RD SHARMA

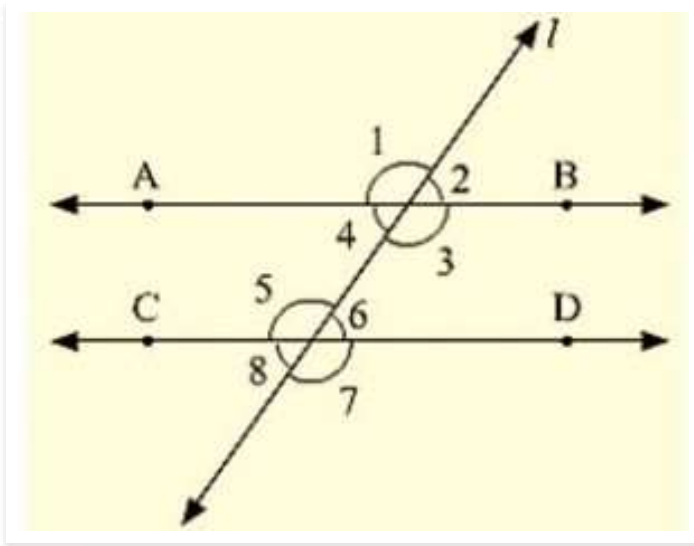## Solutions

Class 9 Maths

Chapter 8

Ex 8.4

Q 1: In below fig. AB CD and ∠1 and ∠2 are in the ratio 3 : 2. Determine all angles from 1 to 8.

Ans :   Let ∠1 = 3x and ∠2 = 2x

∠1 and ∠2 are linear pair of angle

Now, ∠1 and ∠2

=> 3x + 2x = 180

=> 5x = 180

=> x = 180 / 5

=> x = 36

$∠1 = 3x = 108°, \ ∠2 = 2x = 72°$

We know, Vertically opposite angles are equal

$∠1 = ∠3 = 108°$

$∠2 = ∠4 = 72°$

$∠6 = ∠7 = 108°$

$∠5 = ∠8 = 72°$

We also know, corresponding angles are equal

$∠1 = ∠5 = 108°$

$∠2 = ∠6 = 72°$

Q 2: In the below fig, l, m and n are parallel lines intersected by transversal p at X. Y and Z respectively. Find ∠1, ∠2 and ∠3
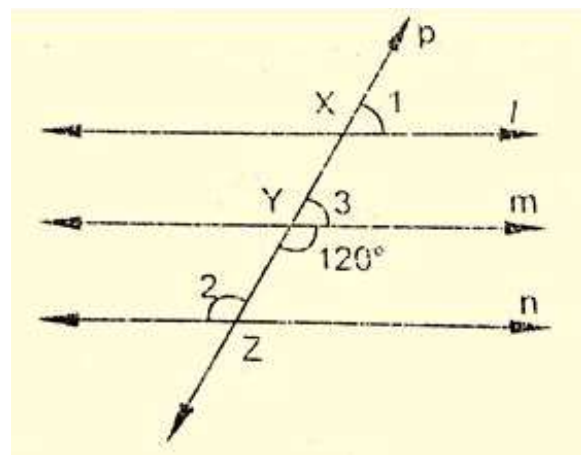
Ans : From the given figure :

$\angle 3 + \angle mYZ = 180°$ [Linear pair]

=> $\angle 3 = 180 - 120$

=> $\angle 3 = 60°$

Now line l parallel to m

$\angle 1 = \angle 3$ [Corresponding angles]

$\angle 1 = 60°$

Also m parallel to n

=> $\angle 2 = 120°$ [Alternative interior angle]

