

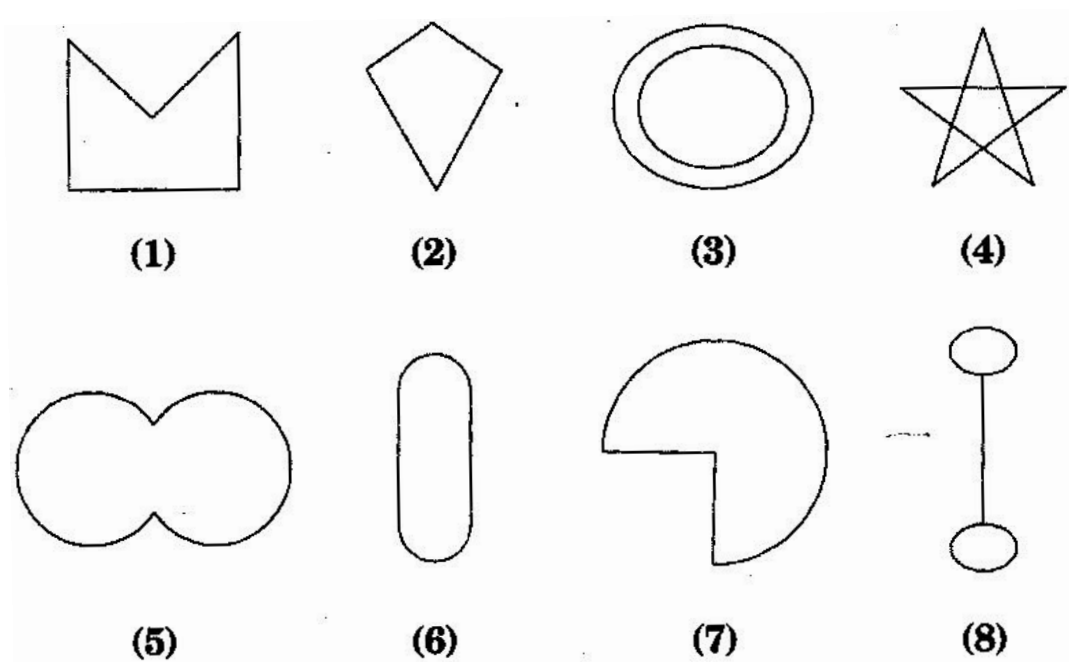
Mathematics

(Chapter – 3) (Understanding Quadrilaterals)
(Class – VIII)

Exercise 3.1

Question 1:

Given here are some figures:

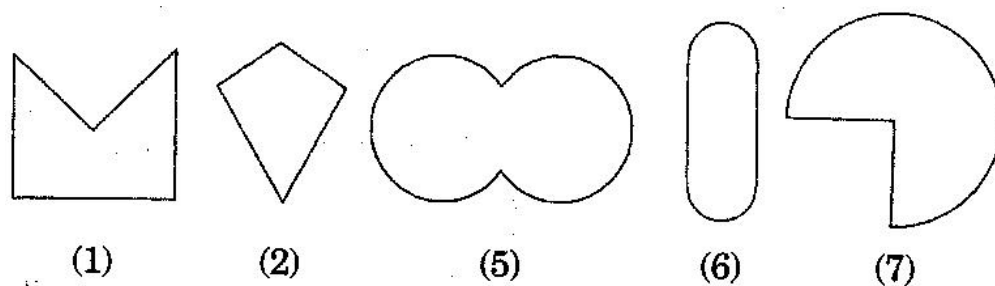


Classify each of them on the basis of the following:

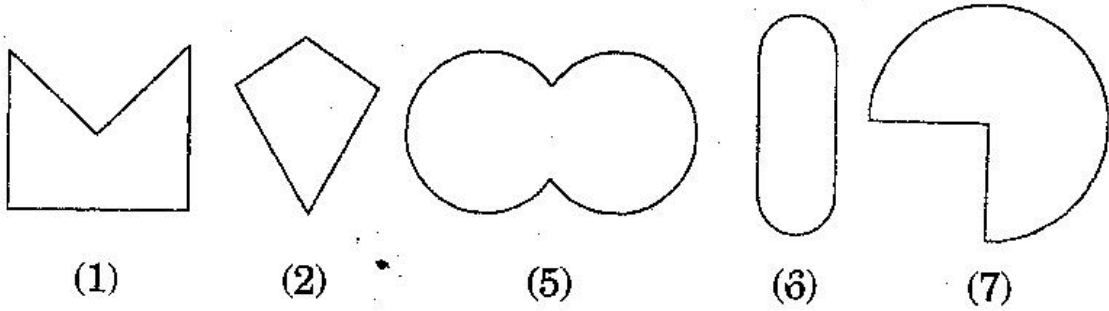
- (a) Simple curve
- (b) Simple closed curve
- (c) Polygon
- (d) Convex polygon
- (e) Concave polygon

Answer 1:

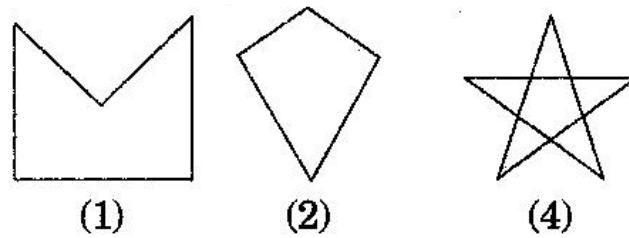
(a) Simple curve



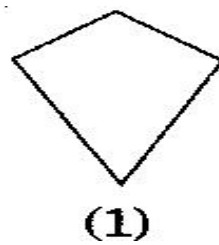
(b) Simple closed curve



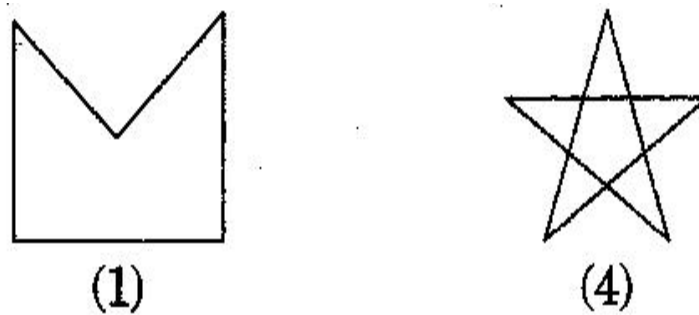
(c) Polygons



(d) Convex polygons



(e) Concave polygon



Question 2:

How many diagonals does each of the following have?

