NCERT SOLUTIONS

Lines and Angles

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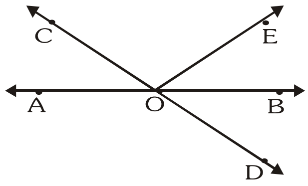
Ex - 6.1

Q1. In figure, lines AB and CD intersect at O. If $\angle AOC + \angle BOE = 70°$ and $\angle BOD = 40°$, find $\angle BOE$ and reflex $\angle COE$.



Sol. $\angle AOC = \angle BOD$ [Vertically opposite angles]

$\Rightarrow \angle AOC = 40°$ [$\because$ $\angle BOD = 40°$ is given]

Now, $\angle AOC + \angle BOE = 70°$ [Given]

$\Rightarrow 40° + \angle BOE = 70°$

$\Rightarrow \angle BOE = 30°$

$\angle AOE + \angle BOE = 180°$ [Linear pair of angles]

$\Rightarrow \angle AOE + 30° = 180°$

$\Rightarrow \angle AOE = 150°$

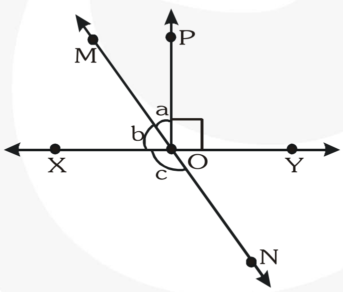
$\Rightarrow \angle AOC + \angle COE = 150°$

$\Rightarrow 40° + \angle COE = 150°$

$\Rightarrow \angle COE = 110°$

Reflex $\angle COE = 360° – 110° = 250°$

Q2. In figure, lines XY and MN intersect at O. If $\angle POY = 90°$ and $a : b = 2 : 3$, find c.



Sol. Ray OP stands on line XY

$\angle POX + \angle POY = 180°$

$\angle POX + 90° = 180°$

$\angle POX = 90°$

$\angle POM + \angle XOM = 90°$

$a + b = 90°$ .... (1)

$a : b = 2 : 3$

$\frac{a}{2} = \frac{b}{3} = k$ (let)

$a = 2k, b = 3k$

$3k + 2k = 90°$ from (1)

$k = 18°$

$\Rightarrow a = 36°$, $b = 54°$

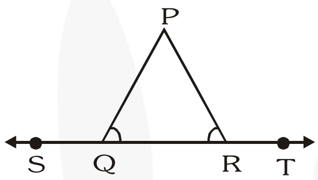
$\therefore$ Ray OX stands on line MN

$\angle XOM + \angle XON = 180°$

$b + c = 180°$

$54° + c = 180° \Rightarrow c = 126°$

Q3. In figure, $\angle PQR = \angle PRQ$, then prove that $\angle PQS = \angle PRT$.



Sol. $\angle PQR = \angle PRQ = x$ (say) ...(1)

Now, $\angle PQS + \angle PQR = 180°$ [Linear pair of angles]

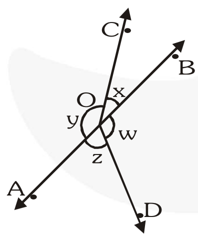
and $\angle PRT + \angle PRQ = 180°$ [Linear pair of angles]

$\Rightarrow \angle PQS + \angle PQR = \angle PRT + \angle PRQ$ [$\because$ each = 180°]

$\Rightarrow \angle PQS + x = \angle PRT + x$ [By (1)]

$\Rightarrow \angle PQS = \angle PRT$

Q4. In figure, if $x + y = w + z$, then prove that AOB is a line.



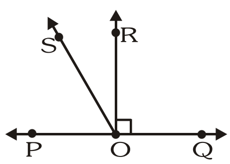
Sol. $x + y = w + z$ ...(1)

$x + y + w + z = 360°$ [Complete angle]

$\Rightarrow 2(x + y) = 360°$, $x + y = 180°$ [From (1)]

$\Rightarrow$ AOB is a line.

