1. Given a parallelogram ABCD. Complete each statement along with the definition or property used.
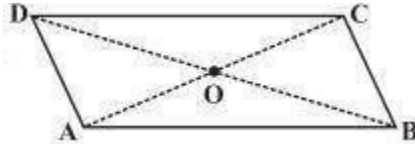
   (i) AD = ...   (ii) ∠DCB = ...
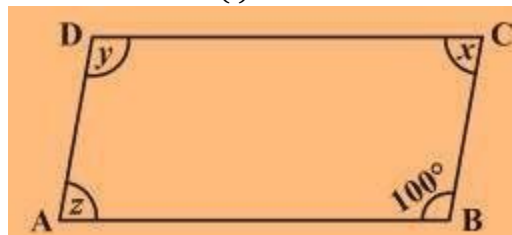   (iii) OC = ...   (iv) m ∠DAB + m ∠CDA = ...

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
   (iv) m ∠DAB + m ∠CDA = 180°
                                    equal)

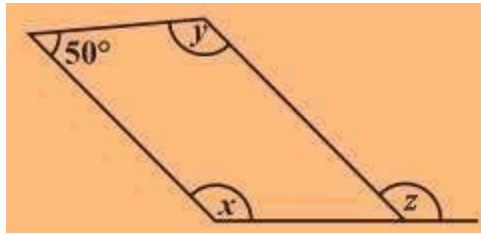2. Consider the following parallelograms. Find the values of the unknowns x, y, z.
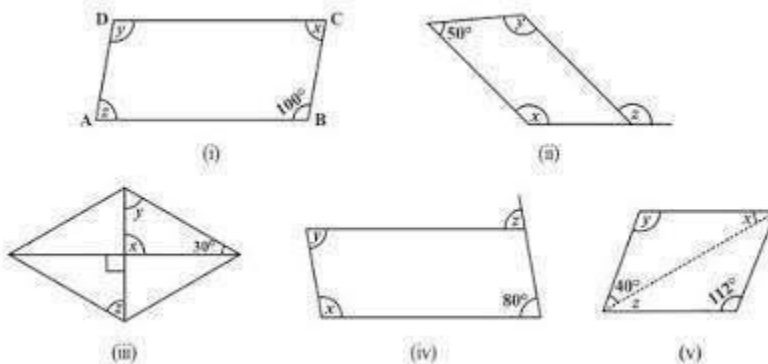
Solution:

(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° ⇒ x = 180° - 50° = 130° (Adjacent angles of a parallelogram)
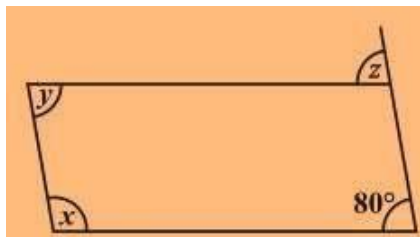
x = y = 130° (opposite angles of a parallelogram) x
= z = 130° (corresponding angle)

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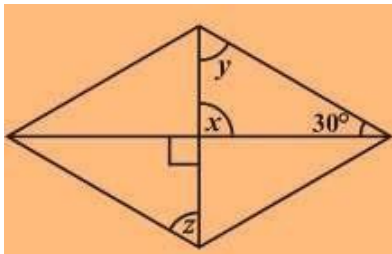
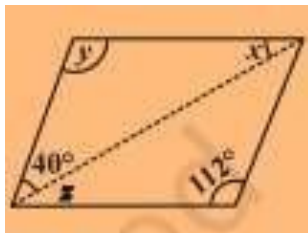x = 90° (vertical opposite angles)
x + y + 30° = 180° (angle sum property of a triangle)
⇒ 90° + y + 30° = 180° ⇒ y =
180° - 120° = 60° also, y = z = 60°
(alternate angles)

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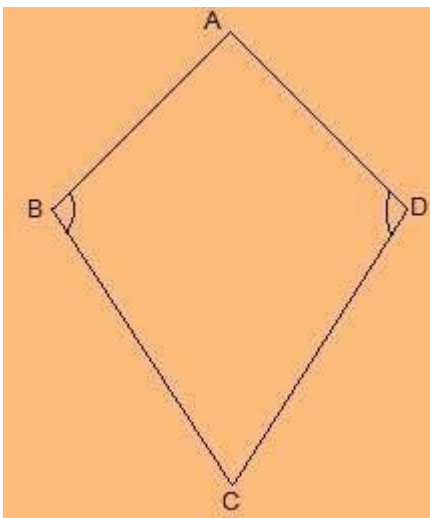
ABCD is a figure of quadrilateral that is not a parallelogram but has exactly two opposite angles that is ∠B = ∠D of equal measure. It is not a parallelogram because ∠A ≠ ∠C.