Hence, $\angle 1 = \angle 3 = 60°$

$\angle 2 = 120°$

3. In the below fig, AB || CD || EF and GH || KL Find $\angle HKL$
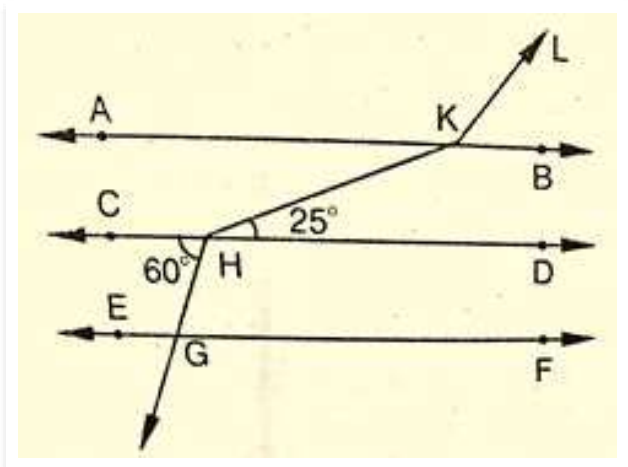
Ans :   Produce LK to meet GF at N.

Now, alternative angles are equal

$\angle CHG = \angle HGN = 60°$
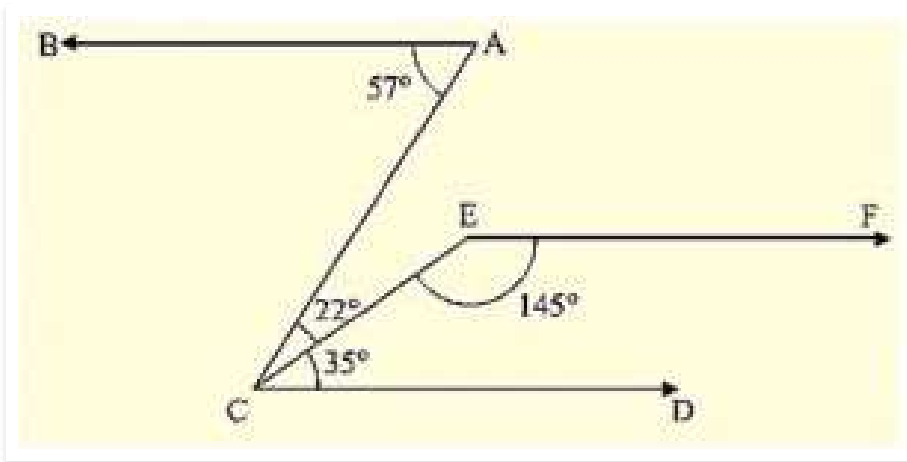
$\angle HGN = \angle KNF = 60°$ [Corresponding angles]

Hence, $\angle KNG = 180 - 60 = 120$

=> ∠GNK = ∠AKL = 120° [Corresponding angles]

∠AKH = ∠KHD = 25°   [alternative angles]

Therefore, ∠HKL = ∠AKH + ∠AKL = 25 + 120 = 145°

Q 4 : In the below fig, show that AB || EF

Ans : Produce EF to intersect AC at K.

Now, ∠DCE + ∠CEF = 35 + 145 = 180°

Therefore, EF || CD   (Since Sum of Co-interior angles is 180) --(1)

Now, ∠BAC = ∠ACD = 57°

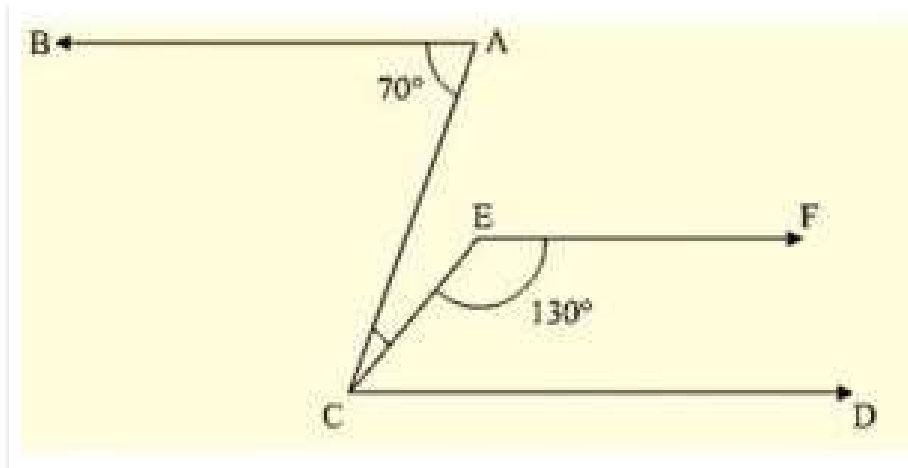=>BA || EF   [Alternative angles are equal]   --(2)

From (1) and (2)

AB || EF [Since, Lines parallel to the same line are parallel to each other]

Hence proved.

