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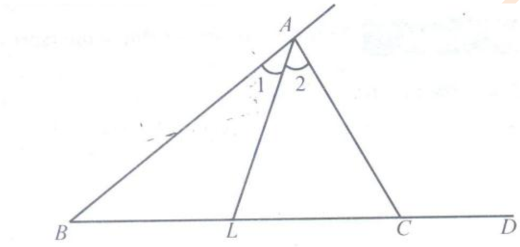
Class: 9
Subject: Mathematics
Topic: Lines and Angles
No. of Questions: 20

Q1. If the ratio of three angles of a triangle is 1 : 2 : 3, find the angles.

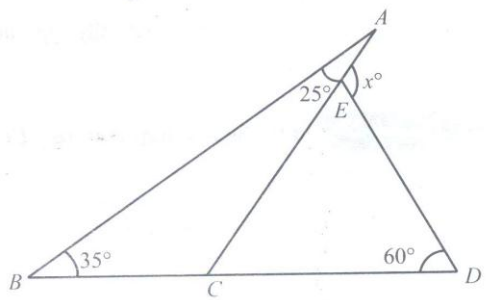
Sol. Ratio of the three angles of a triangle = 1: 2: 3
Let the angles be x, 2x, and 3x
X +2X + 3X = 180°
∴ 6X = 180°
Hence the first angle = x = 30°
The second angle = 2x = 60°
The third angle = 3x = 90°

Q2. The side BC of a triangle ABC is produced to D. The bisector of the ∠A meets BC in L. Prove that ∠ABC + ∠ACD = 2 ∠ALC



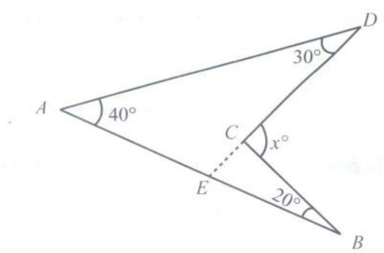
Sol. ∠ALC = ∠1 + ∠B
⇒ 2∠ALC = 2∠1 + 2 ∠B
⇒ 2 ∠ALC = ∠A + 2∠B
⇒ 2 ∠ALC = (∠ACD - ∠B) + 2∠B
(∵ ∠ACD = ∠A + ∠B)
⇒ 2 ∠ALC = ∠ACD + ∠B = ∠ACD + ∠ABC

Q3. In the figure, find the value of x°



Sol. In the ΔABC, ∠A+∠B+∠ACB = 180°
⇒ 25° + 35° + ∠ACB = 180°
⇒ ∠ACB = 120°
Now ∠ACB + ∠ACD = 180° [linear pair]
Or 120° + ∠ACD = 180°
Or ∠ACD = 60° = ∠EDC
Again in the ΔCDE, CE is produced to A.
Hence, ∠AED = ∠ECD + ∠EDC
⇒ x = 60°+ 60° = 120°

Q4. In the given figure find the value of x°



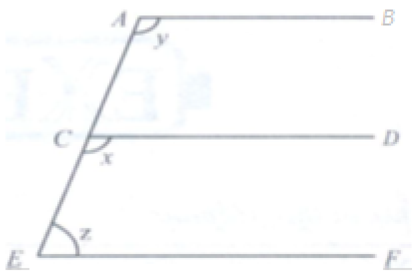
Sol. Produced DC such that it meets AB in E
Now in the ΔAED,
Side AE is produced to B
∴ ∠DEB = ∠EDA + ∠DAE [Ext. angle of a triangle]
∠DEB = 30° +40° = 70° = ∠CEB
Now in the ΔBEC,
Side EC is produced to D
∴ ∠DCB = ∠ CEB + ∠CBE [Ext. angle of a triangle]

∴ $\angle DCB = 70° + 20° = 90°$
⇒ $x° = 90°$

Q5. An angle is 16° more than its complement. What is its measure?

Sol. Let one angle = a°
Then second angle = (a+16)°
Now, a+(a+16) = 90 °
⇒ 2a+16 = 90° ⇒ a = 37°
Second angle = 37° + 16° = 53°

Q6. In the given figure, AB, CD and EF are parallel. If ∠z = 70 °, find the value of x and y.

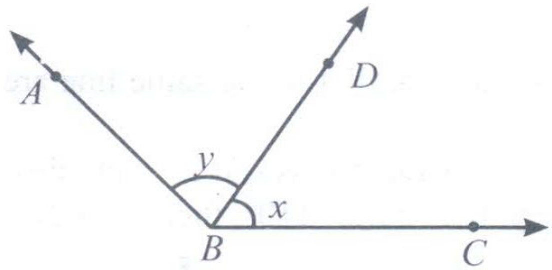


Sol. X = y = 110°

Q7. Why is Axiom 5, in the list of Euclid's axiom, considered a 'universal truth;? (Note the question is not about the fifth postulate).

