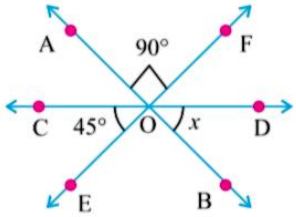
EXample-8 : In the given figure AB, CD and EF are three straight lines intersecting each other at a point O. If ∠COE = 45° and ∠AOF = 90°, find ∠DOB.



Sol. Let $\angle DOB = x$

$\angle FOD$ and $\angle COE$ are vertically opposite angles

$\therefore \quad \angle FOD = \angle COE = 45°$

AOB is a straight line

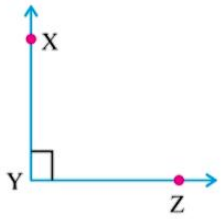
$$\angle AOF + \angle FOD + \angle DOB = 180°$$
$$90° + 45° + x = 180°$$
$$135° + x = 180°$$
$$x = 180° - 135°$$
$$x = 45°$$

Required angle $\angle DOB = 45°$

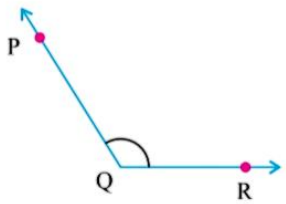
EXERCISE - 5.1

1. Name each of the following as acute, obtuse, right straight or a reflex angle.

(*i*)

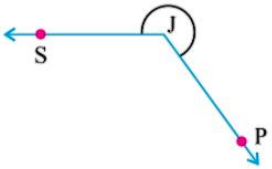


(*ii*)

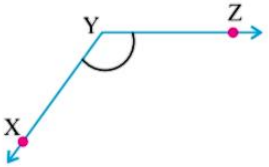


(*iii*)

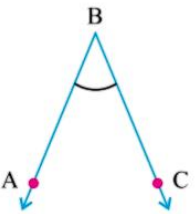
(*iv*)



(*v*)



(*vi*)



2. Write the complement of each of the following angles

(*i*) 53° (*ii*) 90° (*iii*) 85°

(*iv*) $\frac{4}{9}$ of a right angle (*v*) 0°

3. Write the supplement of each of the following angle

(*i*) $55°$ (*ii*) $105°$

(*iii*) $100°$ (*iv*) $\frac{2}{3}$ of a right angle

(*v*) $\frac{1}{3}$ of $270°$

4. Identify the following pairs of angles as complementary or supplementary.

(*i*) $65°$ and $115°$ (*ii*) $112°$ and $68°$

(*iii*) $63°$ and $27°$ (*iv*) $45°$ and $45°$

(*v*) $130°$ and $50°$

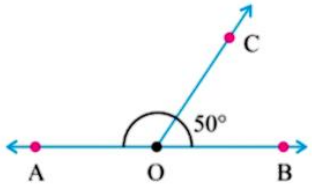
5. Two complementary angles are in the ratio of 4 : 5, find the angles.

6. Two supplementary angles are in the ratio of 5 : 13, find the angles.

7. Find the angle which is equal to its complement.

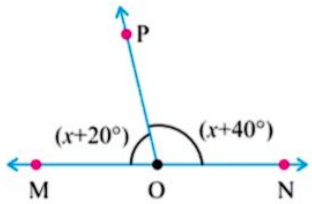
8. Find the angle which is equal to its supplement.

9. In the given figure, AOB is straight line. Find the measure of $\angle AOC$.



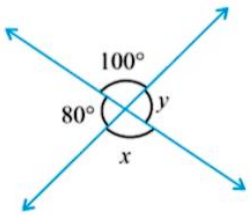
10. In the given figure, MON is straight line find

(*i*) $\angle MOP$ (*ii*) $\angle NOP$

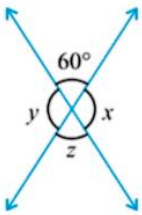


11. Find the value of x, y and z in each of following.

(*i*)

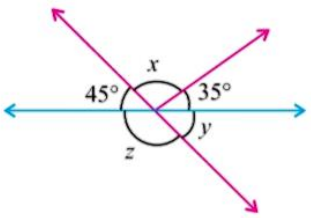


(*ii*)

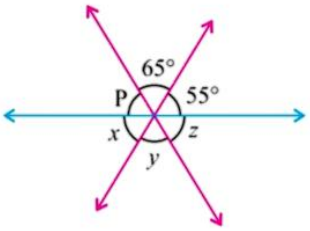


12. Find the value of x, y, z and p in each of following.

(*i*)



(*ii*)



13. Multiple Choice Question :-

(*i*) If two angles are complementary then the sum of their measure is ..... .

