Understanding Quadrilaterals

polygon :

A closed figure bounded by many line segment.

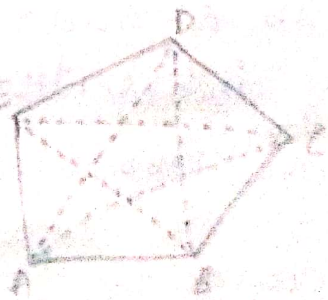
Classification of polygons:
(According to number of sides and verticies)

1) Triangle.		3-sides
2) Quadritaleral		4-sides
3) pentagon		5
4) Hexagon		6
5) Heptagon		7
6) Octagon		8
7) Nanagon		9
8) Decagon		10

etc....

Diagonals :
A diagonals is a line segment which connects two non-consecutive (opposite) vertices of a polygon.

SQ & PR are diagonals

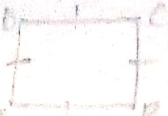


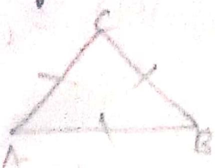
AC, BE, DA, BD, EC,
diagonals

Regular polygon :-

polygon having both 'equiangular' and 'equilateral'

ex: Square , equilateral Triangle , regular hexagon



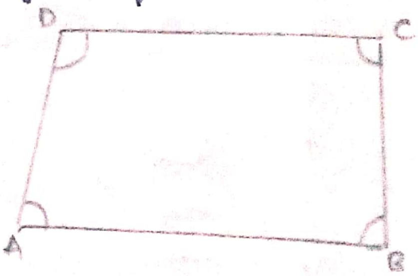


In □ABCD, AB = BC = CD = AD

In △ABC , AB = BC = AC

Angle Sum property of a Quadrilateral :-

" The Sum of measure of four angles of a Quadrilateral is 360°."



⇒ In □ABCD,

* AB, BC, CD and AC are sides.
* A, B, C and D are verticies
* ∠A, ∠B, ∠C and ∠D are four angles of Quadrilaterals.

$$\boxed{\because \angle A + \angle B + \angle C + \angle D = 360^\circ}$$

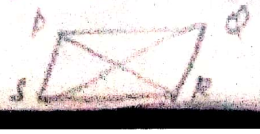
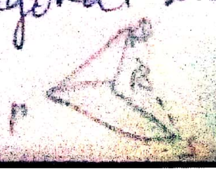
Note :

1) Formula to find Sum of interior angles of a polygon = $(n-2) \times 180^\circ$ [where n → no of sides of given polygon]

2) In a quadrilateral, the sum of 4 angle formed by intersention of two diagonals at the Centre is 360°

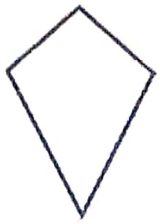
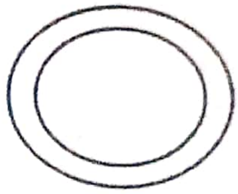
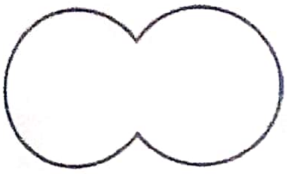
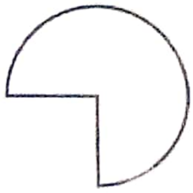
$\angle W + \angle X + \angle Y + \angle Z = 360^\circ$

3) Convex and concave polygons (Quadrilaterals)

In convex polygon, the diagonals lies inside the polygon	In cancave polygon diagonal lies outside
	

EXERCISE 4.1

1. Given here are some figures.

			
(1)	(2)	(3)	(4)
			
(5)	(6)	(7)	(8)

Classify each of them on the basis of the following.

(a) Simple curve (b) Simple closed curve (c) Polygon

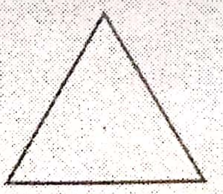
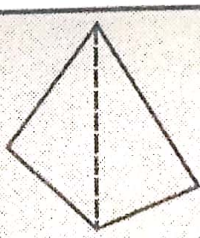
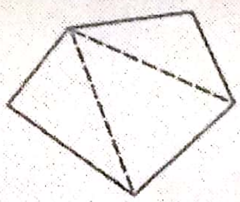
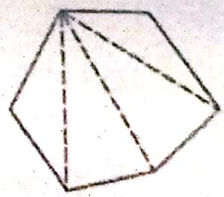
(d) Convex polygon (e) Concave polygon

2. How many diagonals does each of the following have?

(a) A convex quadrilateral (b) A regular hexagon (c) A triangle

3. What is the sum of the measures of the angles of a convex quadrilateral? Will this property hold if the quadrilateral is not convex? (Make a non-convex quadrilateral and try!)

4. Examine the table. (Each figure is divided into triangles and the sum of the angles deduced from that.)

Figure				
Side	3	4	5	6
Angle sum	180°	$2 \times 180^\circ = (4-2) \times 180^\circ$	$3 \times 180^\circ = (5-2) \times 180^\circ$	$4 \times 180^\circ = (6-2) \times 180^\circ$

Exercise 4.1 :-

I. Given here are some figures, Classify them :-

1) Simple curve : 1, 2, 5, 6, 7

2) Simple closed curve. : 1, 2, 5, 6, 7

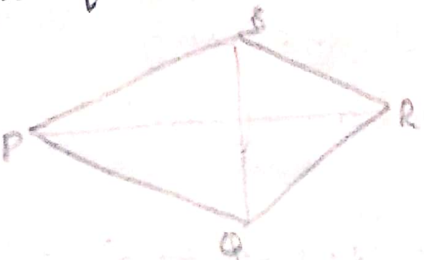
3) polygon : 1, 2

4) Convex polygon : 2

5) Concave polygon. : 1

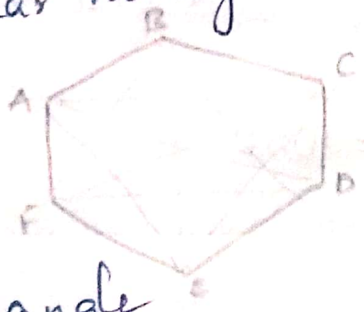
2) How many diagonals does each of the following have?

