# *Important Concepts . . .*

# Preview Review

**Mathematics**                                    **Grade 6**

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

## Important Concepts of Grade 6 Mathematics

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

Mathematics Grade 6
Version 5
Preview/Review W2 - Lesson 5

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# Preview/Review Concepts
## for
# Grade Six Mathematics
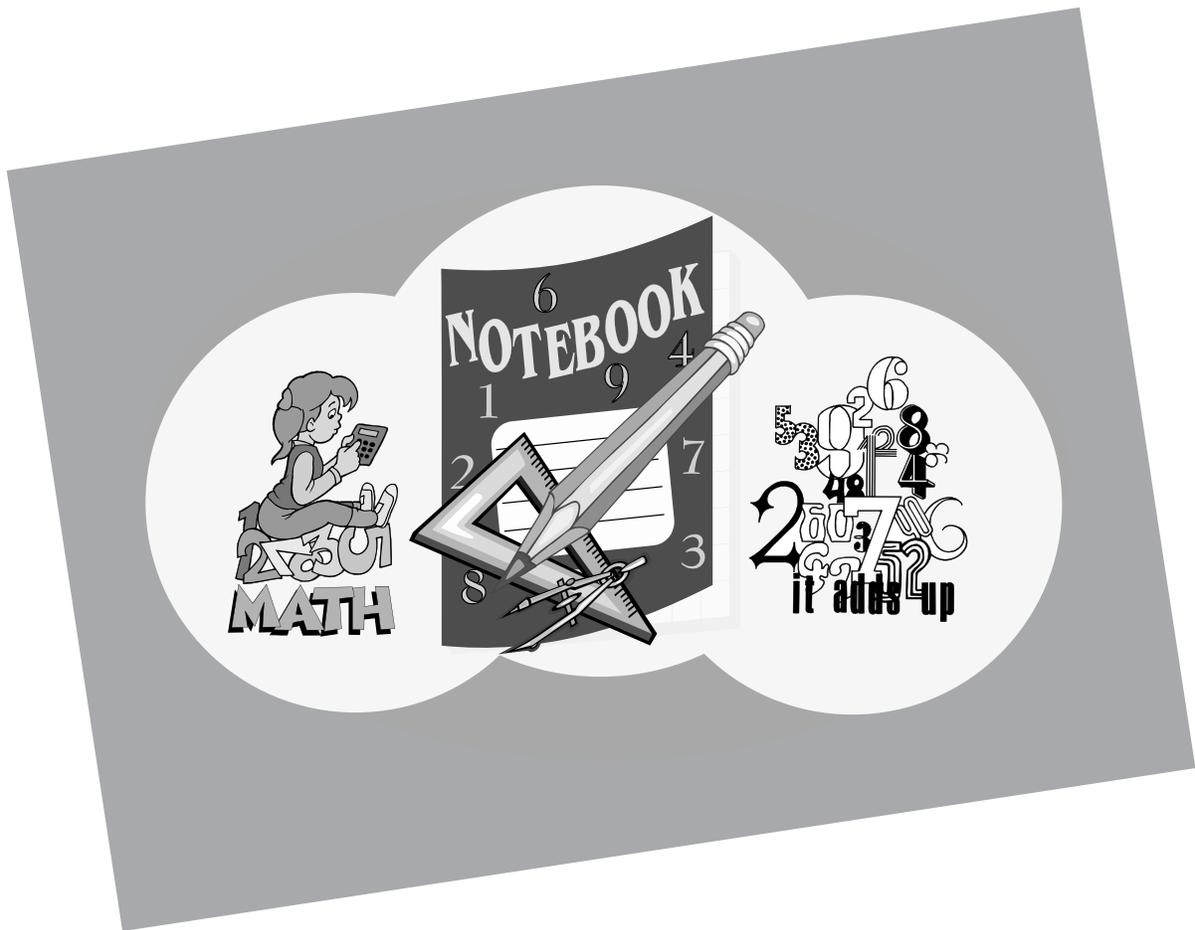


*W2 - Lesson 5: Working with Angles and Drawing Objects and Shapes*

# 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 90º

**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 90º but less than 180º

**obtuse triangle** - triangle with one angle greater than 90º

**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 180º

**right angle** - angle of 90º

**right-angle triangle** - triangle with one angle of 90º

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

**straight line or straight angle** - angle of 180º

**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?
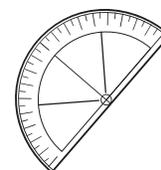
## Drawing and Measuring Angles

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 °.  A twenty degree angle is written 20°.

