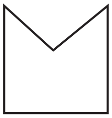
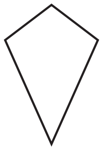
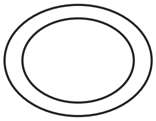
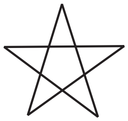
EXERCISE 3.1

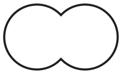
1. Given here are some figures.

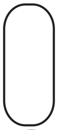
(i) 

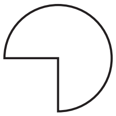
(ii) 

(iii) 

(iv) 

(v) 

(vi) 

(vii) 

(viii) 

Classify each of them on the basis of the following.

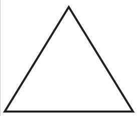
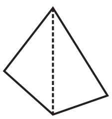
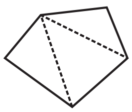
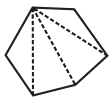
(a) Simple curve
(b) Simple closed curve
(c) Polygon
(d) Convex polygon
(e) Concave polygon

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 × 180° = (4 – 2) × 180°	3 × 180° = (5 – 2) × 180°	4 × 180° = (6 – 2) × 180°

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?

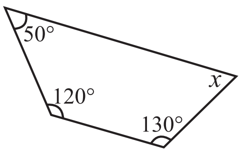
State the name of a regular polygon of

(i) 3 sides (ii) 4 sides

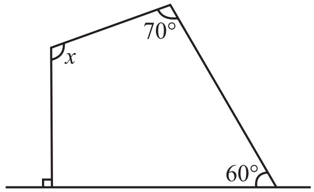
(iii) 6 sides

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

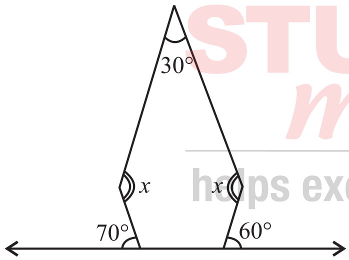
(a)



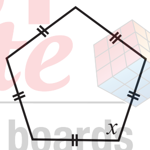
(b)



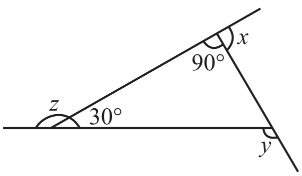
(c)

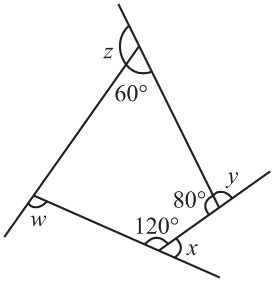


(d)



7.



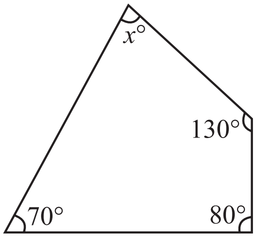


(a) Find $x + y + z$ (b) Find $x + y + z + w$

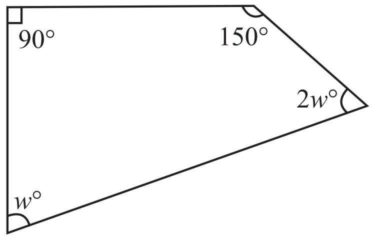
Test Yourself - UQ1

1. Find the value of the unknown angle in each of the following figures:

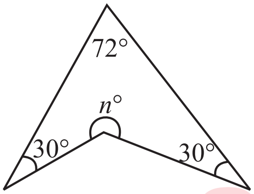
(i)



(ii)



(iii)



2. What is the sum of all exterior angles of a convex quadrilateral?
3. What is sum of all interior angles of a pentagon?
4. In a quadrilateral ABCD, ∠A = 150° and ∠B = ∠C = ∠D, find ∠B, ∠C and ∠D.
5. The measures of three angles of a quadrilateral are 39°, 141° and 13°. Find the fourth angle.

