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

(a) 7 (b) 8

(c) 10 (d) n

5. What is a regular polygon?

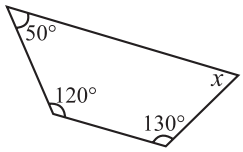
State the name of a regular polygon of

(i) 3 sides (ii) 4 sides

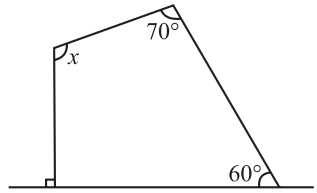
(iii) 6 sides

6. Find the angle measure x in the following figures.

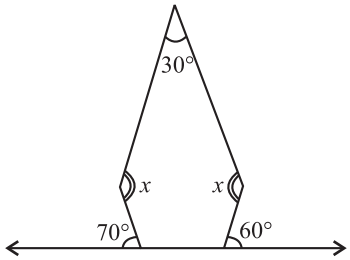
(a)



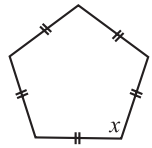
(b)



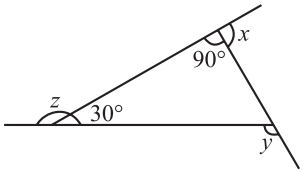
(c)



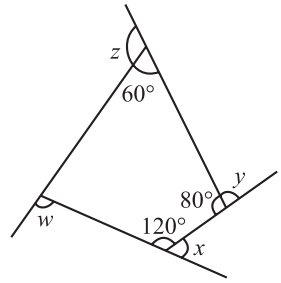
(d)



7.



(a) Find $x + y + z$



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

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

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

5. (a) Is it possible to have a regular polygon with measure of each exterior angle as 22°?

(b) Can it be an interior angle of a regular polygon? Why?

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?

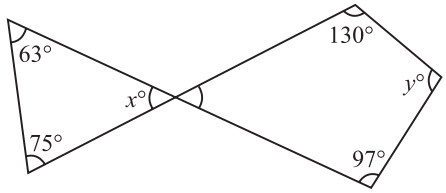
Test Yourself - UQ2

1. A quadrilateral has all four angles of the same measure, what is the measure of each angle?

2. Two angles of a quadrilateral are of measure 50° and the other two angles are equal. What is the measure of each of these two angles?

3. ABCD is a quadrilateral. AO and BO are the angle bisectors of angle A and B which meet at O. If ∠C = 70°, ∠D = 50°, find ∠AOB.

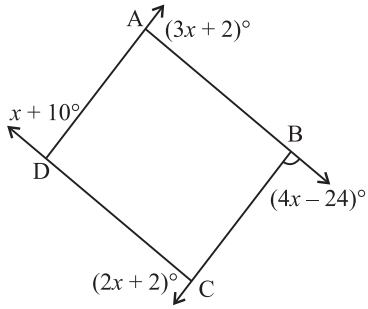
4. The value of y in the given figure is:



(a) 89° (b) 91°

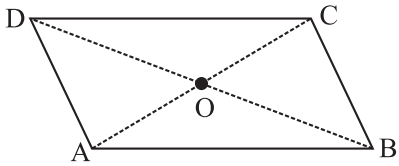
(c) 101° (d) 79°

5. Find the measure of ∠ADC.



EXERCISE 3.3

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



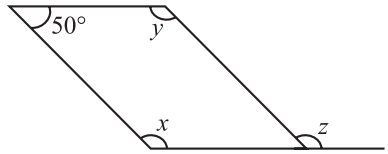
(i) AD = ... (ii) ∠DCB = ...

(iii) OC = ... (iv) $m\angle DAB + m\angle CDA$ = ...

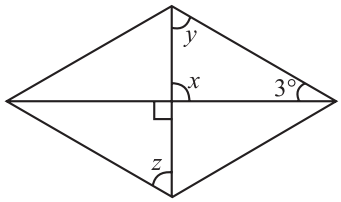
2. Consider the following parallelograms. Find the values of the unknowns x, y, z.