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

Starts here

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 ∠. Below is ∠ABC.  This angle can also be named ∠B.
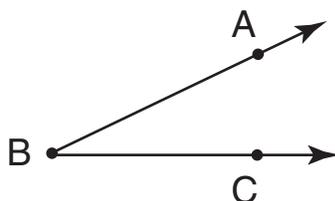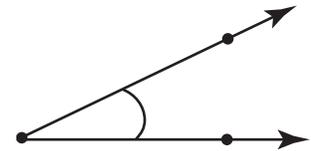
## The Names of Different Angles

A **right angle** is an angle that forms a square corner.  It is exactly 90°.  The small square connecting the rays is a symbol for a right angle.
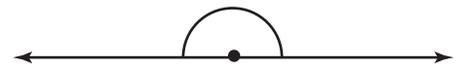
An **acute angle** is <u>less</u> than 90°.  An acute angle is between 0° and 90°.
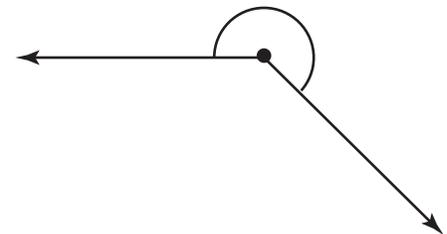
An **obtuse angle** is <u>more</u> than 90° but less than a straight line.  An obtuse angle is between 90° and 180°.

A **straight line** is an angle that is exactly 180°.

A **reflex angle** is an angle that is greater than a straight line.  A reflex angle is between 180° and 360°.
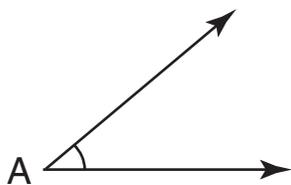
### Drawing Angles

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° angle, place the protractor on the ray, find the band of numbers that start at 0°, and move to 70°.  Make a mark at 70°.  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.
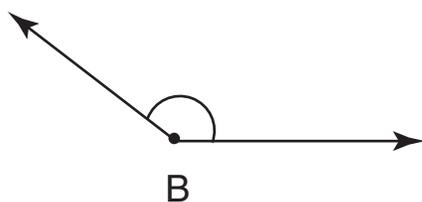
## Questions

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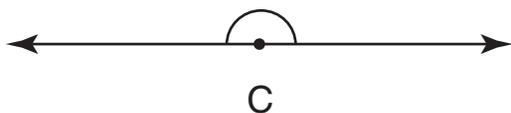    your measurement inside the angle.

