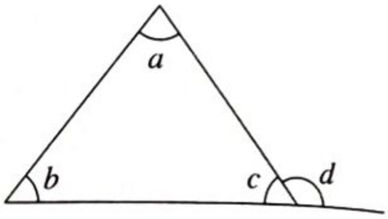
TOPIC 11

Polygons and Geometrical Constructions

REVISION notes

Angle Properties of Triangles



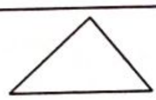
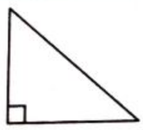
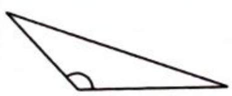
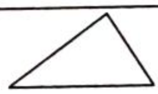
1. In the triangle, $\angle a$, $\angle b$ and $\angle c$ are interior angles while $\angle d$ is an exterior angle.

2. The sum of interior angles of a triangle is 180°, i.e. $\angle a + \angle b + \angle c = 180°$ ($\angle$ sum of $\triangle$)

3. If one side of a triangle is produced or extended, then the exterior angle formed is equal to the sum of its interior opposite angles, i.e. $\angle d = \angle a + \angle b$ (ext. $\angle$ of $\triangle$)

Classification of Triangles

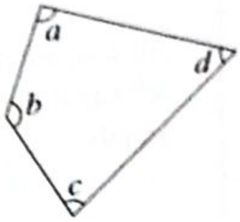
4.

Name	Definition	Figure	Remarks
Equilateral triangle	A triangle with 3 equal sides		All angles are equal to 60°. ($\angle$s of equilateral $\triangle$)
Isosceles triangle	A triangle with at least 2 equal sides		The base angles of an isosceles triangle are equal. (base $\angle$s of isos. $\triangle$)
Scalene triangle	A triangle with no equal sides		All the angles in a scalene triangle are different.
Right-angled triangle	A triangle with 1 right angle		There are many kinds of right-angled triangles which are scalene but there is only 1 right-angled triangle that is isosceles with angles 45°, 45° and 90°.
Obtuse-angled triangle	A triangle with 1 obtuse angle		There are many kinds of obtuse-angled triangles which are either isosceles or scalene.
Acute-angled triangle	A triangle with all 3 acute angles		There are many kinds of acute-angled triangles which are either isosceles or scalene.

Angle Properties of Quadrilaterals

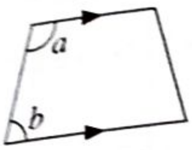
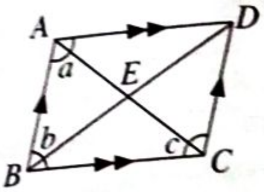
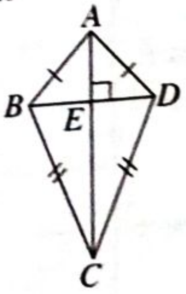
5. A quadrilateral is a closed 4-sided plane figure.

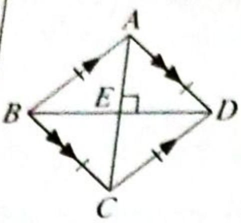
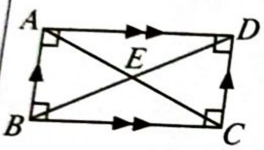
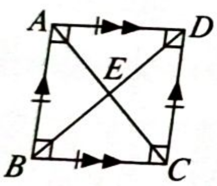
6. Sum of interior angles of a quadrilateral is 360°,
i.e. $\angle a + \angle b + \angle c + \angle d = 360°$



Geometrical Properties of Special Quadrilaterals

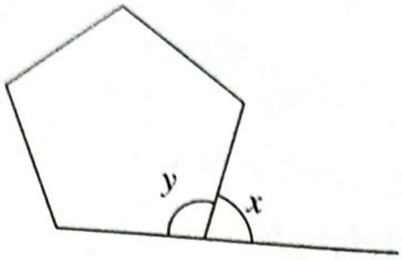
7.

