateral, isosceles, or scalene? **Isosceles**

How large is  $\angle L$ ?  **$70^\circ$**

*\* Measure for accuracy*



## Drawing Polygons and Measuring Angles

A **quadrilateral** is a four-sided figure. The most common quadrilaterals are squares, rectangles, and parallelograms. The sum of the four angles in a quadrilateral is  $360^\circ$ .

A **pentagon** is a five-sided figure. The sum of the five angles is  $540^\circ$ .

The numbers of degrees in various figures are in the chart below.

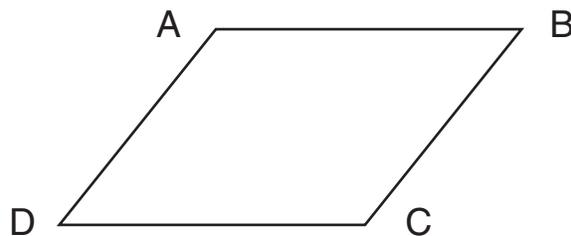
Polygon	Number of Sides	Number of Degrees
Triangle	3	$180^\circ$
Square	4	$360^\circ$
Rectangle	4	$360^\circ$
Parallelogram	4	$360^\circ$
Pentagon	5	$540^\circ$

The angles in squares and rectangles are all right angles.

In a **parallelogram**, opposite sides and opposite angles are equal. In parallelogram ABCD, the following sides and angles are equal.

$$AB = DC \text{ and } AD = BC$$

$$\angle A = \angle C \text{ and } \angle B = \angle D$$



In a parallelogram, the top two angles ( $\angle A$  and  $\angle B$ ) and the bottom two angles ( $\angle D$  and  $\angle C$ ) equal  $180^\circ$ .

For **example**, in parallelogram ABCD

$$\angle D = 60^\circ. \text{ Therefore, } \angle C \text{ is } 120^\circ \text{ because } 180^\circ - 60^\circ = 120^\circ.$$

$$\angle B = 60^\circ. \text{ Therefore, } \angle A \text{ is } 120^\circ \text{ because } 180^\circ - 60^\circ = 120^\circ.$$

**Questions**

1. Use a protractor to measure all the angles in the figures below. Record the number of degrees in the space provided. Calculate the sum of all the angles in each figure.

