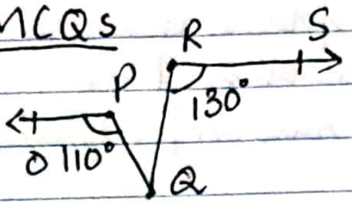
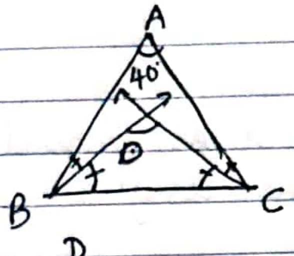
## IX Revision – Lines and Angles

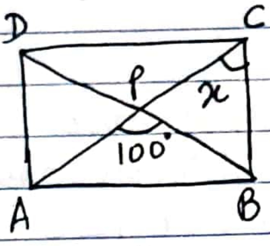
**MCQs**

1) 


If $OP \parallel RS$, $\angle OPQ = 110°$ and $\angle QRS = 130°$, then $\angle PQR =$ ___
(a) 40° (b) 50° (c) 60° (d) 70°

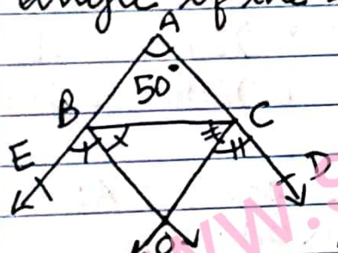
2) 


$\angle BOC =$ ___
(a) 110° (b) 40° (c) 70° (d) 60°

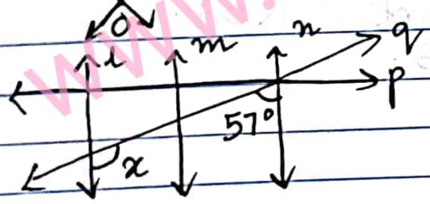
3) 


ABCD is a rectangle in which $\angle APB = 100°$. The value of $x$ is
(a) 40° (b) 50° (c) 60° (d) 70°

4) Angles of a $\Delta$ are in the ratio 2:4:3. The smallest angle of the $\Delta$ is (a) 60° (b) 40° (c) 80° (d) 20°

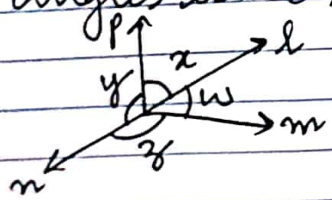
5) 


$\angle BOC =$ ___
(a) 50° (b) 65° (c) 60° (d) 55°

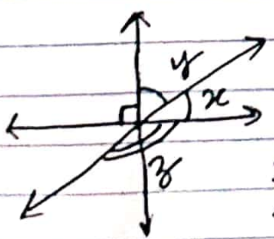
6) 


$l \parallel m \parallel n$, p and q are transversals. Then $\angle x =$ ___
(a) 57° (b) 43° (c) 150° (d) 123°

7) Two adjacent complementary angles are equal, then angles are (a) 90°, 90° (b) 75°, 75° (c) 30°, 30° (d) 45°, 45°

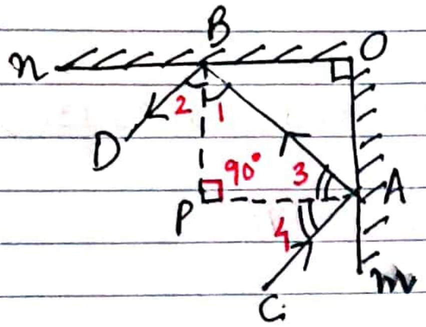
8) 


$\angle x = 20°$, $\angle y = 160°$, $\angle w = 105°$, $\angle z = 75°$
Indicate the correct option
(a) ray m and ray n are opposite rays
(b) ray l and ray n are opposite rays
(c) ray p and ray n are opposite rays
(d) none of these.

9) 

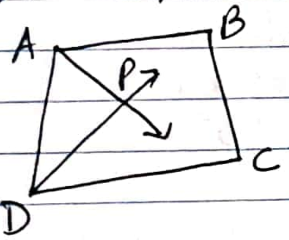

If the angles x and y are in the ratio 2:3, then $z =$ ___ (a) 180° (b) 144° (c) 126° (d) 90°

10) If two complementary angles are in the ratio 13:5, then the angles are (a) 65°, 35° (b) 65°, 25° (c) 13x°, 5x° (d) 60°, 30°

11) 

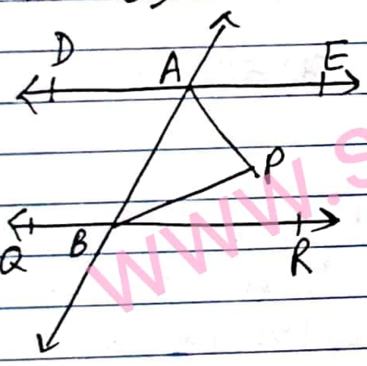

m and n are two plane mirrors perpendicular to each other. Prove that the incident ray CA || reflected ray BD.

