FA – II
Class – IX
Mathematics

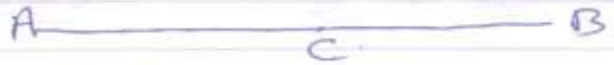
Chapter – 5 (Introduction to Euclid's Geometry)

Exercise 5.1

Q1 1) False. This can be seen visually by the student.
2) False. This contradicts Axiom 5.1
3) True. (Postulate 2)
4) True. Their radii will coincide.
5) True. First axiom of Euclid.

Q3. These 'Postulates' do not follow from Euclid's Postulates. However they follow from Axiom 5.1

Q4.



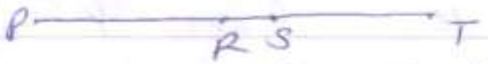
$AC = BC$

$AC + AC = BC + AC$ (Equals are added to equals)

$2AC = AB$ $(BC + AC = AB)$.

$\therefore AC = \frac{1}{2} AB$

Q5 Prove this statement by contradiction method - Assuming that line segment PT has two mid-pts R and S.



$PR = \frac{1}{2} PT$

$PS = \frac{1}{2} PT$ ($\because$ R & S are mid-pts by Assumption)

$PR = PS$ But this is not possible.

Q6. $AC = BD$ $= AB + BC$ (Point B lies bet. A and C)

$BD = BC + CD$ (Point C lies between B and D)

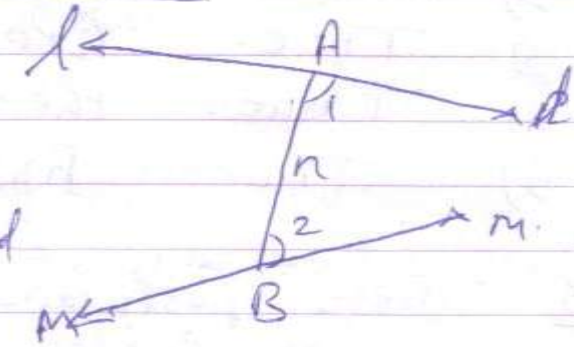
$\therefore AB + BC = BC + CD$.

So $AB = CD$ (Subtracting equals from equals)

Q7 Since this is true for any thing in any Part of the World. Thus is a Universal truth.

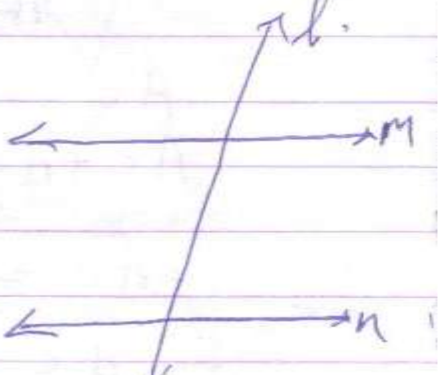
Exercise 5.2

Q1



If a line n is falling on l at A and m at B such that $\angle 1 + \angle 2$ is less than two right angles then l and m must intersect somewhere at P as shown.

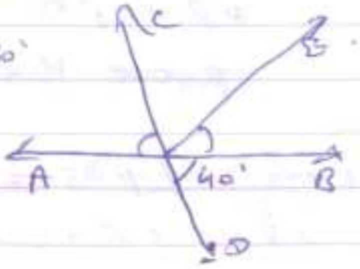
Q2.



By Euclid's fifth Postulate if a St. line l falls on two St. lines m and n such that the Sum of interior angles on Same Side of l is 180°, then the lines will not meet on this Side of l. If Sum of the interior angles on the other Side of the line l will be 180°. Hence line m and n never meet. i.e. they are Parallel lines.