Q 5 : If below fig.if AB || CD and CD || EF, find ∠ACE.

Ans : Since EF || CD

Therefore, EFC + ECD = 180   [co-interior angles are supplementary]

=> ECD = 180 − 130 = 50

Also BA || CD

=> BAC = ACD = 70   [alternative angles]

But, ACE + ECD =70

=> ACE = 70 – 50 = 20

Q 6 : In the below fig, PQ || AB and PR || BC. If $\angle QPR = 102°$, determine $\angle ABC$ Give reasons.
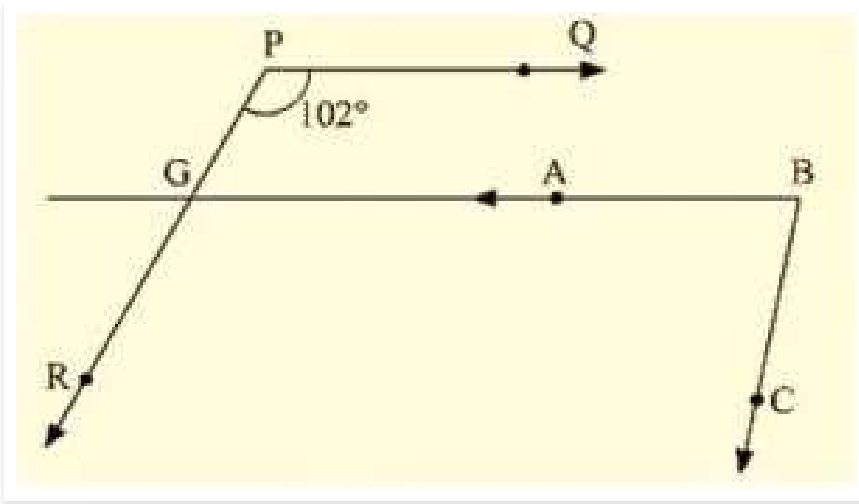
Ans : AB is produce to meet PR at K

Since PQ || AB

$\angle QPR = \angle BKR = 102°$ [corresponding angles]
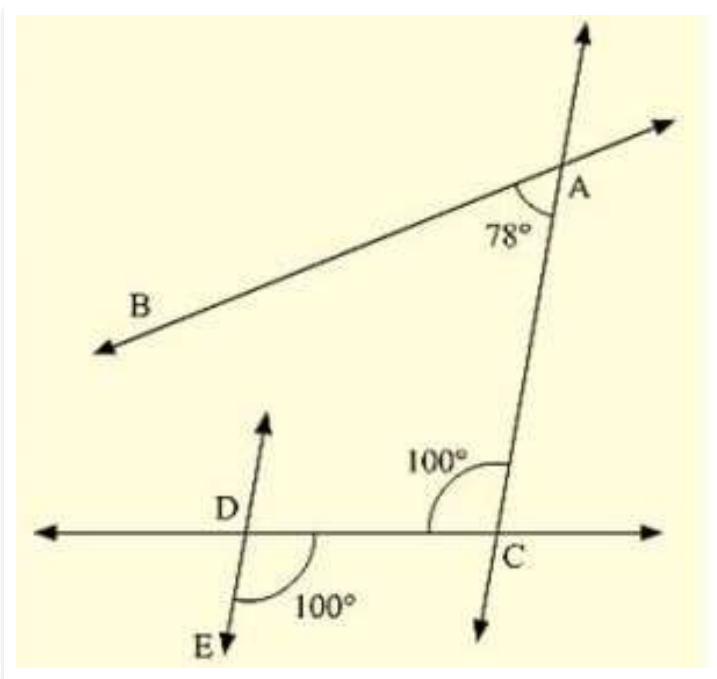
Since PR || BC

