

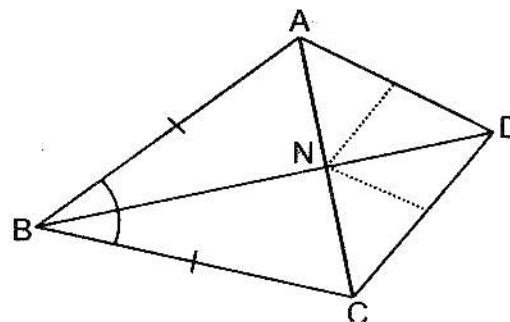
Exercise 12.2

1. In a quadrilateral $ABCD$, $\overline{AB} \cong \overline{BC}$ and the right bisectors of $\overline{AD}$, $\overline{CD}$ meet each other at point N . prove that $\overline{BN}$ is a bisector of $\angle ABC$.

Given Quadrilateral $ABCD$ in which $\overline{AB} \cong \overline{BC}$. Right bisectors of $\overline{AD}$ and $\overline{CD}$ meet each other at point N .

To prove $\overline{BN}$ is a bisector of $\angle ABC$

Construction Join N with A, B, C, D



Proof:

Statements	Reasons
$\overline{NC} \cong \overline{ND}$ (i)	N is on the right bisector of $\overline{CD}$
$\overline{NA} \cong \overline{ND}$ (ii)	N is on the right bisector of $\overline{AD}$
$\overline{NA} \cong \overline{NC}$ (iii)	By (i) and (ii)
In $\triangle ABN \leftrightarrow \triangle CBN$	
$\overline{AB} \cong \overline{BC}$	Given
$\overline{BN} \cong \overline{BN}$	Common
$\overline{NA} \cong \overline{NC}$	Proved
$\therefore \triangle ABN \cong \triangle CBN$	S.S.S $\cong$ S.S.S
$\angle ABN \cong \angle CBN$	Corresponding angles of congruent
$\therefore \overline{BN}$ is a bisector of $\angle ABC$.	triangles.

2. The bisectors of $\angle A$, $\angle B$ and $\angle C$ of a quadrilateral $ABCP$ meet each other at point O . Prove that the bisectors of $\angle P$ will also pass through the point O .

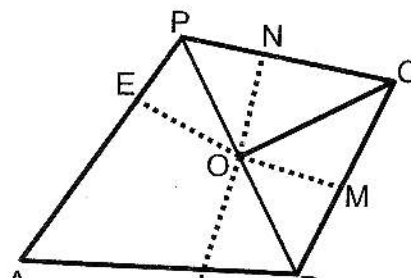
Given Bisector of the angles A, B, C meet at O .

To Prove

Bisector of $\angle P$ will also pass through O .

Construction

From O draw $\perp$ on the sides of quadrilateral BCP .

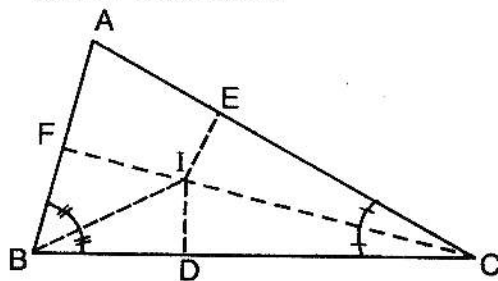


Proof:

Statements	Reasons
$\overline{OE} \cong \overline{OL}$ (i)	O is on the bisector of $\angle A$
$\overline{OL} \cong \overline{OM}$ (ii)	O is on the bisector of $\angle B$
$\overline{OM} \cong \overline{ON}$ (iii)	O is on the bisector of $\angle C$
$\therefore \overline{OE} \cong \overline{ON}$	By (i) and (ii), (iii)
$\therefore$ O is on the bisector of $\angle P$.	$\overline{OE} \cong \overline{ON}$

Theorem

The bisectors of the angles of a triangle are concurrent.



Given

$\triangle ABC$

To Prove

The bisectors of $\angle A$, $\angle B$ and $\angle C$ are concurrent.

Construction

Draw the bisectors of $\angle B$ and $\angle C$ which intersect at point I. From I, draw $\overline{IF} \perp \overline{AB}$, $\overline{ID} \perp \overline{BC}$ and $\overline{IE} \perp \overline{CA}$.

Proof:

Statements	Reasons
$\overline{ID} \cong \overline{IF}$ Similarly, $\overline{ID} \cong \overline{IE}$ $\therefore \overline{IE} \cong \overline{IF}$ So, the point I is on the bisector of $\angle A$ (i)	(Any point on bisector of an angle is equidistant from its arms) Each $\cong$ ID, proved.
Also the point I is on the bisectors of $\angle ABC$ and $\angle BCA$(ii)	Construction
Thus the bisectors of $\angle A$, $\angle B$ and $\angle C$ are concurrent at I.	{from (i) and (ii)}

Exercise

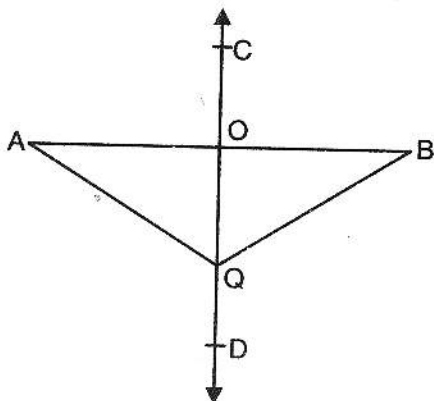
1. Which of the following are true and which are false?

