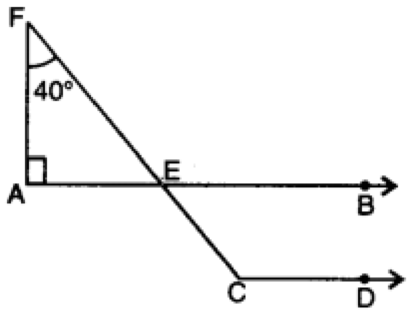
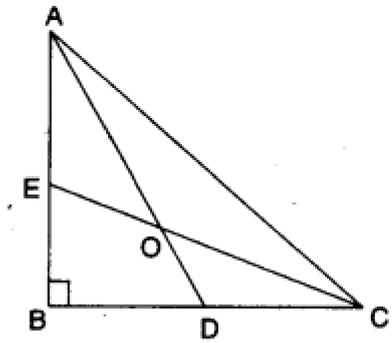
Chapter 6 Lines and Angles Class 9 Important Questions NCERT Maths

Question 1.
In the given figure, AB || CD, ∠FAE = 90°, ∠AFE = 40°, find ∠ECD.



Solution:
In AFAE,
ext. ∠FEB = ∠A + F
= 90° + 40° = 130°
Since AB || CD
∴ ∠ECD = FEB = 130°
Hence, ∠ECD = 130°.

Question 2.
In the fig., AD and CE are the angle bisectors of ∠A and ∠C respectively. If ∠ABC = 90°, then find ∠AOC.



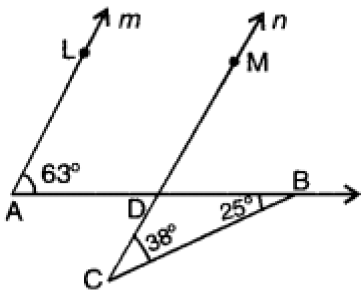
Solution:
∵ AD and CE are the bisector of ∠A and ∠C

$$\therefore \quad \angle OAC = \frac{1}{2}\angle A \text{ and}$$
$$\angle OCA = \frac{1}{2}\angle C$$
$$\Rightarrow \angle OAC + \angle OCA = \frac{1}{2}(\angle A + \angle C)$$
$$= \frac{1}{2}(180^\circ - \angle B) \quad [\because \angle A + \angle B + \angle C = 180^\circ]$$
$$= \frac{1}{2}(180^\circ - 90^\circ] \quad [\because \angle ABC = 90^\circ]$$
$$= \frac{1}{2} \times 90^\circ = 45^\circ$$

In ΔAOC,
∠AOC + ∠OAC + ∠OCA = 180°
⇒ ∠AOC + 450 = 180°
⇒ ∠AOC = 180° – 45° = 135°.

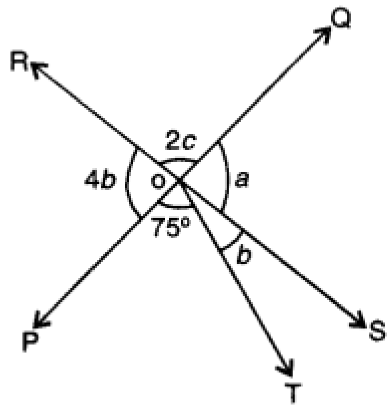
Question 3.
In the given figure, prove that m || n.

Solution:
In ΔBCD,
ext. ∠BDM = ∠C + ∠B
= 38° + 25° = 63°
Now, ∠LAD = ∠MDB = 63°
But, these are corresponding angles. Hence,
m || n



Question 4.
In the given figure, two straight lines PQ and RS intersect each other at O. If ∠POT = 75°, find the values of a, b, c.

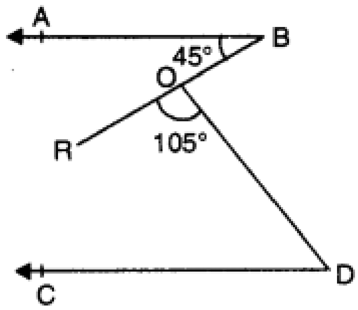
Solution:
Here, 4b + 75° + b = 180° [a straight angle]
5b = 180° – 75° = 105°
b – 105∘5 = 21°
∴ a = 4b = 4 × 21° = 84° (vertically opp. ∠s]
Again, 2c + a = 180° [a linear pair]
⇒ 2c + 84° = 180°
⇒ 2c = 96°
⇒ c = 96∘2 = 48°
Hence, the values of a, b and c are a = 84°, b = 21° and c = 48°.