$\angle RKB + \angle CBK = 180°$ [Since Corresponding angles are supplementary]

$\angle CKB = 180 – 102 = 78$

∴ $\angle CKB = 78°°$

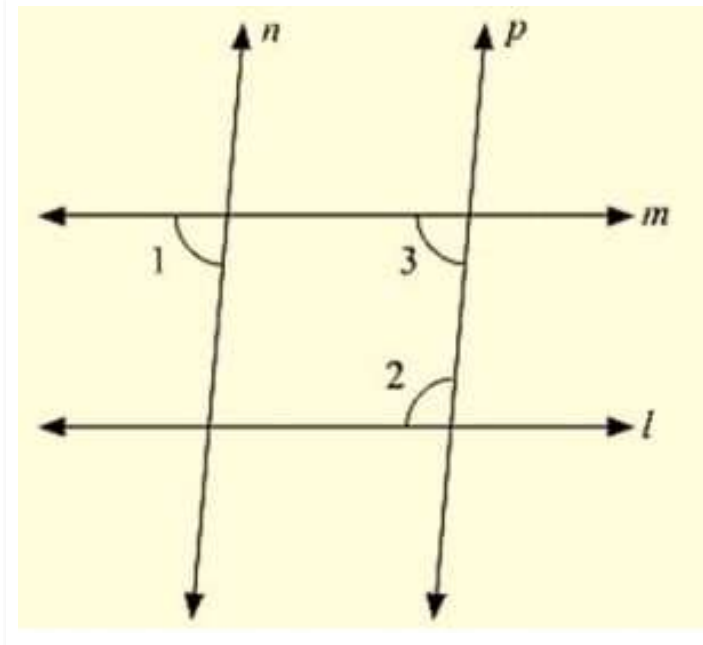Q 7 : In the below fig, state Which lines are parallel and why?

Ans : Vertically opposite angles are equal

=> $\angle EOC = \angle DOK = 100°$

$\angle DOK = \angle ACO = 100°$

Here two lines EK and CA cut by a third line and the corresponding angles to it are equal Therefore, EK || AC.

8. In the below fig. if l||m, n || p and $\angle 1 = 85°$. find $\angle 2$.

Ans : Corresponding angles are equal

=> $\angle 1 = \angle 3 = 85°$
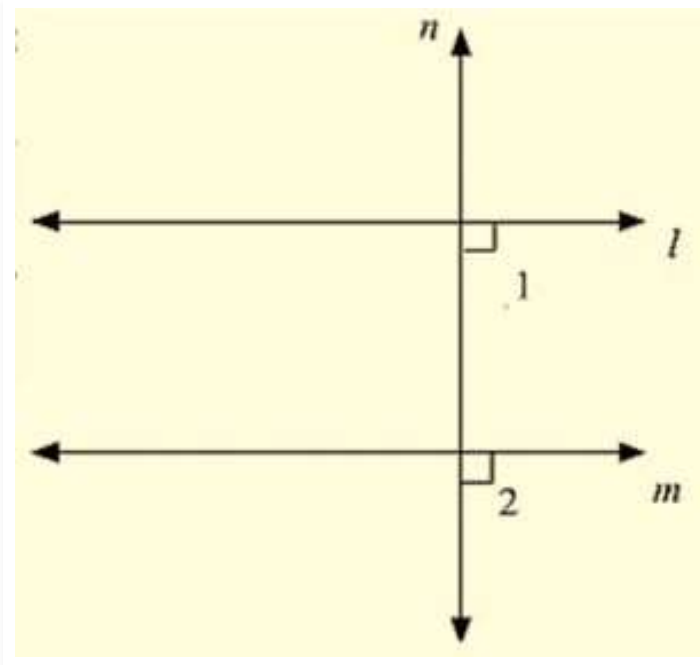
By using the property of co-interior angles are supplementary

$\angle 2 + \angle 3 = 180°$

$\angle 2 + 55 = 180$

$\angle 2 = 180 - 85$

$\angle 2 = 95°$

Q 9 : If two straight lines are perpendicular to the same line, prove that they are parallel to each other.

