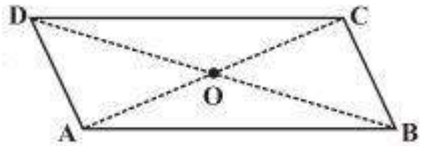
Exercise 3.3 Page: 50

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

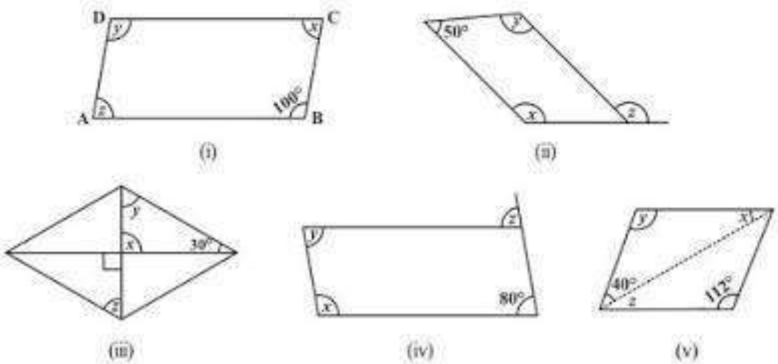


(i) AD = ... (ii) ∠DCB = ...
(iii) OC = ... (iv) m ∠DAB + m ∠CDA = ...

Solution:

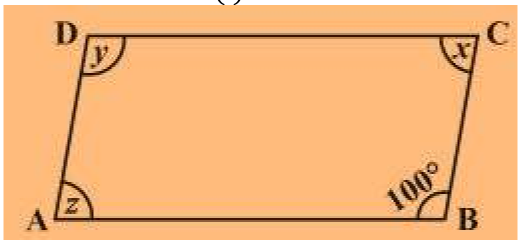
(i) AD = BC (Opposite sides of a parallelogram are equal)
(ii) ∠DCB = ∠DAB (Opposite angles of a parallelogram are equal)
(iii) OC = OA (Diagonals of a parallelogram are equal)
(iv) m ∠DAB + m ∠CDA = 180°

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



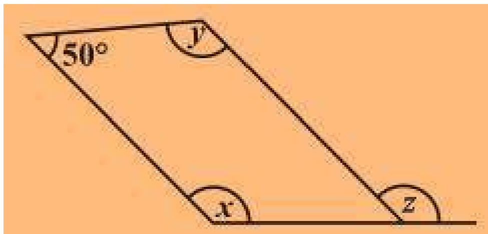
Solution:

(i)



y = 100° (opposite angles of a parallelogram)
x + 100° = 180° (Adjacent angles of a parallelogram)
⇒ x = 180° - 100° = 80°
x = z = 80° (opposite angles of a parallelogram)
∴, x = 80°, y = 100° and z = 80°

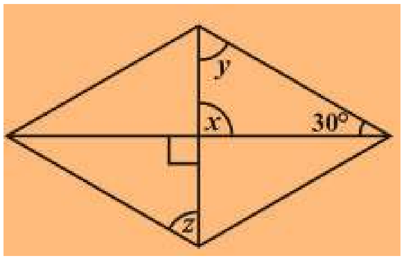
(ii)



$50° + x = 180° \Rightarrow x = 180° - 50° = 130°$ (Adjacent angles of a parallelogram)

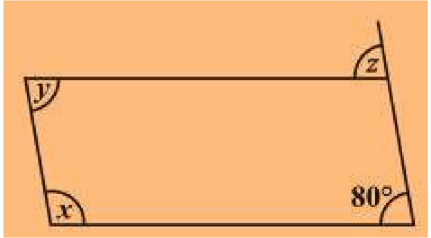
$x = y = 130°$ (opposite angles of a parallelogram)
$x = z = 130°$ (corresponding angle)

(iii)



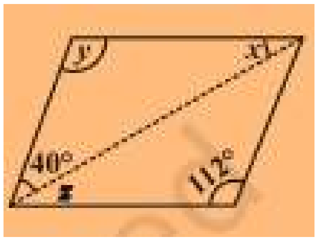
$x = 90°$ (vertical opposite angles)
$x + y + 30° = 180°$ (angle sum property of a triangle)
$\Rightarrow 90° + y + 30° = 180°$
$\Rightarrow y = 180° - 120° = 60°$
also, $y = z = 60°$ (alternate angles)

(iv)



$z = 80°$ (corresponding angle)
$z = y = 80°$ (alternate angles)
$x + y = 180°$ (adjacent angles)
$\Rightarrow x + 80° = 180° \Rightarrow x = 180° - 80° = 100°$

(v)



$x=28^o$

$y = 112^o$
$z = 28^o$

3. Can a quadrilateral ABCD be a parallelogram if

(i) $\angle D + \angle B = 180°$?
(ii) AB = DC = 8 cm, AD = 4 cm and BC = 4.4 cm?
(iii) $\angle A = 70°$ and $\angle C = 65°$?

Solution:

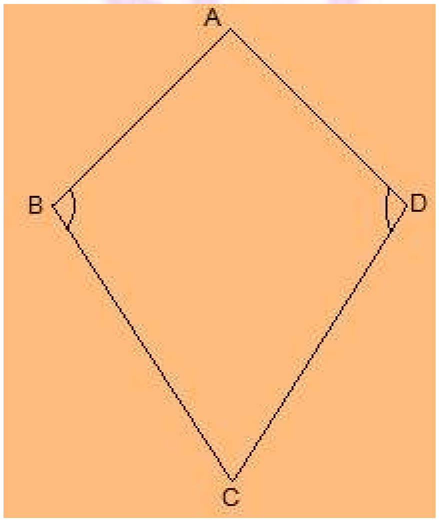
(i) Yes, a quadrilateral ABCD be a parallelogram if $\angle D + \angle B = 180°$ but it should also fulfilled some conditions which are:
- The sum of the adjacent angles should be 180°.
- Opposite angles must be equal.