(*a*) 180° (*b*) 90°

(*c*) 360° (*d*) none of these

(*ii*) Two angles are called ..... if the sum of their measures is 180°.

(*a*) supplementary (*b*) complementary

(*c*) right (*d*) none of these

(*iii*) If two adjacent angles are supplementary then, they form a .....

(*a*) right angle (*b*) vertically opposite angles

(*c*) linear pair (*d*) corresponding angles

(*iv*) If two lines intersect at a point, the vertically opposite angles are always .....

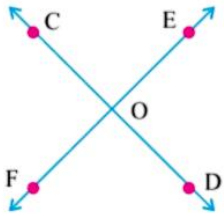
(*a*) equal (*b*) zero

(*c*) 90° (*d*) none of these

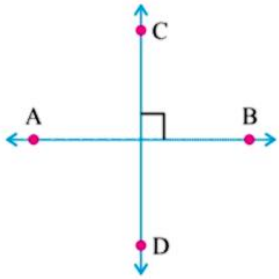
PAIRS OF LINES

Here, we shall discuss about intersecting lines, transversal, perpendicular lines, angles made by transversal with parallel lines and non-parallel lines.

1. Intersecting lines : When two lines intersect exactly at one point, they are called intersecting lines. In figure, CD and EF are intersecting lines and O is the point of intersection.



2. Perpendicular lines : Two lines are said to be perpendicular to each other if they meet or intersect at a right angle. In figure, CD is perpendicular to AB and is written as CD $\perp$ AB.



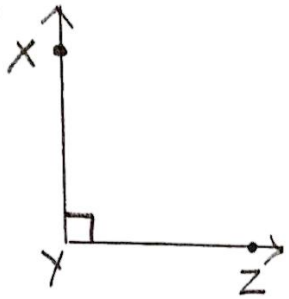
Exercise – 5.1

(अभ्यास – 5.1)

Question 1.

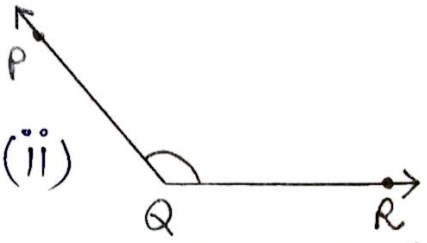
Solution → (उत्तर)

(i)



Right Angle
(समकोण)

(ii)

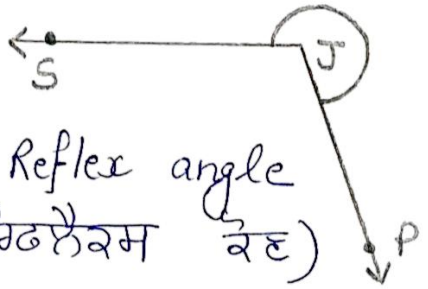


Obtuse Angle
(अधिक कोण)

iii)

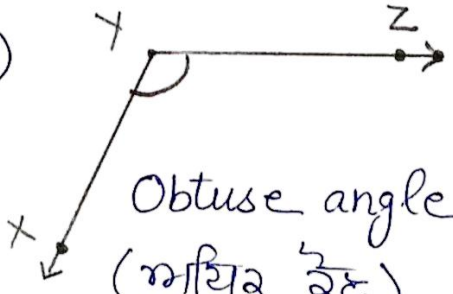
Straight angle
(सरल कोण)

iv)



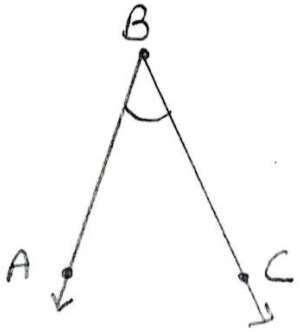
Reflex angle
(प्रतिवर्ती कोण)

v)



