

RD SHARMA

Solutions

Class 9 Maths

Chapter 14

Ex 14.2

Q1) Two opposite angles of a parallelogram are $(3x-2)^\circ$ and $(50-x)^\circ$. Find the measure of each angle of the parallelogram.

Solution:

We know that,

Opposite sides of a parallelogram are equal.

$$(3x-2)^\circ = (50-x)^\circ$$

$$\Rightarrow 3x + x = 50 + 2$$

$$\Rightarrow 4x = 52$$

$$\Rightarrow x = 13^\circ$$

$$\text{Therefore, } (3x-2)^\circ = (3 \cdot 13 - 2) = 37^\circ$$

$$(50-x)^\circ = (50-13) = 37^\circ$$

Adjacent angles of a parallelogram are supplementary.

$$\therefore x + 37 = 180^\circ$$

$$\therefore x = 180^\circ - 37^\circ = 143^\circ$$

Hence, four angles are : $37^\circ, 143^\circ, 37^\circ, 143^\circ$.

Q2) If an angle of a parallelogram is two-third of its adjacent angle, find the angles of the parallelogram.

Solution:

Let the measure of the angle be x .

Therefore, the measure of the angle adjacent is $\frac{2x}{3}$

We know that the adjacent angle of a parallelogram is supplementary.

$$\text{Hence, } x + \frac{2x}{3} = 180^\circ$$

$$2x + 3x = 540^\circ$$

$$\Rightarrow 5x = 540^\circ$$

$$\Rightarrow x = 108^\circ$$

Adjacent angles are supplementary

$$\Rightarrow x + 108^\circ = 180^\circ$$

$$\Rightarrow x = 180^\circ - 108^\circ = 72^\circ$$

$$\Rightarrow x = 72^\circ$$

Hence, four angles are $180^\circ, 72^\circ, 180^\circ, 72^\circ$

Q3) Find the measure of all the angles of a parallelogram, if one angle is 24° less than twice the smallest angle.

Solution:

$$x + 2x - 24 = 180^\circ$$

$$\Rightarrow 3x - 24 = 180^\circ$$

$$\Rightarrow 3x = 108^0 + 24$$

$$\Rightarrow 3x = 204^0$$

$$\Rightarrow x = \frac{204}{3} = 68^0$$

$$\Rightarrow x = 68^0$$

$$\Rightarrow 2x - 24^0 = 2 \cdot 68^0 - 24^0 = 112^0$$

Hence, four angles are $68^0, 112^0, 68^0, 112^0$.

Q4) The perimeter of a parallelogram is 22cm. If the longer side measures 6.5cm what is the measure of the shorter side?

Solution:

Let the shorter side be 'x'.

Therefore, perimeter = $x + 6.5 + 6.5 + x$ [Sum of all sides]

$$22 = 2(x + 6.5)$$

$$11 = x + 6.5$$

$$\Rightarrow x = 11 - 6.5 = 4.5\text{cm}$$

Therefore, shorter side = 4.5cm

Q5) In a parallelogram ABCD, $\angle D = 135^0$. Determine the measures of $\angle A$ and $\angle B$.

Solution:

In a parallelogram ABCD

Adjacent angles are supplementary

$$\text{So, } \angle D + \angle C = 180^0$$

$$\angle C = 180^0 - 135^0$$

$$\angle C = 45^0$$

In a parallelogram opposite sides are equal.

$$\angle A = \angle C = 45^0$$

$$\angle B = \angle D = 135^0$$

Q6) ABCD is a parallelogram in which $\angle A = 70^0$. Compute $\angle B$, $\angle C$ and $\angle D$.

Solution:

In a parallelogram ABCD

$$\angle A = 70^0$$

$$\angle A + \angle B = 180^0 \quad [\text{Since, adjacent angles are supplementary}]$$

$$70^0 + \angle B = 180^0 \quad [\because \angle A = 70^0]$$

$$\angle B = 180^0 - 70^0$$

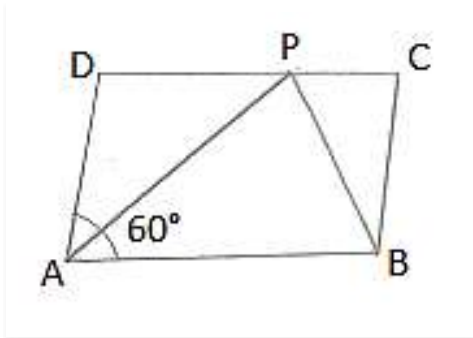
$$\angle B = 110^0$$

In a parallelogram opposite sides are equal.

$$\angle A = \angle C = 70^\circ$$

$$\angle B = \angle D = 110^\circ$$

Q7) In Figure 14.34, ABCD is a parallelogram in which $\angle A = 60^\circ$. If the bisectors of $\angle A$, and $\angle B$ meet at P, prove that $AD = DP$, $PC = BC$ and $DC = 2AD$.



