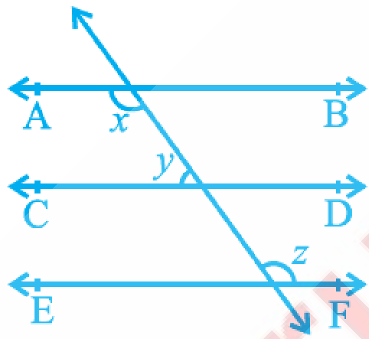
Exercise 6.2

1. In Fig. 6.23, if AB || CD, CD || EF and $y : z = 3 : 7$, find x.

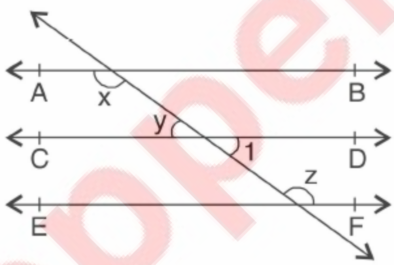


Sol. AB ∥ CD and CD ∥ EF ...(*i*) [Given]

$\angle 1 = y$ [Vertically opposite angles]

$\angle 1 + z = 180°$ [CD ∥ EF and ∠1, ∠z are on the same side of the transversal]

$\Rightarrow \quad y + z = 180°$ ...(*ii*)



Given: $y : z = 3 : 7 \Rightarrow \frac{y}{z} = \frac{3}{7} \Rightarrow y = \frac{3z}{7}$

$\therefore \quad \frac{3z}{7} + z = 180° \Rightarrow \frac{10z}{7} = 180°$ [From (*ii*)]

$\Rightarrow \quad z = 126°$

$\therefore \quad y = 180° - 126° = 54°$ [From (*i*)]

Now, AB || CD and transversal intersects these lines.

$\therefore \quad x + y = 180° \Rightarrow x + 54° = 180° \Rightarrow x = 180° - 54°$
$= 126°$.

2. In Fig. 6.24, if AB || CD, EF ⊥ CD and ∠ GED = 126°, find ∠ AGE, ∠ GEF and ∠ FGE.

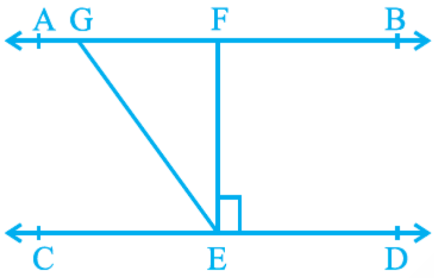


Fig. 6.24

Sol. AB || CD and GE is transversal.

$\therefore$ $\angle AGE = \angle GED$ [Alternate angles]

$\Rightarrow$ $AGE = 126°.$

Further, $\angle GED = \angle GEF + \angle FED$

$\Rightarrow$ $126° = \angle GEF + 90°$ [$\because$ EF ⊥ CD]

$\Rightarrow$ $\angle GEF = 126° - 90° = 36°.$

Again, AB || CD and GE is transversal.

$\therefore$ $\angle FGE + \angle GED = 180°$ [Sum of interior angles on the same side of transversal is 180°.]

$\Rightarrow$ $\angle FGE + 126° = 180°$

$\Rightarrow$ $\angle FGE = 180° - 126° = 54°.$

3. In Fig. 6.25, if PQ || ST, ∠ PQR = 110° and ∠ RST = 130°, find ∠ QRS.

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

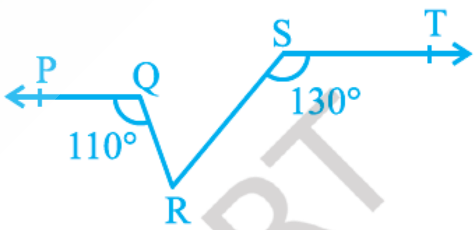


Fig. 6.25

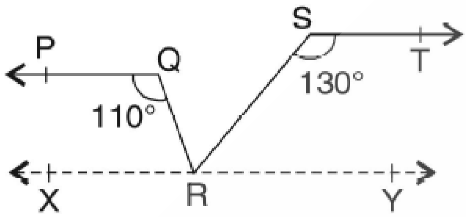
Sol. Construction: Through R draw a line XRY parallel to PQ.