$\therefore$ Euclid fifth Postulate imply the existence of Parallel lines

Chapter 6
Lines and Angles
Exercise 6.1



Q1 i) clearly $\angle AOC + \angle COE + \angle BOE = 180°$

$70° + \angle COE = 180°$

$\angle COE = 110°$

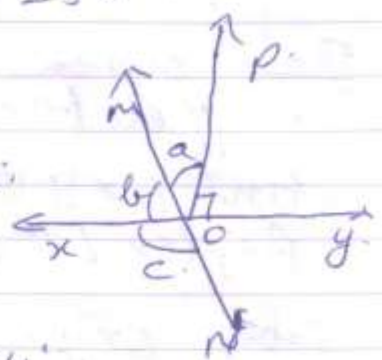
again $\angle COE + \angle BOE + \angle BOD = 180°$

$110° + \angle BOE + 40 = 180°$

$\angle BOE = 30°$

ii) Since $\angle COE = 110°$,

$\therefore$ reflex $\angle COE = 360° - 110° = 250°$



Q2 Given: $\angle POY = 90°$,

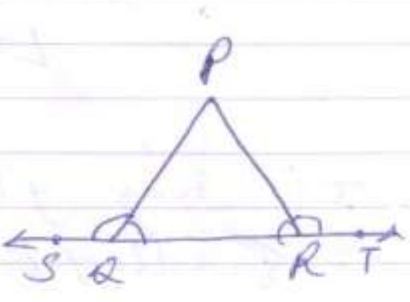
$a : b = 2 : 3$ Let $a = 2x$, $b = 3x$.

$a + b + \angle POY = 180°$

$2x + 3x + 90° = 180°$, $x = 18°$

$a = 2 \times 18° = 36°$, $b = 3 \times 18° = 54°$

$54° + c = 180° \Rightarrow c = 126°$



Q3. Since $\angle PQR = \angle PRQ$

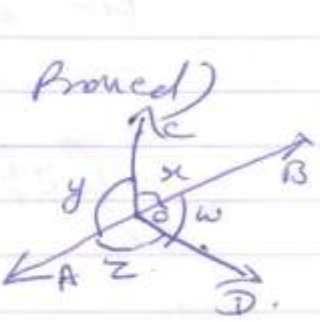
$\therefore 180° = \angle PQR + \angle PQS$ (I)

$180° = \angle PRQ + \angle PRT$ (II)

From I & II

$\angle PQR + \angle PQS = \angle PRQ + \angle PRT$

$\therefore \angle PQS = \angle PRT$ (Hence Proved)



Q4. Given $x + y = w + z$,

But $x + y + z + w = 360°$

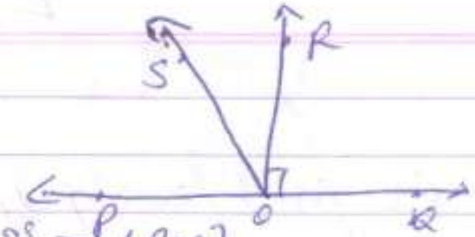
$2(x + y) = 360°$ (By given)

$x + y = 180°$

$\angle AOB = 180°$ i.e. AOB is a st. line.

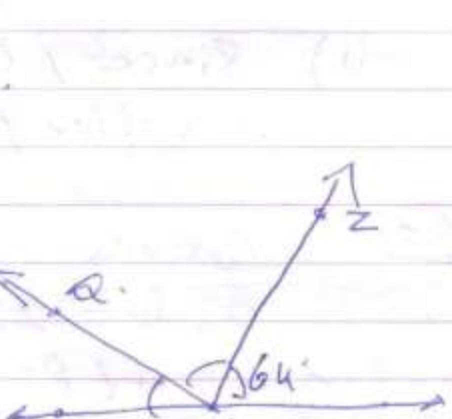
4

Q5 Given: POQ is a line
OR ⊥ PQ.
Prove that: $\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$



Proof: $\angle POS + \angle ROS = 90°$ (I)
Also $\angle QOS - \angle ROS = 90°$ (II)
From I & II, we get
$\angle POS + \angle ROS = \angle QOS - \angle ROS$
$2\angle ROS = \angle QOS - \angle POS$
$\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$