12) If two parallel lines are intersected by a transversal, then prove that the bisectors of the interior angles form a rectangle.

13) 


AP and DP are the bisectors of two adjacent angles A and D of a quadrilateral ABCD. Prove that $2\angle APD = \angle B + \angle C$.

14) Arms BA and BC of $\angle ABC$ are respectively parallel to arms ED and EF of $\angle DEF$. Prove that (i) $\angle ABC = \angle DEF$
(ii) $\angle ABC + \angle DEF = 180^\circ$

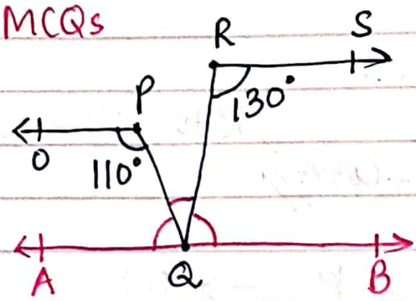
15) 


DE || QR and AP bisects $\angle EAB$ and BP bisects $\angle RBA$. Find $\angle APB$.

IX Revision – LINES AND ANGLES – answers

MCQs

1)




Construction: draw $AB \parallel OP \parallel RS$

$\angle OPQ + \angle PQA = 180°$ (co-interior angles, $OP \parallel AQ$ and $PQ$ is transversal)

$\therefore \angle PQA = 180° - 110° = \underline{70°}$

Similarly, $\angle SRQ + \angle RQB = 180°$ (co-interior angles, $RS \parallel QB$ and $RQ$ is the transversal)

$\therefore \angle RQB = 180° - 130° = \underline{50°}$

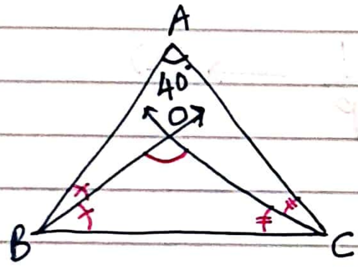
Thus, $\angle PQA + \angle PQR + \angle RQB = 180°$ (angles on a straight line)

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

$= 180° - 120°$

$= 60°$ (C)

2)




Using angle sum property in $\triangle ABC$, $\angle A + \angle B + \angle C = 180°$

$\Rightarrow \angle B + \angle C = 180° - 40° = 140° \rightarrow (1)$

Using angle sum property in $\triangle BOC$,

$\angle OBC + \angle OCB + \angle BOC = 180°$

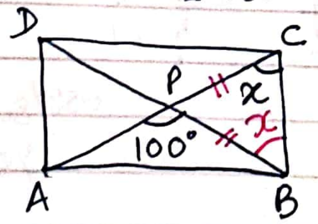
$\Rightarrow \frac{1}{2}\angle B + \frac{1}{2}\angle C + \angle BOC = 180°$

$\Rightarrow \frac{1}{2}(\angle B + \angle C) + \angle BOC = 180°$

$\Rightarrow \frac{1}{2} \times 140° + \angle BOC = 180°$

$\Rightarrow \angle BOC = 180° - 70° = \underline{\underline{110°}}$ (A)

3)




Since diagonals of a rectangle are equal and bisect each other,

$PC = PB$

$\Rightarrow \angle PBC = \angle PCB = x$ (angles opposite to equal sides)

Using exterior angle property in $\triangle PBC$,

$x + x = 100^\circ$

$\Rightarrow 2x = 100^\circ$

$\therefore x = 50^\circ$ (b)

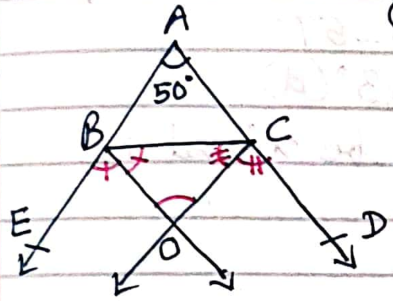
4) Using angle sum property, $2x + 4x + 3x = 180^\circ$

