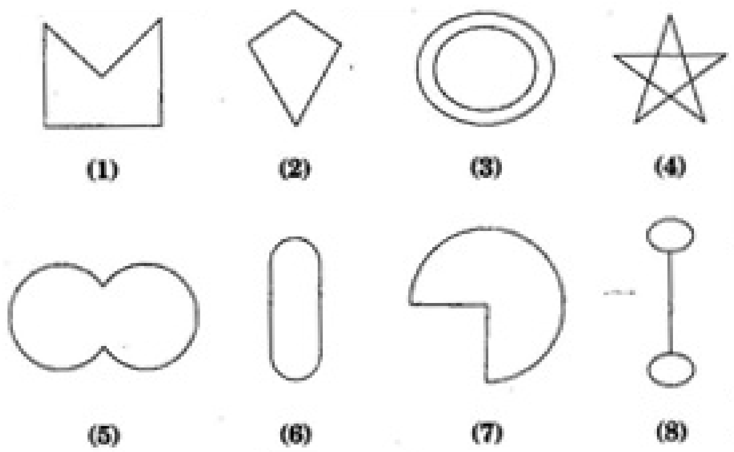
**CBSE Class –VIII Mathematics**

**NCERT Solutions**

**CHAPTER - 3**

**Understanding Quadrilaterals (Ex. 3.1)**

**1. Given here are some figures:**




**Classify each of them on the basis of the following:**

**(a) Simple curve**

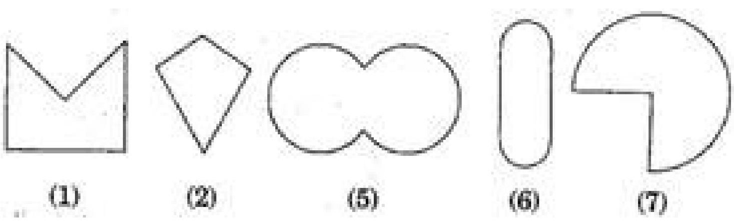
**(b) Simple closed curve**

**(c) Polygon**

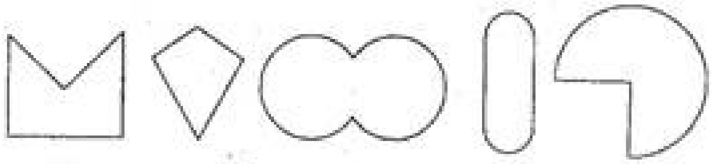
**(d) Convex polygon**

**(e) Concave polygon**

**Ans.** (a) Simple curve

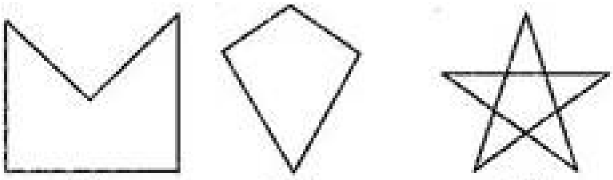



(b) Simple closed curve



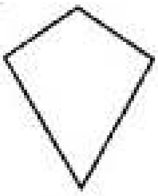
(1) (2) (5) (6) (7)

(c) Polygons



(1) (2) (4)

(d) Convex polygons



(1)

(e) Concave polygon

(1) (4)

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

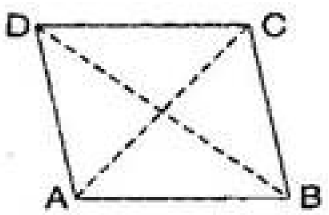
**(a) A convex quadrilateral**

**(b) A regular hexagon**

**(c) A triangle**

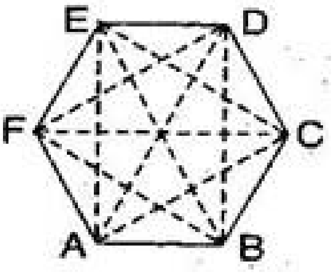
**Ans.** (a) A convex quadrilateral has two diagonals.

Here, AC and BD are two diagonals.




(b) A regular hexagon has 9 diagonals.

Here, diagonals are AD, AE, BD, BE, FC, FB, AC, EC and FD.




