

Student Name: _____	Grade: _____
Date: _____	Score: _____

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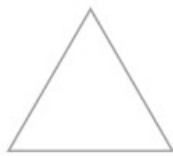
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6 Year 7 Term 3 Week 6 Homework

6.1 Properties of geometrical figures

6.1.1 Recognising plane shapes

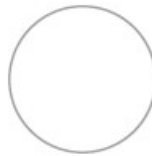
A plane shape is a closed, two-dimensional figure which lies in a flat surface. Here are some common plane shapes:



triangle



quadrilateral



circle



ellipse



square



rectangle



parallelogram



rhombus



trapezium



kite

Exercise 6.1.1

1. Name all the quadrilaterals that have at least one pair of opposite sides parallel.

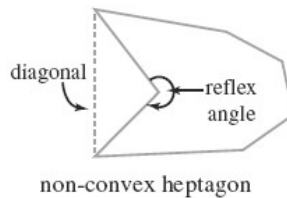
2. A rhombus is a quadrilateral that has four equal sides. Which other quadrilateral is also a rhombus?

3. If a rhombus is placed alongside another rhombus of the same size, what common shape could be formed?

4. What shape could be formed if two isosceles triangles of the same size are placed side by side in two different ways?

6.1.2 Polygons

- The name polygon is derived from the prefix ‘poly’ which means many and ‘gon’ means side.
- polygon is a closed figure bounded by straight sides.
- a polygon is said to be regular if all sides are equal and all angles are equal.
- the points where two sides of a polygon meet is called **vertex**
- a line joining two vertices is called a diagonal.
- a polygon is said to be convex if all of its diagonals lie entirely within the figure.
- a polygon is non-convex if at least one diagonal does not lie completely inside the figure.

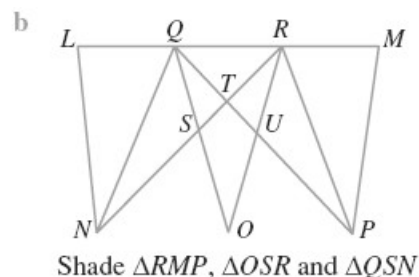
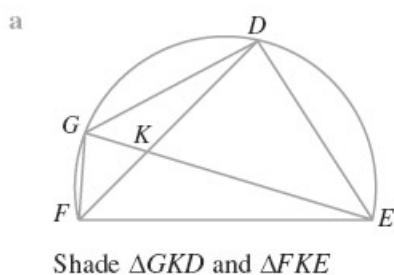


- the first ten polygons and the number of sides in each are:

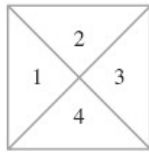
triangle (3)	quadrilateral (4)	pentagon (5)	hexagon (6)	heptagon (7)
octagon (8)	nonagon (9)	decagon (10)	undecagon (11)	dodecagon (12)

Exercise 6.1.2

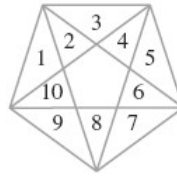
1. Name a quadrilateral that has equal sides but does not have equal angles. _____.
2. Name a quadrilateral that has equal angles but does not have equal sides. _____.
3. If a polygon which is not a triangle has equal sides, it may or may not have equal _____.
4. If a polygon which is not a triangle has equal angles, it may or may not have equal _____.
5. For each of the following diagrams shade in the triangle(s) indicated.



Exercise 6.1.3 The polygon shown below are regular. All their diagonals have been drawn in and the small triangles that share a vertex with the polygon have been counted.



A regular quadrilateral (square)
Diagonals 2
Triangles 4



A regular pentagon
Diagonals 5
Triangles 10

1. How many diagonals can be drawn in a regular hexagon? _____.
2. How many small triangles share a common vertex with the hexagon? _____.
3. Complete the following table:

	square	pentagon	hexagon
Number of sides (n)	4	5	6
Number of diagonals (d)	2	5	
Number of triangles (t)	4	10	

4. Write a statement and an algebraic formula which shows the relationship between the number of triangles and the number of diagonals.

5. Write a statement and an algebraic formula which shows the relationship between the number of triangles and the number of sides.

6. Use the algebraic formula to find the number of triangles in a regular polygon with 10 sides.

7. Compare the two formulae to find a new formula that could be used to find the number of diagonals in a regular polygon with 100 sides.