Obtuse angle
(अधिक कोण)

vi)



Acute angle
(न्यून कोण)

Question ਪ੍ਰਸ਼ਨ 2 →

When the sum of measure of two angles is 90°, then these angles are complementay angles.
(ਜੇਕਰ ਦੋ ਕੋਣਾਂ ਦਾ ਮੇਲ 90° ਹੁੰਦਾ ਹੈ ਤਾਂ ਇਹ ਕੋਣ ਪੂਰਕ ਕੋਣ ਹੁੰਦੇ ਹਨ)

(i) 53°

ਪਹਿਲਾ ਕੋਣ (First angle) = 53°

ਦੂਜਾ ਕੋਣ (Second angle) = x

$\therefore 53 + x = 90°$

$x = 90° - 53°$

$\boxed{x = 37°}$ Ans

(ii) 90°

ਪਹਿਲਾ ਕੋਣ (First angle) = 90°

ਮੰਨ ਲਉ, ਦੂਜਾ ਕੋਣ (Second angle) = x
(Let)

$\therefore 90° + x = 90°$

$x = 90 - 90$

$\boxed{x = 0°}$ Ans

(iii) 85°

ਪਹਿਲਾ ਕੋਣ (First angle) = 85°

ਮੰਨ ਲਉ, ਦੂਜਾ ਕੋਣ (Second angle) = x
(Let)

$\therefore 85 + x = 90°$

$x = 90 - 85$

$\boxed{x = 5°}$ Ans

(iv) $\frac{4}{9}$ of a right angle (ਸਮਕੋਣ ਦਾ $\frac{4}{9}$)

ਪਹਿਲਾ ਕੋਣ (First angle) $= \frac{4}{9} \times 90^{10}$

$= 4 \times 10$

$= 40^\circ$

ਦੂਜਾ ਕੋਣ (Second angle) $= x$

$\therefore \quad 40 + x = 90$

$x = 90 - 40$

$\boxed{x = 50^\circ}$

v) 0°

ਪਹਿਲਾ ਕੋਣ (First angle) $= 0^\circ$

ਦੂਜਾ ਕੋਣ (Second angle) $= x$

$\therefore \quad 0 + x = 90$

$x = 90 - 0$

$\boxed{x = 90^\circ}$

Question 3

(ਹੱਲ) → When the sum of measure of two angles is 180°. Then these angles are supplementary angles. (ਜਦੋਂ ਦੋ ਕੋਣਾਂ ਦਾ ਜੋੜ 180° ਹੁੰਦਾ ਹੈ ਤਾਂ ਇਹ ਕੋਣ ਦੂਜੇ ਕੋਣ ਦਾ ਸੰਪੂਰਕ ਹੁੰਦਾ ਹੈ)

i) 55°

ਪਹਿਲਾ ਕੋਣ (First angle) $= 55^\circ$

ਅਤੇ ਦੂਜਾ ਕੋਣ (Second angle) $= x$

(Ans)

Now, ਹੁਣ $55 + x = 180^\circ$

$x = 180 - 55^\circ$

$\boxed{x = 125^\circ}$

$$\begin{array}{r} {}^{7}\cancel{1}80 \\ -\ 55 \\ \hline 125 \end{array}$$

(ii) 105°

ਪਹਿਲਾ ਕੋਣ (First angle) $= 105^\circ$

ਮੰਨ ਲਓ, ਦੂਜਾ ਕੋਣ (Second angle) $= x$
(Let) =

ਹੁਣ (Now), $105 + x = 180^\circ$

$x = 180 - 105$

$\boxed{x = 75^\circ}$

$$\begin{array}{r} 180 \\ -\ 105 \\ \hline 75 \end{array}$$

(iii) 100°

ਪਹਿਲਾ ਕੋਣ (First angle) $= 100^\circ$

ਮੰਨ ਲਓ, ਦੂਜਾ ਕੋਣ (Second angle) $= x$
(Let) =

ਹੁਣ (Now), $100 + x = 180^\circ$

$x = 180^\circ - 100^\circ$

$\boxed{x = 80^\circ}$

(iv) $\frac{2}{3}$ of a right angle (ਸਮਕੋਣ ਦਾ $\frac{2}{3}$)