$\Rightarrow 9x = 180^\circ$

$\therefore x = \frac{180^\circ}{9} = 20^\circ$

$\therefore$ The smallest angle of the $\Delta$ is $2x = 2 \times 20^\circ$

$= 40^\circ$ (b)

5) 


Using angle sum property in $\Delta ABC$,

$\angle A + \angle B + \angle C = 180^\circ$

$\angle B + \angle C = 180^\circ - 50^\circ = 130^\circ$

Now, $\angle ABC + \angle CBE = 180^\circ$ (linear pair)

$\Rightarrow \angle CBE = 180^\circ - \angle B$

$\Rightarrow \frac{1}{2} \angle CBE = 90^\circ - \frac{\angle B}{2}$

$\Rightarrow \angle OBC = 90^\circ - \frac{\angle B}{2} \longrightarrow (1)$

Also, $\angle ACB + \angle BCD = 180^\circ$ (linear pair)

$\Rightarrow \angle BCD = 180^\circ - \angle C$

$\Rightarrow \frac{1}{2} \angle BCD = 90^\circ - \frac{\angle C}{2}$

$\Rightarrow \angle BCO = 90^\circ - \frac{\angle C}{2} \longrightarrow (2)$

Using angle sum property in $\Delta BOC$,

$\angle OBC + \angle BCO + \angle BOC = 180^\circ$

$\therefore \angle BOC = 180^\circ - \angle OBC - \angle BCO$

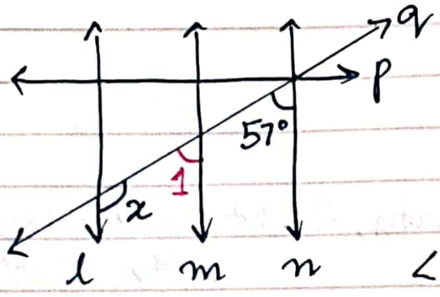
$= \cancel{180^\circ} - \cancel{90^\circ} + \frac{\angle B}{2} - \cancel{90^\circ} + \frac{\angle C}{2}$

$= \frac{1}{2} (\angle B + \angle C)$

$= \frac{1}{2} \times 130^\circ$

$= 65^\circ$ (b)

6)




$\angle 1 = 57°$ (Corresponding angles, $m \parallel n$ and q is the transversal)

$\angle 1 + \angle x = 180°$ (co-interior angles, $l \parallel m$ and q is the transversal)

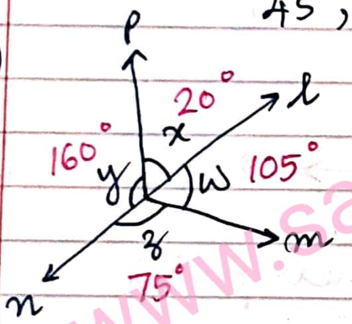
$\therefore \angle x = 180° - 57°$
$= 123°$ (d)

7) Let the complementary angles be $x$ and $x$.

Then, $x + x = 90°$
$2x = 90°$
$\therefore x = \frac{90°}{2} = 45°$

$45°, 45°$ (d)

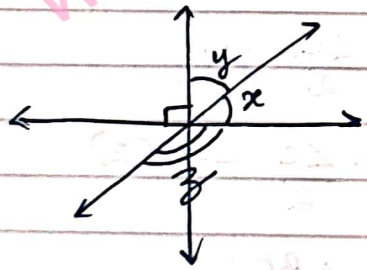
8)




Since $x + y = 160° + 20° = 180°$, line nl forms a straight line. ray l and ray n are opposite rays (b)



9)



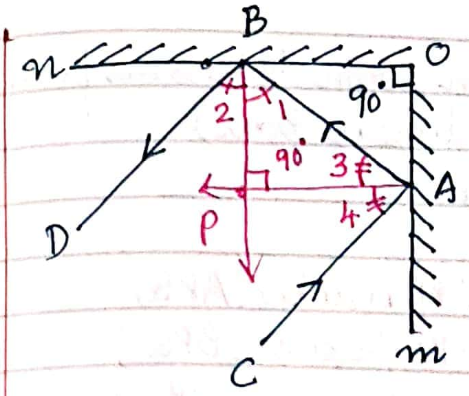

$x + y = 90°$
$\Rightarrow 2a + 3a = 90°$
$\Rightarrow 5a = 90°$
$\therefore a = \frac{90°}{5} = 18°$

Thus $x = 2a = 36°$

Then, $x + z = 180°$ (linear pair)
$z = 180° - 36°$
$= 144°$ (b)