(a) A convex quadrilateral

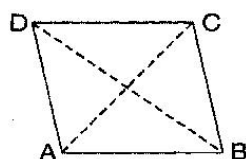
(b) A regular hexagon

(c) A triangle

Answer 2:

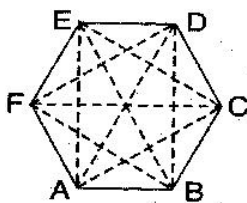
(a) A convex quadrilateral has two diagonals.

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.

Question 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)

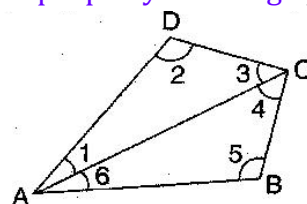
Answer 3:

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

$$\begin{aligned}\angle A + \angle B + \angle C + \angle D &= \angle 1 + \angle 6 + \angle 5 + \angle 4 + \angle 3 + \angle 2 \\ &= (\angle 1 + \angle 2 + \angle 3) + (\angle 4 + \angle 5 + \angle 6) \\ &= 180^\circ + 180^\circ && \text{[By Angle sum property of triangle]} \\ &= 360^\circ\end{aligned}$$

Hence, the sum of measures of the angles of a convex quadrilateral is 360° .

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)

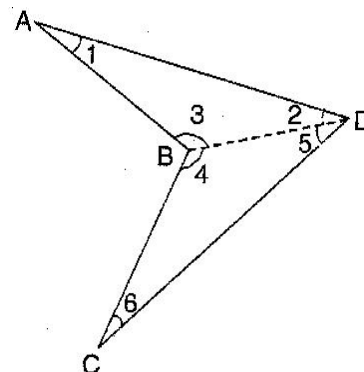
In $\triangle BDC$, $\angle 4 + \angle 5 + \angle 6 = 180^\circ$ (ii)

Adding eq. (i) and (ii),

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

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

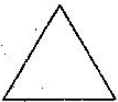
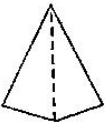
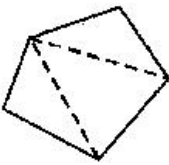
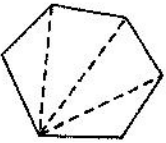
$$\Rightarrow \angle A + \angle B + \angle C + \angle D = 360^\circ$$



Hence proved.

Question 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	$1 \times 180^\circ$ $= (3 - 2) \times 180^\circ$	$2 \times 180^\circ$ $= (4 - 2) \times 180^\circ$	$3 \times 180^\circ$ $= (5 - 2) \times 180^\circ$	$4 \times 180^\circ$ $= (6 - 2) \times 180^\circ$

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

Answer 4:

(a) When $n = 7$, then

$$\text{Angle sum of a polygon} = (n - 2) \times 180^\circ = (7 - 2) \times 180^\circ = 5 \times 180^\circ = 900^\circ$$

(b) When $n = 8$, then

$$\text{Angle sum of a polygon} = (n - 2) \times 180^\circ = (8 - 2) \times 180^\circ = 6 \times 180^\circ = 1080^\circ$$

(c) When $n = 10$, then

$$\text{Angle sum of a polygon} = (n - 2) \times 180^\circ = (10 - 2) \times 180^\circ = 8 \times 180^\circ = 1440^\circ$$

(d) When $n = n$, then

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

Question 5:

What is a regular polygon? State the name of a regular polygon of:

- (a) 3 sides
- (b) 4 sides
- (c) 6 sides

Answer 5:

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

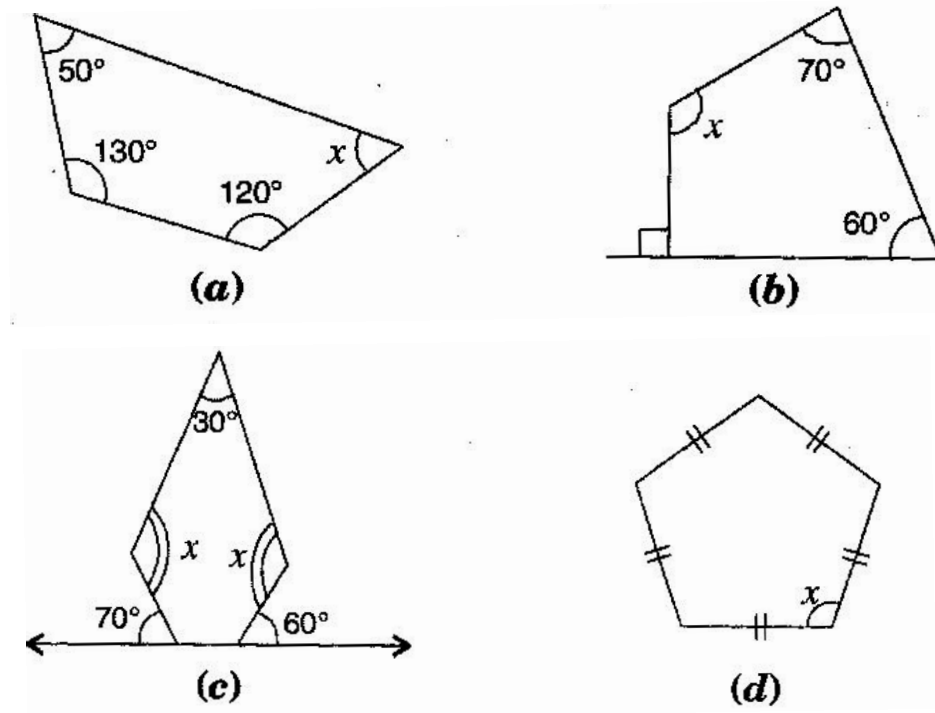
Polygon having four sides is called a *quadrilateral*.