(i)

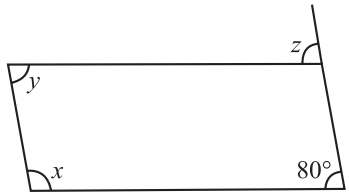
(ii)



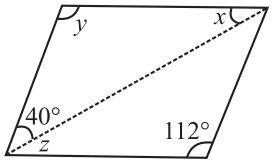
(iii)



(iv)



(v)



3. Can a quadrilateral ABCD be a parallelogram if

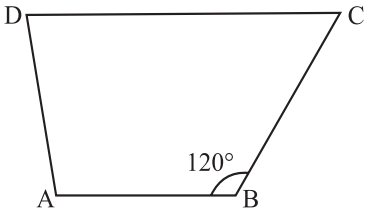
(i) ∠D + ∠B = 180°?

(ii) AB = DC = 8 cm, AD = 4 cm and BC = 4.4 cm?

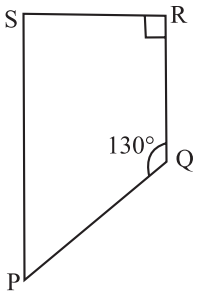
(iii) ∠A = 70° and ∠C = 65°?

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

11. Find $m\angle C$ in Fig 3.33 if $\overline{AB} \parallel \overline{DC}$.



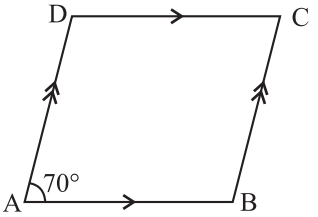
12. Find the measure of $\angle P$ and $\angle S$ if $\overline{SP} \parallel \overline{RQ}$ in Fig 3.34. (If you find $m\angle R$, is there more than one method to find $m\angle P$?)



Test Yourself - UQ3

1. The angles of a quadrilateral are in the ratio 2 : 3 : 5 : 8. Find the measure of each of the four angles.

2. ABCD is a parallelogram: If $\angle A = 70°$, calculate $\angle B$, $\angle C$ and $\angle D$.



3. The perimeter of a parallelogram is 150 cm. One of its sides is greater than the other by 25 cm. Find the lengths of all the sides of the parallelogram.

4. The ratio of two sides of a parallelogram is 3 : 5, and its perimeter is 48 cm. Find the sides of the parallelogram.

5. Diagonals of a parallelogram ABCD intersect at). XY contains O, and X, Y are points on opposite sides of the parallelogram. Give reasons for each of the following statements:

(g) All parallelograms are trapeziums.

(h) All squares are trapeziums.

2. Identify all the quadrilaterals that have.

(a) four sides of equal length

(b) four right angles

3. Explain how a square is.

(i) a quadrilateral (ii) a parallelogram

(iii) a rhombus (iv) a rectangle

4. Name the quadrilaterals whose diagonals.

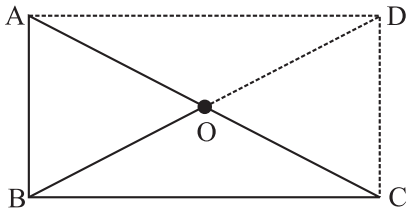
(i) bisect each other

(ii) are perpendicular bisectors of each other

(iii) are equal

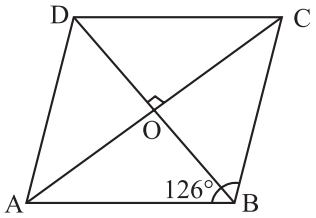
5. Explain why a rectangle is a convex quadrilateral.

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).