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

(iii) No, opposite angles should be of same measures. $\angle A \neq \angle C$

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 $\angle B = \angle D$ of equal measure. It is not a parallelogram because $\angle A \neq \angle C$.

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 $\angle A$ and $\angle B$ be 3x and 2x respectively in parallelogram ABCD.
$\angle A + \angle B = 180°$
$\Rightarrow 3x + 2x = 180°$

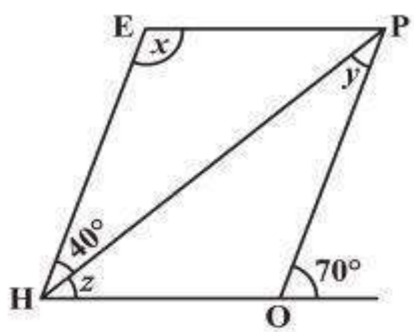
$\Rightarrow 5x = 180°$
$\Rightarrow x = 36°$
We know that opposite sides of a parallelogram are equal.
$\angle A = \angle C = 3x = 3 \times 36° = 108°$
$\angle B = \angle D = 2x = 2 \times 36° = 72°$

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, $90° + \angle B = 180°$
$\Rightarrow \angle B = 180° - 90° = 90°$
$\angle A = \angle C = 90°$
$\angle B = \angle D = 90°$

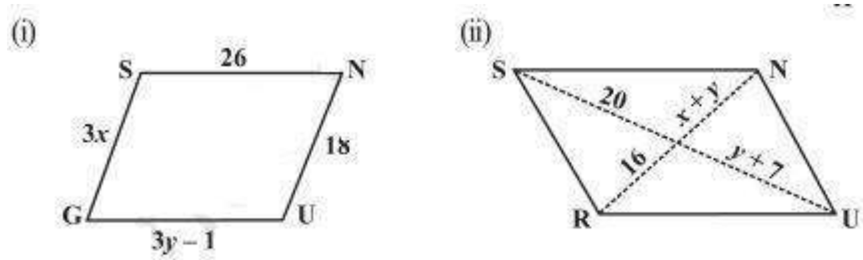
7. The adjacent figure HOPE is a parallelogram. Find the angle measures x, y and z. State the properties you use to find them.



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)

$3x = 18$

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

$3y - 1 = 26$ and,

$\Rightarrow 3y = 26 + 1$

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

$x = 6$ and $y = 9$

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

$y + 7 = 20$

$\Rightarrow y = 20 - 7 = 13$ and,

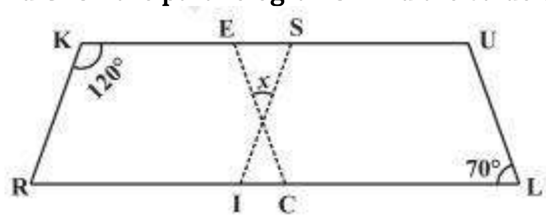
$x + y = 16$

$\Rightarrow x + 13 = 16$

$\Rightarrow x = 16 - 13 = 3$

$x = 3$ and $y = 13$

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



Solution:

$\angle K + \angle R = 180°$ (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)

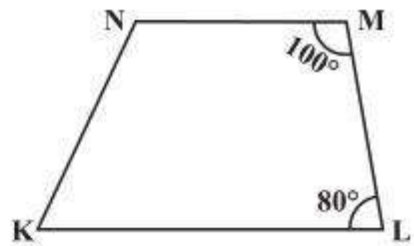


Fig 3.32

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 line therefore it is a trapezium.
MN and LK are parallel lines.

11. Find m∠C in Fig 3.33 if AB || DC ?

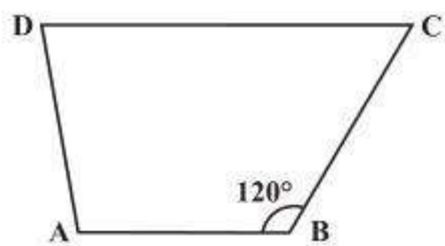


Fig 3.33

Solution:

$m\angle C + m\angle B = 180°$ (angles on the same side of transversal)
$\Rightarrow m\angle C + 120° = 180°$
$\Rightarrow m\angle C = 180° - 120° = 60°$

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?)

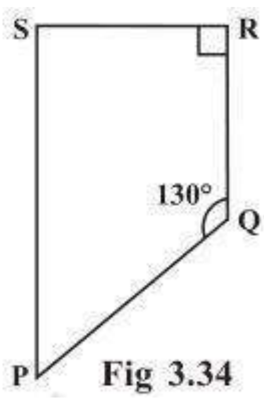


Fig 3.34

Solution:

$\angle P + \angle Q = 180°$ (angles on the same side of transversal)
$\Rightarrow \angle P + 130° = 180°$
$\Rightarrow \angle P = 180° - 130° = 50°$
also, $\angle R + \angle S = 180°$ (angles on the same side of transversal)
$\Rightarrow 90° + \angle S = 180°$
$\Rightarrow \angle S = 180° - 90° = 90°$
Thus, $\angle P = 50°$ and $\angle S = 90°$

Yes, there are more than one method to find m$\angle$P.
PQRS is a quadrilateral. Sum of measures of all angles is 360°.
Since, we know the measurement of $\angle Q$, $\angle R$ and $\angle S$.
$\angle Q = 130°$, $\angle R = 90°$ and $\angle S = 90°$
$\angle P + 130° + 90° + 90° = 360°$
$\Rightarrow \angle P + 310° = 360°$
$\Rightarrow \angle P = 360° - 310° = 50°$