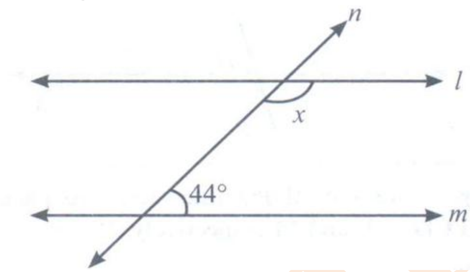
Sol. This is true for anything in any part of the world, this is a universal truth.

Q8. For what value of x+y in the given figure, will ABC be a line? Justify your answer.



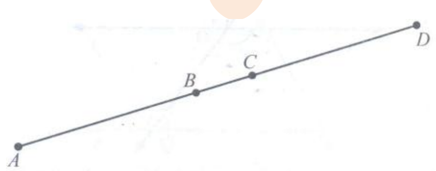
Sol. For A, B,C must be lie in a line x+y =180°

Q9. In the given figure, find the value of x for which the lines l and m are parallel.



Sol. $x+44° = 180°$ i.e. , $x = 136°$

Q10. If AC = BD, then Prove that AB = CD



Sol. AC = BD ...(i)
AC = AB + BC [B lies between A and C] ...(ii)
BD = BC + CD [C lies between B and D] ...(iii)
Substituting (ii) and (iii) in (i), we get
AB + BC = BC+ CD
⇒ AB = CD [Subtracting equals from equal]

Q11. The supplement of an angle is one-fifth of itself. Determine the angle and its supplement.

Sol. Let the measures of the angle be x°, then the measure of its supplementary angles is 180°-x°.

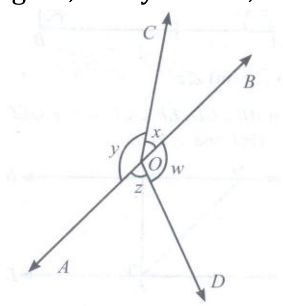
It is given that $180 – x = \frac{1}{5}x$

$\Rightarrow 5\,(180° - x) = x$

$\Rightarrow 900 - 5x = x \Rightarrow 900 = 5x + x$

$\Rightarrow 900 = 6x \Rightarrow 6x = 900 \Rightarrow x = \frac{900}{6} = 150$

Q12. In figure, if x+y = w+z, then prove that AOB is a line.



Sol. x+y = w+z ...(i) [Given]

∵ The sum of all the angles round a point is equal to 360°

∴ x+y+w+z = 360°

⇒ 2(x+y) = 360°

$\Rightarrow x+y = \frac{360°}{20}$

⇒ x+y = 180°

∴ AOB is a line. (if the sum of two adjacent angles is 180°, then the non-common arms of the angles form a line)

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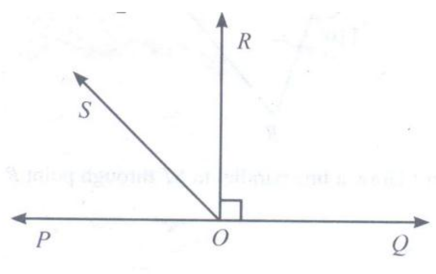
Q13. In figure, POQ, is a line. Ray OR is perpendicular to line PQ. OS is another ray lying between rays OP and OR. Prove that $\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$



Sol. Since OR ⊥ PQ

$\therefore\ \angle QOR = \angle POR = 90°$ ...(i)

And $\angle QOS = \angle QOR + \angle ROS$ ...(ii)

Also, $\angle POS = \angle POR - \angle ROS$ ...(iii)

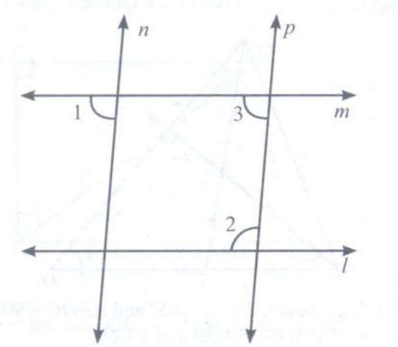
Subtracting (ii) and (iii),

$\Rightarrow\ \angle QOS - \angle POS = (\angle QOS - \angle POR) + 2\angle ROS$

$= 2\angle ROS$ (using (i))

$\Rightarrow\ \angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$

Q14. In figure if l ∥ m, n∥ p, and $\angle 1 = 85°$ then find $\angle 2$.