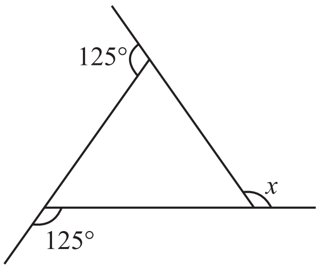
   (a) 117° (b) 167°

   (c) 108° (d) 137°

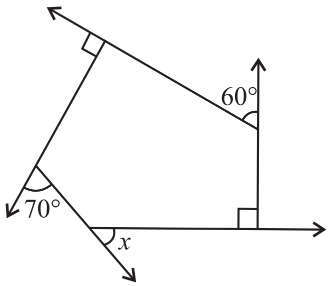
EXERCISE 3.2

1. Find x in the following figures.

(a)



(b)



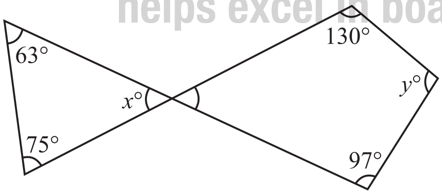
2. Find the measure of each exterior angle of a regular polygon of

   (i) 9 sides (ii) 15 sides

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?

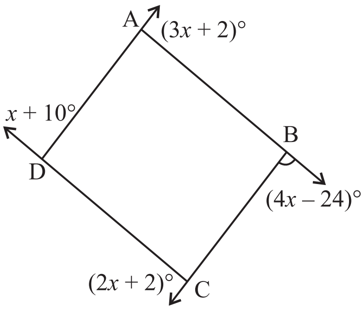
TEST YOURSELF - UQ2

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 $\angle C = 70°$, $\angle D = 50°$, find $\angle AOB$.
4. The value of y in the given figure is:



(a) 89° (b) 91°
(c) 101° (d) 79°

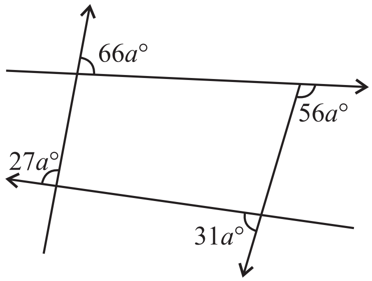
5. Find the measure of $\angle ADC$.



(a) 37° (b) 47°

(c) 133° (d) 43°

6. What is the value of a?

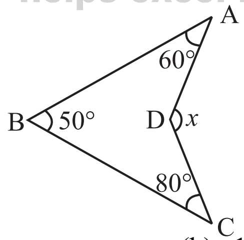


(a) 90° (b) 10°

(c) 180° (d) 2°

7. Find the values of x, y and z in the diagram. Give reasons wherever necessary.

8. In the given diagram, the value of x is



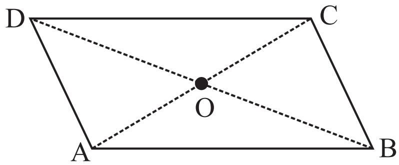
(a) 170° (b) 190°

(c) 100° (d) 90°

9. If the angles of a quadrilateral are $x°$, $(2x + 13)°$, $(3x + 10)°$, $(x - 6)°$, find x.

EXERCISE 3.3

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



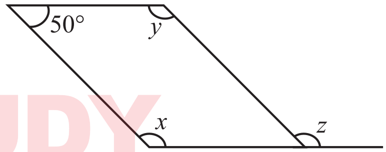
(i) AD = ... (ii) ∠DCB = ...

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

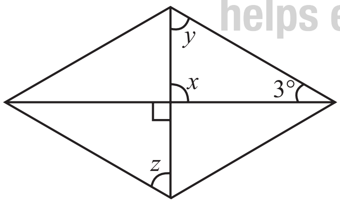
2. Consider the following parallelograms. Find the values of the unknowns x, y, z.

(i)

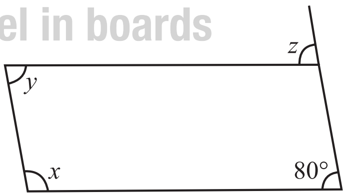
(ii)



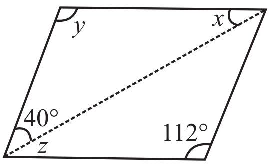
(iii)



(iv)



(v)



3. Can a quadrilateral ABCD be a parallelogram if

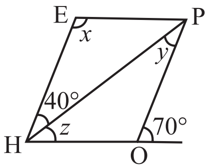
(i) ∠D + ∠B = 180°?

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

(iii) ∠A = 70° and ∠C = 65°?

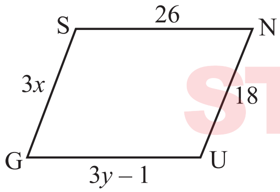
4. Draw a rough figure of a quadrilateral that is not a parallelogram but has exactly two opposite angles of equal measure.

