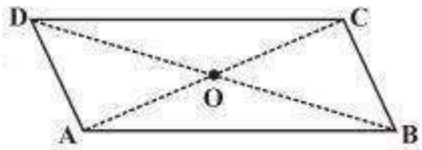
EXERCISE 3.3

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



(i) AD = …… (ii) ∠DCB = ……

(iii) OC = …… (iv) m ∠DAB + m ∠CDA = ……

Solution:

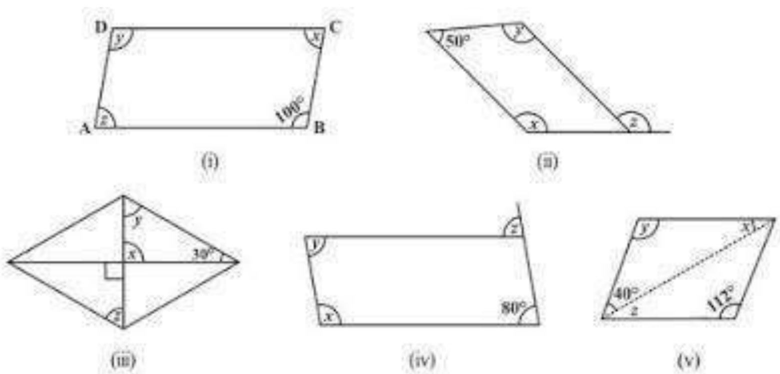
(i) AD = BC (Opposite sides of a parallelogram are equal)

(ii) ∠DCB = ∠DAB (Opposite angles of a parallelogram are equal)

(iii) OC = OA (Diagonals of a parallelogram are equal)

(iv) m ∠DAB + m ∠CDA = 180°

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



Solution:

(i)

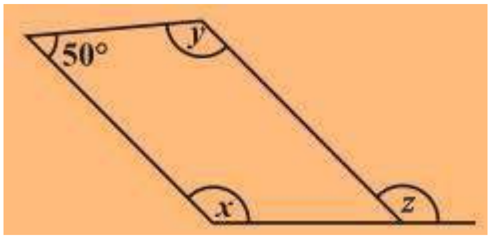
y = 100° (opposite angles of a parallelogram)

$x + 100° = 180°$ (adjacent angles of a parallelogram)

$\Rightarrow x = 180° – 100° = 80°$

$x = z = 80°$ (opposite angles of a parallelogram)

$\therefore$, $x = 80°$, $y = 100°$ and $z = 80°$

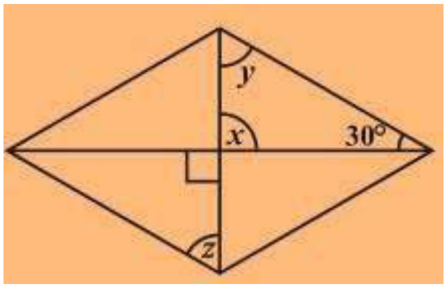


(ii)

$50° + x = 180° \Rightarrow x = 180° – 50° = 130°$ (adjacent angles of a parallelogram) $x = y = 130°$ (opposite angles of a parallelogram)

$x = z = 130°$ (corresponding angle)

(iii)



$x = 90°$ (vertical opposite angles)

$x + y + 30° = 180°$ (angle sum property of a triangle)

$\Rightarrow 90° + y + 30° = 180°$

$\Rightarrow y = 180° – 120° = 60°$

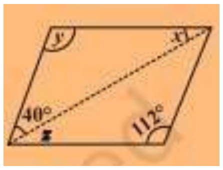
also, $y = z = 60°$ (alternate angles)

(iv)

z = 80° (corresponding angle) z = y = 80° (alternate angles) x + y = 180° (adjacent angles)

⇒ x + 80° = 180° ⇒ x = 180° – 80° = 100°

(v)



x=28o

y = 112o z = 28o

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°?