Question 5.
In figure, if AB || CD. If ∠ABR = 45° and ∠ROD = 105°, then find ∠ODC.

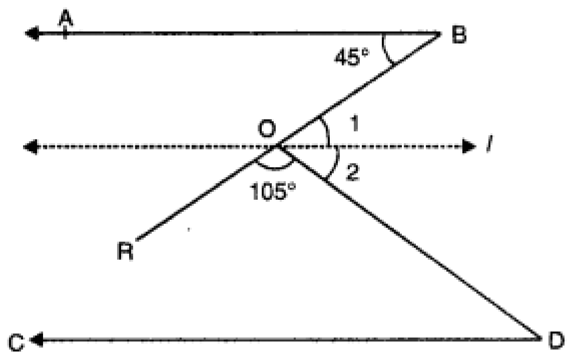
Solution:

Through O, draw a line 'l' parallel to AB.
⇒ line I will also parallel to CD, then
∠1 = 45°[alternate int. angles]
∠1 + ∠2 + 105° = 180° [straight angle]
∠2 = 180° – 105° – 45°
⇒ ∠2 = 30°
Now, ∠ODC = ∠2 [alternate int. angles]
= ∠ODC = 30°



Question 6.
In the figure, ∠X = 72°, ∠XZY = 46°. If YO and ZO are bisectors of ∠XYZ and ∠XZY respectively of ΔXYZ, find ∠OYZ and ∠YOZ.

Solution:



In ΔXYZ, we have

$\angle X + XY + \angle Z = 180°$

$\Rightarrow \angle Y + \angle Z = 180° - \angle X$

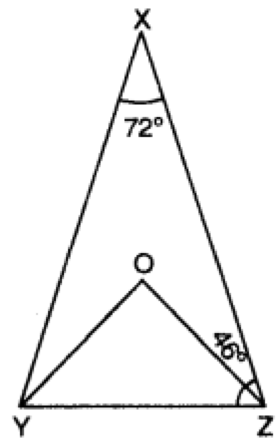
$\Rightarrow \angle Y + \angle Z = 180° - 72°$

$\Rightarrow Y + \angle Z = 108°$

$\Rightarrow 12\ \angle Y + 12\angle Z = 12 \times 108°$

$\angle OYZ + \angle OZY = 54°$

[$\because$ YO and ZO are the bisector of $\angle XYZ$ and $\angle XZY$]



$\Rightarrow \angle OYZ + 12 \times 46° = 54°$

$\angle OYZ + 23° = 54°$

$\Rightarrow \angle OYZ = 549 - 23° = 31°$

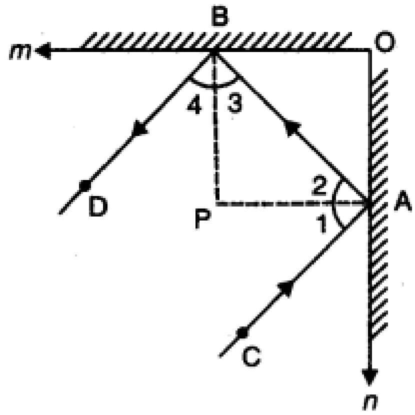
In ΔYOZ, we have

$\angle YOZ = 180° - (\angle OYZ + \angle OZY)$

$= 180° - (31° + 23°)\ 180° - 54° = 126°$

Question 7.
In the given figure, m and n are two plane mirrors perpendicular to each other. Show that incident rays CA is parallel to reflected ray BD.

Solution:



Let normals at A and B meet at P.

As mirrors are perpendicular to each other, therefore, BP || OA and AP || OB.

So, $BP \perp PA$ i.e., $\angle BPA = 90°$

Therefore, $\angle 3 + \angle 2 = 90°$ [angle sum property] ...(i)

Also, $\angle 1 = \angle 2$ and $\angle 4 = \angle 3$ [Angle of incidence = Angle of reflection]

Therefore, $\angle 1 + \angle 4 = 90°$ [from (i)) ...(ii]

Adding (i) and (ii), we have

$\angle 1 + \angle 2 + \angle 3 + \angle 4 = 180°$

i.e., $\angle CAB + \angle DBA = 180°$

Hence, CA || BD

Question 8
If in ΔABC, the bisectors of $\angle B$ and $\angle C$ intersect each other at O. Prove that $\angle BOC = 90° + 12\angle A$.