5. The measures of two adjacent angles of a parallelogram are in the ratio 3 : 2. Find the measure of each of the angles of the parallelogram.
6. Two adjacent angles of a parallelogram have equal measure. Find the measure of each of the angles of the parallelogram.

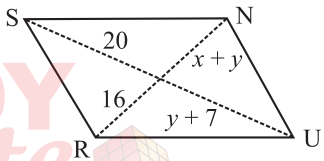


7. The adjacent figure HOPE is a parallelogram. Find the angle measures x, y and z. State the properties you use to find them.
8. The following figures GUNS and RUNS are parallelograms. Find x and y. (Lengths are in cm)

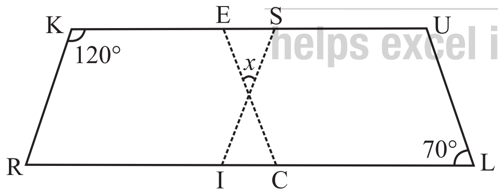
(i)



(ii)

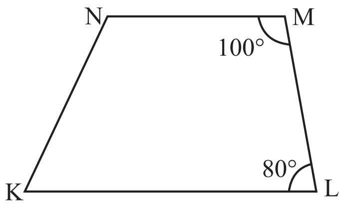


9.

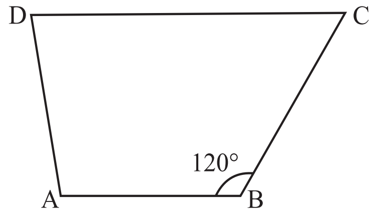


In the above figure both RISK and CLUE are parallelograms. Find the value of x.

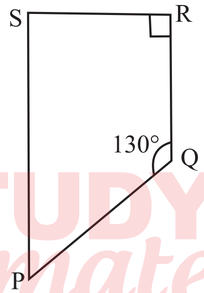
10. Explain how this figure is a trapezium. Which of its two sides are parallel? (Fig 3.32)



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

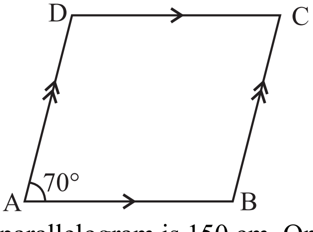


12. Find the measure of $\angle P$ and $\angle S$ if $\overline{SP} \parallel \overline{RQ}$ in Fig 3.34. (If you find $m\angle R$, is there more than one method to find $m\angle P$?)



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 $\angle D$.

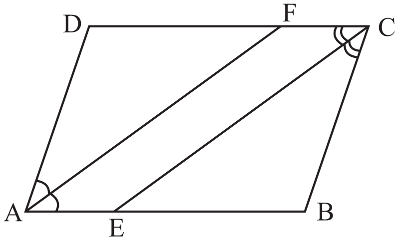


3. The perimeter of a parallelogram is 150 cm. One of its sides is greater than the other by 25 cm. Find the lengths of all the sides of the parallelogram.
4. The ratio of two sides of a parallelogram is 3 : 5, and its perimeter is 48 cm. Find the sides of the parallelogram.
5. Diagonals of a parallelogram 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:

(i) OB = OD (ii) $\angle OBY = \angle ODX$
(iii) $\angle BOY = \angle DOX$ (iv) $\Delta BOY \cong \Delta DOX$

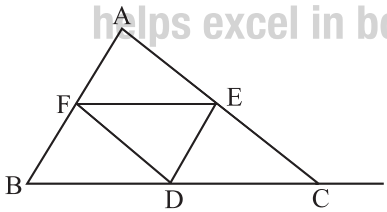
Now, state if XY is bisected at O.

6. ABCD is a parallelogram. CE bisects $\angle C$ and AF bisects $\angle A$. In each of the following, if the statement is true, give a reason for the same.



(i) $\angle A = \angle C$ (ii) $\angle FAB = 1/2\angle A$
(iii) $\angle DCE = 1/2\angle C$ (iv) $\angle FAB = \angle DCE$
(v) $\angle DCE = \angle CEB$ (vi) $\angle CEB = \angle FAB$
(vii) CE||AF (viii) AE||FC

7. In a ΔABC, D, E, F are respectively, the mid-points of BC, CA and AB. If the lengths of side AB, BC and CA are 17 cm, 18 cm and 19 cm respectively, find the perimeter of ΔDEF.



EXERCISE 3.4

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.

NCERT TEXTUAL EXERCISES AND ASSIGNMENTS

(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.