i.e. $\frac{2}{\cancel{3}_1} \times \cancel{90}^{30^\circ} = 60^\circ$

ਪਹਿਲਾ ਕੋਣ (First angle) $= 60^\circ$

ਮੰਨ ਲਓ, ਦੂਜਾ ਕੋਣ (Second angle) $= x$
(Let) =

ਹੁਣ (Now), $60 + x = 180^\circ$

$x = 180 - 60$

$\boxed{x = 120^\circ}$

v) $\frac{1}{3}$ of 270° (270° ਦਾ $\frac{1}{3}$)

i.e. $\frac{1}{3} \times 270^{90^\circ} = 90^\circ$

ਪਹਿਲਾ ਕੋਣ (First angle) $= 90^\circ$

ਮੰਨਲਓ, ਦੂਜਾ ਕੋਣ (second angle) $= x$
(Let)

ਹੁਣ (Now), $90 + x = 180$

$x = 180 - 90$

$\boxed{x = 90^\circ}$

Question 4
(ਪ੍ਰਸ਼ਨ) → ਅਸੀਂ ਜਾਣਦੇ ਹਾਂ ਕਿ ਪੂਰਕ ਕੋਣਾਂ ਦਾ ਜੋੜ 90°
(We know that sum of complementary angles is 90°)

ਅਤੇ ਸੰਪੂਰਕ ਕੋਣਾਂ ਦਾ ਜੋੜ 180° ਹੁੰਦਾ ਹੈ।
and sum of supplementary angles is 180°

(i) $65^\circ, 115^\circ$

$65^\circ + 115^\circ = 180^\circ$

$\therefore$ ਇਹ ਸੰਪੂਰਕ ਕੋਣਾਂ ਦਾ ਜੋੜ ਹੈ।
(These are supplementary angles)

$$\begin{array}{r} 115 \\ 65 \\ \hline 180 \end{array}$$

(ii) $112^\circ, 68^\circ$

$112^\circ + 68^\circ = 180^\circ$

$\therefore$ ਇਹ ਸੰਪੂਰਕ ਕੋਣਾਂ ਦਾ ਜੋੜ ਹੈ।
(These are supplementary angles)

$$\begin{array}{r} 112 \\ 68 \\ \hline 180 \end{array}$$

(iii) $63^\circ, 27^\circ$

$63^\circ + 27^\circ = 90^\circ$

$\therefore$ ਇਹ ਹਰ ਕੋਣਾਂ ਦਾ ਜੋੜਾ ਹੈ।

(These are complementary angles).

$$\begin{array}{r} 63 \\ +\ 27 \\ \hline 90 \end{array}$$

(iv) $45^\circ, 45^\circ$

$45 + 45 = 90^\circ$

$\therefore$ ਇਹ ਹਰ ਕੋਣਾਂ ਦਾ ਜੋੜਾ ਹੈ।

(These are complementary angles)

v) $130^\circ, 50^\circ$

$130 + 50 = 180^\circ$

$\therefore$ ਇਹ ਸਪਲਿਮੈਂਟਰੀ ਕੋਣਾਂ ਦਾ ਜੋੜਾ ਹੈ।

(These are supplementary angles)

Question (ਪ੍ਰਸ਼ਨ) 5 →

ਮੰਨ ਲਓ, ਪਹਿਲਾ ਕੋਣ (First angle) = $4x$

(let) ਦੂਜਾ ਕੋਣ (Second angle) = $5x$

ਅਸੀਂ ਜਾਣਦੇ ਹਾਂ ਕਿ ਹਰ ਕੋਣਾਂ ਦਾ ਜੋੜ 90° ਹੁੰਦਾ ਹੈ।

(We know, sum of complementary angles = 90°)

$\therefore 4x + 5x = 90^\circ$

$9x = 90^\circ$

$x = \frac{90}{9}$

$\boxed{x = 10^\circ}$

$\therefore$ ਪਹਿਲਾ ਕੋਣ (First angle) $= 4x = 4 \times 10 = 40^\circ$ Ans

ਦੂਜਾ ਕੋਣ (Second angle) $= 5x = 5 \times 10 = 50^\circ$ Ans

Question 6 → (ਪ੍ਰਸ਼ਨ)