(c) A triangle has no diagonal.

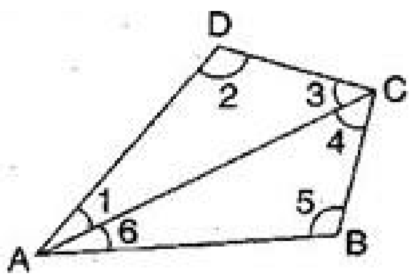
**3. What is the sum of the measures of the angles of a convex quadrilateral? Will this property hold if the quadrilateral is not convex? (Make a non-convex quadrilateral and try)**

**Ans.** Let ABCD is a convex quadrilateral, then we draw a diagonal AC which divides the quadrilateral in two triangles.

$\angle A + B + \angle C + \angle D$

$= \angle 1 + \angle 6 + \angle 5 + \angle 4 + \angle 3 + \angle 2$

$= (\angle 1 + \angle 2 + \angle 3) + (\angle 4 + \angle 5 + \angle 6)$




$= 180^\circ + 180^\circ$

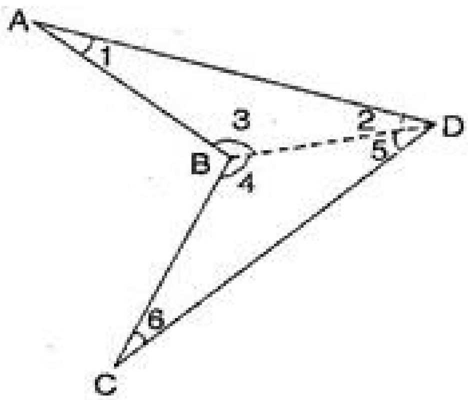
[By Angle sum property of triangle]

= $360^\circ$

Hence, the sum of measures of the triangles of a convex quadrilateral is $360^\circ$.

Yes, if quadrilateral is not convex then, this property will also be applied.

Let ABCD is a non-convex quadrilateral and join BD, which also divides the quadrilateral in two triangles.




Using angle sum property of triangle,

In $\triangle$ABD, $\angle 1 + \angle 2 + \angle 3 = 180^\circ$ ..........(i)

In $\triangle$BDC, $\angle 4 + \angle 5 + \angle 6 = 180^\circ$ ..........(i)

Adding eq. (i) and (ii),

$\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 = 360^\circ$

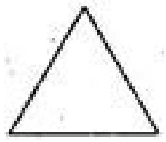
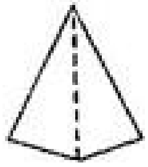
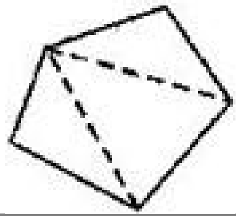
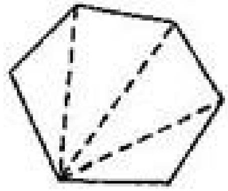
$\Rightarrow \angle 1 + \angle 2 + (\angle 3 + \angle 4) + \angle 5 + \angle 6$

= $360^\circ$

$\Rightarrow \angle A + \angle B + \angle C + \angle D = 360^\circ$

Hence proved.

**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** | $1\times180^\circ$ $=(3-2)\times180^\circ$ | $2\times180^\circ$ $=(4-2)\times180^\circ$ | $3\times180^\circ$ $=(5-2)\times180^\circ$ | $4\times180^\circ$ $=(6-2)\times180^\circ$ |

**What can you say about the angle sum of a convex polygon with number of sides?**

**Ans.** (a) When $n$ = 7, then

Angle sum of a polygon = $(n-2)\times180^\circ$

$=(7-2)\times180^\circ=5\times180^\circ=900^\circ$

(b) When $n$ = 8, then

Angle sum of a polygon = $(n-2)\times180^\circ$

$=(8-2)\times180^\circ=6\times180^\circ=1080^\circ$

(c) When $n$ = 10, then

Angle sum of a polygon = $(n-2)\times180^\circ$

$=(10-2)\times180^\circ=8\times180^\circ=1440^\circ$

(d) When $n$ = $n$, then

Angle sum of a polygon = $(n-2)\times180^\circ$

**5. What is a regular polygon? State the name of a regular polygon of:**

**(a) 3 sides**

**(b) 4 sides**

**(c) 6 sides**

**Ans. A regular polygon**: A polygon having all sides of equal length and the interior angles of equal size is known as regular polygon.