- (iii) 6 sides

Polygon having six sides is called a *hexagon*.

Question 6:

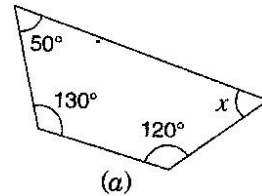
Find the angle measures x in the following figures:



Answer 6:

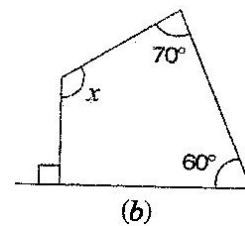
(a) Using angle sum property of a quadrilateral,

$$\begin{aligned}50^\circ + 130^\circ + 120^\circ + x &= 360^\circ \\ \Rightarrow 300^\circ + x &= 360^\circ \\ \Rightarrow x &= 360^\circ - 300^\circ \\ \Rightarrow x &= 60^\circ\end{aligned}$$



(b) Using angle sum property of a quadrilateral,

$$\begin{aligned}90^\circ + 60^\circ + 70^\circ + x &= 360^\circ \\ \Rightarrow 220^\circ + x &= 360^\circ \\ \Rightarrow x &= 360^\circ - 220^\circ \\ \Rightarrow x &= 140^\circ\end{aligned}$$

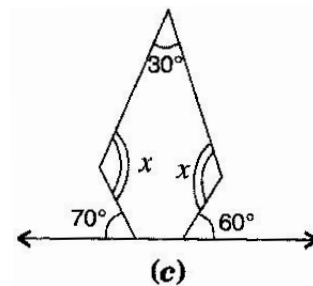


(c) First base interior angle = $180^\circ - 70^\circ = 110^\circ$

Second base interior angle = $180^\circ - 60^\circ = 120^\circ$

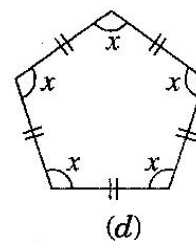
There are 5 sides, $n = 5$

$$\begin{aligned}\therefore \text{Angle sum of a polygon} &= (n-2) \times 180^\circ \\ &= (5-2) \times 180^\circ = 3 \times 180^\circ = 540^\circ \\ \therefore 30^\circ + x + 110^\circ + 120^\circ + x &= 540^\circ \\ \Rightarrow 260^\circ + 2x &= 540^\circ \\ \Rightarrow 2x &= 540^\circ - 260^\circ \\ \Rightarrow 2x &= 280^\circ \\ \Rightarrow x &= 140^\circ\end{aligned}$$



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

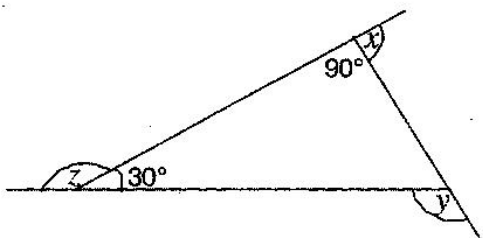
$$\begin{aligned}&= (5-2) \times 180^\circ = 3 \times 180^\circ = 540^\circ \\ \therefore x + x + x + x + x &= 540^\circ \\ \Rightarrow 5x &= 540^\circ \\ \Rightarrow x &= 108^\circ\end{aligned}$$



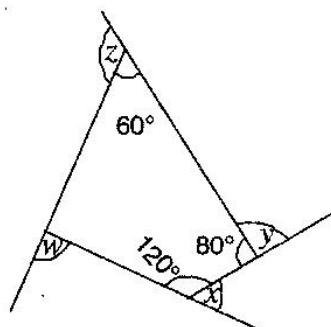
Hence each interior angle is 108° .

Question 7:

(a) Find $x + y + z$



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



Answer 7:

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

$$\therefore 90^\circ + x = 180^\circ$$

$$\Rightarrow x = 180^\circ - 90^\circ = 90^\circ$$

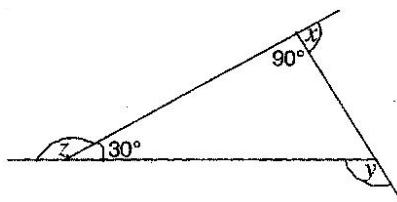
$$\text{And } z + 30^\circ = 180^\circ$$

$$\Rightarrow z = 180^\circ - 30^\circ = 150^\circ$$

$$\text{Also } y = 90^\circ + 30^\circ = 120^\circ$$

[Exterior angle property]

$$\therefore x + y + z = 90^\circ + 120^\circ + 150^\circ = 360^\circ$$



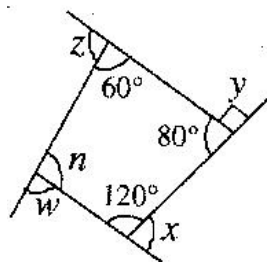
(b) Using angle sum property of a quadrilateral,

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

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

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

$$\Rightarrow n = 100^\circ$$



Since sum of linear pair angles is 180° .