Ans : Given m perpendicular t and I perpendicular to t

$\angle 1 = \angle 2 = 90°$

Since, I and m are two lines and it is transversal and the corresponding angles are equal

L || M

Hence proved

Q 10 : Prove that if the two arms of an angle are perpendicular to the two arms of another angle. then the angles are either equal or supplementary.

Ans : Consider be angles AOB and ACB

Given 0A perpendicular to A0, also 0B perpendicular to BO

To prove : $\angle AOB + \angle ACB = 180°$ (or) $\angle AOB + \angle ACB = 180°$

Proof : In a quadrilateral $= \angle A + \angle O + \angle B + \angle C = 360°$

[Sum of angles of quadrilateral is 360]

=> 180+ O +B + C = 360

=> O+ C = 360 −180

Hence AOB + ACB = 180   −−(1)

Also, B + ACB = 180

=> ACB =180 − 90 = ACES = 90°   −−(2)

From (i) and (ii), ACB = AOB = 90

Hence, the angles are equal as well as supplementary.

Q 11 : In the below fig, lines AB and CD are parallel and P is any point as shown in the figure. Show that $\angle ABP + \angle CDP = \angle DPB$.
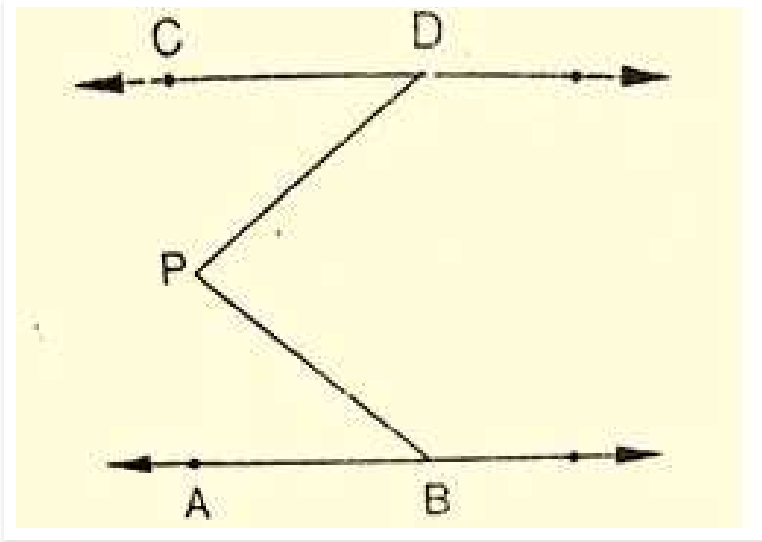
Ans :

Given that AB ||CD

Let EF be the parallel line to AB and CD which passes through P

It can be seen from the figure

Alternative angles are equal

$\angle ABP = \angle BPF$

Alternative angles are equal

$\angle CDP = \angle DPF$
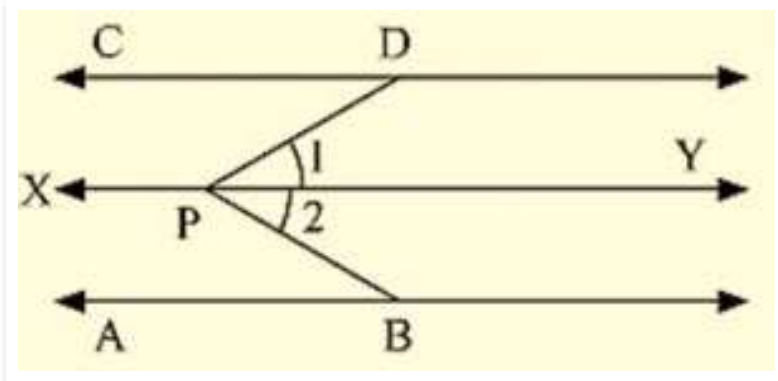
$\angle ABP + \angle CDP = \angle BPF + \angle DPF$