    **Example**:

    40°                               _**acute**_

    A

    a.   Type of Angle:   _____

    B
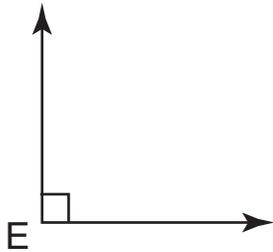
    b.   Type of Angle:   _____

    C

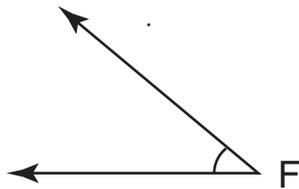    c.   Type of Angle:   _____

D

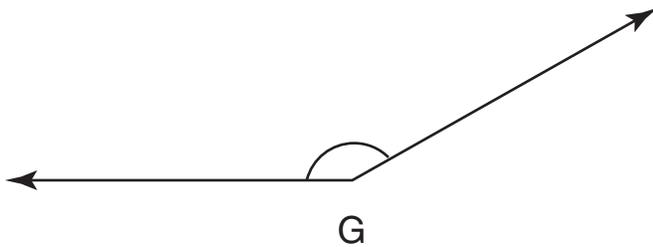d.   Type of Angle:   _____

E

e.   Type of Angle:   _____

F

f.   Type of Angle:   _____
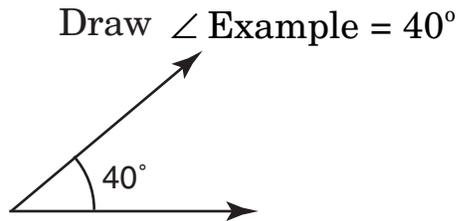
G
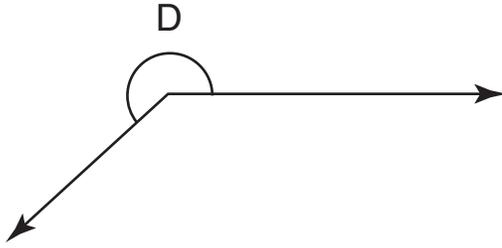
g.   Type of Angle:   _____

2.  Use the rays that are provided and draw angles as instructed.  Your answers should be within 1° of the correct measurement.  Write your measurement inside the angle.
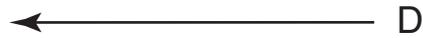
**Example**:

Draw $\angle$ Example = 40°

40°

a.  Draw $\angle$A = 45°

A

b.  Draw $\angle$B = 72°

B

c.   Draw  ∠C = 115°
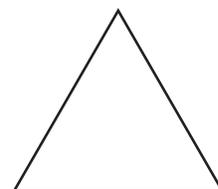
E ⟶

d.   Draw  ∠D = 148°

⟵ D

e.   Draw ∠E = 200°

C ⟶
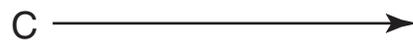
# Types of Triangles

A **triangle** is a three-sided polygon. The sum of three angles of a triangle is always 180°. 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°.

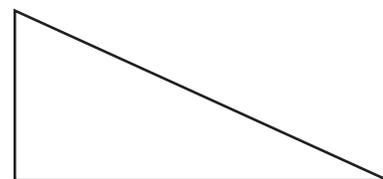**Isosceles triangle** has two sides that are the same length. This triangle has two angles that are equal in size.
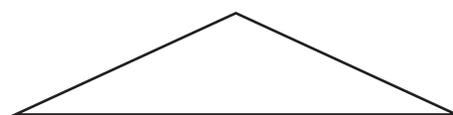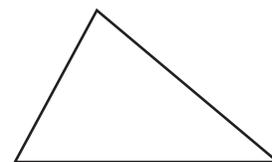
**Scalene triangle** has no sides the same length. Also, none of the angles of this triangle are equal.
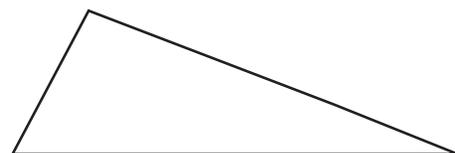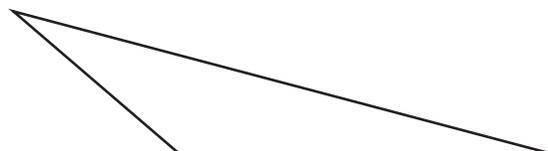
**Right-angle triangle** is a triangle with one angle that is 90°.

**Acute triangle** is a triangle with all 3 angles less than 90°.
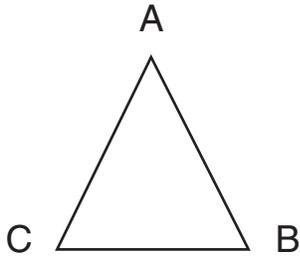
**Obtuse triangle** is a triangle that has one angle greater than 90°.

## 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.

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

$\angle$A = 60°, $\angle$B = 60°, and $\angle$C = 60°

The sum of the three angles is 180°.
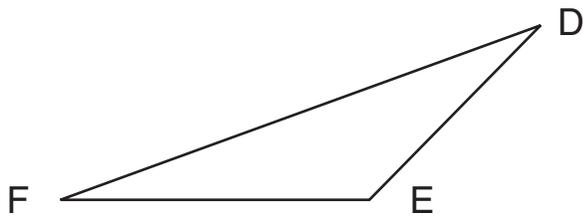
$\triangle$DEF is a scalene triangle and an obtuse triangle.