(i) 3 sides

Polygon having three sides is called a **triangle**.

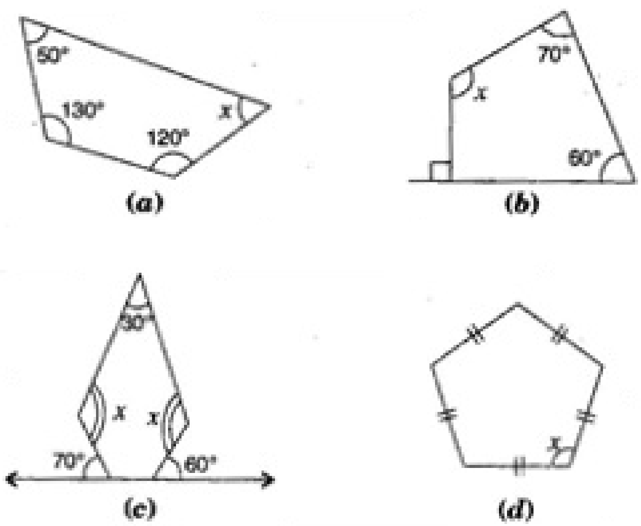
(ii) 4 sides

Polygon having four sides is called a **quadrilateral**.

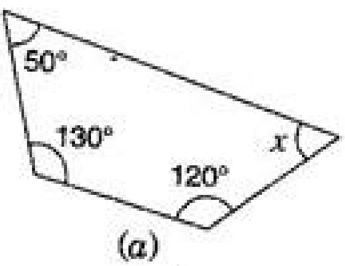
(iii) 6 sides

Polygon having six sides is called a **hexagon**.

**6. Find the angle measures $x$ in the following figures:**




**Ans.** (a) Using angle sum property of a quadrilateral,



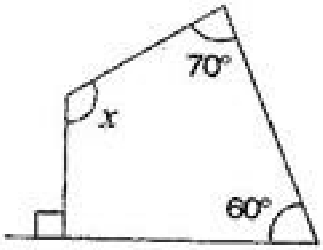

$$50^\circ + 130^\circ + 120^\circ + x = 360^\circ$$

$\Rightarrow 300° + x = 360°$

$\Rightarrow x = 360° - 300°$

$\Rightarrow x = 60°$

(b) Using angle sum property of a quadrilateral,




(b)

$90° + 60° + 70° + x = 360°$

$\Rightarrow 220° + x = 360°$

$\Rightarrow x = 360° - 220°$

$\Rightarrow x = 140°$

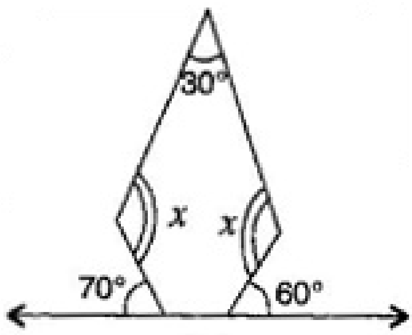
(a) First base interior angle

$= 180° - 70° = 110°$

Second base interior angle

$= 180° - 60° = 120°$

There are 5 sides, $n$ = 5




(c)

$\therefore$ Angle sum of a polygon = $(n-2)\times 180^\circ$

= $(5-2)\times 180^\circ = 3\times 180^\circ$ = $540^\circ$

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

$\Rightarrow\ 260^\circ + 2x = 540^\circ$

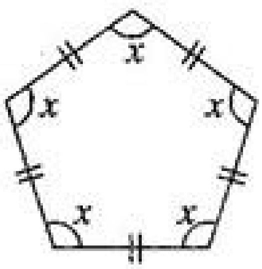
$\Rightarrow\ 2x = 540^\circ - 260^\circ$