Q6. Given $\angle XYZ = 64°$
YQ bisect $\angle ZYP$
find $\angle XYQ$ and
Reflex $\angle QYP$

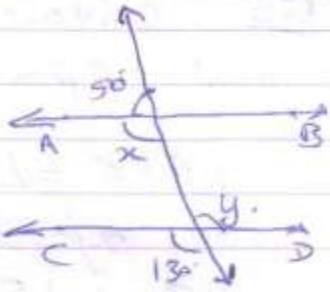


Soln: $\angle XYZ + \angle ZYQ + \angle QYP = 180°$
$64° + \angle ZYQ + \angle QYP = 180°$
$\angle ZYQ + \angle QYP = 180° - 64°$
$= 116°$

If ray YQ bisects $\angle ZYP$, $\therefore \angle ZYQ = \frac{1}{2}\angle ZYP$
Similarly $\angle QYP = \frac{1}{2}\angle ZYP$.
$\therefore \angle ZYQ = \angle QYP$.
Hence $2\angle ZYQ = 116°$
$\angle ZYQ = \frac{116}{2} = 58°$
Reflex $\angle QYP = 360° - \angle QYP$
$= 360° - 58°$
$= 302°$

Exercise 6.2. ③

Q1 Given: $AB \parallel CD$



$50° + x = 180°$ (Linear Pair)

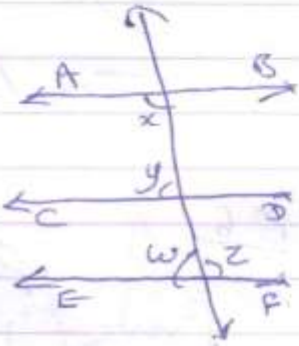
$x = 130°$

$x = y$ (By alt int angle)

$\therefore \angle y = 130°$

Q2 Given: $AB \parallel CD$, $CD \parallel EF$

$y : z = 3 : 7$



$y = 3a$ and $z = 7a$

$w + z = 180°$ (Linear Pair)

$w = y$ (C.A)

$y + z = 180° \Rightarrow 3a + 7a = 180°$

$a = 18°$

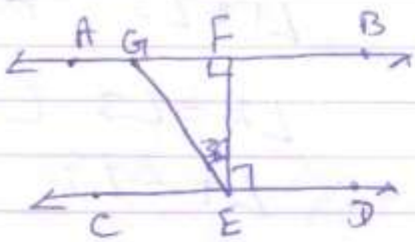
Now. $y = 3a = 3 \times 18° = 54°$

$x + y = 180°$ (Consecutive int angles)

$x = 180° - 54° = 126°$

Q3 Given: $AB \parallel CD$, $EF \perp CD$,

$\angle GED = 126°$,



$\angle GEF = 126° - 90° = 36°$

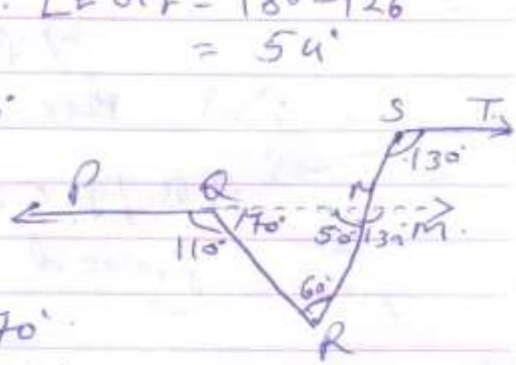
$\angle CEG = 90° - 36° = 54°$

$\angle EFG = 90°$, $\angle GEF = 36°$, $\therefore \angle EGF = 180° - 126°$

$= 54°$

Q4 Given: $PQ \parallel ST$, $\angle PQR = 110°$

$\angle RST = 130°$, find $\angle QRS$.



extend PQ to pt M.

