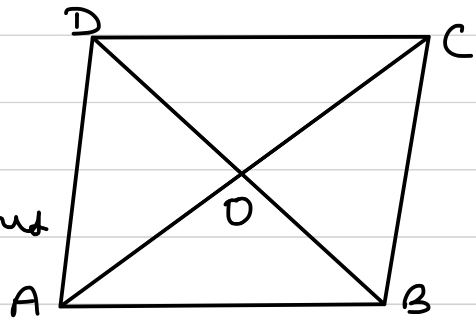
Understanding Quadrilaterals Ex. 3.4

Ex. 3.4

1. (B) 5 cm



$AC = 6$ cm

$BD = 8$ cm

Diagonals of a rhombus bisect each other at 90°

$\therefore OA = OC = \frac{AC}{2} = \frac{6}{2} = 3$ cm

$OB = OD = \frac{BD}{2} = \frac{8}{2} = 4$ cm

$\angle AOB = 90°$

Using Pythagoras th^m in $\triangle AOB$

$AB^2 = OA^2 + OB^2$

or $AB^2 = 3^2 + 4^2$

or $AB^2 = 9 + 16$

or $AB^2 = 25$

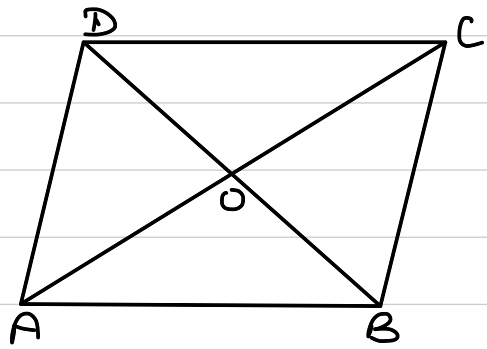
Taking square root on both sides

$AB = 5$ cm

2. (A) In a rhombus, the diagonals are equal.

Correct statement : In a rhombus, the diagonals are unequal.

3. Given – In rhombus ABCD, $AC = 14$ cm and $BD = 48$ cm.



Find – length of AB

Solution – The diagonals of a rhombus bisect each other at 90°

$\therefore\ OA = OC = \frac{AC}{2} = \frac{14}{2} = 7$ cm

$OB = OD = \frac{BD}{2} = \frac{48}{2} = 24$ cm

$\angle AOB = 90°$

Using Pythagoras thm in ΔAOB

$AB^2 = OA^2 + OB^2$

or $AB^2 = 7^2 + 24^2$

or $AB^2 = 49 + 576$

or $AB^2 = 625$

Taking square root on both sides

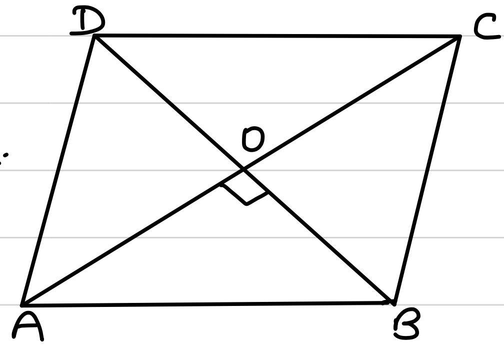
$AB = 25$ cm

$\therefore$ Side of rhombus $= 25$ cm

4. <u>Given</u> – In rhombus ABCD, $AC = 12$ cm and $BD = 16$ cm.