ਮੰਨ ਲਓ, ਪਹਿਲਾ ਕੋਣ (First angle) = $5x$
(Let)

ਦੂਜਾ ਕੋਣ (second angle) = $13x$

ਸਾਨੂੰ ਪਤਾ ਹੈ ਕਿ ਸੰਪੂਰਕ ਕੋਣਾਂ ਦਾ ਜੋੜ $180°$ ਹੁੰਦਾ ਹੈ।
(We know, sum of supplementary angles is $180°$)

$\therefore 5x + 13x = 180°$

$18x = 180°$

$x = \frac{180°}{18°}$

$\boxed{x = 10°}$

$\therefore$ ਪਹਿਲਾ ਕੋਣ (First angle) $= 5x = 5 \times 10° = 50°$ Ans

ਦੂਜਾ ਕੋਣ (Second angle) $= 13x = 13 \times 10° = 130°$ Ans

Question 7 → (ਪ੍ਰਸ਼ਨ)

ਸਾਨੂੰ ਉਹ ਕੋਣ ਪਤਾ ਕਰਨਾ ਹੈ ਜੋ ਆਪਣੇ ਪੂਰਕ ਦੇ ਬਰਾਬਰ ਹੋਵੇ।
(we have to find an angle which is equal to its complement).

ਮੰਨ ਲਓ, ਕੋਣ $= x$
(Let, the angle)

$\therefore x + x = 90°$

$2x = 90°$

$\boxed{x = 45°}$

Question ਪ੍ਰਸ਼ਨ 8 → ਅਜਿਹੇ ਕੋਣ ਦਾ ਮਾਪ ਕੱਢੋ ਜੋ ਆਪਣੇ ਸੰਪੂਰਕ ਦੇ ਬਰਾਬਰ ਹੋਵੇ।
(We have to find an angle which is equal to its supplement.

ਮੰਨ ਲਉ, ਕੋਣ = x
(Let the angle)

$\therefore \quad x + x = 180$

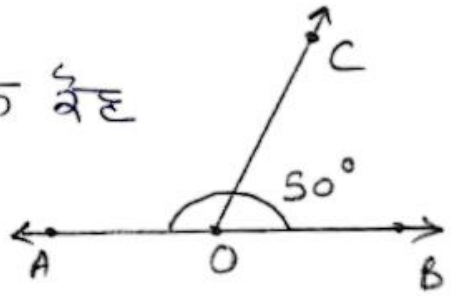
$2x = 180$

$x = \frac{180}{2}$

$\boxed{x = 90^\circ}$

Question ਪ੍ਰਸ਼ਨ 9 →

ਅਸੀਂ ਜਾਣਦੇ ਹਾਂ ਕਿ ਸਰਲ ਰੇਖਾ ਦਾ ਮਾਪ 180° ਹੁੰਦਾ ਹੈ।
(We know angle in a straight line is 180°)



ਇਥੇ (Here), $\angle BOC = 50^\circ$ (ਦਿੱਤਾ ਹੈ। given)

ਹੁਣ (Now), $\angle AOC + \angle BOC = 180^\circ$ [ਸਰਲ ਕੋਣ (Straight angle)]

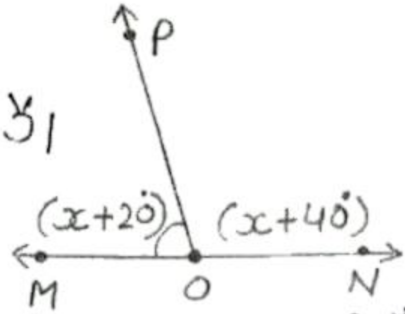
$\angle AOC + 50^\circ = 180^\circ$

$\angle AOC = 180^\circ - 50^\circ$

$\boxed{\angle AOC = 130^\circ}$

Question 10

ਹੱਲ → ਅਸੀਂ ਜਾਣਦੇ ਹਾਂ ਕਿ ਸਰਲ ਕੋਣ ਦਾ ਮਾਪ 180° ਹੁੰਦਾ ਹੈ।
(We know that angle in a straight line is 180°)



ਇੱਥੇ (Here), $\angle MOP = x+20°$, $\angle PON = x+40°$ (ਦਿੱਤਾ ਹੈ given)