Test Yourself - UQ4

1. ABCD is a rhombus with $\angle ABC = 126°$. Determine $\angle ACD$.



2. ABCD is a square. Determine $\angle DCA$.

ANSWERS

NCERT Textual Exercises and Assignments

Exercise – 3.1

1. (a) Simple curve

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

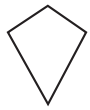
(b) Simple closed curve

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

(c) Polygons

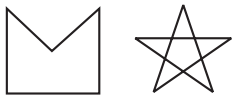
(1) (2) (4)

(d) Convex polygons



(1)

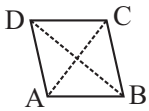
(e) Concave polygon



(1) (4)

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) When $n = 10$, then

Angle sum of a polygon = $(n - 2) \times 180° = (10 - 2) \times 180° = 8 \times 180° = 1440°$

(d) When $n = n$, then

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

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**.

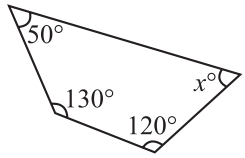
(ii) 4 sides

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

(iii) 6 sides

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

6. (a) Using angle sum property of a quadrilateral,



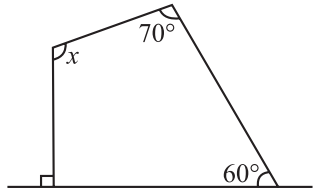
$50° + 130° + 120° + x = 360°$

$\Rightarrow 300° + x = 360°$

$\Rightarrow x = 360° - 300$

$\Rightarrow x = 60°$

(b) Using angle sum property of a quadrilateral,



$90° + 60° + 70° + x = 360°$

$\Rightarrow 220° + x = 360°$

$\Rightarrow x = 360° - 220$

$\Rightarrow x = 140°$

(c) First base interior angle = $180° - 70° = 110°$

Second base interior angle = $180° - 60° = 120°$

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

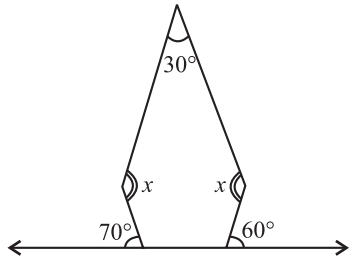
$= (5 - 2) \times 180° = 3 \times 180° = 540°$

$\therefore 30° + x + 110° + 120° + x = 540°$

$\Rightarrow 260° + 2x = 540°$

$\Rightarrow 2x = 280°$

$\Rightarrow x = 140°$

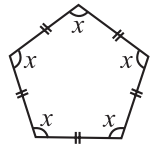


(d) Angle sum of a polygon = $(n - 2) \times 180°$

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

$\therefore x + x + x + x + x = 540°$

$\Rightarrow 5x = 540° \quad \Rightarrow x = 108°$

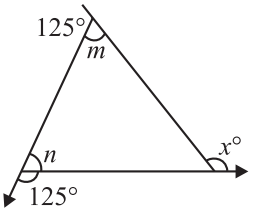


Hence each interior angle is 108°.

Exercise – 3.2

1. (a) Here, $125° + m = 180°$ [Linear pair]

$\Rightarrow$ $m = 180° - 125° = 55°$



and $125° + n = 180°$ [Linear pair]

$\Rightarrow$ $n = 180° - 125° = 55°$

$\because$ Exterior angle $x°$ = sum of opposite interior angles

$\therefore$ $x° = 55° + 55° = 110$

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

$= (5 \times 2) \times 180°$

$= 3 \times 180° = 540°$

By linear pairs of angles,

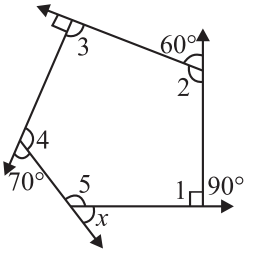
$\angle 1 + 90° = 180°$ ...(i)

$\angle 2 + 60° = 180°$ ...(ii)

$\angle 3 + 90° = 180°$ ...(iii)

$\angle 4 + 70° = 180°$ ....(iv)

$\angle 5 + x = 180°$ ...(v)



Adding equation (i), (ii), (iii), (iv) and (v)