$PM \parallel ST$, $\therefore$ forming

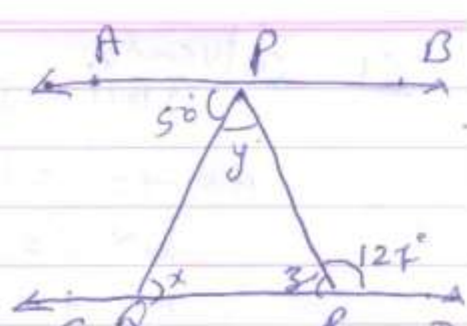
ΔQNR. $\angle PQR = 180° - 110° = 70°$

$\angle QNR = 180° - 130° = 50°$

$\therefore \angle QRN = 180° - (70 + 50) = 180 - 120$

$\angle QRN = 60°$

Q5 Given:- $AB \parallel CD$, $\angle APQ = 50°$ and $\angle PRD = 127°$, find x, y.



$\angle APQ = \angle PQR = 50°$ (alt. int.)

$x = 50°$,

$z = 180° - 127°$ (Linear Pair)

$z = 53°$

In ΔPQR, $y = 180° - (50 + 53)$

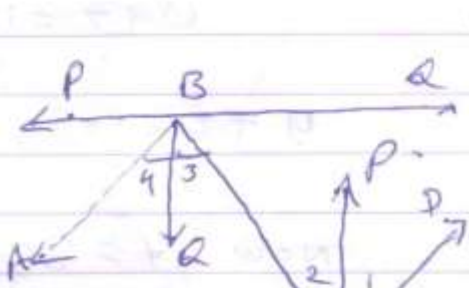
$= 180° - 103°$

$= 77°$

Q6

$PQ \parallel RS$.

Prove that $AB \parallel CD$.



Draw BQ (Normal) and PC on PQ & RS.

$BQ \perp PQ$, $PC \perp RS$.

$\therefore BQ \parallel PC$.

$\angle 1 = \angle 2$ and $\angle 3 = \angle 4$ (By laws of Reflection)

$\angle 2 = \angle 3$ (alt. int. angles)

$\therefore \angle 1 = \angle 4$ (By laws of Ref.)

$\therefore$ From above $\angle 1 + \angle 2 = \angle 3 + \angle 4$.

$\angle ABC = \angle BCD$

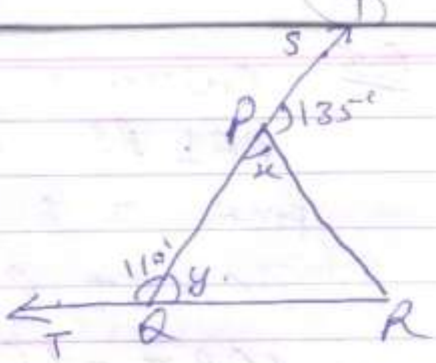
But this pair is alt. int. angle

$\therefore AB \parallel CD$. (formed on $\parallel$ lines)

Proved

Exercise 6.3

Q1 find $\angle PRQ$.



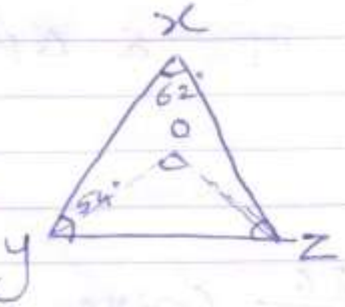
$\angle x = 180° - 135° = 45°$

$\angle y = 180° - 110° = 70°$

$\therefore \angle PRQ = 180° - (70 + 45°)$

$= 180° - 115° = 65°$

Q2 Given $\angle x = 62°$, $\angle y = 54°$



$\therefore \angle z = 180° - (62 + 54)$

$= 180° - 116 = 64°$

Bisector $\angle y$ & $\angle z$

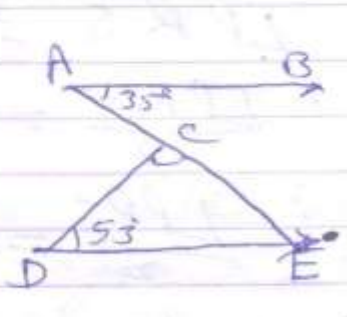
are $\frac{\angle y}{2} = \frac{54}{2} = 27°$, $\frac{\angle z}{2} = \frac{64}{2} = 32°$