Quadrilateral	Sides	Angles	Diagonal	Family of Quadrilaterals
Trapezium 	1 pair of parallel sides.	$\angle a + \angle b = 180°$ (int. $\angle$s)		Trapezium
Parallelogram 	1. 2 pairs of parallel sides. 2. Opposite sides are equal.	1. $\angle a + \angle b = 180°$ (int. $\angle$s) 2. Opposite angles are equal, i.e. $\angle a = \angle c$ (opp. $\angle$s of //gram)	Diagonals AC and BD bisect each other at E, i.e. $AE = EC$ and $BE = ED$	Parallelogram
Kite 	1. 2 pairs of equal adjacent sides 2. Both $\triangle ABD$ and $\triangle BCD$ are isosceles.	$\angle ABD = \angle ADB$ and $\angle BDC = \angle DBC$.	1. Diagonals AC and BD cut each other at right angles at E 2. The longer diagonal AC bisects the shorter diagonal BD	Kite

Rhombus 	1. 2 pairs of parallel sides. 2. All four sides are equal in length.	1. $\angle ABC + \angle BCD = 180°$ (int. $\angle$s) 2. Opposite angles are equal, i.e. $\angle ABC = \angle ADC$ and $\angle BAD = \angle BCD$ 3. $\angle ABD = \angle ADB$ and $\angle CBD = \angle CDB$	1. Diagonals AC and BD bisect each other at right angles at E, i.e. $AE = EC$ and $BE = ED$. 2. Diagonals bisect the interior angles, i.e. $\angle ABD = \angle CBD$ and $\angle ACB = \angle ACD$.	Parallelogram or Kite
Rectangle 	1. 2 pairs of parallel sides. 2. Opposite sides are equal.	The four corner angles at the vertices are right angles, i.e. $\angle ABC = \angle BCD = 90°$ and $\angle BAD = \angle ADC = 90°$.	1. Diagonals AC and BD are equal in length. 2. Diagonals AC and BD bisect each other at E, i.e. $AE = EC$ and $BE = ED$.	Parallelogram
Square 	1. 2 pairs of parallel sides. 2. All four sides are equal in length.	The four corner angles at the vertices are right angles, i.e. $\angle ABC = \angle BCD = 90°$ and $\angle BAD = \angle ADC = 90°$.	1. Diagonals AC and BD are equal in length. 2. Diagonals AC and BD bisect each other at right angles at E, i.e. $AE = EC$ and $BE = ED$. 3. Diagonals bisect the interior angles, i.e. $\angle ACB = \angle ACD = 45°$.	Parallelogram or Rectangle or Kite

Polygons

8. A **polygon** is a closed plane figure with three or more sides. A polygon with all sides equal and all angles equal is known as a **regular** polygon.



9. In a polygon, the sum of an interior angle and its corresponding exterior angle is 180°, i.e. $\angle x + \angle y = 180°$.

10. The sum of exterior angles of an n-sided polygon is 360°.
In the case of a n-sided regular polygon, each exterior angle, $\angle x = \frac{360°}{n}$.

11. The sum of interior angles of an n-sided polygon is $(n - 2) \times 180°$ or $(2n - 4) \times 90°$.
In the case of a n-sided regular polygon, each interior angle, $\angle y = \frac{(n-2) \times 180°}{n}$ or $\frac{(2n-4) \times 90°}{n}$.

12. Some of the common polygons and their sum of interior angles are shown in the table below.

No. of sides (n)	Name of Polygon	Sum of interior angles $= (n - 2) \times 180°$
3	Triangle	$(3 - 2) \times 180° = 180°$
4	Quadrilateral	$(4 - 2) \times 180° = 360°$
5	Pentagon	$(5 - 2) \times 180° = 540°$
6	Hexagon	$(6 - 2) \times 180° = 720°$
7	Heptagon	$(7 - 2) \times 180° = 900°$
8	Octagon	$(8 - 2) \times 180° = 1080°$
9	Nonagon	$(9 - 2) \times 180° = 1260°$
10	Decagon	$(10 - 2) \times 180° = 1440°$