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

$\Rightarrow$ $x + 540° + 310° = 900$

$\Rightarrow$ $x + 850° = 900°$

$\Rightarrow$ $x = 900° - 850° = 50°$

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

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

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

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

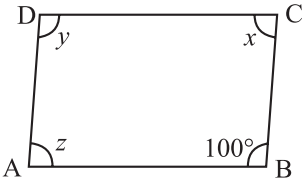
$$\text{Each interior angle} = \frac{\text{Sum of interior angles}}{\text{Number of sides}} = \frac{360°}{15} = 24°$$

3. Let number of sides be n.

Sum of exterior angles of a regular polygon = 360°

Exercise – 3.3

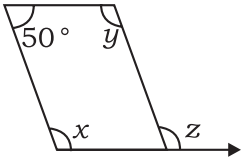
1. (i) AD = BC [Since opposite sides of a parallelogram are equal]
   (ii) $\angle DCB = \angle DAB$ [Since opposite angles of a parallelogram are equal]
   (iii) OC = OA [since diagonals of a parallelogram bisect each other]
   (iv) $m\angle DAB + m\angle CDA = 180°$ [Adjacent angles in a parallelogram are supplementary]
2. (i) $\angle B + \angle C = 180°$ [Adjacent angles in a parallelogram are supplementary]



$\Rightarrow$ $100° + x = 180°$

$\Rightarrow$ $x = 180° - 100° = 80°$

and $z = x = 80°$ [Since opposite angles of a parallelogram are equal]



Also $y = 100°$ [Since opposite angles of a parallelogram are equal]

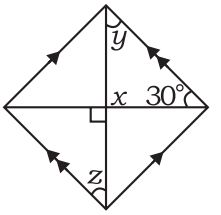
(ii) $x + 50° = 180°$ [Adjacent angles in a || gm are supplementary]

$\Rightarrow$ $x = 180° - 50° = 130°$

$\Rightarrow$ $z = x = 130°$ [Corresponding angles]

(iii) $x = 90°$ [Vertically opposite angle]

$\Rightarrow$ $y + x + 30° = 180°$ [Angle sum property of a triangle]



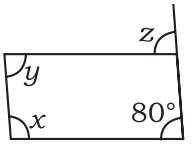
$\Rightarrow$ $y + 90° + 30° = 180°$

$\Rightarrow$ $y + 120 = 180°$

$\Rightarrow$ $y = 180° - 120° = 60°$

$\Rightarrow$ $z = y = 60°$ [Alternate angles]

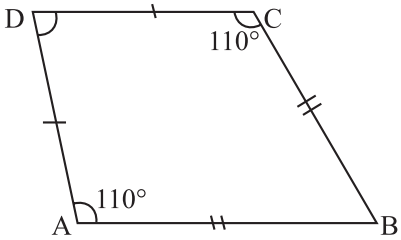
(iv) $z = 80°$ [Corresponding angles]



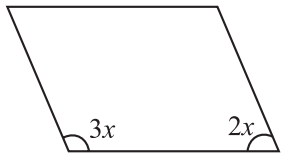
$\Rightarrow$ $x + 80° = 180°$ [Adjacent angles in a || gm are supplementary]

$\Rightarrow$ $x = 180° - 80° = 100°$

and $y = 80°$ [Opposite angles are equal in a ||gm]



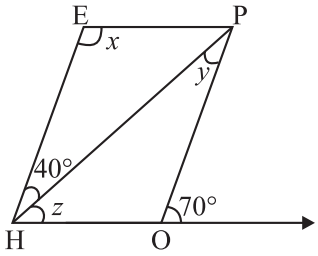
5. Let two adjacent angles be $3x$ and $2x$.
   Since the adjacent angles in a parallelogram are supplementary.
   $\therefore \quad 3x + 2x = 180° \quad \Rightarrow \quad 5x = 180°$
   $\Rightarrow \quad x = \frac{180°}{5} = 36°$



   $\therefore$ One angle $= 3x = 3 \times 36° = 108°$
   And Another angle $= 2x = 2 \times 36° = 72°$

6. Let each adjacent aangle be x.
   Since the adjacent angles in a parallelogram are supplementary.
   $\therefore \quad x + x = 180° \quad \Rightarrow \quad 2x = 180°$
   $\Rightarrow \quad x = \frac{180°}{2} = 90°$
   Hence, each adjacent angle is 90°.