$$\therefore w + 100 = 180^\circ \quad \dots\dots\dots\text{(i)}$$

$$x + 120^\circ = 180^\circ \quad \dots\dots\dots\text{(ii)}$$

$$y + 80^\circ = 180^\circ \quad \dots\dots\dots\text{(iii)}$$

$$z + 60^\circ = 180^\circ \quad \dots\dots\dots\text{(iv)}$$

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

$$\Rightarrow x + y + z + w + 100^\circ + 120^\circ + 80^\circ + 60^\circ = 180^\circ + 180^\circ + 180^\circ + 180^\circ$$

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

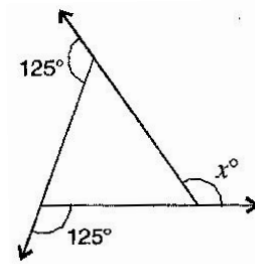
$$\Rightarrow x + y + z + w = 720^\circ - 360^\circ$$

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

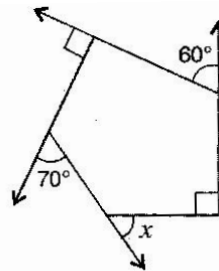
Exercise 3.2

Question 1:

Find x in the following figures:



(a)



(b)

Answer 1:

(a) Here, $125^\circ + m = 180^\circ$

[Linear pair]

$$\Rightarrow m = 180^\circ - 125^\circ = 55^\circ$$

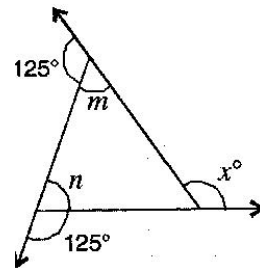
and $125^\circ + n = 180^\circ$

[Linear pair]

$$\Rightarrow n = 180^\circ - 125^\circ = 55^\circ$$

$\therefore$ Exterior angle $x^\circ = \text{Sum of opposite interior angles}$

$$\therefore x^\circ = 55^\circ + 55^\circ = 110^\circ$$



(b) Sum of angles of a pentagon $= (n - 2) \times 180^\circ$

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

$$= 3 \times 180^\circ = 540^\circ$$

By linear pairs of angles,

$$\angle 1 + 90^\circ = 180^\circ \quad \dots\dots\dots\text{(i)}$$

$$\angle 2 + 60^\circ = 180^\circ \quad \dots\dots\dots\text{(ii)}$$

$$\angle 3 + 90^\circ = 180^\circ \quad \dots\dots\dots\text{(iii)}$$

$$\angle 4 + 70^\circ = 180^\circ \quad \dots\dots\dots\text{(iv)}$$

$$\angle 5 + x = 180^\circ \quad \dots\dots\dots\text{(v)}$$

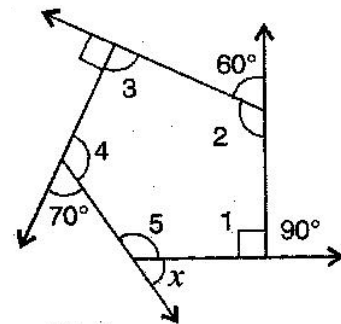
Adding eq. (i), (ii), (iii), (iv) and (v),

$$x + (\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5) + 310^\circ = 900$$

$$\Rightarrow x + 540^\circ + 310^\circ = 900^\circ$$

$$\Rightarrow x + 850^\circ = 900^\circ$$

$$\Rightarrow x = 900^\circ - 850^\circ = 50^\circ$$



Question 2:

Find the measure of each exterior angle of a regular polygon of:

(a) 9 sides

(b) 15 sides

Answer 2:

(i) Sum of angles of a regular polygon = $(n - 2) \times 180^\circ$

$$= (9 - 2) \times 180^\circ = 7 \times 180^\circ = 1260^\circ$$

$$\text{Each interior angle} = \frac{\text{Sum of interior angles}}{\text{Number of sides}} = \frac{1260^\circ}{9} = 140^\circ$$

$$\text{Each exterior angle} = 180^\circ - 140^\circ = 40^\circ$$

(ii) Sum of exterior angles of a regular polygon = 360°

$$\text{Each interior angle} = \frac{\text{Sum of interior angles}}{\text{Number of sides}} = \frac{360^\circ}{15} = 24^\circ$$

Question 3:

How many sides does a regular polygon have, if the measure of an exterior angle is 24° ?

Answer 3:

Let number of sides be n .

$$\text{Sum of exterior angles of a regular polygon} = 360^\circ$$

$$\text{Number of sides} = \frac{\text{Sum of exterior angles}}{\text{Each interior angle}} = \frac{360^\circ}{24^\circ} = 15$$

Hence, the regular polygon has 15 sides.

Question 4:

How many sides does a regular polygon have if each of its interior angles is 165° ?

Answer 4:

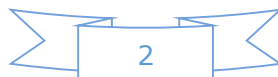
Let number of sides be n .

$$\text{Exterior angle} = 180^\circ - 165^\circ = 15^\circ$$

$$\text{Sum of exterior angles of a regular polygon} = 360^\circ$$

$$\text{Number of sides} = \frac{\text{Sum of exterior angles}}{\text{Each interior angle}} = \frac{360^\circ}{15^\circ} = 24$$

Hence, the regular polygon has 24 sides.



Question 5:

- (a) Is it possible to have a regular polygon with of each exterior angle as 22° ?
(b) Can it be an interior angle of a regular polygon? Why?

Answer 5:

- (a) No. (Since 22 is not a divisor of 360°)
(b) No, (Because each exterior angle is $180^\circ - 22^\circ = 158^\circ$, which is not a divisor of 360°)

Question 6:

- (a) What is the minimum interior angle possible for a regular polygon? Why?
(b) What is the maximum exterior angle possible for a regular polygon?