- (i) Bisection means to divide into two equal parts. **(True)**
- (ii) Right bisection of line segment means to draw perpendicular which passes through the mid-point. **(True)**
- (iii) Any point on the right bisector of a line segment is not equidistant from its end points. **(False)**
- (iv) Any point equidistant from the end points of a line segment is on the right bisector of it. **(True)**
- (v) The right bisectors of the sides of a triangle are not concurrent. **(False)**
- (vi) The bisectors of the angles of a triangle are concurrent. **(True)**
- (vii) Any point on the bisector of an angle is not equidistant from its arms **(False)**
- (viii) Any point inside an angle, equidistant from its arms, is on the bisector of it. **(True)**

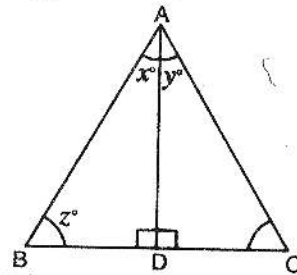
2. If $\overline{CD}$ is right bisector of line segment $\overline{AB}$, then:

(i) $m\overline{OA} = m\overline{OB}$

(ii) $m\overline{AQ} = m\overline{BQ}$



3. The given triangle ABC is equilateral triangle and $\overline{AD}$ is bisector of angle A, then find the values of unknowns x° , y° and z° .



$\therefore$ ABC is an equilateral triangle.

Its each angle = 60°

$\therefore z = 60^\circ$

$x + y = 60^\circ$

But $y = x$

$x + x = 60^\circ$

$2x = 60^\circ$

$x = \frac{60^\circ}{2}$

$x = 30^\circ$

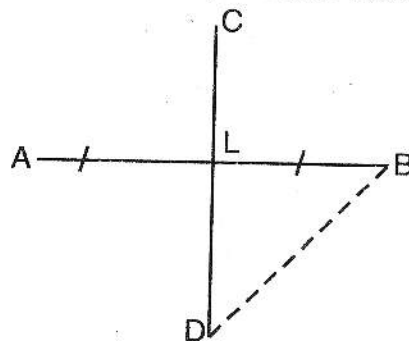
$\therefore y = 30^\circ$

Hence $z = 60^\circ$

4. $\overline{CD}$ is right bisector of the line segment $\overline{AB}$.

(i) if $m\overline{AB} = 6\text{cm}$, then find the $m\overline{AL}$ and $m\overline{LB}$.

(ii) If $m\overline{BD} = 4\text{cm}$, then find $m\overline{AD}$.



Given $\overline{CD}$ is a right bisector on the line segment $\overline{AB}$.

To find (i) $m\overline{AL}$, $m\overline{LB}$ when $m\overline{AB} = 6\text{cm}$

Proof:

(ii) $m\overline{AD}$ when $m\overline{BD} = 4\text{cm}$

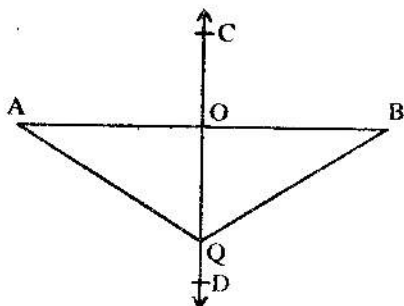
Construction Join B with D.

Statements	Reasons
(i) $m\overline{AL} = m\overline{LB}$ $m\overline{AL} = \frac{1}{2} m\overline{AB}$ $= \frac{1}{2} (6)$ $= 3\text{cm}$ $m\overline{LB} = m\overline{AL}$ $= 3\text{cm}.$	$\overline{CD}$ is a right bisector of $\overline{AB}$ $\therefore m\overline{AB} = 6\text{cm}$
(ii) $m\overline{AD} = m\overline{BD}$ $\therefore m\overline{AD} = 4\text{cm}$	$\therefore \overline{LD}$ is a right bisector of $\overline{AB}$ $\therefore m\overline{BD} = 4\text{cm}$

Objective

- Bisection means to divide into _____ equal parts
 (a) Two (b) Three
 (c) Four (d) Five
- _____ of line segment means to draw perpendicular which passes through the mid-point of line segment.
 (a) Right bisection (b) Bisection
 (c) Congruent (d) mid-point
- Any point on the _____ of a line segment is equidistant from its end points:
 (a) Right bisector (b) Angle bisector
 (c) Median (d) Altitude
- Any point equidistant from the end points of line segment is on the _____ of it:
 (a) Right bisector (b) Angle bisector
 (c) Median (d) Altitude
- The bisectors of the angles of a triangle are:
 (a) Concurrent (b) Congruent
 (c) Parallel (d) None
- Bisection of an angle means to draw a ray to divide the given angle into _____ equal parts:
 (a) Four (b) Three
 (c) Two (d) Five
- If $\overline{CD}$ is right bisector of line segment $\overline{AB}$ then: (i) $m\overline{OA} =$

- (a) $\overline{mOQ}$ (b) $\overline{mOB}$
 (c) $\overline{mAQ}$ (d) $\overline{mBQ}$



8. If $\overline{CD}$ is right bisector of line segment $\overline{AB}$, then $\overline{mAQ} = \underline{\hspace{1cm}}$
 (a) $\overline{mOA}$ (b) $\overline{mOB}$
 (c) $\overline{mBQ}$ (d) $\overline{mOD}$

9. The right bisectors of the sides of an acute triangle intersect each other the triangle.
 (a) Inside (b) Outside
 (c) Midpoint (d) None
10. The right bisectors of the sides of a right triangle intersect each other on the
 (a) Vertex (b) Midpoint
 (c) Hypotenuse (d) None
11. The right bisectors of the sides of an obtuse triangle intersect each other the triangle.
 (a) Outside (b) Inside
 (c) Midpoint (d) None

ANSWER KEY

1.	a	2.	a	3.	a	4.	a	5.	a
6.	c	7.	b	8.	c	9.	a	10.	c
11.	a								