6.1.3 Classification of triangles and their properties

Classification according to sides:

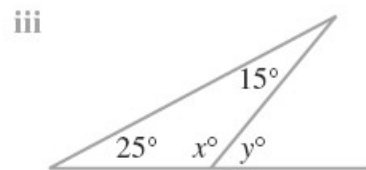
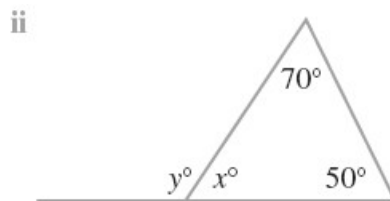
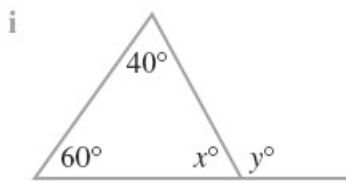
- An equilateral triangle is a triangle in which all three sides are equal in length
- An isosceles triangle is a triangle in which two sides are equal in length
- A scalene triangle is a triangle in which no sides are equal in length.

Classification according to angles:

- An acute-angled triangle is a triangle in which all three angles are acute.
- A right-angled triangle is a triangle in which there is one right angle.
- An obtuse-angled triangle is a triangle in which there is one obtuse angle.

Exercise 6.1.4

1. Find values for x and y in each of the following figures:

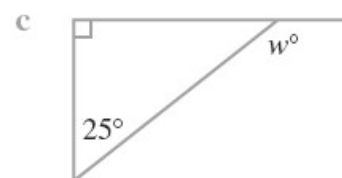
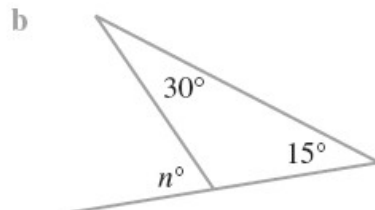
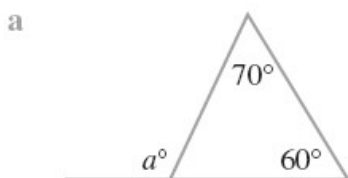


(a) $x =$ _____ ; $y =$ _____

(b) $x =$ _____ ; $y =$ _____

(c) $x =$ _____ ; $y =$ _____

2. Use the exterior angle property of triangles to find the value of each pronumeral:



(a) $a =$ _____

(b) $n =$ _____

(c) $w =$ _____

6.1.4 Angle sum of a triangle

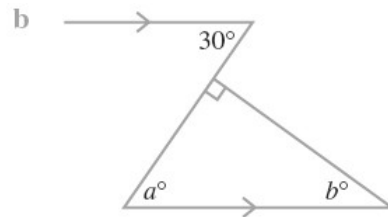
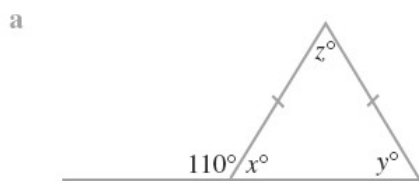
- The angle sum of any triangle is 180°
- In an equilateral triangle, the angles are all 60°
- In an isosceles triangle, the equal sides lie opposite the equal angles.

Exercise 6.1.5

1. Is it possible for (YES/NO):

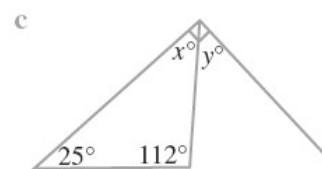
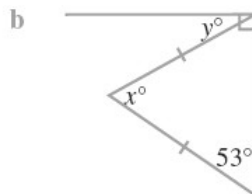
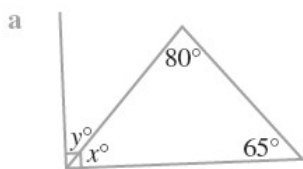
- (a) a triangle to have two right angles? _____
- (b) a scalene triangle to be right angle? _____
- (c) a triangle to be both equilateral and right-angled? _____
- (d) a triangle to have two obtuse angles? _____
- (e) a triangle both right angled and isosceles? _____

2. Find the value of all pronumerals in each of these:



- (a) $x =$ _____ ; $y =$ _____ ; $z =$ _____
- (b) $a =$ _____ ; $b =$ _____

3. Find the value of x and y in each of the following:



- (a) $x =$ _____ ; $y =$ _____
- (b) $x =$ _____ ; $y =$ _____
- (c) $x =$ _____ ; $y =$ _____

6.1.5 Properties of quadrilaterals

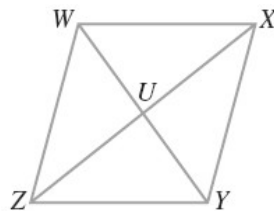
- A quadrilateral is any four-sided polygon.
- There are six special quadrilaterals: square, rectangle, parallelogram, rhombus, trapezium and kite.