Solution:

(i) Yes, a quadrilateral ABCD can be a parallelogram if ∠D + ∠B = 180° but it should also fulfil some conditions, which are:

(a) The sum of the adjacent angles should be 180°.

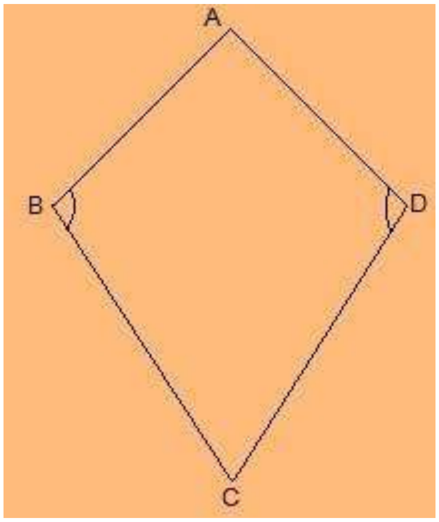
(b) Opposite angles must be equal.

(ii) No, opposite sides should be of the same length. Here, AD ≠ BC

(iii) No, opposite angles should be of the same measures. ∠A ≠ ∠C

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

Solution:



ABCD is a figure of quadrilateral that is not a parallelogram but has exactly two opposite angles, that is, ∠B = ∠D of equal measure. It is not a parallelogram because ∠A ≠ ∠C.

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.

Solution:

Let the measures of two adjacent angles ∠A and ∠B be 3x and 2x, respectively in

parallelogram ABCD.

∠A + ∠B = 180°

⇒ 3x + 2x = 180°

⇒ 5x = 180°

⇒ x = 36°

We know that opposite sides of a parallelogram are equal.

∠A = ∠C = 3x = 3 × 36° = 108°

∠B = ∠D = 2x = 2 × 36° = 72°

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

Solution:

Let ABCD be a parallelogram.

Sum of adjacent angles of a parallelogram = 180°

$\angle A + \angle B = 180°$

$\Rightarrow 2\angle A = 180°$

$\Rightarrow \angle A = 90°$

also, $90° + \angle B = 180°$

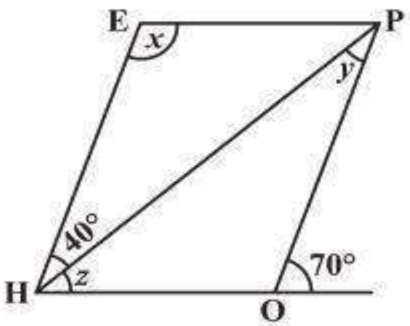
$\Rightarrow \angle B = 180° – 90° = 90°$

$\angle A = \angle C = 90°$

$\angle B = \angle D = 90$

°

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



Solution:

y = 40° (alternate interior angle)

$\angle P = 70°$ (alternate interior angle)

$\angle P = \angle H = 70°$ (opposite angles of a parallelogram)

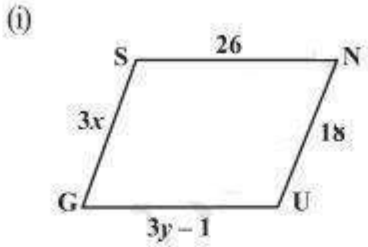
$z = \angle H – 40° = 70° – 40° = 30°$

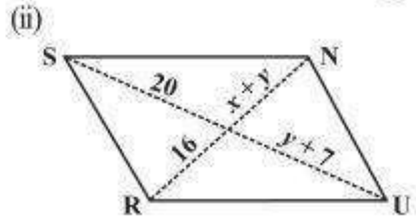
$\angle H + x = 180°$

$\Rightarrow 70° + x = 180°$

$\Rightarrow x = 180° – 70° = 110°$

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





Solution:

(i) SG = NU and SN = GU (opposite sides of a parallelogram are equal) 3x = 18

x = 18/3

⇒ x =6

3y – 1 = 26

⇒ 3y = 26 + 1

⇒ y = 27/3=9

x = 6 and y = 9

(ii) 20 = y + 7 and 16 = x + y (diagonals of a parallelogram bisect each other) y + 7 = 20