<u>Find</u> – length of AB

<u>Solution</u> – The diagonals of a rhombus bisect each other at $90°$



$\therefore\ OA = OC = \frac{AC}{2} = \frac{12}{2} = 6$ cm

$OB = OD = \frac{BD}{2} = \frac{16}{2} = 8$ cm

$\angle AOB = 90°$

Using Pythagoras thm in ΔAOB

$AB^2 = OA^2 + OB^2$

$AB^2 = 6^2 + 8^2$

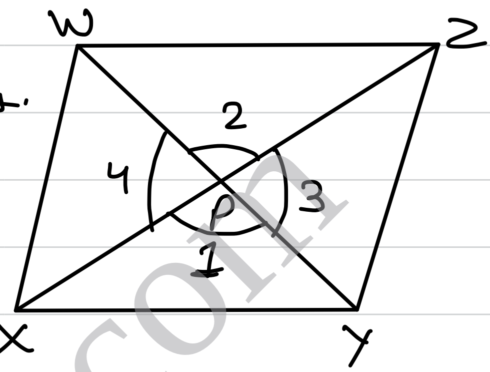
$AB^2 = 36 + 64$

$AB^2 = 100$

Taking square root on both sides

$AB = 10$ cm

$\therefore$ Side of rhombus $= 10$ cm



5. Given – XYZW is a rhombus. Diagonals XZ and YW intersect at P.

Solution –

a. Is $PY = PW$?

Yes, $PY = PW$, because diagonals of a rhombus bisect each other.

b. Is $PZ = PX$?

Yes, $PZ = PX$, because diagonals of a rhombus bisect each other.

c. Is $XZ = WY$?

No, $XZ \neq WY$, because the diagonals of rhombus are unequal.

d. Is $\triangle PXY \cong \triangle PZW$

Yes, $\triangle PXY \cong \triangle PZW$

In $\triangle PXY$ and $\triangle PZW$

$PX = PZ$ (diagonals bisect each other)

$\angle 1 = \angle 2$ (vertically opposite angles)

$PY = PW$ (diagonals bisect each other)

$\therefore \triangle PXY \cong \triangle PZW$ by SAS congruence

e. Is $\triangle PYZ \cong \triangle PWX$?

Yes, $\triangle PYZ \cong \triangle PWX$

In $\triangle PYZ$ and $\triangle PWX$

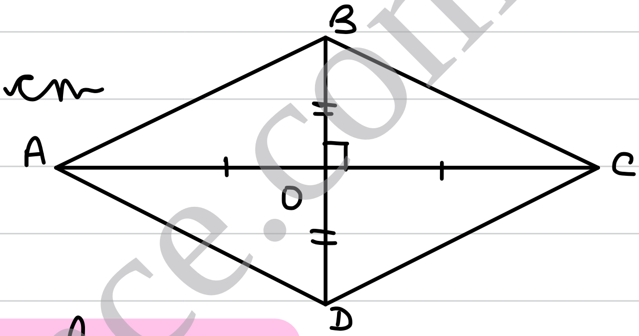
$PZ = PX$ (diagonals bisect each other)

$\angle 3 = \angle 4$ (vertically opposite angles)

$PY = PW$ (diagonals bisect each other)

$\therefore \triangle PYZ \cong \triangle PWX$ by SAS congruence.

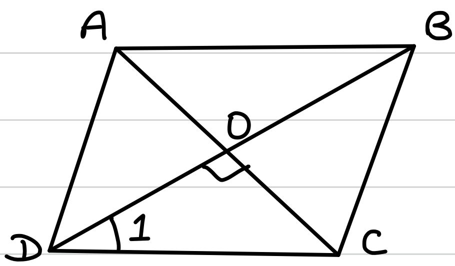
6. $AC = 8$ cm and $BD = 6$ cm bisect each other at point O and $AC \perp BD$.



$\therefore$ ABCD is a rhombus as the diagonals bisect each other at 90°

7. Given - In rhombus ABCD, $\angle ABC = 56^\circ$

Find - value of $\angle ACD$



Solution - Opposite angles of a rhombus are equal.

$\therefore \angle ADC = \angle ABC = 56^\circ$

The diagonals of a rhombus bisect the angles at each vertex.