ਹੁਣ (Now), $\angle MOP + \angle PON = 180°$ [ਸਰਲ ਕੋਣ (Straight angle)]

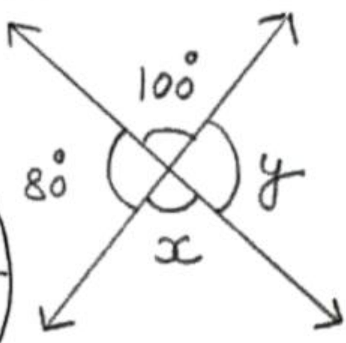
$$x+20+x+40 = 180°$$
$$2x+60 = 180°$$
$$2x = 180°-60°$$
$$2x = 120°$$
$$x = \frac{120°}{2}$$
$$x = 60°$$

$\therefore \angle MOP = x+20 = 60+20 = 80°$

ਅਤੇ (and) $\angle PON = x+40 = 60+40 = 100°$ Ans

Question-11

ਹੱਲ

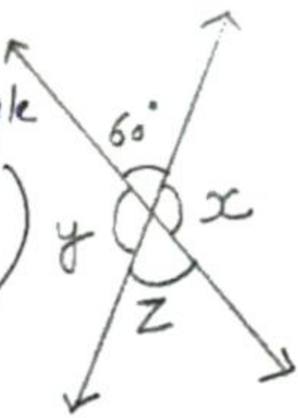


(i) $x = 100°$ (ਸਿਖਰ ਸਨਮੁੱਖ ਕੋਣ Vertically opposite angle)

$y = 80°$ (ਸਿਖਰ ਸਨਮੁੱਖ ਕੋਣ vertically opposite angle)

(10)

(ii) $\boxed{Z = 60^\circ}$ (અભિમુખ કોણ / Vertically opposite angle)



Now (હવે), $y + 60^\circ = 180^\circ$ (રૈખિક જોડ / linear pair)

$y = 180^\circ - 60^\circ$

$\boxed{y = 120^\circ}$

And (અને) $x = y$ (અભિમુખ કોણ / Vertically opposite angle)

$\therefore \boxed{x = 120^\circ}$

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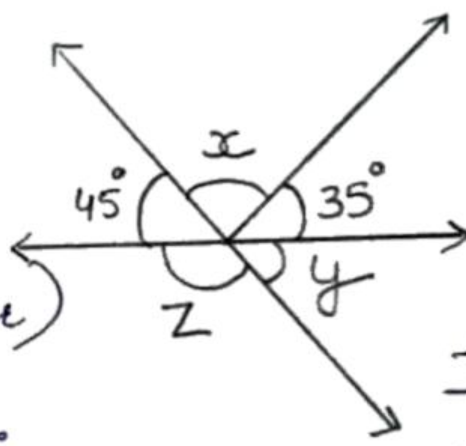
12 Question → (પ્રશ્ન)



(i) $45^\circ + x + 35^\circ = 180^\circ$ (રૈખિક જોડ / Linear pair)

$$\begin{array}{r} 45 \\ +35 \\ \hline 80 \end{array}$$

$80 + x = 180^\circ$

$x = 180^\circ - 80^\circ$

$\boxed{x = 100^\circ}$

$45 + Z = 180^\circ$ (રૈખિક જોડ / linear pair)

$$\begin{array}{r} 180 \\ -45 \\ \hline 135 \end{array}$$

$Z = 180^\circ - 45^\circ$

$\boxed{Z = 135^\circ}$

and (અને) $Z + y = 180^\circ$ (રૈખિક જોડ / linear pair)

$135 + y = 180^\circ$

$y = 180^\circ - 135^\circ$

$\boxed{y = 45^\circ}$

$\begin{array}{r} 180 \\ -135 \\ \hline 45 \end{array}$

$\therefore x = 100^\circ, \quad y = 45^\circ, \quad z = 135^\circ$

Question ਪ੍ਰਸ਼ਨ 13 →

(i) (b) 90°

(ii) (a) Supplementary (ਸੰਪੂਰਕ)

(iii) (c) Linear pair (ਰੇਖੀ ਜੋੜ)

(iv) (a) Equal (ਬਰਾਬਰ)

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