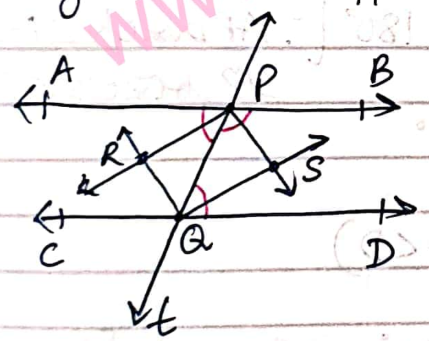
10) $13x + 5x = 90°$
$18x = 90°$
$x = \frac{90°}{18} = 5°$

$\therefore$ The angles are $13x = 13 \times 5 = 65°$
$5x = 5 \times 5 = 25°$ (b)

11) 


Given : $OA \perp OB$
CA is the incident ray
BD is the reflected ray
To prove : $CA \parallel BD$
Construction :- draw $PB \perp OB$ and $PA \perp OA$

Proof :- Since angle of incidence = angle of reflection,
Then $\angle 4 = \angle 3 \rightarrow (1)$
and $\angle 1 = \angle 2 \rightarrow (2)$
Since $\angle AOB = 90°$, $\angle OBP = \angle OAP = 90°$, thus $\angle BPA = 90°$
(angle sum property of a quadrilateral)
Hence, PAOB is a rectangle.
In right $\triangle APB$, $\angle 1 + \angle 3 + 90° = 180°$ (angle sum property)
$\Rightarrow \angle 1 + \angle 3 = 180° - 90° = 90°$
$\Rightarrow 2\angle 1 + 2\angle 3 = 2 \times 90° = 180°$
$\Rightarrow \angle ABD + \angle CAB = 180°$ [from (1) and (2)]
These angles form a pair of co-interior angles only when $CA \parallel BD$. Hence proved.

12) 


Given : $AB \parallel CD$ and t is the transversal
PR bisects $\angle APQ$
RQ bisects $\angle PQC$
PS bisects $\angle BPQ$
QS bisects $\angle PQD$
To prove : PRQS is a rectangle.
Proof :- Since $AB \parallel CD$ and t is the transversal,
$\angle APQ = \angle PQD$ (alternate interior angles)
$\Rightarrow \frac{1}{2}\angle APQ = \frac{1}{2}\angle PQD$

$\Rightarrow \angle RPQ = \angle PQS$ [$\because$ PR bisects $\angle APQ$ and QS bisects $\angle PQD$]
These angles form a pair of alternate interior angles only when $PR \parallel QS$.
Similarly, we can prove $QR \parallel PS$.

Thus, PRQS is a parallelogram with both sides parallel.
Also, $\angle APQ + \angle BPQ = 180^\circ$ (linear pair)

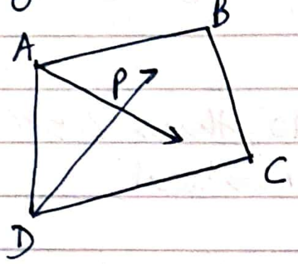
$\Rightarrow \frac{1}{2}\angle APQ + \frac{1}{2}\angle BPQ = \frac{1}{2} \times 180^\circ$

$\Rightarrow \angle RPQ + \angle SPQ = 90^\circ$ [$\because$ PR bisects $\angle APQ$, PS bisects $\angle BPQ$]

$\Rightarrow \angle RPS = 90^\circ$

Thus, parallelogram PRQS is a rectangle with each angle measures $90^\circ$. Hence Proved.

13)




Given:- in quadrilateral ABCD, AP bisects $\angle A$ and DP bisects $\angle D$

To prove: $2\angle APD = \angle B + \angle C$

Proof:- Using angle sum property in quadrilateral ABCD,

$\angle A + \angle B + \angle C + \angle D = 360^\circ$

$\angle A + \angle D = 360^\circ - (\angle B + \angle C) \rightarrow (1)$

In $\triangle APD$, using angle sum property,

$\angle PAD + \angle PDA + \angle APD = 180^\circ$

$\Rightarrow \frac{1}{2}\angle A + \frac{1}{2}\angle D + \angle APD = 180^\circ$ [$\because$ AP bisects $\angle A$ and DP bisects $\angle D$]

$\Rightarrow \frac{1}{2}(\angle A + \angle D) + \angle APD = 180^\circ$

$\Rightarrow \angle APD = 180^\circ - \frac{1}{2}(\angle A + \angle D)$

$= 180^\circ - \frac{1}{2}(360^\circ - \angle B - \angle C)$ [from eq:(1)]

$= \cancel{180^\circ} - \cancel{180^\circ} + \frac{\angle B}{2} + \frac{\angle C}{2}$

$\therefore \angle APD = \frac{1}{2}(\angle B + \angle C)$

Thus, $2\angle APD = \angle B + \angle C$ //
Hence Proved.