Solution:

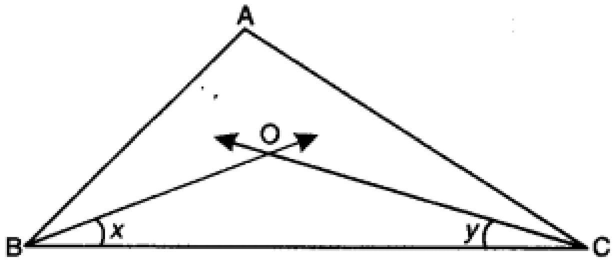
Let $\angle B = 2x$ and $\angle C = 2y$

$\because$OB and OC bisect $\angle B$ and $\angle C$ respectively.

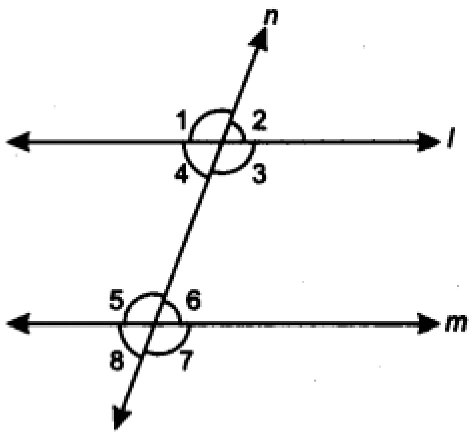
$\angle OBC = 12\angle B = 12 \times 2x = x$

and $\angle OCB = 12\angle C = 12 \times 2y = y$

Now, in ΔBOC, we have
$\angle BOC + \angle OBC + \angle OCB = 180°$
$\Rightarrow \angle BOC + x + y = 180°$
$\Rightarrow \angle BOC = 180° - (x + y)$
Now, in ΔABC, we have
$\angle A + 2B + C = 180°$
$\Rightarrow \angle A + 2x + 2y = 180°$
$\Rightarrow 2(x + y) = 12(180° - \angle A)$
$\Rightarrow x + y = 90° - 12\angle A$ .....(ii)
From (i) and (ii), we have
$\angle BOC = 180° - (90° - 12\angle A) = 90° + 12 \angle A$



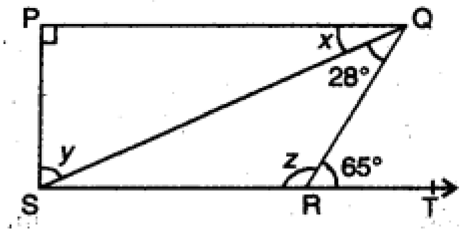
Question 9.
In figure, if I || m and $\angle 1 = (2x + y)°$, $\angle 4 = (x + 2y)°$ and $\angle 6 = (3y + 20)°$. Find $\angle 7$ and $\angle 8$.



Solution:
Here, $\angle 1$ and $\angle 4$ are forming a linear pair
$\angle 1 + \angle 4 = 180°$
$(2x + y)° + (x + 2y)° = 180°$
$3(x + y)° = 180°$
$x + y = 60$
Since I || m and n is a transversal
$\angle 4 = \angle 6$
$(x + 2y)° = (3y + 20)°$
$x - y = 20$
Adding (i) and (ii), we have
$2x = 80 = x = 40$
From (i), we have
$40 + y = 60 \Rightarrow y = 20$
Now, $\angle 1 = (2 \text{ x } 40 + 20)° = 100°$
$\angle 4 = (40 + 2 \text{ x } 20)° = 80°$
$\angle 8 = \angle 4 = 80°$ [corresponding $\angle$s]
$\angle 1 = \angle 3 = 100°$ [vertically opp. $\angle$s]
$\angle 7 = \angle 3 = 100°$ [corresponding $\angle$s]
Hence, $\angle 7 = 100°$ and $\angle 8 = 80°$

Question 10.
In the given figure, if $PQ \perp PS$, PQ || SR, $\angle SQR = 28o$ and $\angle QRT = 65°$. Find the values of x, y and z.

Solution:
Here, PQ || SR .
$\Rightarrow \angle PQR = \angle QRT$
$\Rightarrow x + 28° = 65°$



$\Rightarrow x = 65° - 28° = 37°$

Now, in it. ΔSPQ, $\angle P = 90°$

$\therefore \angle P + x + y = 180°$ [angle sum property]

$\therefore 90° + 37° + y = 180°$

$\Rightarrow y = 180° - 90° - 37° = 53°$

Now, $\angle SRQ + \angle QRT = 180°$ [linear pair]

$z + 65° = 180°$

$z = 180° - 65° = 115°$