Q5. 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. $\angle POR = \angle QOR = 90°$ ...(1)

$[\because OR \perp PQ$ at $O]$

Now, $\angle QOS = \angle QOR + \angle ROS$

$\Rightarrow \angle QOS = 90° + \angle ROS$ ...(2) {by (1)}

$\angle POS + \angle ROS = \angle POR$

$\Rightarrow \angle POS = \angle POR - \angle ROS$

$\Rightarrow \angle POS = 90° - \angle ROS$ ...(3) {by (1)}

Subtracting (3) from (2),

$\angle QOS - \angle POS = \{90° + \angle ROS\} - \{90° - \angle ROS\}$

$= 2 \times \angle ROS$

$\Rightarrow 2 \times \angle ROS = \{\angle QOS - \angle POS\}$

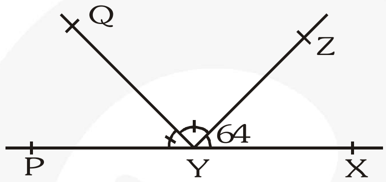
i.e., $\angle ROS = \frac{1}{2}\{\angle QOS - \angle POS\}$

Q6. It is given that $\angle XYZ = 64°$ and XY is produced to point P. Draw a figure from the given information. if ray YQ bisects $\angle ZYP$, find $\angle XYQ$ and reflex $\angle QYP$.

Sol. $\angle XYZ + \angle ZYP = 180°$ [Linear pair]

$\Rightarrow 64 + \angle ZYP = 180°$

$\Rightarrow \angle ZYP = 116°$



Ray YQ bisects angle $\angle ZYP$

$\Rightarrow \angle PYQ = \angle ZYP = \frac{116}{2} = 58°$

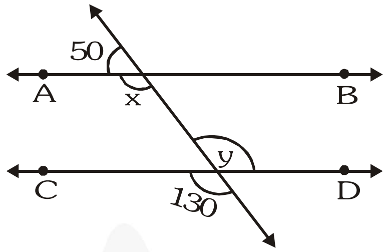
Reflex $\angle QYP = 360° - 58° = 302°$

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

$= 64° + 58° = 122°$

Ex - 6.2

Q1. In figure, find the values of x and y and then show that AB || CD.



Sol. $x + 50 = 180°$ (Linear pair of angles)

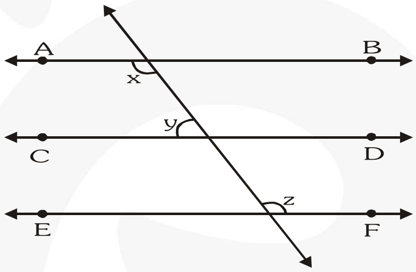
$\Rightarrow x = 130°$

$y = 130°$ (Vertically opposite angles)

Now, x = y and the two angles form a pair of alternate angles made by a transversal intersecting the lines AB and CD

Therefore, AB || CD.

Q2. In figure, if AB || CD, CD || EF and y : z = 3 : 7, find x.



Sol. $AB \| CD$ and $CD \| EF$

$\Rightarrow AB \| EF$

$\Rightarrow x = z$ (Alternate angles)

Now, $x + y = 180°$

(Pair of interior angles on the same side of the transversal)

$\Rightarrow z + y = 180°$ i.e, $y + z = 180°$

Also, we are given that, y : z = 3 : 7

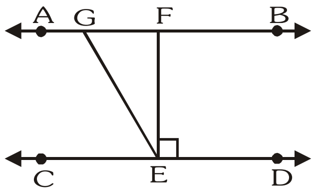
Then, $y = \frac{3}{10} \times 180° = 54°$

and $z = \frac{7}{10} \times 180° = 126°$

We have $x = z = 126°$

Therefore, $x = 126°$

Q3. In figure, if AB || CD, FE $\perp$ CD and $\angle GED = 126°$, find $\angle AGE$, $\angle GEF$ and $\angle FGE$.



Sol. AB||CD [given]

$\angle AGE = \angle GED = 126°$ [Alternate angles]

$\Rightarrow \angle GEF + 90° = 126°$

$\angle GEF = 36°$

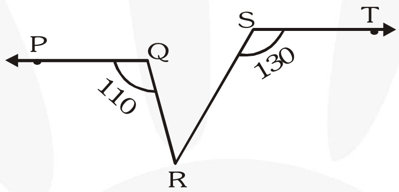
$\angle GEC + \angle GEF + \angle FED = 180°$ [Straight line]

$\angle GEC + 126° = 180°$

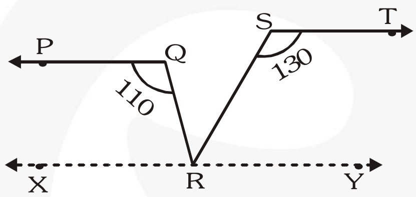
$\angle GEC = 180° - 126° = 54°$

$\angle FGE = \angle GEC = 54°$ [Alternate angles]

Q4. In figure, if PQ || ST, $\angle PQR = 110°$ and $\angle RST = 130°$, find $\angle QRS$.