Sol. ∵ n ∥ p and m is transversal

$\therefore \angle 1 = \angle 3 = 85°$ (corresponding angles)

Also, m ∥ l & p is transversal

$\therefore\ \angle 2 + \angle 3 = 180°$

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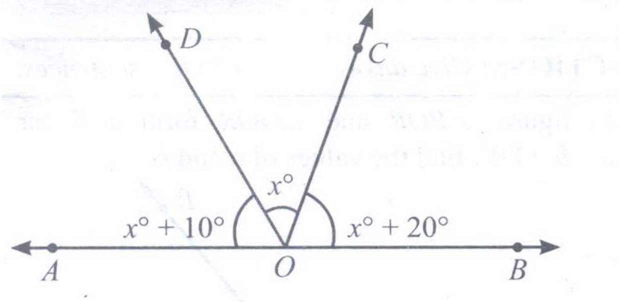
$\Rightarrow \angle 2 + 85° = 180°$

$\Rightarrow \angle 2 = 180° - 85°$

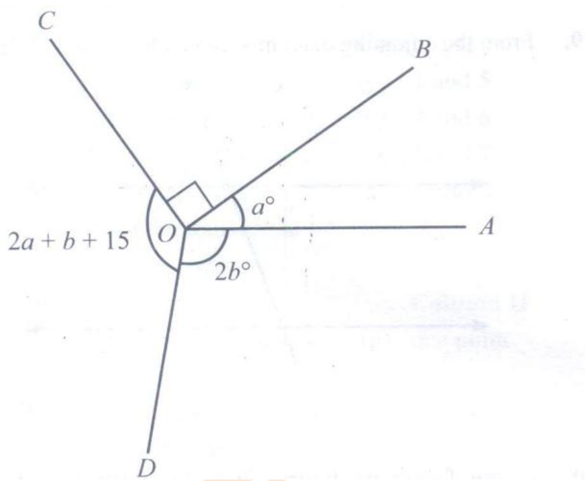
$\Rightarrow \angle 2 = 95$

Q15. In the following figure, find ∠x. further find ∠BOC, ∠COD and ∠AOD.



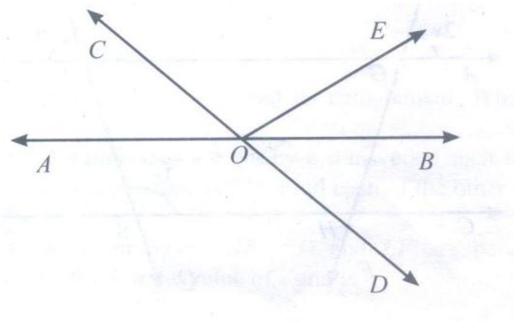
Sol. X = 50°, ∠BOC=70°, ∠COD= 50° , ∠AOD=60°

Q16. In the given figure 2b – a = 65° and ∠BOC = 90°, find the measure of ∠AOB, ∠AOD and ∠COD.



Sol. 35° , 100° , 135°

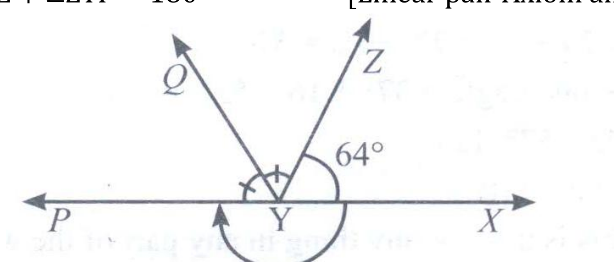
Q17. In figure, Lines AB and CD intersect at O. If ∠AOC + ∠BOE = 70° and ∠BOD = 40°, find ∠BOE and reflex ∠COE.



Sol. ∠AOC = ∠BOD [Vertically Opposite Angles]
But Given ∠BOD = 40° ...(i)
∴ ∠AOC = 40° [Alternate Angle] ...(ii)
Now, Given ∠AOC + ∠BOE = 70°
⇒ ∠BOE = 70°- 40° [From (ii)]
⇒ ∠BOE = 30°
Again, Reflex ∠COE = ∠COD + ∠BOD+∠BOE
∵ Ray OA stands on line CD
= ∠COD + 40° + 30° [Using (i) and (ii)]
= 180° + 40° + 30°
= 250° [∵ Ray OA stands on line CD]

Q18. It is given that ∠XYZ = 64° and XY is produced to point P. Draw a figure from the given information. If ray YQ bisects ∠ZYP, find ∠XYQ and reflex ∠QYP.

