Grade 7 – Book C
(Revised CAPS edition)

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Chapter C2

Geometry of 2-D shapes

C2.1 Lines and angles:

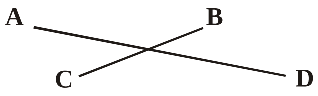
C2.1.1 Classification of lines:

(1) Line: A set of points with no definite starting point or end point.

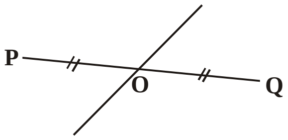
(2) Line segment: A set of points with a definite starting point and end point.

(3) Ray: A set of points with a definite starting point but no definite end point.

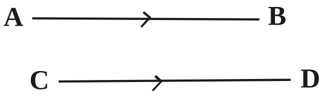
(4) Intersecting lines: Two lines intersecting each other. ∴ AD intersects BC.



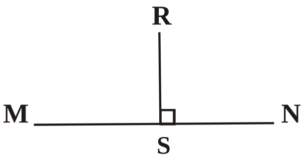
(5) Bisecting lines: One line intersects another line precisely in the middle. ∴ PO = OQ.



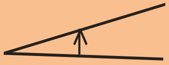
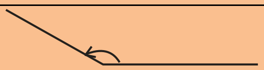
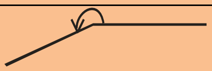
(6) Parallel lines: Two or more lines that are always the same distance from each other. The lines will therefore never cross. ∴ AB // CD.



(7) Perpendicular lines: A line that is perpendicular to another line if it makes an angle of 90° with the line. ∴ RS ⊥ MN.



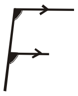
C2.1.2 Angles:

Type of angle:	Example:	Angle size:
Acute angle		Larger than 0° but smaller than 90°.
Right angle		Equal to 90°.
Obtuse angle		Larger than 90° but smaller than 180°.
Straight angle		Equal to 180°.
Reflex angle		Larger than 180° but smaller than 360°.
Revolution		Equal to 360°.

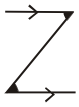
C2.1.3 Parallel lines:

If two lines are parallel to each other, the following will be valid:

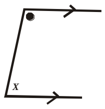
(1) Corresponding angles:
E.g. $a = e$; $b = f$;
$c = g$ and $d = h$.

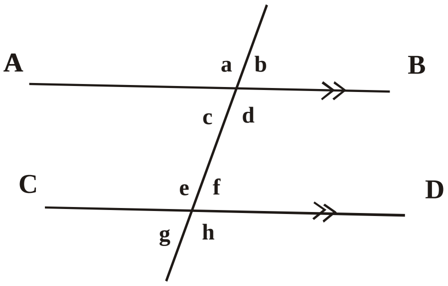


(2) Alternate angles:
E.g. $e = d$; $c = f$;
$a = h$ and $b = g$.



(3) Co-interior angles:
E.g. $c + e = 180°$ and
$d + f = 180°$

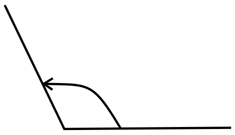




Exercise 1: Date: ________________________

(1) Classify each of the following angles without measuring them:

(a)



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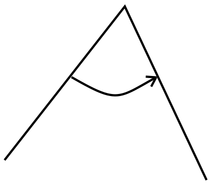
(b)



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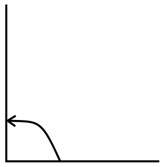
(c)



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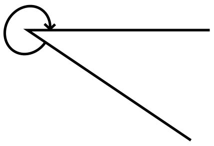
(d)



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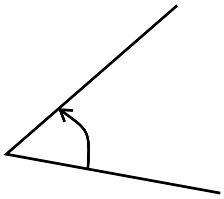
(e)



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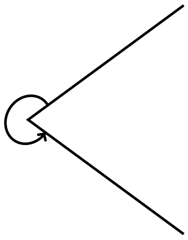
(f)



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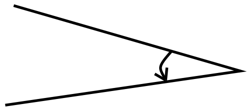
(g)



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(h)

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(2) Classify the following pairs of angles as corresponding, alternate or co-interior angles:

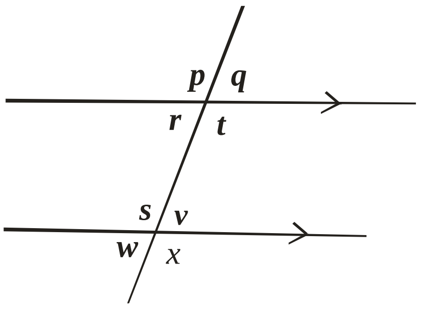
(a) p and s: ______________________________

(b) s and r: ______________________________

(c) v and r: ______________________________

(d) t and x: ______________________________

(e) q and v: ______________________________



(3) Classify each of the following angles:

(a) 56°

(b) 234°

(c) 180°

(d) 148°

(e) 200°

(f) 89°

(g) 360°

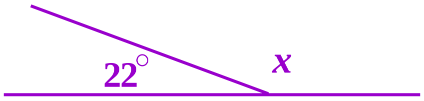
(h) 4°

(i) 111°

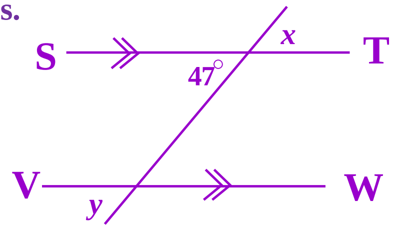
C2.1.4 Applications:

E.g.1 Calculate the value(s) of x and/or y. Provide reasons.

(a)



(b)



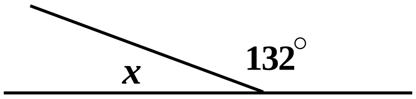
Statement:	**Reason:**
$x = 180° - 22°$	Adj $\angle^s$ on str line
$\therefore\ x = 158°$	

Statement:	**Reason:**
$x = 47°$	Vertically opposite $\angle^s$
$y = 47°$	Corresponding $\angle^s$; ST//VW

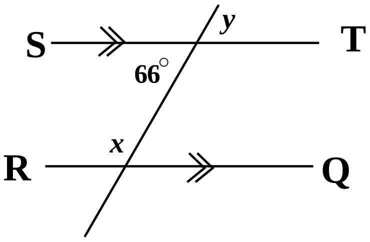
Exercise 2: Date: ____________________

Calculate the value(s) of x and/or y. Provide reasons.

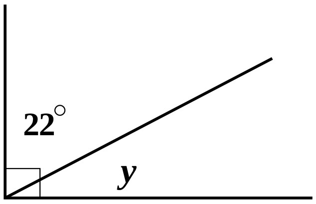
(1)



(2)



(3)



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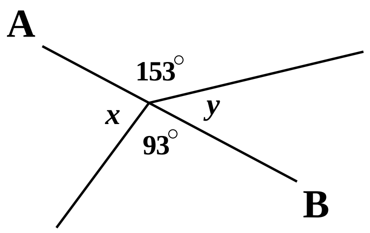
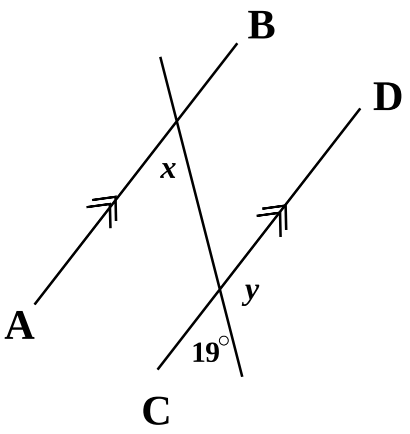
(4)



AB is a straight line.

(5)



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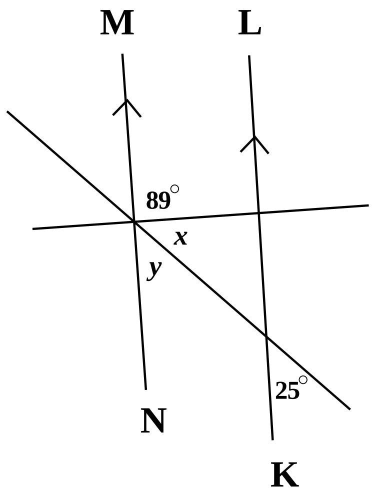

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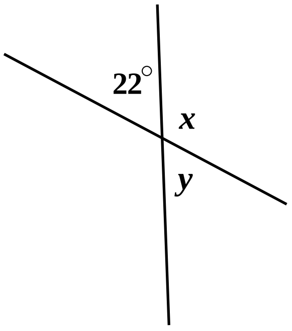

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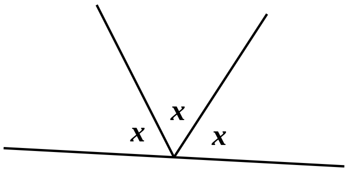
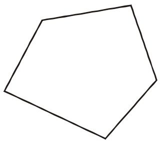


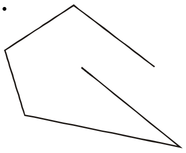
C2.2 **Polygon**:

Polygons are closed figures with a certain number of sides and angles.