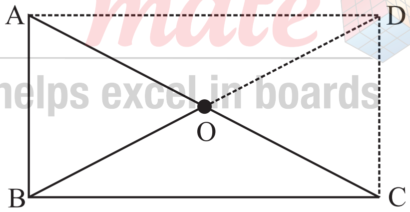
(i) bisect each other

(ii) are perpendicular bisectors of each other

(iii) are equal

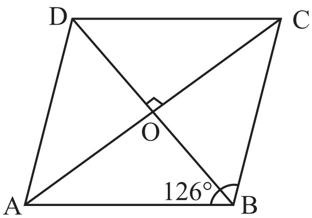
5. Explain why a rectangle is a convex quadrilateral.

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).



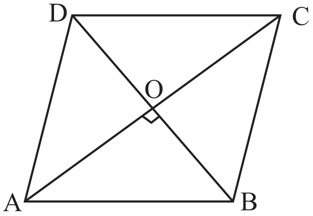
Test Yourself - UQ4

1. ABCD is a rhombus with ∠ABC = 126°. Determine ∠ACD.



2. ABCD is a square. Determine ∠DCA.

3. The diagonals of a rhombus are 6 cm and 8 cm. Find the length of a side of the rhombus.



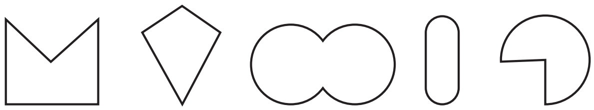
4. ABCD is a rhombus with ∠ABC = 56°. Determine ∠CAD.
5. ABCD is a trapezium and ABED is a square. If BE = EC, find: (a) ∠BAE (b) ∠ABC (c) What shape is the figure ABCE?
6. ABCD is a kite and ∠A = ∠C. If ∠CAD = 70°, ∠CBD = 65°, find: (a) ∠BCD (b) ∠ADC.

ANSWERS

NCERT Textual Exercises and Assignments

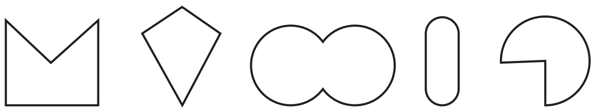
Exercise – 3.1

1. (a) Simple curve



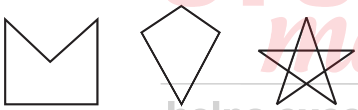
(1) (2) (5) (6) (7)

(b) Simple closed curve



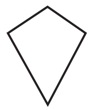
(1) (2) (5) (6) (7)

(c) Polygons



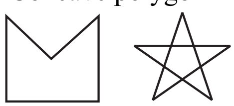
(1) (2) (4)

(d) Convex polygons



(1)

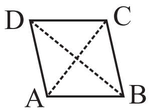
(e) Concave polygon



(1) (4)

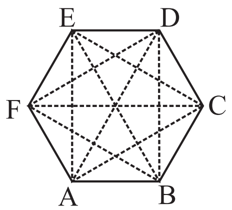
2. (a) A convex quadrilateral has two diagonals.

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) A triangle has no diagonal.

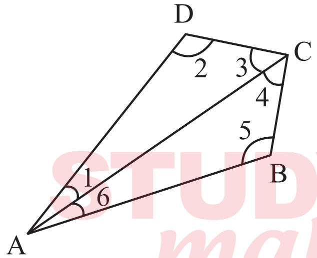
3. Let ABCD is a convex quadrilateral, then we draw a diagonal AC which divides the quadrilateral in two triangles.

$\angle A + B + \angle C + \angle D = \angle 1 + \angle 6 + \angle 5 + \angle 4 + \angle 3 + \angle 2$

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

$= 180° + 180°$[By Angle sum property of triangle]

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



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

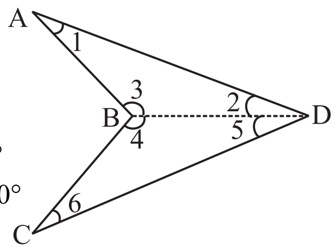
Let ABCD is a non-convex quadrilateral and join BD, which also divides the quadrilateral in two triangles.

Using angle sum property of triangle,

In DABD,

$\angle 1 + \angle 2 + \angle 3 = 180°$ ...(i)

$\angle 4 + \angle 5 + \angle 6 = 180°$ ...(ii)



Adding equation (i)and (ii),

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

$\Rightarrow \quad \angle 1 + \angle 2 + (\angle 3 + \angle 4) + \angle 5 + \angle 6 = 360°$

$\Rightarrow \quad \angle A + \angle B + \angle C + \angle D = 360°$

Hence proved.