$\angle$D = 42°, $\angle$E = 123° and $\angle$ F = 15°

The sum of the three angles is 180°.

## Questions

1.  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 = _____ Category I: _____

    $\angle$I = _____ Category II: _____

    $\angle$J = _____

    Total = _____
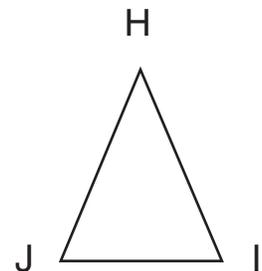
b.   ∠K = _____   Category I: _____        K

∠L = _____   Category II: _____

∠M = _____

Total = _____                                 M ⌐_____⌐ L
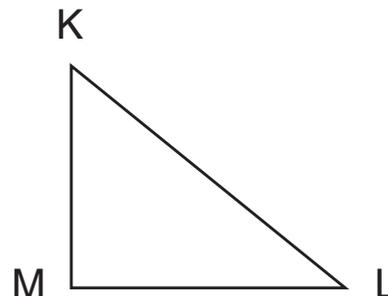
c.   ∠N = _____   Category I:  _____

∠O = _____   Category II:  _____

∠P = _____

Total = _____
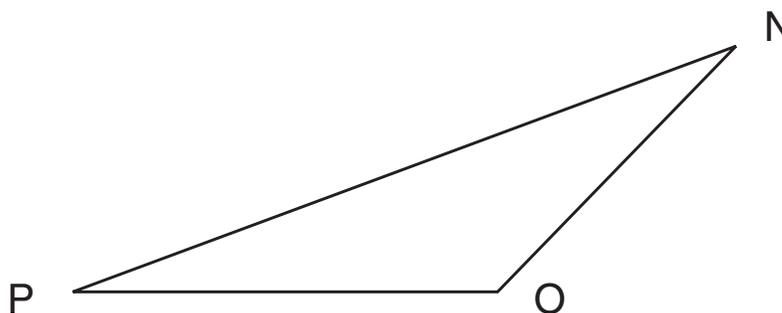
d.   ∠Q = _____   Category I:  _____

∠R = _____   Category II:  _____

∠ S= _____

Total = _____
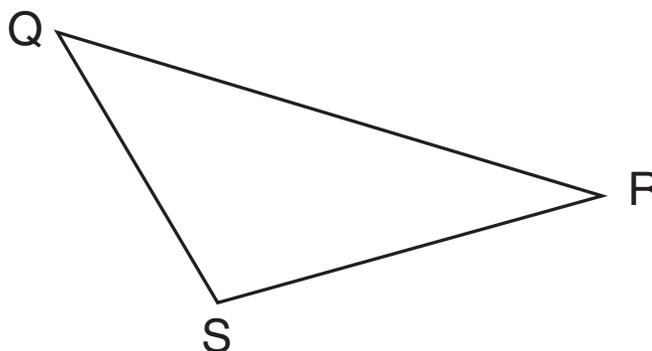
e.    ∠T = _____ Category I:   _____

      ∠U = _____ Category II:  _____

      ∠ V = _____

      Total = _____



f.    ∠W = _____Category I:   _____

      ∠ X = _____Category II:  _____

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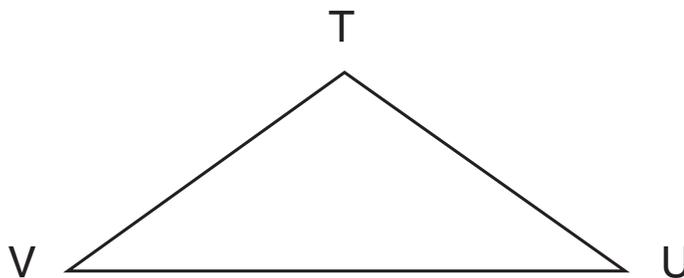
      Total = _____
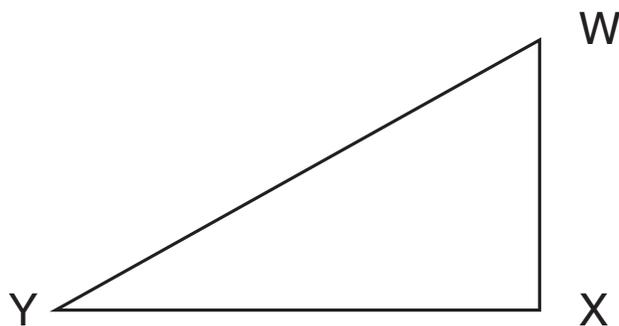
2.  Use a ruler and protractor to draw triangles to fit the descriptions given below.  For each question a named line segment is given.  You must add to the line segment to make a triangle.