Closed figure:

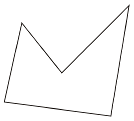


Non-closed figure:

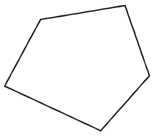


Polygons can therefore also be classified as concave or convex:

Concave:



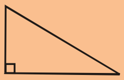
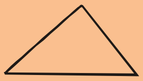
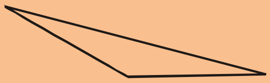
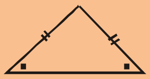
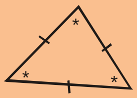
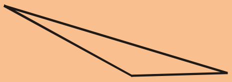
Convex:



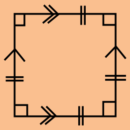
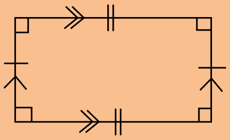
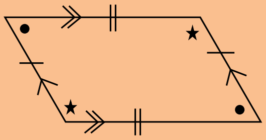
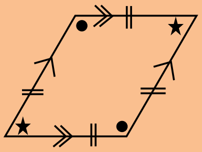
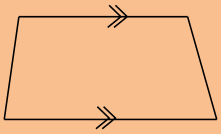
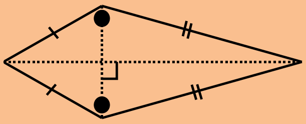
Polygons are classified according to the number of angles and sides they consist of.

- * Triangles are closed figures with three angles and three sides.
- * Quadrangles are closed figures with four angles and four sides.
- * Pentagons are closed figures with five angles and five sides ……etc.

C2.2.1 **Types of triangles**:

Type of triangle:	**Example:**	**Description:**
Right angled triangle		* One angle is equal to 90°.
Acute angled triangle		* All the angles are acute angles.
Obtuse angled triangle		* One of the angles is an obtuse angle.
Isosceles triangle		* Two of the sides are of equal length. * The angles opposite the equal sides are of equal size.
Equilateral triangle		* All three sides are of equal length. * All three the angles are equal to 60°.
Scalene triangle		* All three sides have different lengths.

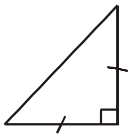
C2.2.2 Types of quadrangles:

Type of quadrangles:	Example:	Characteristics:
Square		* All the sides are of equal length. * The opposite sides are parallel. * All the angles are 90°.
Rectangle		* Opposite sides are of equal length and are parallel. * All the angles are 90°.
Parallelogram		* Opposite sides are of equal length and are parallel. * The opposite angles are of equal size.
Rhombus		* All the sides are of equal length. * The opposite sides are parallel. * The opposite angles are of equal size.
Trapezium		* Only one pair of opposite sides is parallel to one another.
Kite		* Two pairs of adjacent sides are of equal length. * One pair of opposite angles is of equal size. * Diagonals are perpendicular.

Exercise 3: Date: ________________________

(1) Classify each of the following triangles according to their angles:

(a)



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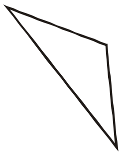

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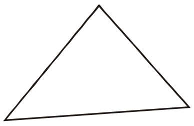
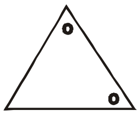


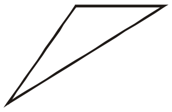
(d)



__________________ __________________ __________________ __________________

(2) Classify each of the following triangles according to their sides:

(a)



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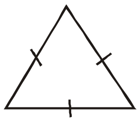

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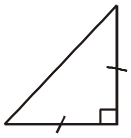
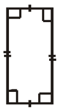


__________________ __________________ __________________ __________________

(3) Classify each of the following quadrangles:

(a)



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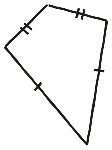

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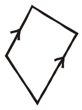

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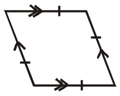

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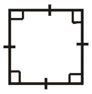

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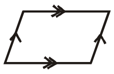

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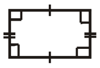

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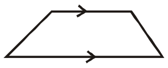


(4) Classify each of the following:

(a) Angle $\hat{A}$: ____________________

(b) Quadrilateral ABCD: ____________________

(c) Triangle AEB: ____________________

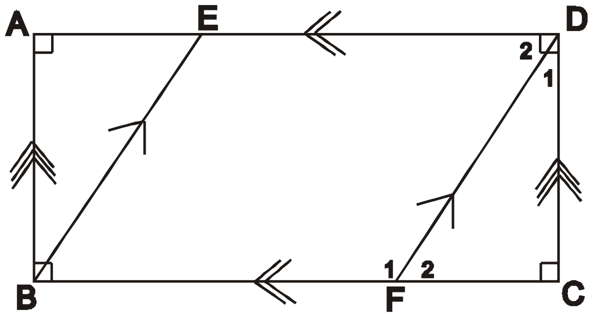
(d) Angle $\hat{F}_1$: ____________________

(e) Quadrilateral BEDF: ____________________

(f) Angle $\hat{D}_1$: ____________________

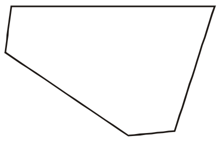
(g) Quadrilateral EDCB: ____________________