$\angle ABP + \angle CDP = \angle DPB$

Hence proved

AB parallel to CD, P is any point

To prove: $\angle ABP + \angle BPD + \angle CDP = 360°$

Construction : Draw EF || AB passing through P

Proof : Since AB ||EF and AB || CD, Therefore EF || CD   [Lines parallel to the same line are parallel to each other)

$\angle ABP + \angle EPB = 180°$ [Sum of co-interior angles is180)

$\angle EPD + \angle COP = 180°$ --(1) [Sum of co-interior angles is180)

$\angle EPD + \angle CDP = 180°$ --(2)

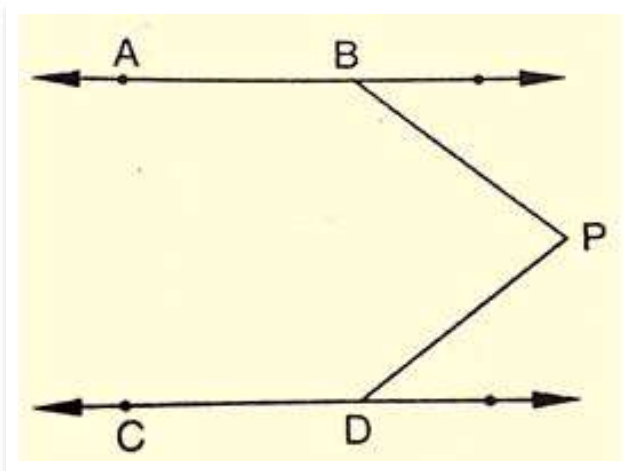By adding (1) end (2)

$\angle ABP + \angle EPB + \angle EPD + \angle CDP = (180 + 180)°$

$\angle ABP + \angle EPB + \angle COP = 360°$

Q 12 : In the below fig, AB || CD and P is any point shown in the figure. Prove that :
$\angle ABP + \angle BPD + \angle CDP = 360°$

Ans : Through P, draw a line PM parallel to AB or CD.

Now,

A8 || PM => ABP + BPM = 180

And

CD||PM = MPD + CDP = 180

Adding (i) and (ii), we get A8P + (BPM + MPD) CDP = 360

=> ABP + BPD + CDP = 360

Q 13 : Two unequal angles of a parallelogram are in the ratio 2 : 3. Find all its angles in degrees.
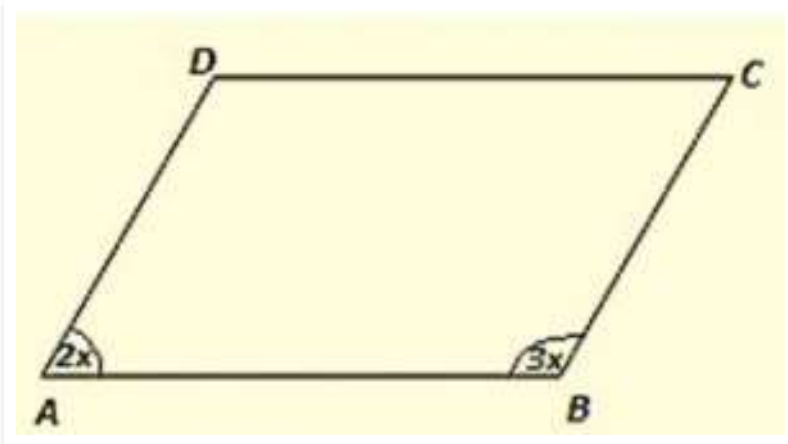
Ans : Let A = 2x and B = 3x

Now, A +B = 180   [Co-interior angles are supplementary]

2x + 3x – 180   [AD II BC and AB is the transversal)