Exercise 6.1.6 Complete the following table and answer the following questions:

Property	Square	Rectangle	Parallelogram	Rhombus
all sides are equal				
opposite sides are equal				
opposite sides are parallel				
all angles are right angles				
opposite angles are equal				
diagonals are equal in length				
diagonals intersect at right angles				
diagonals bisect each other				
diagonals bisect angles at vertices				

1. In which quadrilateral is there only one pair of parallel sides? _____
2. In which quadrilateral are two pairs of adjacent sides equal? _____
3. The angle sum of any quadrilateral is _____

Exercise 6.1.7 WXYZ is a rhombus. WZ = 13 cm, ZX = 24 cm and $\angle ZWX = 135^\circ$



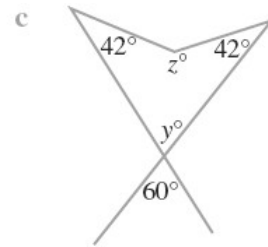
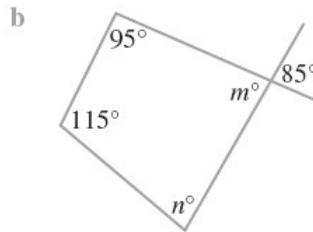
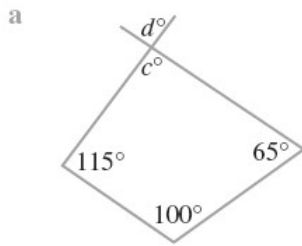
1. How long is ZY? _____
2. What size is $\angle WZY$ _____
3. Which side is parallel to XY? _____
4. Which size is $\angle XWU$ _____

6.1.6 Angle sum of a quadrilateral

The angle sum of a quadrilateral is 360° .

Exercise 6.1.8

1. Find the values of the pronumerals:

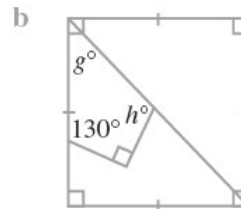
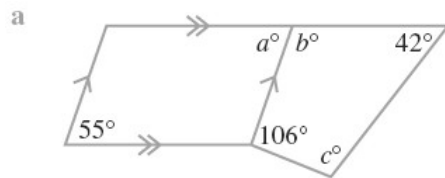


(a) $c =$ _____ ; $d =$ _____

(b) $m =$ _____ ; $n =$ _____

(c) $y =$ _____ ; $z =$ _____

2. Use the properties of the special quadrilaterals to find pronumerals in each of these:



(a) $a =$ _____ ; $b =$ _____ ; $c =$ _____

(b) $g =$ _____ ; $h =$ _____

3. In which of the special quadrilaterals:

(a) are the opposite sides parallel? _____

(b) are opposite angles equal? _____

(c) are the diagonals equal? _____

(d) do the diagonals intersect at right angles? _____

(e) do the diagonals bisect the angles at the vertices? _____

6.2 Miscellaneous exercises

Exercise 6.2.1

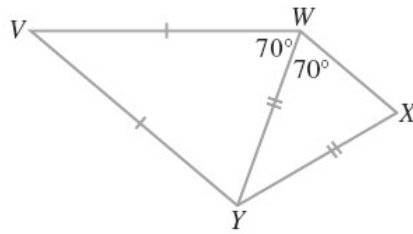
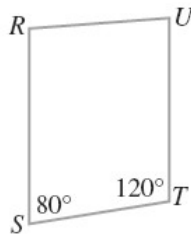
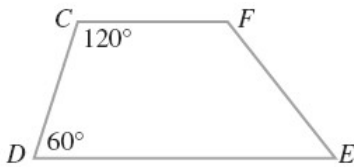
1. When a figure is drawn inside another plane shape so as to touch it all sides, we say that the smaller figure has been inscribed in the large figure. Is it possible to inscribe:

(a) a parallelogram that is not a rectangle in a circle? _____

(b) a rectangle that is not a square in a circle? _____

(c) a rhombus that is not a square in an ellipse? _____

2. State whether each quadrilateral is a trapezium. Give reasons for your answers.



(a) _____

(b) _____

(c) _____

3. State true or false for each of the following statements:

(a) a rhombus is a square _____

(b) a square is a rhombus _____

(c) a rectangle is a square _____

(d) a square is a rectangle _____

(e) a trapezium is a parallelogram _____

(f) a parallelogram is trapezium _____

(g) a parallelogram is a rhombus _____

(h) a rhombus is a parallelogram _____

6.3 Maths challenge

Exercise 6.3.1

1. A class of nine kindergarten children is to be taking for a walk each afternoon. The teacher decides that they will walk in sets of three, and any pair of children will walk together on one day only. For how many days can this system be maintained without repetition?

- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

2. What is the largest possible remainder when a two-digit number is divided by the sum of its digits?

- (A) 13 (B) 14 (C) 15 (D) 16 (E) 17

3. A cube is given as shown. How many planes are there which pass through at least three of its vertices?