(h) Angles $\hat{D}_2$ and $\hat{F}_2$: ____________________

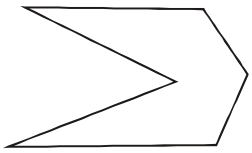


(5) Classify the following polygons: E.g. Concave pentagon

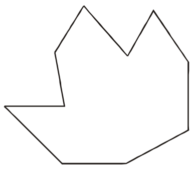
(a)



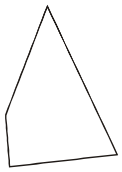
(b)



(c)



(d)



(6) Complete the following:

(a) A rhombus is a parallelogram of which ____________________

(b) A square is a rectangle of which ____________________

(c) A parallelogram is a quadrangle of which ____________________

(d) A square is a rhombus of which ____________________

(e) A trapezium is a quadrangle of which ____________________

C2.2.3 Interior angles of polygons:

Exercise 4: Date: ______________________

(1) (a) Draw any triangle. Use a protractor and measure all the interior angles of the triangle involved. Then calculate the sum of all the interior angles of the triangle.

____

(b) Then extend any of the sides of the triangle in (a). It forms an exterior angle of the triangle. Measure the exterior angle. Determine the relation between the exterior angle and the opposite interior angles.

____

____

(2) (a) Then draw any quadrilateral. Use a protractor and measure all the interior angles of the quadrilateral involved. Then determine the sum of all the interior angles of the quadrilateral.

____

____

(b) Then divide the quadrilateral in (a) into two triangles by drawing a diagonal. Measure each triangle's interior angles and again calculate the sum of the interior angles of each triangle.

____

____

(3) (a) Then draw any pentagon. Use a protractor and measure all the interior angles of the pentagon involved. Then determine the sum of all the interior angles of the pentagon.

____

____

(b) Then divide the pentagon in (a) into the smallest number of triangles by inserting diagonals. Measure each triangle's interior angles and calculate the sum of the interior angles of each triangle again.

____

____

____

(4) From numbers 1 – 3 we can deduce the following:

(a) The sum of the interior angles of any triangle is always equal to ________________________

(b) The sum of the interior angles of any quadrilateral is always equal to______________________

(c) The sum of the interior angles of any pentagon is always equal to ________________________

(5) Predict the sum of the interior angles of an octagon without making a sketch and without Measuring it. Use the deductions in number 4.

____

____

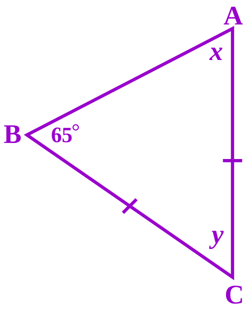
☺ **All the following are names for a type of polygon. Do research and find out which type of polygon it is. Also collect pictures of examples from everyday life of at least two types of polygons from magazines, newspapers, the internet or any other source.**

(1) hexagon **(2) tetragon** **(3) pentagon** **(4) octagon**

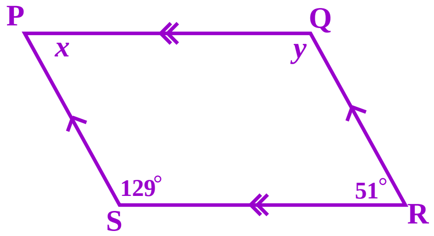
C2.2.4 Applications:

E.g.2 Calculate the value(s) of x and/or y. Provide reasons.

(a)



(b)



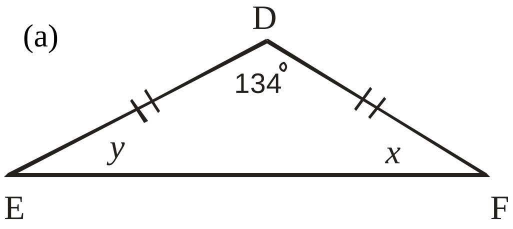
Statement:	**Reason:**
$x = 65°$	$\angle^s$ opp equal sides
$y = 180° - 65° - 65°$	
$\therefore\ y = 50°$	int $\angle^s$ of Δ

Statement:	**Reason:**
$x = 51°$	opp $\angle^s$ of parm
$y = 129°$	opp $\angle^s$ of parm

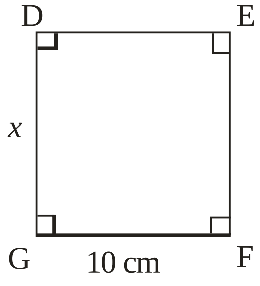
Exercise 5: Date: ________________________

(1) Calculate the value(s) of x and/or y. Provide reasons.