Answer 6:

- (a) The equilateral triangle being a regular polygon of 3 sides has the least measure of an interior angle of 60° .

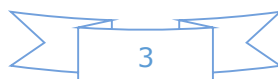
$$\therefore \text{Sum of all the angles of a triangle} = 180^\circ$$

$$\therefore x + x + x = 180^\circ$$

$$\Rightarrow 3x = 180^\circ$$

$$\Rightarrow x = 60^\circ$$

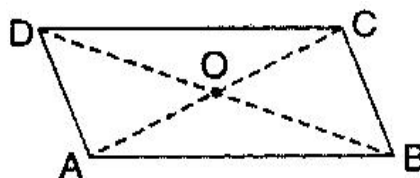
- (b) By (a), we can observe that the greatest exterior angle is $180^\circ - 60^\circ = 120^\circ$.



Exercise 3.3

Question 1:

Given a parallelogram ABCD. Complete each statement along with the definition or property used.



- (i) $AD =$ _____
- (ii) $\angle DCB =$ _____
- (iii) $OC =$ _____
- (iv) $m\angle DAB + m\angle CDA =$ _____

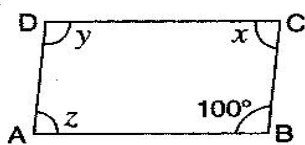
Answer 1:

- (i) $AD = BC$ [Since opposite sides of a parallelogram are equal]
- (ii) $\angle DCB = \angle DAB$ [Since opposite angles of a parallelogram are equal]
- (iii) $OC = OA$ [Since diagonals of a parallelogram bisect each other]
- (iv) $m\angle DAB + m\angle CDA = 180^\circ$

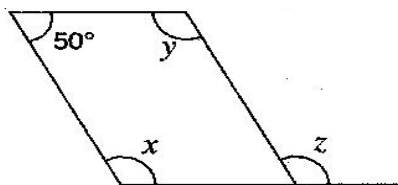
[Adjacent angles in a parallelogram are supplementary]

Question 2:

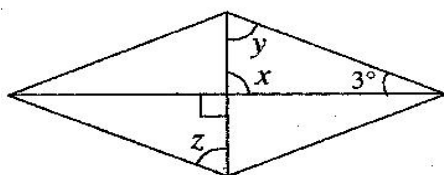
Consider the following parallelograms. Find the values of the unknowns x, y, z .



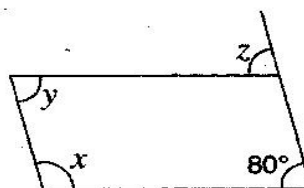
(i)



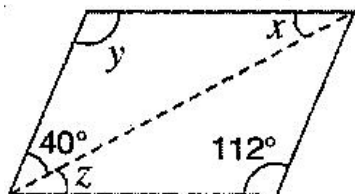
(ii)



(iii)



(iv)

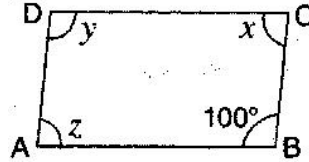


(v)

Note: For getting correct answer, read $3^\circ = 30^\circ$ in figure (iii)

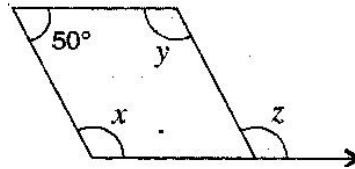
Answer 2:

- (i) $\angle B + \angle C = 180^\circ$ [Adjacent angles in a parallelogram are supplementary]
 $\Rightarrow 100^\circ + x = 180^\circ$
 $\Rightarrow x = 180^\circ - 100^\circ = 80^\circ$



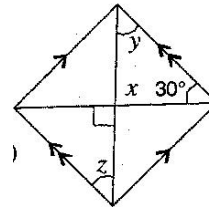
and $z = x = 80^\circ$ [Since opposite angles of a parallelogram are equal]
 also $y = 100^\circ$ [Since opposite angles of a parallelogram are equal]

- (ii) $x + 50^\circ = 180^\circ$ [Adjacent angles in a $\parallel^{\text{gm}}$ are supplementary]



$\Rightarrow x = 180^\circ - 50^\circ = 130^\circ$
 $\Rightarrow z = x = 130^\circ$ [Corresponding angles]

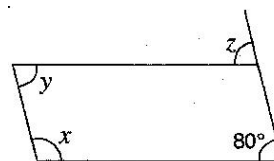
- (iii) $x = 90^\circ$ [Vertically opposite angles]
 $\Rightarrow y + x + 30^\circ = 180^\circ$ [Angle sum property of a triangle]



$\Rightarrow y + 90^\circ + 30^\circ = 180^\circ$
 $\Rightarrow y + 120^\circ = 180^\circ$
 $\Rightarrow y = 180^\circ - 120^\circ = 60^\circ$
 $\Rightarrow z = y = 60^\circ$ [Alternate angles]

- (iv) $z = 80^\circ$ [Corresponding angles]
 $\Rightarrow x + 80^\circ = 180^\circ$ [Adjacent angles in a $\parallel^{\text{gm}}$ are supplementary]

$\Rightarrow x = 180^\circ - 80^\circ = 100^\circ$



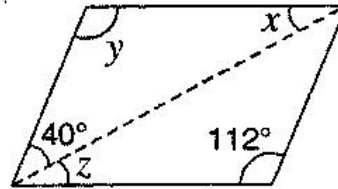
and $y = 80^\circ$ [Opposite angles are equal in a $\parallel^{\text{gm}}$]

(v) $y = 112^\circ$ [Opposite angles are equal in a ||gm]

$\Rightarrow 40^\circ + y + x = 180^\circ$ [Angle sum property of a triangle]

$\Rightarrow 40^\circ + 112^\circ + x = 180^\circ$

$\Rightarrow 152^\circ + x = 180^\circ$



$\Rightarrow x = 180^\circ - 152^\circ = 28^\circ$

and $z = x = 28^\circ$ [Alternate angles]

Question 3:

Can a quadrilateral ABCD be a parallelogram, if:

(i) $\angle D + \angle B = 180^\circ$?