$\therefore \angle 1 = \frac{1}{2}\angle ADC = \frac{1}{2} \times 56^\circ = 28^\circ$

In $\triangle OCD$, $\angle 1 + \angle DOC + \angle OCD = 180^\circ$

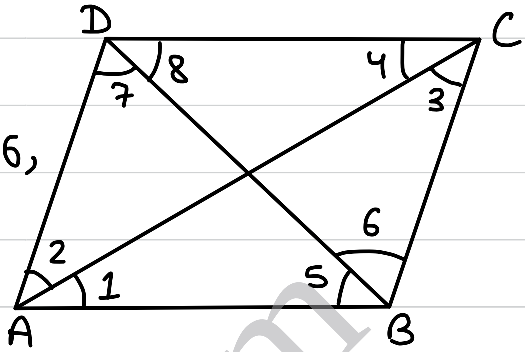
or $28^\circ + 90^\circ + \angle OCD = 180^\circ$

or $118^\circ + \angle OCD = 180^\circ$

or $\angle OCD = 180^\circ - 118^\circ$

or $\angle OCD = 62°$
or $\angle ACD = 62°$

8. <u>Given</u> – A rhombus ABCD.



<u>To prove</u> – $\angle 1 = \angle 2$, $\angle 3 = \angle 4$, $\angle 5 = \angle 6$, $\angle 7 = \angle 8$

<u>Proof</u> – In $\triangle ABC$ and $\triangle ADC$

$AB = AD$ (sides of a rhombus
$BC = CD$ are equal)
$AC = AC$ (common)

$\therefore \triangle ABC \cong \triangle ADC$ by SSS congruence

$\therefore \angle 1 = \angle 2$ (c.p.c.t)
$\angle 3 = \angle 4$

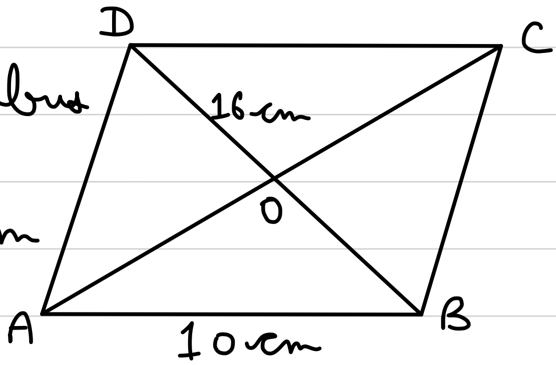
In $\triangle ABD$ and $\triangle CBD$

$AB = CB$ (sides of a rhombus
$AD = CD$ are equal)
$BD = BD$ (common)

$\therefore \triangle ABD \cong \triangle CBD$ by SSS congruence

$\therefore \angle 5 = \angle 6$ (c.p.c.t)
$\angle 7 = \angle 8$

9. <u>Given</u> – ABCD is a rhombus in which the diagonals intersect at O, $AB = 10$ cm and $BD = 16$ cm



<u>Find</u> – length of diagonal AC.

<u>Solution</u> – The diagonals of a rhombus bisect each other at $90°$

$\therefore$ $OB = \frac{1}{2} BD$

or $OB = \frac{1}{\cancel{2}} \times \cancel{16}^{8}$

or $OB = 8$ cm

$\angle AOB = 90°$

In $\triangle AOB$, using Pythagoras theorem

$AB^2 = OA^2 + OB^2$

or $10^2 = OA^2 + 8^2$

or $100 = OA^2 + 64$

or $100 - 64 = OA^2$

or $36 = OA^2$

Taking square root on both sides

$OA = 6$ cm

$OA = OC = 6$ cm (diagonals bisect each other)

$\therefore$ $AC = OA + OC$

or $AC = 6 + 6$

or $AC = 12$ cm

10a. A rhombus is a parallelogram in which adjacent sides are equal.

b. A rhombus has all the sides of equal length.

c. The diagonals of a rhombus bisect each other at right angle.

d. If the diagonals of a parallelogram bisect each other at right angles, then it is a rhombus.

e. In a rhombus opposite angles are equal.