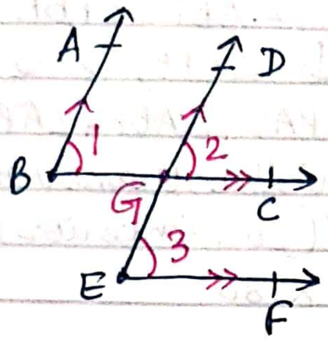
14) Given :- in $\angle ABC$ and $\angle DEF$, $BA \parallel ED$ and $BC \parallel EF$.

To prove : (i) $\angle ABC = \angle DEF$

(ii) $\angle ABC + \angle DEF = 180^\circ$

Proof !-

Case 1 :-




Since $BA \parallel ED$ and $BC$ is the transversal,

$\angle 1 = \angle 2$ (corresponding angles)

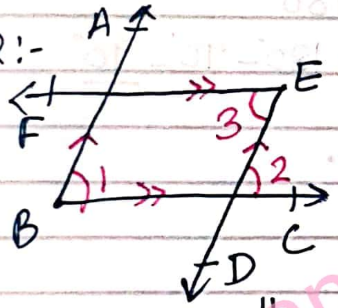
Also, since $BC \parallel EF$ and $ED$ is the transversal,

$\angle 2 = \angle 3$ (corresponding angles)

$\therefore \angle 1 = \angle 3$

$\Rightarrow \angle ABC = \angle DEF$

Case 2 :-




Since $BA \parallel ED$ and $BC$ is the transversal,

$\angle 1 = \angle 2$ (corresponding angles)

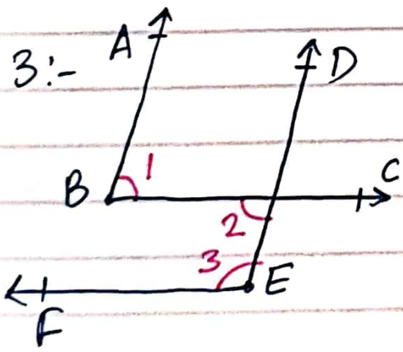
Also, since $BC \parallel EF$ and $DE$ is the transversal,

$\angle 3 = \angle 2$ (alternate interior angles)

$\therefore \angle 1 = \angle 3$

$\Rightarrow \angle ABC = \angle DEF$

Case 3 :-




Since $BA \parallel ED$ and $BC$ is the transversal,

$\angle 1 = \angle 2$ (alternate interior angles)

Also, since $BC \parallel EF$ and $ED$ is the transversal,

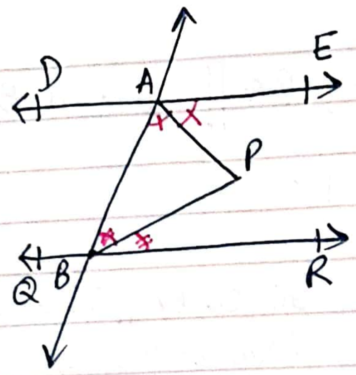
$\angle 2 + \angle 3 = 180^\circ$ (co-interior angles)

$\Rightarrow \angle 1 + \angle 3 = 180^\circ$ [$\because \angle 1 = \angle 2$]

$\Rightarrow \angle ABC + \angle DEF = 180^\circ$

Hence Proved.

15)




Since AP bisects $\angle EAB$,

$\angle EAP = \angle PAB \rightarrow (1)$

Also, since BP bisects $\angle ABR$,

$\angle ABP = \angle PBR \rightarrow (2)$

In $\triangle APB$, using angle sum property

$\angle PAB + \angle ABP + \angle APB = 180^\circ \rightarrow (3)$

Since $DE \parallel QR$ and AB is the transversal,

$\angle EAB + \angle ABR = 180^\circ$ (co-interior angles)

$\Rightarrow \frac{1}{2}\angle EAB + \frac{1}{2}\angle ABR = \frac{1}{2} \times 180^\circ$

$\Rightarrow \angle PAB + \angle ABP = 90^\circ$ [from eq: (1) and (2)] $\rightarrow (4)$

From eq: (3), $90^\circ + \angle APB = 180^\circ$

$\therefore \angle APB = 180^\circ - 90^\circ = \underline{\underline{90^\circ}}$