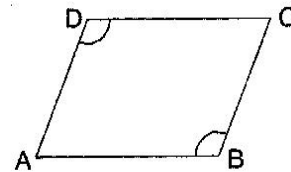
(ii) $AB = DC = 8 \text{ cm}$, $AD = 4 \text{ cm}$ and $BC = 4.4 \text{ cm}$?

(iii) $\angle A = 70^\circ$ and $\angle C = 65^\circ$?

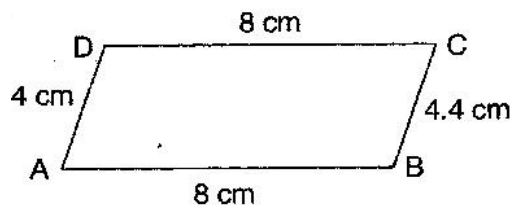
Answer 3:

(i) $\angle D + \angle B = 180^\circ$

It can be, but here, it needs not to be.

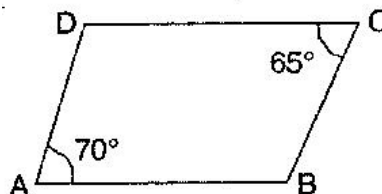


- (ii) No, in this case because one pair of opposite sides are equal and another pair of opposite sides are unequal. So, it is not a parallelogram.



- (iii) No. $\angle A \neq \angle C$.

Since opposite angles are equal in parallelogram and here opposite angles are not equal in quadrilateral ABCD. Therefore it is not a parallelogram.



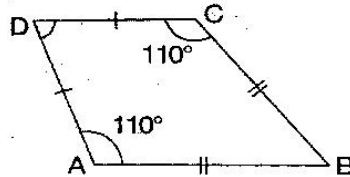
Question 4:

Draw a rough figure of a quadrilateral that is not a parallelogram but has exactly two opposite angles of equal measures.

Answer 4:

ABCD is a quadrilateral in which angles $\angle A = \angle C = 110^\circ$.

Therefore, it could be a kite.

**Question 5:**

The measure of two adjacent angles of a parallelogram are in the ratio 3:2. Find the measure of each of the angles of the parallelogram.

Answer 5:

Let two adjacent angles be $3x$ and $2x$.

Since the adjacent angles in a parallelogram are supplementary.

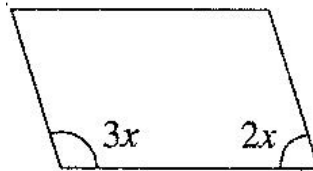
$$\therefore 3x + 2x = 180^\circ$$

$$\Rightarrow 5x = 180^\circ$$

$$\Rightarrow x = \frac{180^\circ}{5} = 36^\circ$$

$$\therefore \text{One angle} = 3x = 3 \times 36^\circ = 108^\circ$$

$$\text{and another angle} = 2x = 2 \times 36^\circ = 72^\circ$$

**Question 6:**

Two adjacent angles of a parallelogram have equal measure. Find the measure of the angles of the parallelogram.

Answer 6:

Let each adjacent angle be x .

Since the adjacent angles in a parallelogram are supplementary.

$$\therefore x + x = 180^\circ$$

$$\Rightarrow 2x = 180^\circ$$

$$\Rightarrow x = \frac{180^\circ}{2} = 90^\circ$$

Hence, each adjacent angle is 90° .

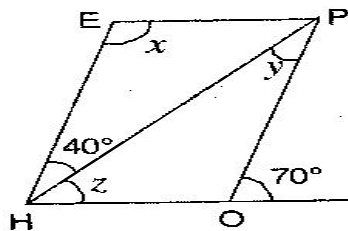
$$\therefore x + x + x = 180^\circ$$

$$\Rightarrow 3x = 180^\circ$$

$$\Rightarrow x = 60$$

Question 7:

The adjacent figure HOPW is a parallelogram. Find the angle measures x, y and z . State the properties you use to find them.



Answer 7:

Here $\angle HOP + 70^\circ = 180^\circ$

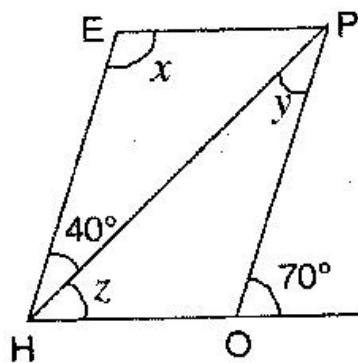
[Angles of linear pair]

$$\angle HOP = 180^\circ - 70^\circ = 110^\circ$$

and $\angle E = \angle HOP$

[Opposite angles of a $\parallel^{\text{gm}}$ are equal]

$$\Rightarrow x = 110^\circ$$



$$\angle PHE = \angle HPO$$

[Alternate angles]

$$\therefore y = 40^\circ$$

Now $\angle EHO = \angle O = 70^\circ$ [Corresponding angles]