(a)

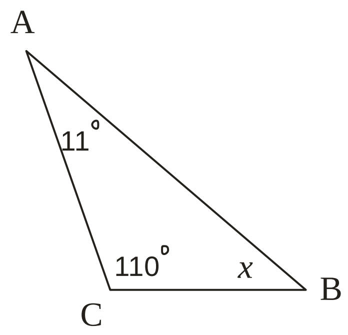


(b)

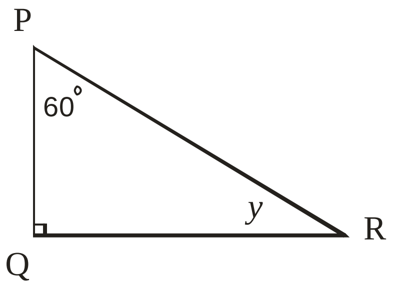


DEFG is a square.

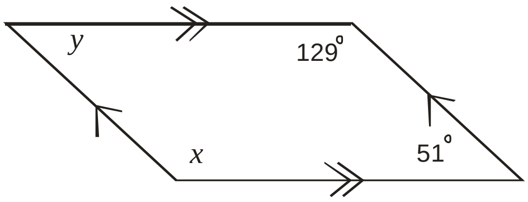
(c)



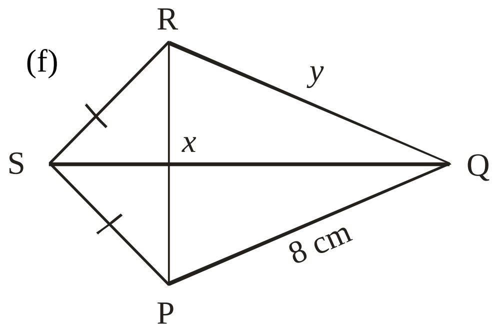
(d)



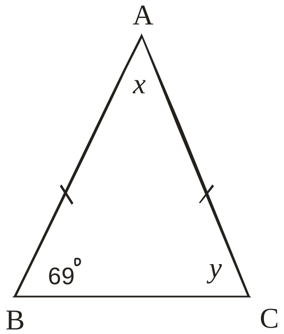
(e)



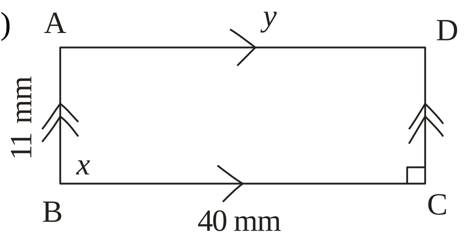
(f)



(g)

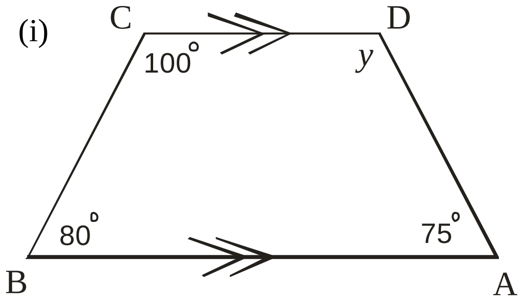


(h)

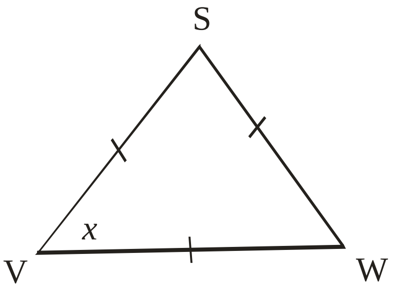


ABCD is a rectangle.

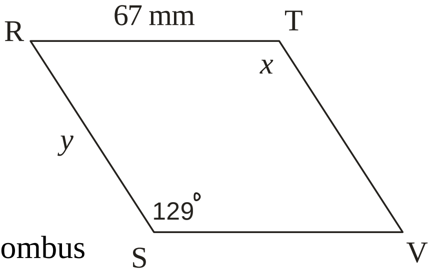
(i)



(j)

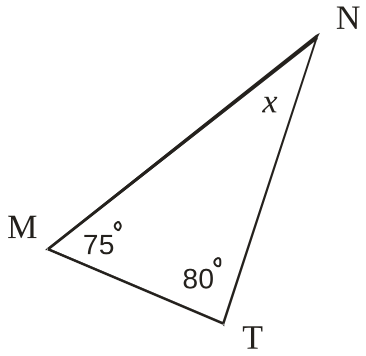


(k)



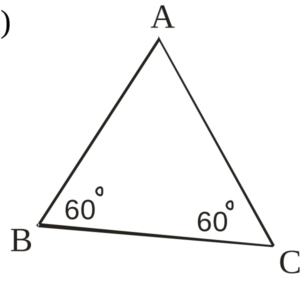
RSTV is a rhombus

(l)

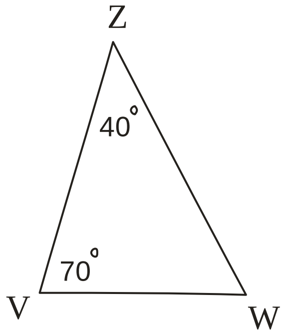


(2) Are the following triangles isosceles, equilateral and / or right-angled triangles?