Sol. ∠XYZ + ∠ZYP = 180° [Linear pair Axiom and YZ stands on line PX]



Given, ∠XYZ = 64°
∴ 64° + ∠ZYP = 180°
⇒ ∠ZYP = 116° ...(i)
Also, Ray YQ bisect ∠ZYP

$\therefore\ \angle PYQ = \angle ZYQ = \frac{1}{2}\angle ZYP$

$= \frac{1}{2}(116°) = 58°$ (Using (i)) ...(ii)

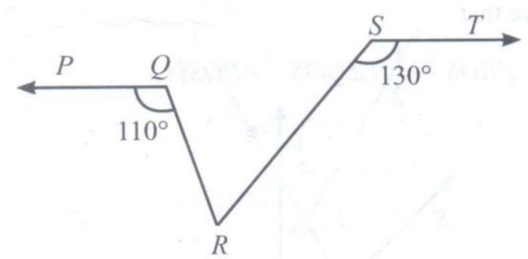
$\therefore$ Reflex $\angle QYP = 360° - 58° = 302°$ [$\because$ The sum of all angles round a point is equal to 360°]

Again, $\angle XYQ = \angle XYZ + \angle ZYQ$

$= 64° + 58°$

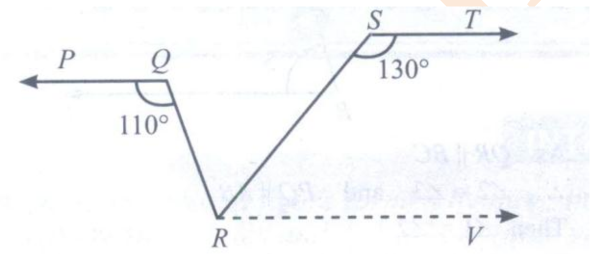
$= 122°$ [$\because \angle XYZ = 64°$ (given) and $\angle ZYQ = 58°$ (from (ii))]

Q19. If figure, if PQ ∥ ST, $\angle PQR = 110°$ and $\angle RST = 130°$, find $\angle QRS$.



[Hint : Draw a line parallel to ST through point R.]

Sol. Draw a line RV parallel to ST through point R.



$\therefore \angle RST + \angle SRV = 180°$ [$\because$ sum of the consecutive interior angles on the same side of the transversal is 180°]

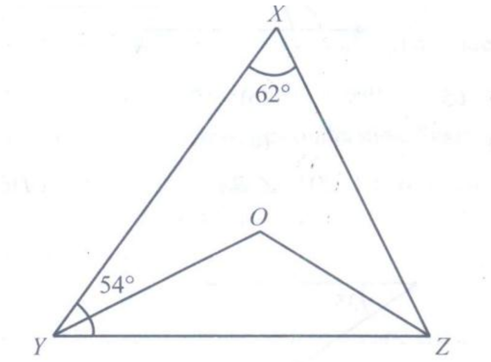
$\Rightarrow \angle SRV = 180° - 130° = 50°$ ...(i)

Also, $\angle QRV = \angle PQR = 110°$ [Alternative interior Angles]

$\Rightarrow \angle QRS + \angle SRV = 110°$

$\Rightarrow \angle QRS = 110° - 50° = 60°$ [Using (i)]

Q20. In figure, ∠X = 62°, ∠XYZ = 54°. If YO and ZO are the bisectors of ∠XYZ and ∠XYZ, find ∠OZY and ∠YOZ



Sol. From ΔXYZ, we have

∠XYZ + ∠YZX + ∠ZXY = 180° [By Δ's angle sum property]

⇒ 54° + ∠YZX + 62° = 180

⇒ ∠YZX = 180° - 116° = 64° ...(i)

Given YO is the bisector of ∠XYZ

∴ ∠XYO = ∠OYZ = $\frac{1}{2}$∠XYZ = $\frac{1}{2}$(54°) = 27° ...(ii)

Similarly

∠XYO = ∠OZY = $\frac{1}{2}$∠YZX = $\frac{1}{2}$(64°) = 32° ...(iii)

(∵ ZO is the bisector ∠YZX)

Now. Consider Δ OYZ, which gives

∠OYZ + ∠OZY + ∠YOZ = 180° [BY angle sum property]

⇒ 27° + 32° + ∠YOZ = 180° [Using (ii)and (iii)]

⇒ ∠YOZ = 180°- 59° = 121°.

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