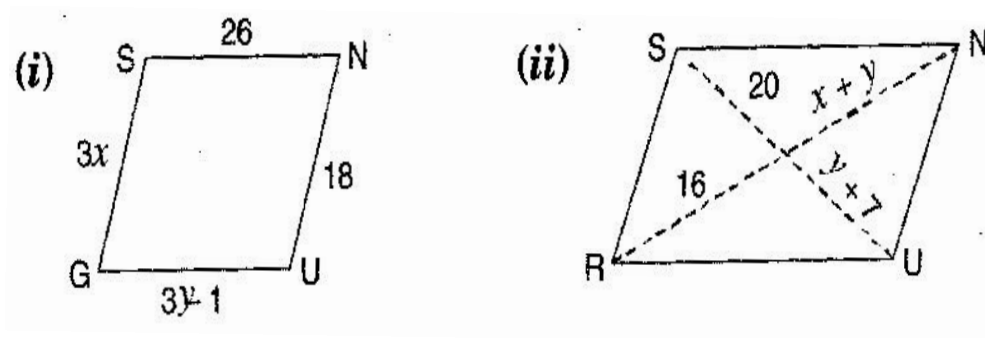
$$\Rightarrow 40^\circ + z = 70^\circ$$

$$\Rightarrow z = 70^\circ - 40^\circ = 30^\circ$$

Hence, $x = 110^\circ, y = 40^\circ$ and $z = 30^\circ$

Question 8:

The following figures GUNS and RUNS are parallelograms. Find x and y . (Lengths are in cm)

**Answer 8:**

(i) In parallelogram GUNS,

$$GS = UN$$

[Opposite sides of parallelogram are equal]

$$\Rightarrow 3x = 18$$

$$\Rightarrow x = \frac{18}{3} = 6 \text{ cm}$$

Also $GU = SN$

[Opposite sides of parallelogram are equal]

$$\Rightarrow 3y - 1 = 26$$

$$\Rightarrow 3y = 26 + 1$$

$$\Rightarrow 3y = 27$$

$$\Rightarrow y = \frac{27}{3} = 9 \text{ cm}$$

Hence, $x = 6$ cm and $y = 9$ cm.

(ii) In parallelogram RUNS,

$$y + 7 = 20$$

[Diagonals of $\parallel^{\text{gm}}$ bisect each other]

$$\Rightarrow y = 20 - 7 = 13 \text{ cm}$$

and $x + y = 16$

$$\Rightarrow x + 13 = 16$$

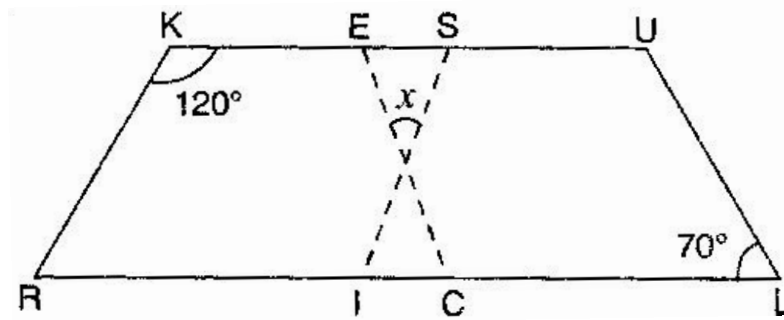
$$\Rightarrow x = 16 - 13$$

$$\Rightarrow x = 3 \text{ cm}$$

Hence, $x = 3$ cm and $y = 13$ cm.

Question 9:

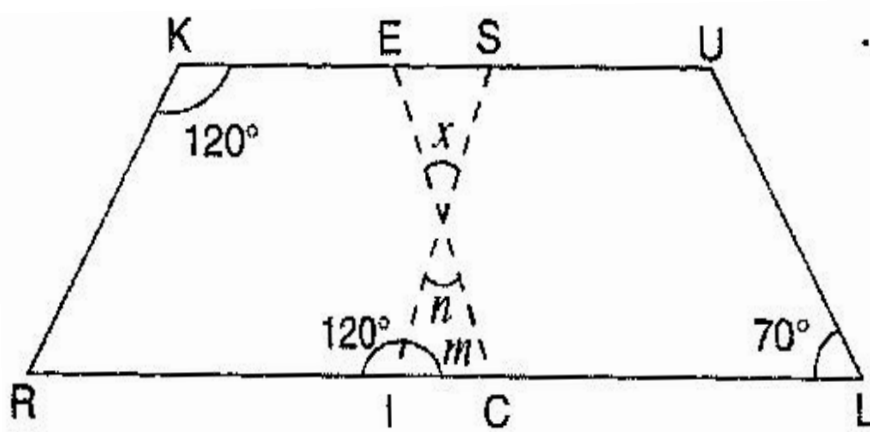
In the figure, both RISK and CLUE are parallelograms. Find the value of x .

**Answer 9:**

In parallelogram RISK,

$$\angle RIS = \angle K = 120^\circ$$

[Opposite angles of a $||^{gm}$ are equal]



$$\angle m + 120^\circ = 180^\circ$$

[Linear pair]

$$\Rightarrow \angle m = 180^\circ - 120^\circ = 60^\circ$$

$$\text{and } \angle ECI = \angle L = 70^\circ$$

[Corresponding angles]

$$\Rightarrow m + n + \angle ECI = 180^\circ$$

[Angle sum property of a triangle]

$$\Rightarrow 60^\circ + n + 70^\circ = 180^\circ$$

$$\Rightarrow 130^\circ + n = 180^\circ$$

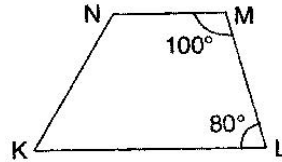
$$\Rightarrow n = 180^\circ - 130^\circ = 50^\circ$$

$$\text{also } x = n = 50^\circ$$

[Vertically opposite angles]

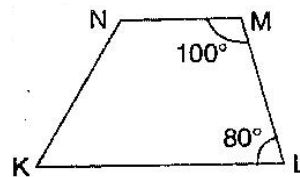
Question 10:

Explain how this figure is a trapezium. Which is its two sides are parallel?