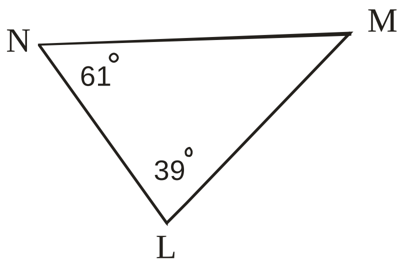
(a)



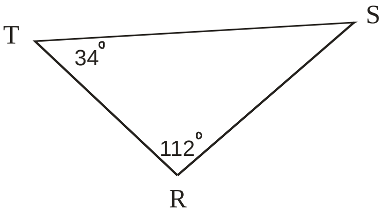
(b)



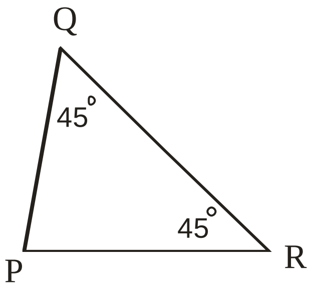
(c)



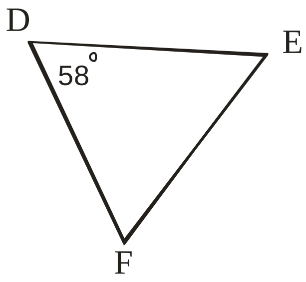
(d)



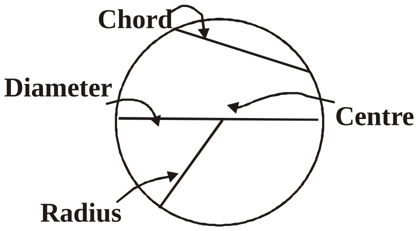
(e)

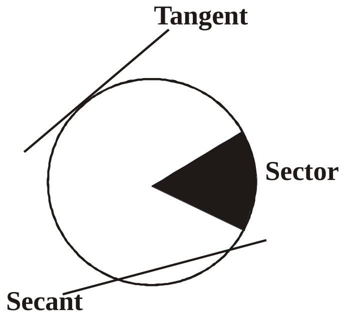


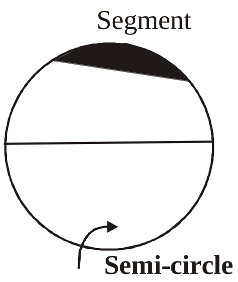
(f)



C2.3 Circles:



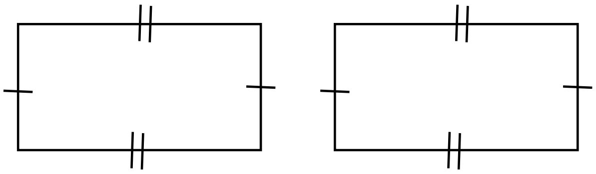




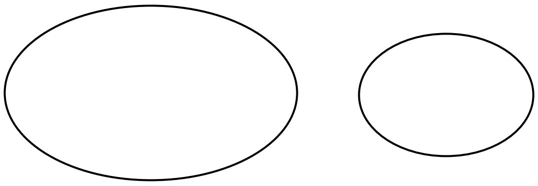
Remember: * Concentric circles have the same centre but different radii.
* All radii in a circle have the same length.
* The diameter of a circle is twice the length of the radius.

C2.4 Congruent and similar figures:

Congruent figures are the same in all aspects.
∴ The figures have the same form and size.
The symbol ≡ is used to indicate congruency.



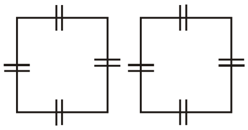
Similar figures are figures with the same shape, but do not necessarily have the same size.
The symbol /// is used to indicate similarity.



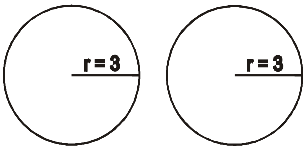
Exercise 6: Date: ________________________

(1) Which of the following pair of figures are congruent?

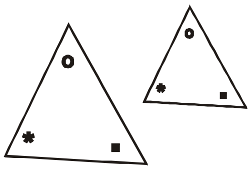
(a)



(b)

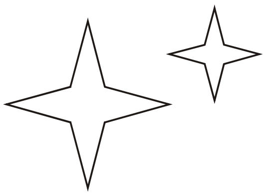


(c)

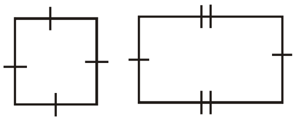


(2) Which of the following pair of figures are similar?