Solution:

AP bisects $\angle A$

$$\text{Then, } \angle DAP = \angle PAB = 30^\circ$$

Adjacent angles are supplementary

$$\text{Then, } \angle A + \angle B = 180^\circ$$

$$\angle B + 60^\circ = 180^\circ$$

$$\angle B = 180^\circ - 60^\circ$$

$$\angle B = 120^\circ$$

BP bisects $\angle B$

$$\text{Then, } \angle PBA = \angle PBC = 30^\circ$$

$$\angle PAB = \angle APD = 30^\circ \quad [\text{Alternate interior angles}]$$

$$\text{Therefore, } AD = DP \quad [\text{Sides opposite to equal angles are in equal length}]$$

Similarly

$$\angle PBA = \angle BPC = 30^\circ \quad [\text{Alternate interior angles}]$$

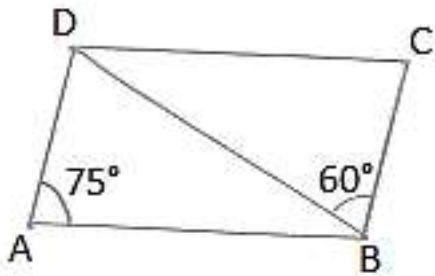
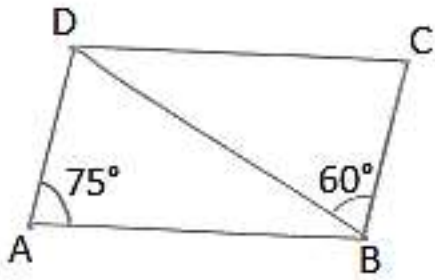
Therefore, $PC = BC$

$$DC = DP + PC$$

$$DC = AD + BC \quad [\text{Since, } DP = AD \text{ and } PC = BC]$$

$$DC = 2AD \quad [\text{Since, } AD = BC, \text{ opposite sides of a parallelogram are equal}]$$

Q8) In figure 14.35, ABCD is a parallelogram in which $\angle DAB = 75^\circ$ and $\angle DBC = 60^\circ$. Compute $\angle CDB$, and $\angle ADB$.



Solution:

To find $\angle CDB$ and $\angle ADB$

$$\angle CBD = \angle ABD = 60^\circ \quad [\text{Alternate interior angle. } AD \parallel BC \text{ and } BD \text{ is the transversal}]$$

In $\triangle BDC$

$$\angle CBD + \angle C + \angle CDB = 180^\circ \quad [\text{Angle sum property}]$$

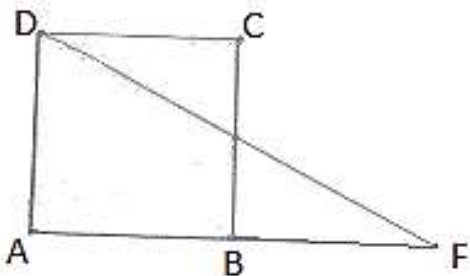
$$\Rightarrow 60^\circ + 75^\circ + \angle CDB = 180^\circ$$

$$\Rightarrow \angle CDB = 180^\circ - (60^\circ + 75^\circ)$$

$$\Rightarrow \angle CDB = 45^\circ$$

$$\text{Hence, } \angle CDB = 45^\circ, \angle ADB = 60^\circ$$

Q9) In figure 14.36, ABCD is a parallelogram and E is the mid-point of side BC. If DE and AB when produced meet at F, prove that $AF = 2AB$.



Solution:

In $\triangle BEF$ and $\triangle CED$

$\angle BEF = \angle CED$ [Verified opposite angle]
 $BE = CE$ [Since, E is the mid-point of BC]
 $\angle EBF = \angle ECD$ [Since, Alternate interior angles are equal]
 $\therefore \triangle BEF \cong \triangle CED$ [ASA congruence]
 $\therefore BF = CD$ [CPCT]
 $AF = AB + BF$
 $AF = AB + AB$
 $AF = 2AB.$

Hence proved.

Q10) Which of the following statements are true (T) and which are false (F)?

- (i) In a parallelogram, the diagonals are equal.**
- (ii) In a parallelogram, the diagonals bisect each other.**
- (iii) In a parallelogram, the diagonals intersect each other at right angles.**
- (iv) In any quadrilateral, if a pair of opposite sides is equal, it is a parallelogram.**
- (v) If all the angles of a quadrilateral are equal, it is a parallelogram.**
- (vi) If three sides of a quadrilateral are equal, it is a parallelogram.**
- (vii) If three angles of a quadrilateral are equal, it is a parallelogram.**
- (viii) If all the sides of a quadrilateral are equal, it is a parallelogram.**

Solution:

- (i) False
- (ii) True
- (iii) False
- (iv) False
- (v) True
- (vi) False
- (vii) False
- (viii) True