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°

∠A + ∠B = 180°

⇒ 2∠A = 180°

⇒ ∠A = 90°

also, 90° + ∠B = 180°

⇒ ∠B = 180° -

∠A = ∠C = 90°

∠B = ∠D = 90°90° = 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.
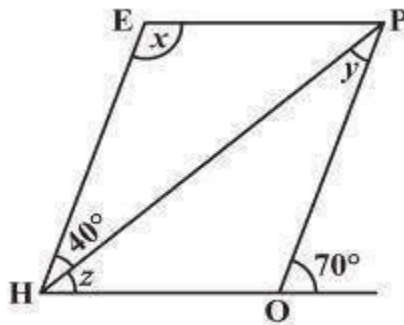
Solution:

y = 40° (alternate interior angle)

∠P = 70° (alternate interior angle)

∠P = ∠H = 70° (opposite angles of a parallelogram)
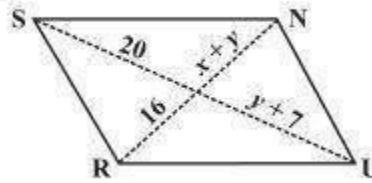
z = ∠H -40°= 70° - 40° = 30°

∠H + x = 180°

⇒ 70° + x = 180°

⇒ x = 180° - 70° = 110°

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

(i)
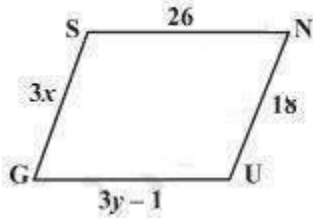
(ii)

Solution:

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

$$\frac{18}{3} = 6$$
3y - 1 = 26 and,
⇒ 3y = 26 + 1
$$⇒ y = \frac{27}{3} = 9$$
x = 6 and y = 9

 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.
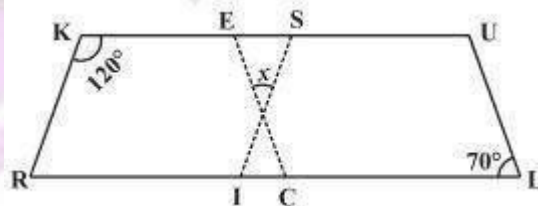
Solution:

3x = 18

⇒ x =

ii)

∠K + ∠R = 180° (adjacent angles of a parallelogram are supplementary)
⇒ 120° + ∠R = 180°
⇒ ∠R = 180° -120° = 60°
also, ∠R = ∠SIL (corresponding angles)
⇒ ∠SIL = 60°
also, ∠ECR = ∠L = 70°(corresponding angles)
x + 60° + 70° = 180° (angle sum of a triangle)
⇒ x + 130° = 180°
⇒ x = 180° - 130° = 50°

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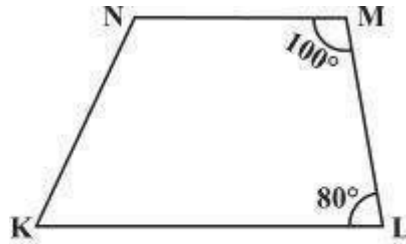

Fig 3.32

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, ∠M + ∠L = 100° + 80° = 180°
Thus, MN || LK
As the quadrilateral KLMN has one pair of parallel line therefore it is a trapezium.
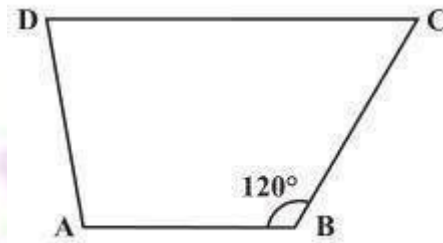MN and LK are parallel lines.

m∠C in Fig 3.33 if AB || DC ?

Fig 3.33

m∠C + m∠B = 180° (angles on the same side of transversal)
⇒ m∠C + 120° = 180°
⇒ m∠C = 180°- 120° = 60°

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?)
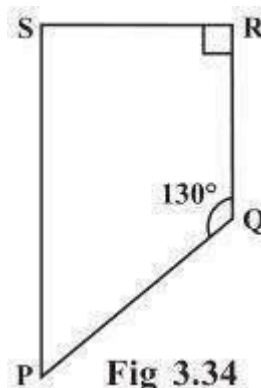
Fig 3.34

11. Find

Solution:

12.

∠P + ∠Q = 180° (angles on the same side of transversal)
⇒ ∠P + 130° = 180°
          also, ∠R + ∠S = 180° (angles on the
⇒ ∠P = 180° -130° = 50° ⇒ 90° + ∠S = 180°   same
                                    side of transversal)
⇒ ∠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° =
⇒ ∠P + 310° = 360°   360°
⇒ ∠P = 360° -310° = 50°