1) A Convex quadrilateral



2-diagonals

2) A regular hexagon



9-diagonals

3) A triangle

deosn't have any diagonal.

3) What is the sum of measures of the angles of a Convex and Concave polygon?

A) The sum of the measures of all angles of both a Convex & Concave quadrilateral is 360°

Examine the table

	Fig	side	Angle sum. $(n-2)\times 180°$
1)		3	$180°$
2)		4	$(4-2)\times 180° = 2\times 180°$
3)		5	$(5-2)\times 180° = 3\times 180° = 540$
4)		6	$(6-2)\times 180° = 4\times 180° = 720$

What can you say about the angle sum of a convex poly-gon with number of sides?

a) 7

W.K.T angle sum of a convex polygon is $(n-2)\times 180°$.

$\therefore (7-2)\times 180° = 5\times 180° = 900$.

b) 8

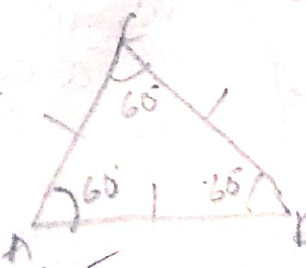
$\Rightarrow (8-2)\times 180° = 6\times 180° = 1080$.

c) 10

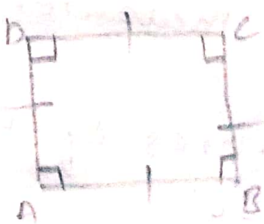
$\Rightarrow (10-2)\times 180° = 8\times 180° = 1260$

→ State the name of regular polygon of

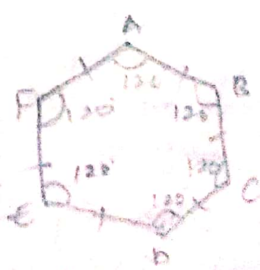
i) 3 sides ii) 4 sides iii) 6 sides.



Equilateral triangle



square

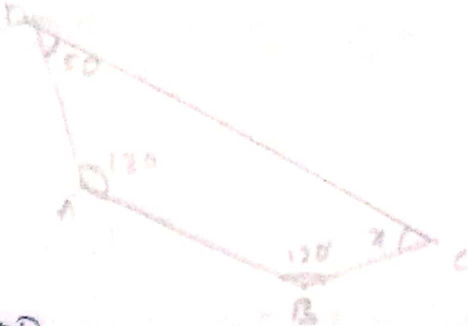


regular hexagon

6) Find the angles measure x in the following fig:

In □ABCD,

a) W.K.T



$\angle DAB + \angle ABC + \angle BCD + \angle CDA = 360^\circ$

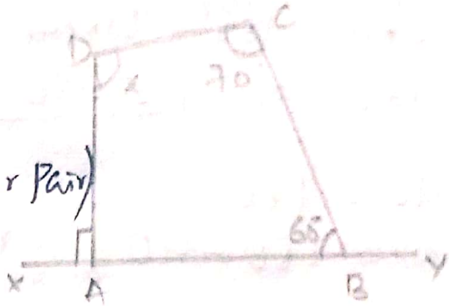
$130^\circ + 120^\circ + x + 50 = 360^\circ$

$x + 300 = 360^\circ$

$x = 360^\circ - 300$

$\boxed{x = 60}$

b)



Given, $\angle XAD = 90^\circ$

W.K.T; $\angle XAD + \angle BAD = 180^\circ$ (Linear Pair)

$90^\circ + \angle BAD = 180$

$\angle BAD = 90^\circ$

In □ABCD,

$\hat{A} + \hat{B} + \hat{C} + \hat{D} = 360^\circ$

$90^\circ + 60^\circ + 70^\circ + x = 360^\circ$

$220 + x = 360^\circ$

$x = 360^\circ - 220$

$\boxed{x = 140^\circ}$

c) Given

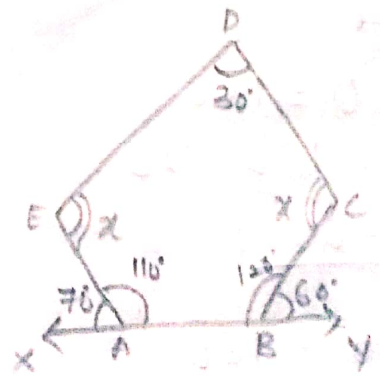
$X\hat{A}E = 70^\circ$

$\therefore E\hat{A}B = 110^\circ$

|||ly

$C\hat{B}Y = 60^\circ$

$C\hat{B}A = 120^\circ$



In fig,

$\angle A + \angle B + \angle C + \angle D + \angle E = 540$

$110 + 120^\circ + x + x + 30^\circ = 540$.

$260 + 2x = 540$

$2x = 540 - 260$.

$2x = 280$

$\boxed{\therefore x = 140^\circ}$