⇒ y = 20 – 7 = 13 and,

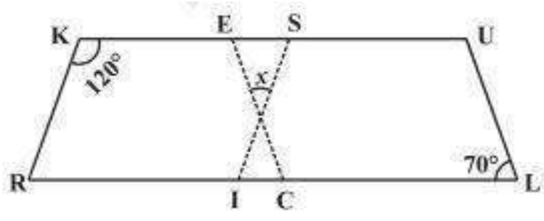
x + y = 16

⇒ x + 13 = 16

⇒ x = 16 – 13 = 3

x = 3 and y = 13

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



Solution:

∠K + ∠R = 180° (adjacent angles of a parallelogram are supplementary)

$\Rightarrow 120° + \angle R = 180°$

$\Rightarrow \angle R = 180° – 120° = 60°$

also, $\angle R = \angle SIL$ (corresponding angles)

$\Rightarrow \angle SIL = 60°$

also, $\angle ECR = \angle L = 70°$ (corresponding angles) $x + 60° + 70° = 180°$ (angle sum of a triangle)

$\Rightarrow x + 130° = 180°$

$\Rightarrow x = 180° – 130° = 50°$

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

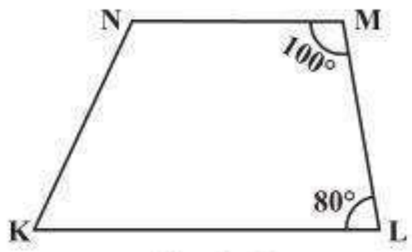


Fig 3.32

Solution:

When a transversal line intersects two lines in such a way that the sum of the adjacent angles on the same side of transversal is 180°, then the lines are parallel to each other. Here, $\angle M + \angle L = 100° + 80° = 180°$

Thus, MN || LK

As the quadrilateral KLMN has one pair of parallel lines, it is a trapezium. MN and LK are parallel lines.

11. Find m∠C in Fig 3.33 if AB || DC.

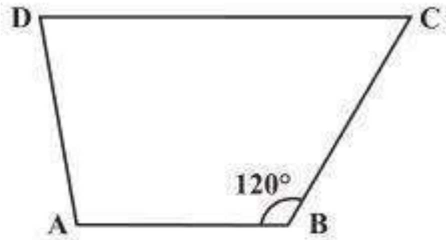


Fig 3.33

Solution:

m∠C + m∠B = 180° (angles on the same side of transversal)

⇒ m∠C + 120° = 180°

⇒ m∠C = 180°- 120° = 60°

12. Find the measure of ∠P and ∠S if SP || RQ ? in Fig 3.34. (If you find m∠R, is there more than one method to find m∠P?)

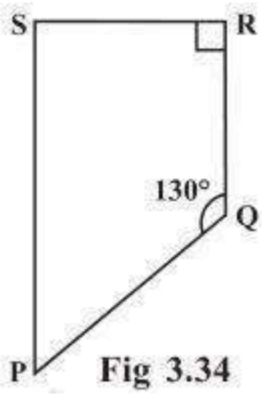


Fig 3.34

Solution:

∠P + ∠Q = 180° (angles on the same side of transversal)

⇒ ∠P + 130° = 180°

⇒ ∠P = 180° – 130° = 50°

also, ∠R + ∠S = 180° (angles on the same side of transversal)

⇒ 90° + ∠S = 180°

⇒ ∠S = 180° – 90° = 90°

Thus, ∠P = 50° and ∠S = 90°

Yes, there are more than one method to find m∠P.

PQRS is a quadrilateral. Sum of measures of all angles is 360°.

Since, we know the measurement of ∠Q, ∠R and ∠S.

∠Q = 130°, ∠R = 90° and ∠S = 90°

∠P + 130° + 90° + 90° = 360°

⇒ ∠P + 310° = 360°

⇒ $\angle P = 360° – 310° = 50°$