Sol. Through R, we draw XRY || PQ.



$\Rightarrow$ XRY || ST ($\because$ PR || ST)

$\angle QRX + 110° = 180°$

and $\angle YRS + 130° = 180°$

$\Rightarrow \angle QRX = 70°$

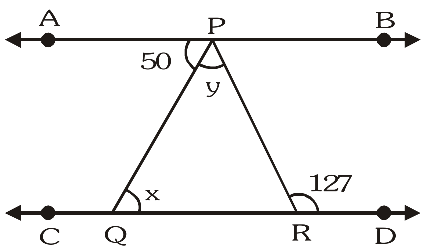
and $\angle YRS = 50°$

Now, $\angle QRX + \angle QRS + \angle YRS = 180°$

$\Rightarrow 70° + \angle QRS + 50° = 180°$

$\Rightarrow \angle QRS = 60°$

Q5. In figure, if AB || CD, $\angle APQ = 50°$ and $\angle PRD = 127°$, find x and y.



Sol. AB||CD [given]

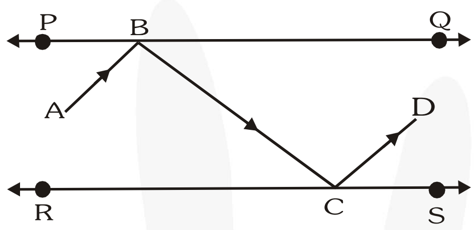
$x = \angle APQ = 50°$ [Alternate angles]

$\angle APQ + y = \angle PRD = 127°$ [Alternate angles]

$50° + y = 127°$

$y = 127° - 50° = 77°$

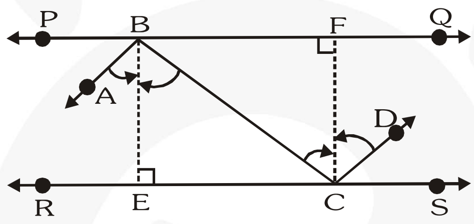
Q6. In figure, PQ and RS are two mirrors placed parallel to each other. An incident ray AB strikes the mirror PQ at B, the reflected ray moves along the path BC and strikes the mirror RS at C and again reflects back along CD. Prove that AB || CD.



Sol. We draw BE ⊥ RS, then BE is also ⊥ PQ

(∵ PQ || RS)

We draw CF ⊥ PQ. Here, also CF ⊥ RS



Here, if we consider PQ as transversal intersecting lines BE and CF, then each pair of corresponding angles is equal. (each equal to 90°)

Thus, we have BE || CF.

Now, $\angle ABE = \angle CBE$

(Angle of incidence = Angle of reflection)

$\Rightarrow \angle ABE = \angle CBE = \frac{1}{2} \times \angle ABC$ ...(1)

Similarly, $\angle BCF = \angle FCD = \frac{1}{2} \times \angle DCB$ ...(2)

Now, BE || CF

$\Rightarrow \angle CBE = \angle BCF$ (alternate angles)

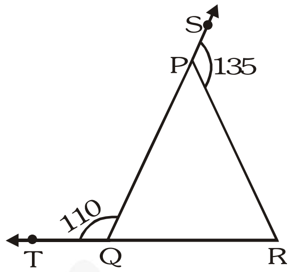
$\Rightarrow \frac{1}{2} \times \angle ABC = \frac{1}{2} \times \angle DCB$ {by (1) and (2)}

$\Rightarrow \angle ABC = \angle DCB$

$\Rightarrow$ AB || CD

Ex - 6.3

Q1. In figure, sides QP and RQ of ΔPQR are produced to points S and T respectively. If $\angle SPR = 135°$ and $\angle PQT = 110°$, find $\angle PRQ$.



Sol. $\angle QPR + 135° = 180°$

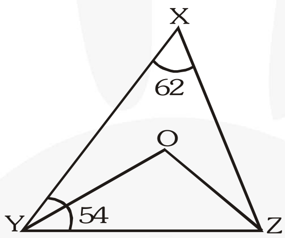
$\Rightarrow \angle QPR = 45°$

Now, $\angle QRP + \angle QPR = \angle PQT$

$\Rightarrow \angle QRP + 45° = 110°$

$\Rightarrow \angle QRP = 65°$

Q2. In figure, $\angle X = 62°$, $\angle XYZ = 54°$. If YO and ZO are the bisectors of $\angle XYZ$ and $\angle XZY$ respectively of ΔXYZ, find $\angle OZY$ and $\angle YOZ$.