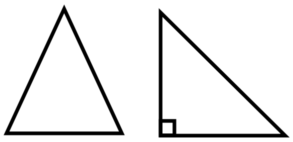
(a)



(b)

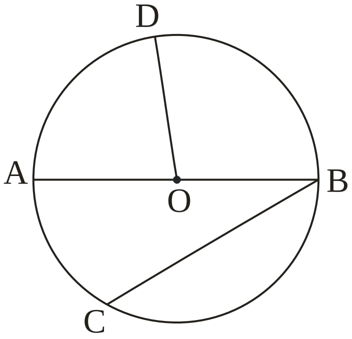


(c)



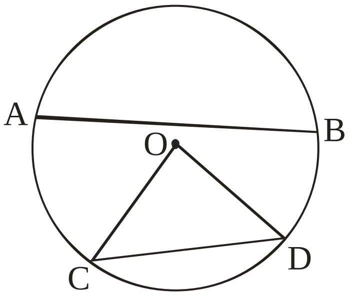
(3) Consider the following circles and name the line segments as requested as a diameter, a radius or a chord. O is the centre of the circle.

(a)



AB, BC, OD and AO

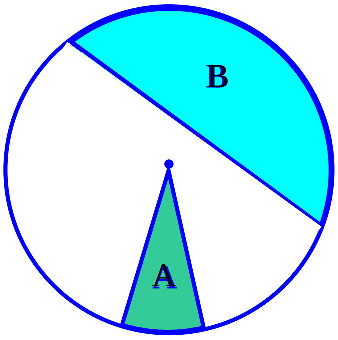
(b)



AB, OC, DC and OD

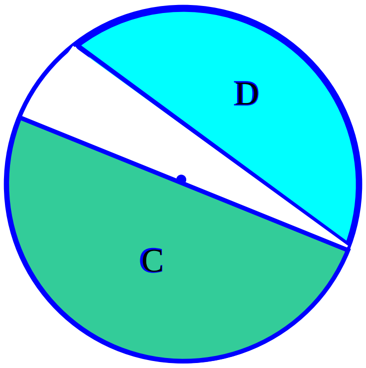
(3) Consider the following circles and name the shaded areas as requested as semi-circle, a sector or a segment. O is the centre of the circle.

(a)



Area A and area B.

(b)

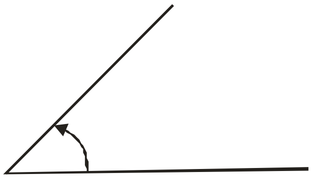


Area C and area D.

C2.5 REVISION EXERCISE:

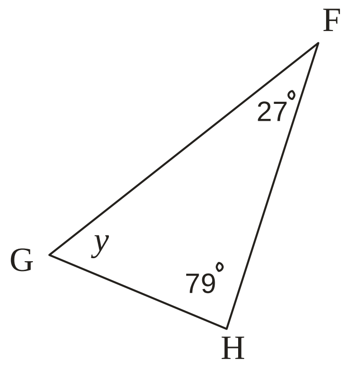
Date: ______________________

(1) Complete the following table:

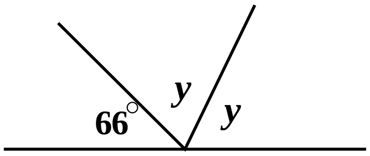
	Type of angle:	Size of angle:	Construction of angle:
(a)	Obtuse angle	__________	
(b)	__________________	__________	
(c)	__________________	300°	

(2) Calculate the value(s) of x and / or y. Give reasons.

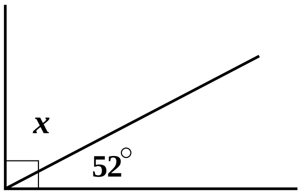
(a)



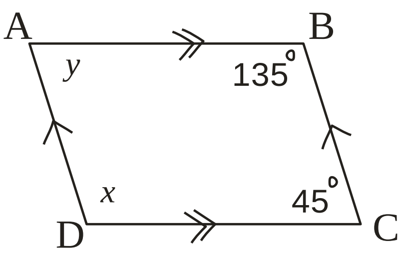
(b)



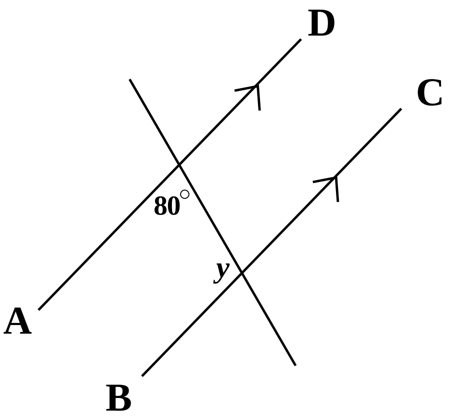
(c)