=> 5x = 180

x = 180/5

x = 36

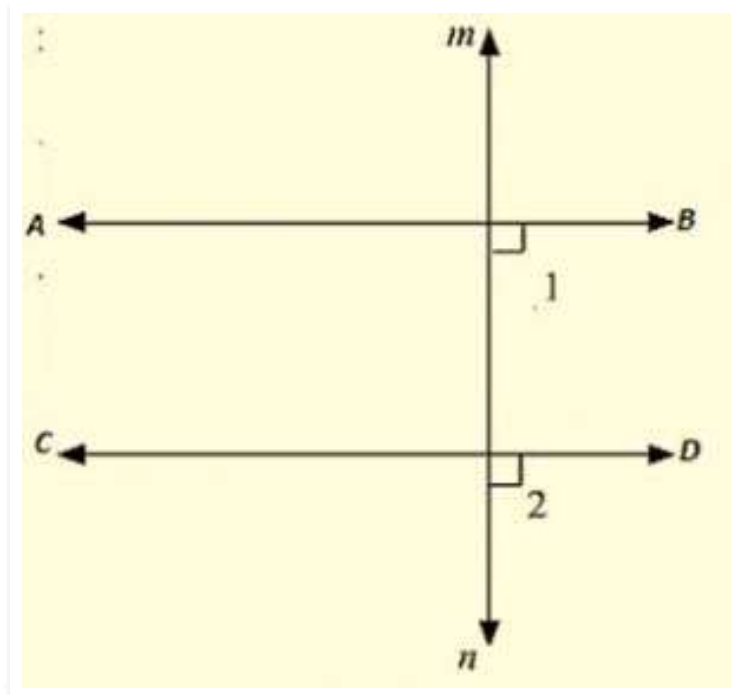Therefore, A = 2 x 36 = 72

b = 3 x 36 = 108

Now, A = C = 72   [Opposite side angles of a parallelogram are equal)

B = D = 108

Q 14 : If each of the two lines is perpendicular to the same line, what kind of lines are they to each other?

Ans :

Let AB and CD be perpendicular to MN

ABD = 90 [AB perpendicular to MN] –– (i)

CON = 90 [CO perpendicular to MN] –– (ii)

Now, ABD = CDN = 90 (From (i) and (ii))

AB parallel to CD,

Since corresponding angles are equal

Q 15 : In the below fig, $\angle 1 = 60°$ and $\angle 2 = (\frac{2}{3})$rd of a right angle. Prove that l|| m.
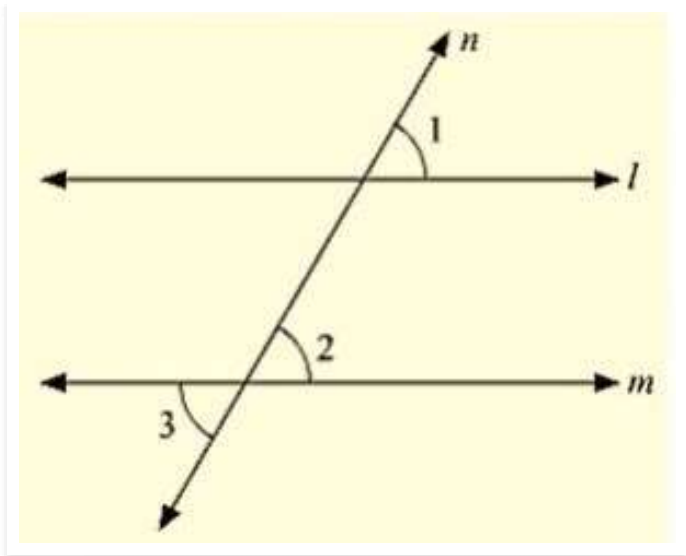
Ans : Given :

$\angle 1 = 60°$ and $\angle 2 = (\frac{2}{3})$rd of a right angle

To prove : parallel Drawn to m

Proof $\angle 1 = 60$

$\angle 2 = (\frac{2}{3}) \times 90 = 60$

Since $\angle 1 = \angle 1 = 60°$

Therefore, Parallel to m as pair of corresponding angles are equal.