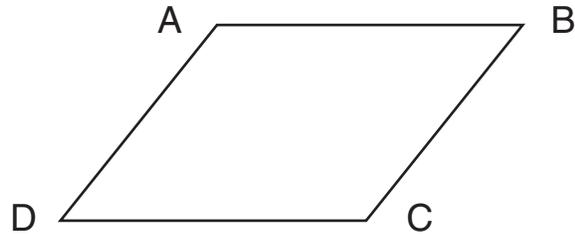
a.  $\angle A = \underline{129^\circ}$

$\angle B = \underline{51^\circ}$

$\angle C = \underline{129^\circ}$

$\angle D = \underline{51^\circ}$

Total =  $\underline{360^\circ}$



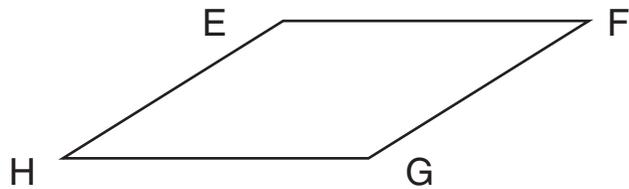
b.  $\angle E = \underline{148^\circ}$

$\angle F = \underline{32^\circ}$

$\angle G = \underline{148^\circ}$

$\angle H = \underline{32^\circ}$

Total =  $\underline{360^\circ}$



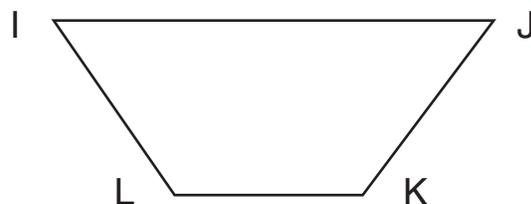
c.  $\angle I = \underline{55^\circ}$

$\angle J = \underline{55^\circ}$

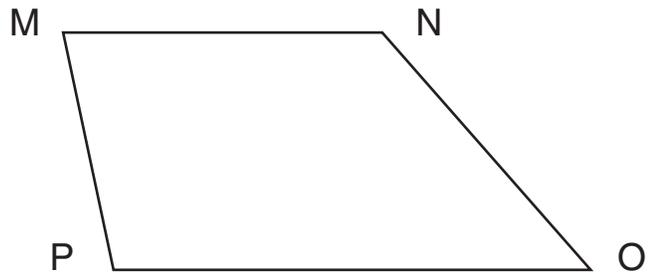
$\angle K = \underline{125^\circ}$

$\angle L = \underline{125^\circ}$

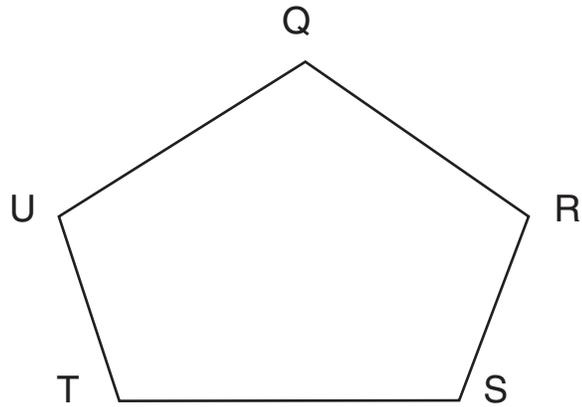
Total =  $\underline{360^\circ}$



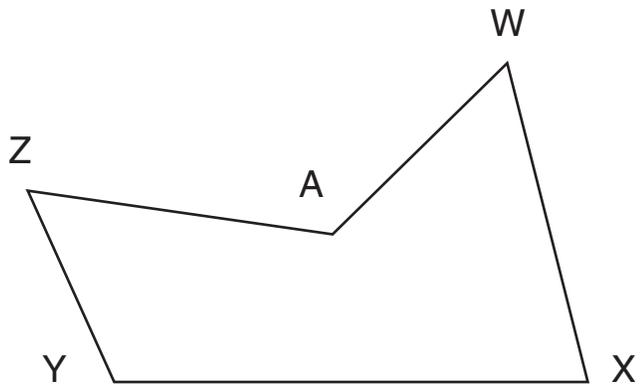
- d.  $\angle M = \underline{78^\circ}$   
 $\angle N = \underline{131^\circ}$   
 $\angle O = \underline{49^\circ}$   
 $\angle P = \underline{102^\circ}$   
 Total =  $\underline{360^\circ}$



- e.  $\angle Q = \underline{112^\circ}$   
 $\angle R = \underline{102^\circ}$   
 $\angle S = \underline{112^\circ}$   
 $\angle T = \underline{110^\circ}$   
 $\angle U = \underline{104^\circ}$   
 Total =  $\underline{540^\circ}$



- f.  $\angle W = \underline{60^\circ}$   
 $\angle X = \underline{76^\circ}$   
 $\angle Y = \underline{115^\circ}$   
 $\angle Z = \underline{56^\circ}$   
 $\angle A = \underline{233^\circ}$   
 Total =  $\underline{540^\circ}$



2. Use a ruler and a protractor to draw figures to fit the description given below. Use capital letters to name the points. Hint: Draw the item that is in **bold** letters first.

a. Draw a parallelogram named ABCD.

**DC = 6 cm**, DA = 4 cm and  $\angle D = 45^\circ$

*\* Check diagram for accuracy*

b. Draw a parallelogram named FGHI.

**IH = 4.5 cm**, all sides = 4.5 cm and  $\angle I = 30^\circ$

*\* Check diagram for accuracy*

c. Draw a quadrilateral named JKLM.

**ML = 9 cm**,  $\angle M = 60^\circ$ ,  $\angle L = 60^\circ$ , and  $LK = MJ = 5\text{ cm}$

What is the length of side JK? 4 cm

*\* Check diagram for accuracy*

d. Draw a pentagon named PQRST.

**SR = 6 cm**,  $\angle S = \angle R = 120^\circ$ ,  $ST = RQ = 4\text{ cm}$ ,  $\angle T = 90^\circ$  and  $TP = 5\text{ cm}$

What is the length of side PQ? 7 cm

*\* Check diagram for accuracy*

## Homework Assignment

1. Draw an Acute Triangle ( $\triangle ABC$ ).

$AB = 4.5$  cm,  $\angle A = 60^\circ$  You can choose the size of the other two angles and the other two sides.

*\* Check diagram for accuracy*

2. Draw a parallelogram named DEFG.

$DE = FG = 7$  cm,  $DG = EF = 3$  cm,  $\angle G = 80^\circ$

*\* Check diagram for accuracy*

3. Draw a pentagon named LMNOP.

$ON = 5$  cm,  $OP = NM = 4$  cm,  $\angle O = 75^\circ$ ,  $\angle N = 115^\circ$

You can choose the size of the other two angles and the other two sides.

*\* Check diagram for accuracy*

## Self-Evaluation

Ask yourself some important questions. Write your answers in sentences for your teacher.

1. In this lesson, what part of your work was **excellent**?

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2. In this lesson, what part of your work **needs improvement**?

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3. If you want help for some of the work in this lesson, ask your teacher in this space.

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