4. (a) When $n = 7$, then

Angle sum of a polygon $= (n - 2) \times 180° = 5 \times 180° = 900°$

(b) When $n = 8$, then

Angle sum of a polygon $= (n - 2) \times 180° = (8 - 2) \times 180° = 6 \times 180$ $=1080°$

(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**.

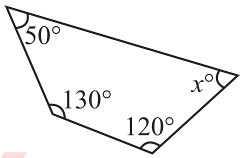
(ii) 4 sides

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,



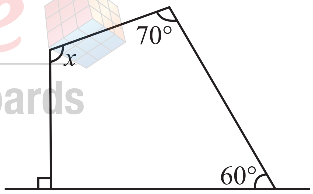
$50° + 130° + 120° + x = 360°$

$\Rightarrow 300° + x = 360°$

$\Rightarrow x = 360° - 300$

$\Rightarrow x = 60°$

(b) Using angle sum property of a quadrilateral,



$90° + 60° + 70° + x = 360°$

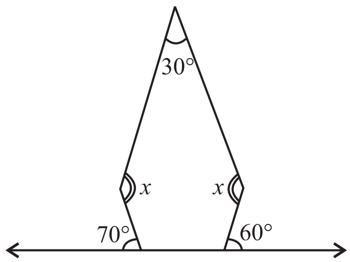
$\Rightarrow 220° + x = 360°$

$\Rightarrow x = 360° - 220$

$\Rightarrow x = 140°$

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

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



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

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

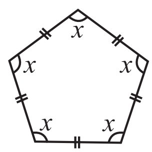
$\therefore 30° + x + 110° + 120° + x = 540°$

$\Rightarrow 260° + 2x = 540°$

$\Rightarrow 2x = 280°$

$\Rightarrow x = 140°$

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



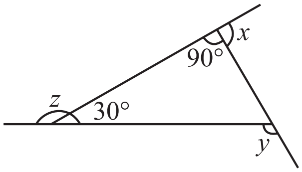
$= (5 - 2) \times 180° = 3 \times 180° = 540°$

$\therefore x + x + x + x + x = 540°$

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

Hence each interior angle is 108°.

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



$\therefore$ $90° + x = 180$

$\Rightarrow$ $x = 180° - 90° = 90°$

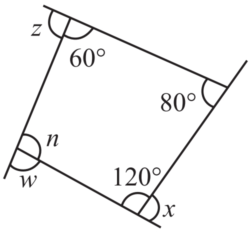
and $z + 30° = 180°$

$\Rightarrow$ $z = 180° - 30° = 150°$

Also $y = 90° + 30° = 120°$ [Exterior angle property]

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

(b) Using angle sum property of a quadrilateral,



$60° + 80° + 120° + \text{n} = 360°$

$\Rightarrow$ $260° + n = 360°$

$\Rightarrow$ $n = 360° - 260°$

$\Rightarrow$ $n = 100°$

Since sum of linear pair angles is 180°

$\therefore$ $w + 100 = 180°$ ....(i)

$x + 120° = 180°$ ....(ii)

$y + 80° = 180°$ ...(iii)

$z + 60° = 180°$ ...(vi)

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

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

$\Rightarrow$ $x + y + z + w + 360° = 720°$

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

$\Rightarrow$ $x + y + z + w = 360°$

Test Yourself - UQ1

1. (i) 80° (ii) 40°

(iii) 233°

2. 360º

3. Sum = 540º

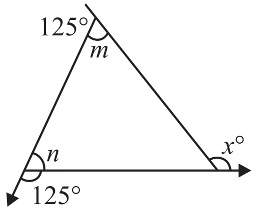
4. 70°, 70°, 70°

5. 167°

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,

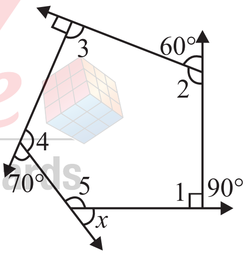
$\angle 1 + 90° = 180°$ ...(i)

$\angle 2 + 60° = 180°$ ...(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 $= (n - 2) \times 180°$

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

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

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

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

3. Let number of sides be n.

Sum of exterior angles of a regular polygon = 360°

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

Hence, the regular polygon has 15 sides.