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

Is this triangle equilateral, isosceles, or scalene?  _____

How large is $\angle$C?  _____

‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
A                              B

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

Is this triangle equilateral, isosceles, or scalene?  _____

How large is $\angle$F?  _____

‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
D                                        E

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

Is this triangle equilateral, isosceles, or scalene?  _____

How large is  $\angle$I?  _____

G                                                            H

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

Is this triangle equilateral, isosceles, or scalene?  _____

How large is  $\angle$L?  _____

J                                                            K
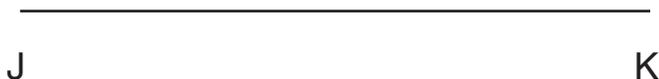
## Drawing Polygons and Measuring Angles

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°.

A **pentagon** is a five-sided figure.  The sum of the five angles is 540°.

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

| Polygon | Number of Sides | Number of Degrees |
|---|---|---|
| Triangle | 3 | 180° |
| Square | 4 | 360° |
| Rectangle | 4 | 360° |
| Parallelogram | 4 | 360° |
| Pentagon | 5 | 540° |

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 and AD = BC
$\angle$A = $\angle$C and $\angle$B = $\angle$ D
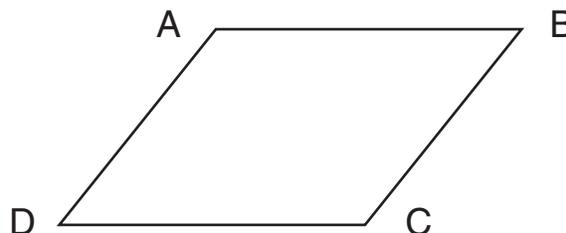


In a parallelogram, the top two angles ($\angle$A and $\angle$B) and the bottom two angles ($\angle$D and $\angle$C) equal 180°.

> For **example**, in parallelogram ABCD
> $\angle$D = 60°.  Therefore, $\angle$C is 120° because 180° - 60° = 120°.
> $\angle$B = 60°.  Therefore, $\angle$A is 120° because 180° - 60° = 120°.