7. Here $\angle HOP = 180° - 70° = 110°$ [Angle of linear pair]
   and $\angle E = \angle HOP$ [Opposite angles of a || gm are equal]
   $\Rightarrow \quad x = 110°$
   $\angle PHE = \angle HPO$ [Alternate angles]
   $\therefore \quad y = 40°$

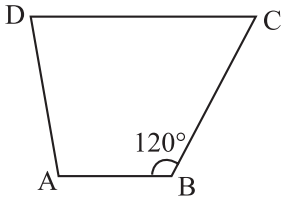


   Now $\angle EHO = \angle O = 70°$ [Corresponding angles]
   $\Rightarrow \quad 40° + z = 70° \quad \Rightarrow \quad z = 70° - 40° = 30°$

$\therefore$ NM and KL are parallel

Hence, KLMN is a trapezium.

11. Here, $\angle B + \angle C = 180°$ $\left[\because \overline{AB} \| \overline{DC}\right]$



$\therefore$ $120 + m\angle C = 180°$

$\Rightarrow$ $m\angle C = 180° - 120° = 60°$

12. Here, $\angle P + \angle Q = 180°$ [Sum of co-interior angles is 180°]

$\Rightarrow$ $\angle P + 130° = 180°$

$\Rightarrow$ $\angle P = 180° - 130°$

$\Rightarrow$ $\angle P = 50°$

$\therefore$ $\angle R = 90°$

$\therefore$ $\angle S + 90° = 180°$

$\Rightarrow$ $\angle S = 180° - 90°$

$\Rightarrow$ $\angle S = 90°$

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

$\angle S + \angle R + \angle Q + \angle P = 360°$ [Angle sum property of quadrilateral]

$\Rightarrow$ $90° + 90° + 130° + \angle P = 360°$

$\Rightarrow$ $310° + \angle P = 360°$

$\Rightarrow$ $\angle P = 360° - 310°$

$\Rightarrow$ $\angle P = 50°$.

TEST YOURSELF - UQ3

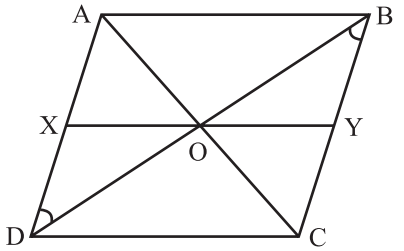
1. 40°, 60°, 100°, 160°

2. 110°, 70°, 110°

3. 25 cm, 50 cm, 25 cm, 50 cm

4. 9 cm, 15 cm, 9 cm and 15 cm

5.



(i) Diagonals of a parallelogram bisect each other.
(ii) Alternate interior angler are equal.
(iii) Vertically opposite angles.
(iv) A.A.S. congrency criteria.

7. 27 cm

Exercise – 3.4

1. (a) False. Since, all sides of squares 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 tines.
2. (a) Rhombus and square have sides of equal length.
   (b) Square and rectangle have four right angles.
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.
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
5. A rectangle is a convex quadrilateral since its vertex are raised and both of Its diagonals lie in its interior.
6. Since, two right triangles make a rectangle where 0 is equidistant point from A, B, C and D because 0 is the mid-point of the two diagonals of a rectangle. Since AC and BD are equal diagonals and intersect at mid-point So, 0 is the equidistant from A. B, C and D

TEST YOURSELF - UQ4

1. 27°
2. 45°

3. 5 cm

4. 34

5. 45

6. 95°, 40°