4. Let number of sides be n.

Exterior angle = 180° – 165° = 15°

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

Hence, the regular polygon has 24 sides.

5. (a) No. (since 22 is not a divisor of 360°)

(b) No, (Because each exterior angle is 180° – 22° = 158°, which is not a divisor of 360°)

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

$\because$ Sum of all the angles of a triangle = 180°

$\therefore$ $x + x + x = 180°$

$\Rightarrow$ $3x = 180°$

$\Rightarrow$ $x = 60°$

(b) By (a), we can observe that the greatest exterior angle is 180° – 60° = 120°.

Test Yourself - UQ2

1. 90°

2. 130°

3. 60°

4. 91°

5. 133°

6. 2°

7. 88°, 68°, 92°

8. 190°

9. $x + 2x + 13 + 3x + 10 + x - 1 = 360°$

$7x + 17 = 360°$

$7x = 360° - 17$

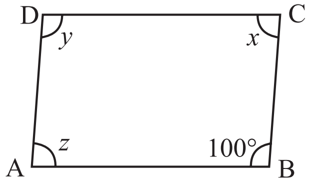
$7x = 343°$

$x = \dfrac{343}{7}$

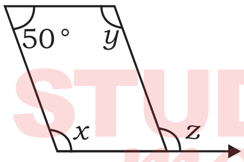
$x = 49°$

Exercise – 3.3

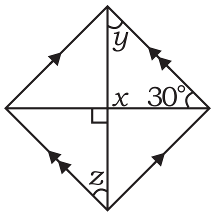
1. (i) AD = BC [Since opposite sides of a parallelogram are equal]
   (ii) $\angle DCB = \angle DAB$ [Since opposite angles of a parallelogram are equal]
   (iii) OC = OA [since diagonals of a parallelogram bisect each other]
   (iv) $m\angle DAB + m\angle CDA = 180°$ [Adjacent angles in a parallelogram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



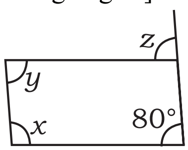
$\Rightarrow$ $100° + x = 180°$
$\Rightarrow$ $x = 180° - 100° = 80°$
and $z = x = 80°$ [Since opposite angles of a parallelogram are equal]



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]

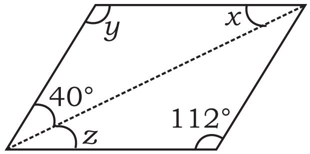


$\Rightarrow$ $y + x + 30° = 180°$ [Angle sum property of a triangle]
$\Rightarrow$ $y + 90° + 30° = 180°$
$\Rightarrow$ $y + 120 = 180°$
$\Rightarrow$ $y = 180° - 120° = 60°$
$\Rightarrow$ $z = y = 60°$ [Alternate angles]
(iv) $z = 80°$ [Corresponding angles]



$\Rightarrow$ $x + 80° = 180°$ [Adjacent angles in a || gm are supplementary]
$\Rightarrow$ $x = 180° - 80° = 100°$
and $y = 80°$ [Opposite angles are equal in a ||gm]

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



$\Rightarrow$ $y = 112°$ [Opposite angles are equal in a || gm]

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

$\Rightarrow$ $40° + 112° + x = 180°$

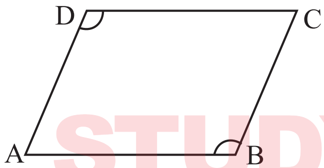
$\Rightarrow$ $152° + x = 180°$

$\Rightarrow$ $x = 180° – 152° = 28°$

and $z = x = 28°$ [alternate angles]

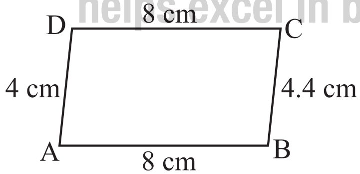
3. (i) $\angle D + \angle B = 180°$

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.

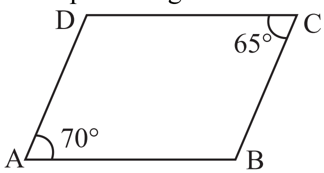
So, it is not a parallellogram.



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

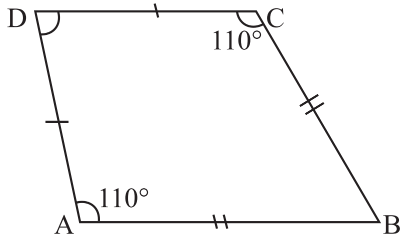
Since opposite angles are equal in parallelogram and here opposite angles are not equal in quadrilateral ABCD.