$\Rightarrow\ 2x = 280^\circ$

$\Rightarrow\ x = 140^\circ$

(b) Angle sum of a polygon = $(n-2)\times 180^\circ$

= $(5-2)\times 180^\circ = 3\times 180^\circ$ = $540^\circ$



(d)

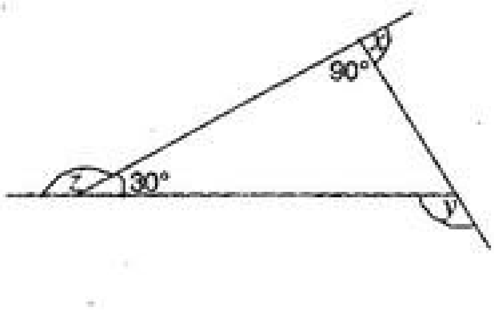
$\therefore\ x + x + x + x + x = 540^\circ$

$\Rightarrow\ 5x = 540^\circ$

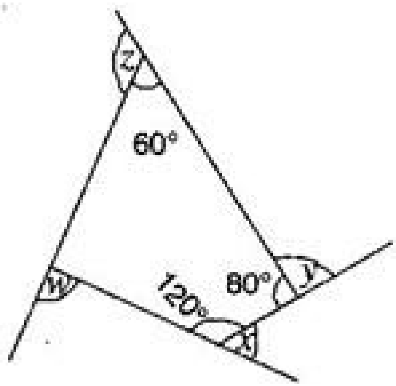
$\Rightarrow\ x = 108^\circ$

Hence each interior angle is $108^\circ$.

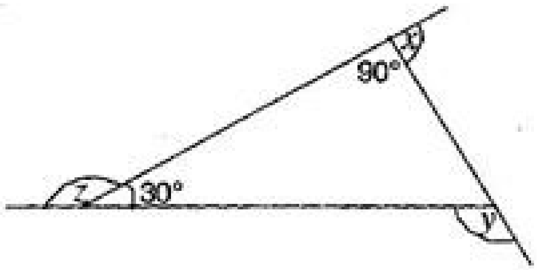
**7. (a) Find** $x + y + z$




**(b) Find** $x+y+z+w$




**Ans.** (a) Since sum of linear pair angles is $180°$.




$\therefore \; 90° + x = 180°$

$\Rightarrow \; x = 180° - 90° = 90°$

And $z + 30° = 180°$

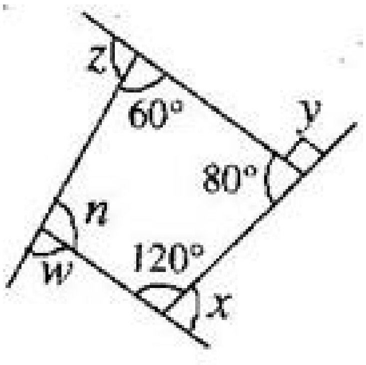
$\Rightarrow \; z = 180° - 30° = 150°$

Also $y = 90° + 30° = 120°$

[Exterior angle property]

$\therefore \; x + y + x = 90° + 120° + 150° = 360°$

(b) Using angle sum property of a quadrilateral,




$60^\circ + 80^\circ + 120^\circ + n = 360^\circ$

$\Rightarrow 260^\circ + n = 360^\circ$

$\Rightarrow n = 360^\circ - 260^\circ$

$\Rightarrow n = 100^\circ$

Since sum of linear pair angles is $180^\circ$.

$\therefore\ w + 100 = 180^\circ$ ..........(i)

$x + 120^\circ = 180^\circ$ ..........(ii)

$y + 80^\circ = 180^\circ$ ..........(iii)

$z + 60^\circ = 180^\circ$ ..........(iv)

Adding eq. (i), (ii), (iii) and (iv),

$\Rightarrow x + y + z + w + 100^\circ + 120^\circ + 80^\circ + 60^\circ$

$= 180^\circ + 180^\circ + 180^\circ + 180^\circ$

$\Rightarrow x + y + z + w + 360^\circ = 720^\circ$

$\Rightarrow x + y + z + w = 720^\circ - 360^\circ$

$\Rightarrow x + y + z + w = 360^\circ$