**Answer 10:**

Here, $\angle M + \angle L = 100^\circ + 80^\circ = 180^\circ$ [Sum of interior opposite angles is 180°]

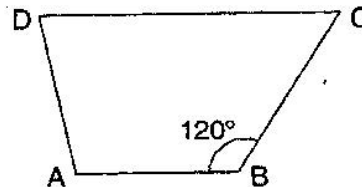
$\therefore$ NM and KL are parallel.



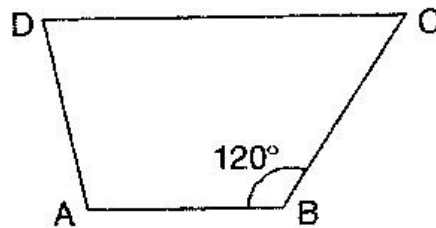
Hence, KLMN is a trapezium.

Question 11:

1. Find $m\angle C$ in figure, if $\overline{AB} \parallel \overline{DC}$,

**Answer 11:**

Here, $\angle B + \angle C = 180^\circ$ [$\because \overline{AB} \parallel \overline{DC}$]



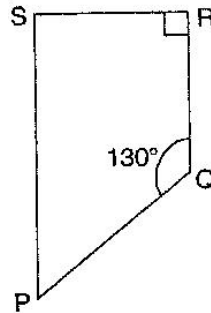
$$\therefore 120^\circ + m\angle C = 180^\circ$$

$$\Rightarrow m\angle C = 180^\circ - 120^\circ = 60^\circ$$

Question 12:

Find the measure of $\angle P$ and $\angle S$ if $\overline{SP} \parallel \overline{RQ}$ in given figure.

(If you find $m\angle R$ is there more than one method to find $m\angle P$)

**Answer 12:**

Here, $\angle P + \angle Q = 180^\circ$

[Sum of co-interior angles is 180°]

$$\Rightarrow \angle P + 130^\circ = 180^\circ$$

$$\Rightarrow \angle P = 180^\circ - 130^\circ$$

$$\Rightarrow \angle P = 50^\circ$$

$$\therefore \angle R = 90^\circ$$

[Given]

$$\therefore \angle S + 90^\circ = 180^\circ$$

$$\Rightarrow \angle S = 180^\circ - 90^\circ$$

$$\Rightarrow \angle S = 90^\circ$$

Yes, one more method is there to find $\angle P$.

$$\angle S + \angle R + \angle Q + \angle P = 360^\circ \quad [\text{Angle sum property of quadrilateral}]$$

$$\Rightarrow 90^\circ + 90^\circ + 130^\circ + \angle P = 360^\circ$$

$$\Rightarrow 310^\circ + \angle P = 360^\circ$$

$$\Rightarrow \angle P = 360^\circ - 310^\circ$$

$$\Rightarrow \angle P = 50^\circ$$

Exercise 3.4

Question 1:

State whether true or false:

- (a) All rectangles are squares.
- (b) All rhombuses are parallelograms.
- (c) All squares are rhombuses and also rectangles.
- (d) All squares are not parallelograms.
- (e) All kites are rhombuses.
- (f) All rhombuses are kites.
- (g) All parallelograms are trapeziums.
- (h) All squares are trapeziums.

Answer 1:

- (a) False. Since, squares have all sides are equal.
- (b) True. Since, in rhombus, opposite angles are equal and diagonals intersect at mid-point.
- (c) True. Since, squares have the same property of rhombus but not a rectangle.
- (d) False. Since, all squares have the same property of parallelogram.
- (e) False. Since, all kites do not have equal sides.
- (f) True. Since, all rhombuses have equal sides and diagonals bisect each other.
- (g) True. Since, trapezium has only two parallel sides.
- (h) True. Since, all squares have also two parallel lines.

Question 2:

Identify all the quadrilaterals that have:

- (a) four sides of equal lengths.
- (b) four right angles.

Answer 2:

- (a) Rhombus and square have sides of equal length.
- (b) Square and rectangle have four right angles.

Question 3:

Explain how a square is:

- | | |
|---------------------|----------------------|
| (i) a quadrilateral | (ii) a parallelogram |
| (iii) a rhombus | (iv) a rectangle |

Answer 3:

- (i) A square is a quadrilateral, if it has four unequal lengths of sides.
- (ii) A square is a parallelogram, since it contains both pairs of opposite sides equal.
- (iii) A square is already a rhombus. Since, it has four equal sides and diagonals bisect at 90° to each other.
- (iv) A square is a parallelogram, since having each adjacent angle a right angle and opposite sides are equal.

Question 4:

Name the quadrilateral whose diagonals:

- (i) bisect each other.
- (ii) are perpendicular bisectors of each other.
- (iii) are equal.

Answer 4:

- (i) If diagonals of a quadrilateral bisect each other then it is a rhombus, parallelogram, rectangle or square.
- (ii) If diagonals of a quadrilateral are perpendicular bisector of each other, then it is a rhombus or square.
- (iii) If diagonals are equal, then it is a square or rectangle.

Question 5:

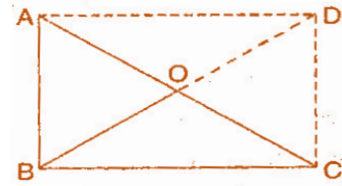
Explain why a rectangle is a convex quadrilateral.

Answer 5:

A rectangle is a convex quadrilateral since its vertex are raised and both of its diagonals lie in its interior.

Question 6:

ABC is a right-angled triangle and O is the mid-point of the side opposite to the right angle. Explain why O is equidistant from A, B and C. (The dotted lines are drawn additionally to help you.)



Answer 6:

Since, two right triangles make a rectangle where O is equidistant point from A, B, C and D because O is the mid-point of the two diagonals of a rectangle.

Since AC and BD are equal diagonals and intersect at mid-point.

So, O is the equidistant from A, B, C and D.