Therefore it is not a parallelogram.



4. ABCD is a quadrilateral in which angles $\angle A = \angle C = 110°$.

Therefore, it could be a kite.

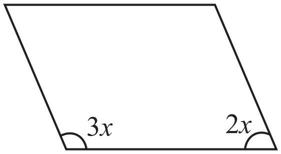


5. Let two adjacent angles be $3x$ and $2x$.

   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°.

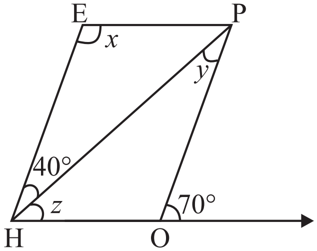
7. Here $\angle HOP = 180° - 70° = 110°$ [Angle of linear pair]

   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]

   $\Rightarrow \quad 40° + z = 70° \quad \Rightarrow \quad z = 70° - 40° = 30°$

8. (i) In parallelogram GUNS,

GS = UN [Opposite sides of parallelogram are equal]

$\Rightarrow$ $3x = 18$ $\quad x = \dfrac{18}{3} = 6$ cm

Also GU = SN [Opposite sides of parallelogram are equal]

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

$\Rightarrow$ $3y = 27$ $\quad \Rightarrow y = \dfrac{27}{3} = 9$ cm

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

(ii) In parallelogram RUNS,

$y + 7 = 20$ [Diagonals of || gm bisects each other]

$\Rightarrow$ $y = 20 - 7 = 13$ cm

And $x + y = 16$ $\Rightarrow$ $x + 13 = 16$ $\Rightarrow$ $x = 16 - 3$

$\Rightarrow$ $x = 3$ cm

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

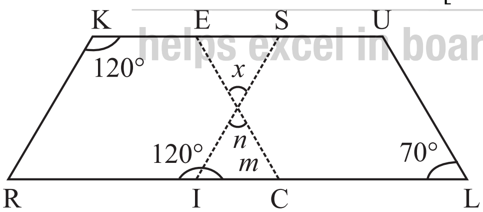
9. In parallelogram RISK,

$\angle RIS = \angle K = 120°$ [Opposite angles of a ||gm are equal]

$\angle m + 120° = 180°$ [Linear pair]

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

And $\angle ECl = \angle L = 70°$ [Corresponding angles]



$\Rightarrow$ $m + n + \angle ECl = 180°$ [Angle sum property of a triangle]

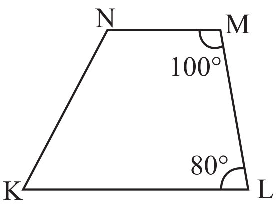
$\Rightarrow$ $60° + n + 70° = 180°$

$\Rightarrow$ $130° + n = 180°$

$\Rightarrow$ $n = 180° - 130° = 50°$

Also $x = n = 50°$ [Vertically opposite angles]

10. Here, $\angle M + \angle L = 100° + 80° = 180°$

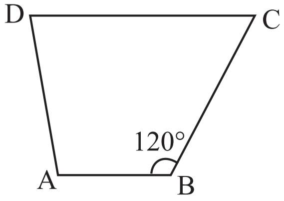


[Sum of interior opposite angle is 180°]

$\therefore$ NM and KL are parallel

Hence, KLMN is a trapezium.

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



$\therefore \quad 120 + m\angle C = 180°$

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

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

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

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

$\Rightarrow \quad \angle P = 50°$

$\therefore \quad \angle R = 90°$

$\therefore \quad \angle S + 90° = 180°$

$\Rightarrow \quad \angle S = 180° - 90°$

$\Rightarrow \quad \angle S = 90°$

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

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

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

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

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

$\Rightarrow \quad \angle P = 50°.$

Test Yourself - UQ3

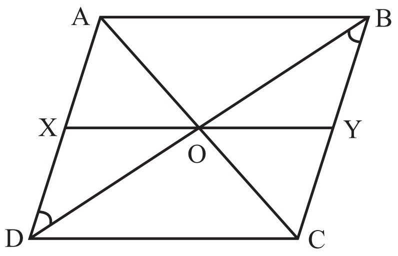
1. 40°, 60°, 100°, 160°

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°