Proof: PQ || XRY and QR is transversal.

$\therefore$ $\angle PQR = \angle QRY = 110°$ ...(*i*) [Alternate angles]

Also, PQ || ST [Given]

and PQ || RY [Construction]



$\therefore$ ST || XRY and SR is transversal.

$\therefore$ $\angle TSR + \angle SRY = 180°$

[Sum of interior angles on the same side of transversal]

$\Rightarrow$ $130° + \angle SRY = 180°$

$\Rightarrow$ $\angle SRY = 180° - 130° = 50°$ ...(*ii*)

Also, $\angle QRY = \angle QRS + \angle SRY$

$\Rightarrow$ $110° = \angle QRS + 50°$ [From (*i*) and (*ii*)]

$\Rightarrow$ $\angle QRS = 110° - 50° = 60°$.

4. In Fig. 6.26, if AB || CD, $\angle$ APQ = 50° and $\angle$ PRD = 127°, find x and y.

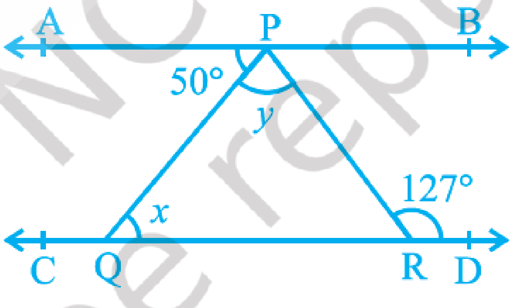


Fig. 6.26

Sol. AB || CD and PQ is transversal.

$\therefore \quad \angle PQR = \angle APQ \quad \Rightarrow \quad x = 50°$

Again AB || CD and PR is transversal.

$\therefore \quad \angle APR = \angle PRD$ [Alternate angles]

$\Rightarrow \quad \angle APQ + \angle QPR = \angle PRD.$

$\Rightarrow \quad 50° + y = 127° \quad \Rightarrow \quad y = 127° - 50° = 77°.$

5. In Fig. 6.27, 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.

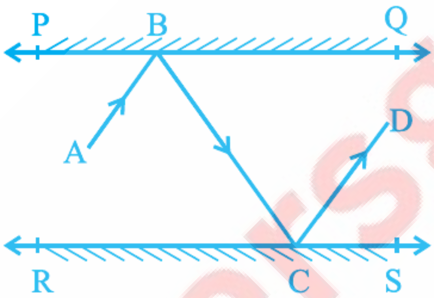
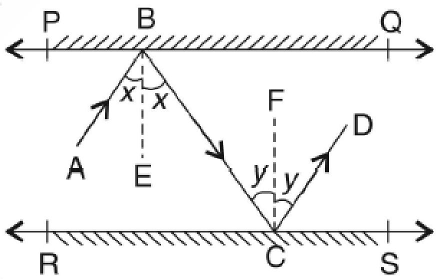


Fig. 6.27

Sol. Construction: Draw BE perpendicular to PQ and CF perpendicular to RS.

Proof: As BE ⊥ PQ and CF ⊥ RS and PQ || RS.



$\Rightarrow \quad BE \parallel CF$ ...(*i*)

Also, we know

Angle of incidence

= angle of reflection.

i.e., $\angle ABE = \angle EBC = x.$ ...(*ii*)

and $\angle BCF = \angle FCD = y.$ ...(*iii*)

From (*i*), BE || CF and BC is transversal.

$\therefore \quad \angle EBC = \angle BCF$ [Alternate angles]

$\Rightarrow \quad x = y \quad \Rightarrow \quad 2x = 2y$

$\Rightarrow \quad \angle ABC = \angle BCD$ [From (*ii*) and (*iii*)]

But these are alternate angles. Hence, AB || CD.