Sol. In ΔXYZ

$\angle XYZ + \angle YZX + \angle ZXY = 180°$

$54° + \angle YZX + 62° = 180°$

$\Rightarrow \angle YZX = 64°$

$\because$ YO is bisector $\Rightarrow \angle XYO = \angle OYZ = \dfrac{54°}{2} = 27°$

ZO is bisector $\Rightarrow \angle XZO = \angle OZY = \dfrac{64°}{2} = 32°$

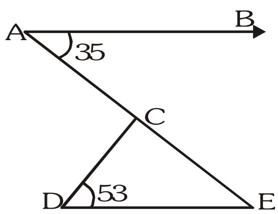
In ΔOYZ

$\angle OYZ + \angle OZY + \angle YOZ = 180°$

$27° + 32° + \angle YOZ = 180°$

$\Rightarrow \angle YOZ = 121°$

Q3. In figure, if AB || DE, $\angle BAC = 35°$ and $\angle CDE = 53°$, find $\angle DCE$.



Sol. AB|| DE (given)

$\angle DEC = \angle BAC = 35°$ (Alternate angles)

$\angle CDE = 53°$

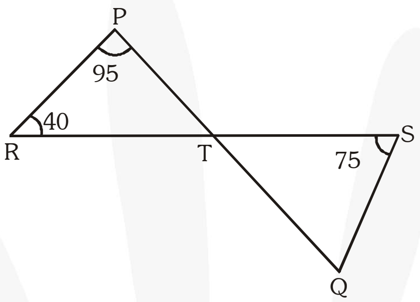
In Δ CDE

$\angle CDE + \angle DEC + \angle DCE = 180°$

$53° + 35° + \angle DCE = 180°$

$\angle DCE = 180° - 88° = 92°$

Q4. In figure, if lines PQ and RS intersect at point T, such that $\angle PRT = 40°$, $\angle RPT = 95^{-}$ and $\angle TSQ = 75°$, find $\angle SQT$.



Sol. In ΔPRT

$\angle PTR + \angle PRT + \angle RPT = 180°$

$\angle PTR + 40° + 95° = 180°$

$\angle PTR = 45°$

$\angle QTS = \angle PTR = 45°$ [Vertically opposite angles]

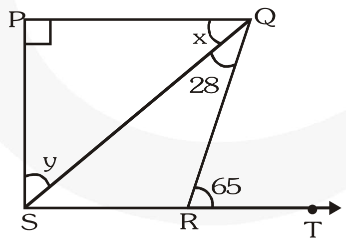
In ΔTSQ

$\angle QTS + \angle TSQ + \angle SQT = 180°$

$45° + 75° + \angle SQT = 180°$

$\angle SQT = 60°$

Q5. In figure, if PQ $\perp$ PS, PQ || SR, $\angle SQR = 28°$ and $\angle QRT = 65°$, then find the value of x and y.



Sol. $\angle QSR = x$ (alternate angles)

Now, $\angle QSR + 28° = 65°$

$\Rightarrow x + 28° = 65°$

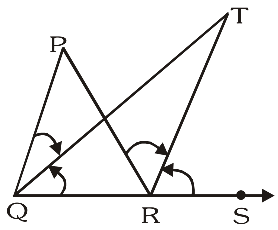
$\Rightarrow x = 37°$

In ΔPQS, $90° + x + y = 180°$

$\Rightarrow 90° + 37° + y = 180°$

$\Rightarrow y = 53°$

Q6. In figure, the side QR of ΔPQR is produced to a point S. If the bisectors of ∠PQR and ∠PRS meet at point T, then prove that $\angle QTR = \frac{1}{2}\angle QPR$.



Sol. $\angle PRS = \angle PQR + \angle QPR$ ...(1)

Now, $\angle QTR + \angle TQR = \angle TRS$

$\Rightarrow \angle QTR + \frac{1}{2} \times \angle PQR = \frac{1}{2}\angle PRS$

$\Rightarrow 2\angle QTR + \angle PQR = \angle PRS$ ...(2)

From (1) and (2),

$2\angle QRT + \angle PQR = \angle PQR + \angle QPR$

$\Rightarrow 2\angle QTR = \angle QPR$

$\Rightarrow \angle QTR = \frac{1}{2}\angle QPR$