$\therefore \angle yoz = 180° - (27 + 32)$

$\angle yoz = 180 - 59° = 121°$

Q3 Given: $AB \parallel DE$.

find $\angle DCE$



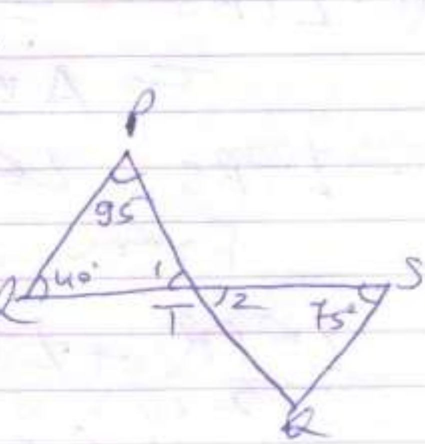
$\angle DEC = \angle BAC = 35°$ (alt int.)

$\therefore \angle DCE = 180° - (53 + 35°)$

$\angle DCE = 180° - 88° = 92°$

Q4

In ΔPRT



$\angle 1 = 180° - (95° + 40°) = 45°$

$\therefore \angle 1 = \angle 2 = 45°$ (V.O.A.)

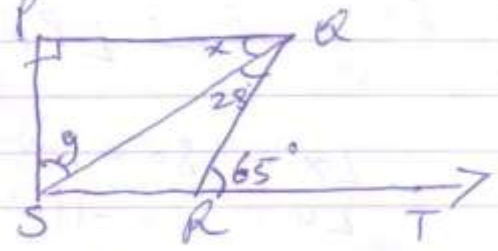
$\therefore \angle SQT = 180 - (75° + 45°)$

$SQT = 60°$

Q5 Given:-

$PQ \perp PS$, $PQ \parallel SR$,

find x & y.



Soln:- $PQ \parallel ST$, RQ is trans.

$\therefore \angle QRT = \angle PQR = 65°$ (alt. int.)

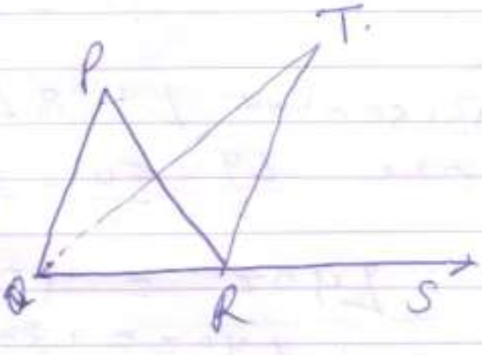
$\angle x = 65° - 28° = 37°$

In a $\triangle PQS$; $x + y + \angle P = 180°$

$y = 180° - (90° + 37°) = 180° - 127°$

$y = 53°$

Q6. Given:- If Bisector $\angle PQR$ & $\angle PRS$ meet at T. Prove that $\angle QTR = \frac{1}{2} \angle QPR$



In $\triangle PQR$.

$\angle PRS = \angle QPR + \angle PQR$ (Ext. angle)

$\therefore \frac{\angle PRS}{2} = \frac{\angle QPR}{2} + \frac{\angle PQR}{2}$ (Bisector)

$\therefore \frac{\angle PRS}{2} = \angle TRS$ (Bisector of $\angle PRS$)

(I) $\therefore \angle TRS = \frac{\angle QPR}{2} + \angle TQR$ ($\frac{\angle PQR}{2}$ is bisector $\angle Q$)

In $\triangle QTR$. $\angle TRS$ is an ext angle

$\therefore \angle TRS = \angle QTR + \angle TQR$ --- (II).

From I & II

$\frac{\angle QPR}{2} + \cancel{\angle TQR} = \angle QTR + \cancel{\angle TQR}$

Hence $\angle QTR = \frac{1}{2} \angle QPR$. Proved.

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