## 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.
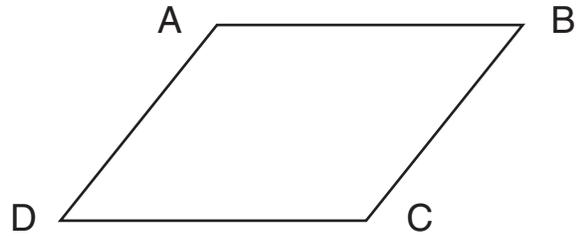
    a.  ∠A = _____

        ∠B = _____

        ∠C = _____

        ∠D = _____

        Total = _____

    b.  ∠E = _____

        ∠F = _____

        ∠G = _____

        ∠H = _____

        Total = _____
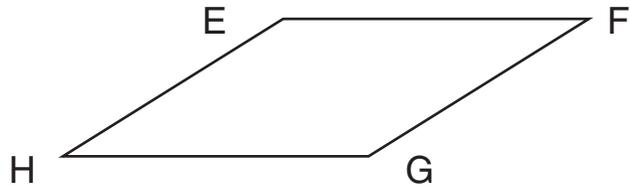
    c.  ∠I = _____

        ∠J = _____

        ∠K = _____

        ∠L = _____

        Total = _____

d.   ∠M = _____

     ∠N = _____

     ∠O = _____

     ∠P = _____

     Total = _____

M _____ N
P _____ O

e.   ∠Q = _____

     ∠R = _____

     ∠S = _____

     ∠T = _____

     ∠U = _____

     Total = _____

Q
U          R
T          S

f.   ∠W = _____

     ∠X = _____

     ∠Y = _____

     ∠Z = _____

     ∠A = _____

     Total = _____

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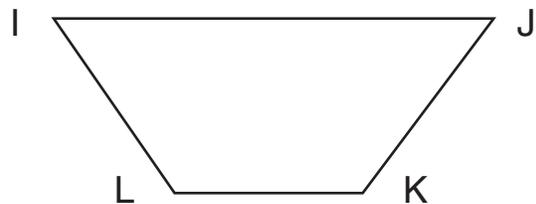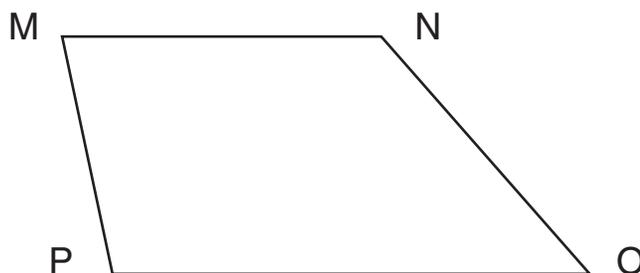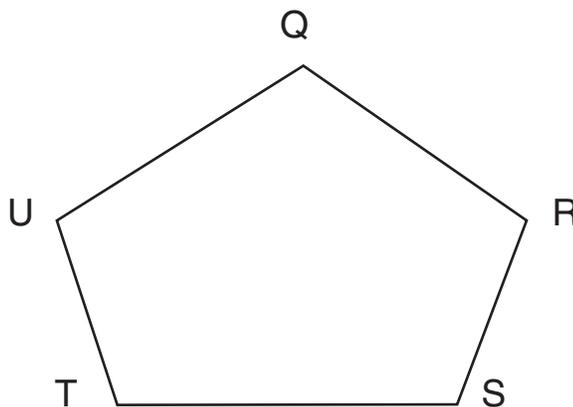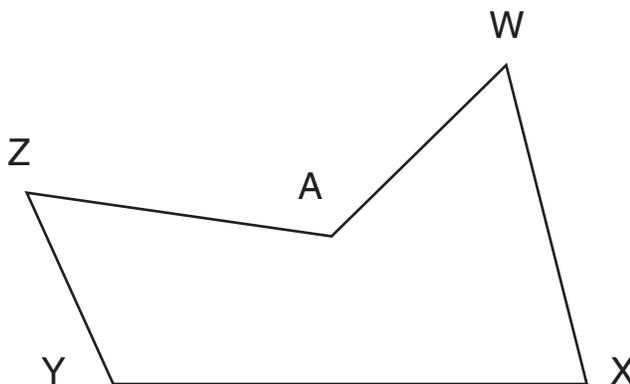
2.  Use a ruler and a protractor to draw figures to fit the description given
    below.  Use capital letters to name the points.  Hint:  Draw the item that
    is in **bold** letters first.


    a.  Draw a parallelogram named ABCD.

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


    b.  Draw a parallelogram named FGHI.

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

c.   Draw a quadrilateral named JKLM.

**ML = 9 cm**, $\angle$M = 60°, $\angle$L = 60°, and LK = MJ = 5cm

What is the length of side JK?  _____

d.   Draw a pentagon named PQRST.

**SR = 6 cm**, $\angle$S = $\angle$R = 120°, ST = RQ = 4 cm, $\angle$T = 90° and TP = 5 cm

What is the length of side PQ?  _____

## Homework Assignment

1.  Draw an Acute Triangle ($\triangle$ABC).
    AB = 4.5 cm, $\angle$A = 60° You can choose the size of the other two angles and the other two sides.

2.  Draw a parallelogram named DEFG.
    DE = FG = 7 cm, DG = EF = 3 cm, $\angle$G = 80°

3.  Draw a pentagon named LMNOP.
    ON = 5 cm, OP = NM =4 cm, $\angle$O = 75°, $\angle$N = 115°
    You can choose the size of the other two angles and the other two sides.

## 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**?

   _____

   _____

   _____

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

   _____

   _____

   _____

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

   _____

   _____

   _____