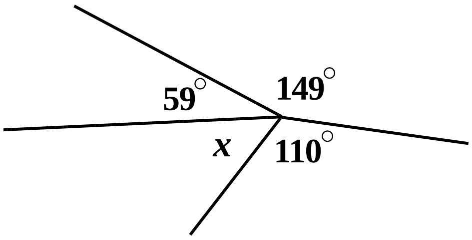
(d)



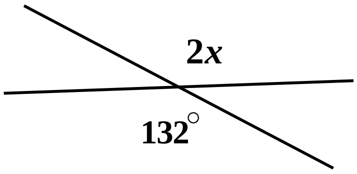
(e)



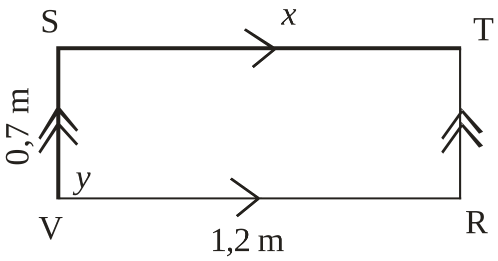
(f)



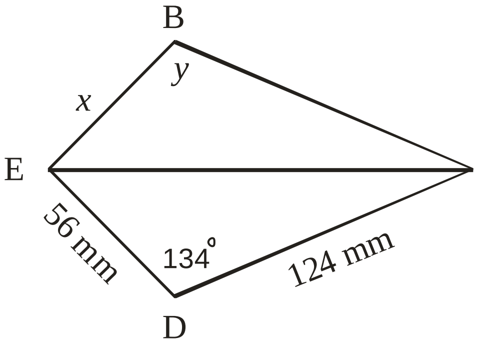
(g)



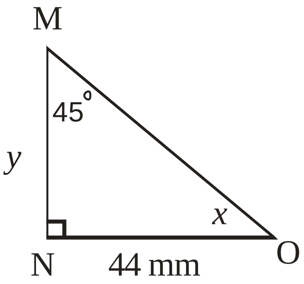
(h) STVR is a rectangle



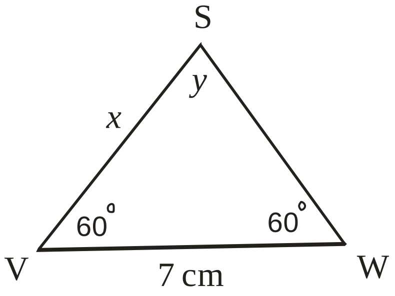
(i) BCDE is a kite



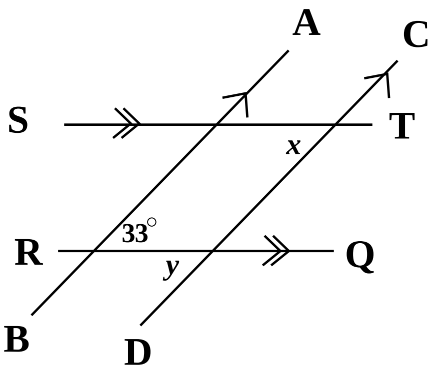
(j)



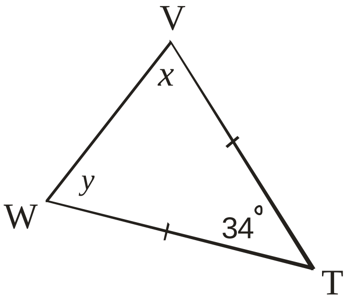
(k)



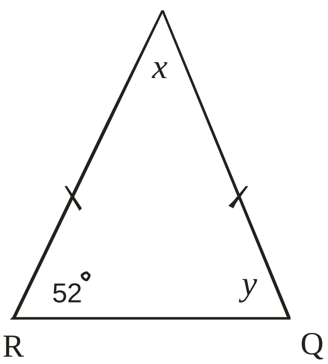
(l)



(m)



(n)



(3) Fit column B to column A:

	Column A	
(a)	All three sides are equal in length.	
(b)	Twice the radius.	
(c)	Sum of interior angles is 540°.	
(d)	Same shape but not the same size.	
(e)	Angles opposite equal sides are equal is size.	
(f)	A quadrilateral with only one pair of opposite sides parallel.	
(g)	An angle greater than 180° and smaller than 360°.	
(h)	A quadrilateral with two pairs of adjacent sides equal in length.	
(i)	Sum of the interior angles of a triangle.	
(j)	A parallelogram of which all the sides are of equal length.	

	Column B
A.	Pentagon.
B.	Congruent figures.
C.	Trapezium.
D.	Reflex angle.
E.	All three angles are equal to 60°.
F.	Kite.
G.	Isosceles triangle.
H.	Diameter.
I.	180°.
J.	Similar figures.
K.	Rhombus.
L.	Straight angle.
M.	360°

****