16. In the below fig, if l||m||n and $\angle 1 = 60°$. Find $\angle 2$.
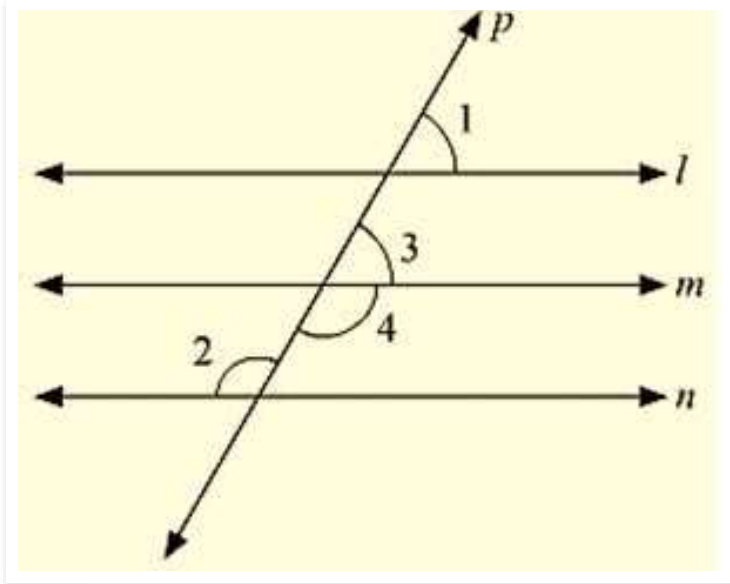
Ans : Since l parallel to m and p is the transversal

Therefore, Given: l||m||n

$\angle 1 = 60°$

To find $\angle 2$

$\angle 1 = \angle 3 = 60°$ [Corresponding angles]

Now, $\angle 3$ and $\angle 4$ are linear pair of angles

$\angle 3 + \angle 4 = 180°$

60 + $\angle 4$ = 180

$\angle 4$ = 180 − 60

=> 120

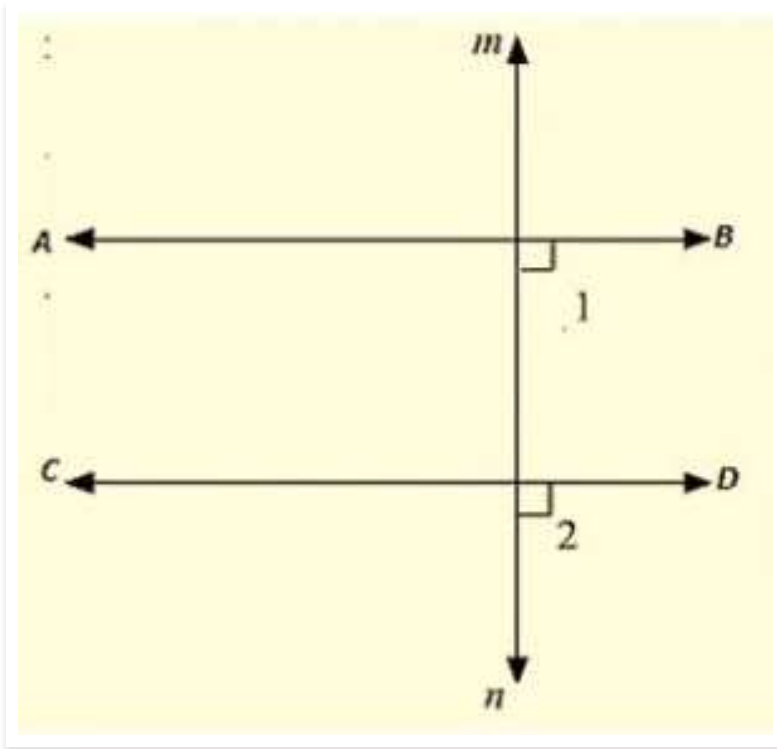Also, m||n and P is the transversal

Therefore $\angle 4$ = $\angle 2$ =120 (Alternative interior angle]

Hence 2 $\angle 2$ = 120

Q 17 : Prove that the straight lines perpendicular to the same straight line are parallel to one another.

Ans : Let AB and CD be drawn perpendicular to the Line MN
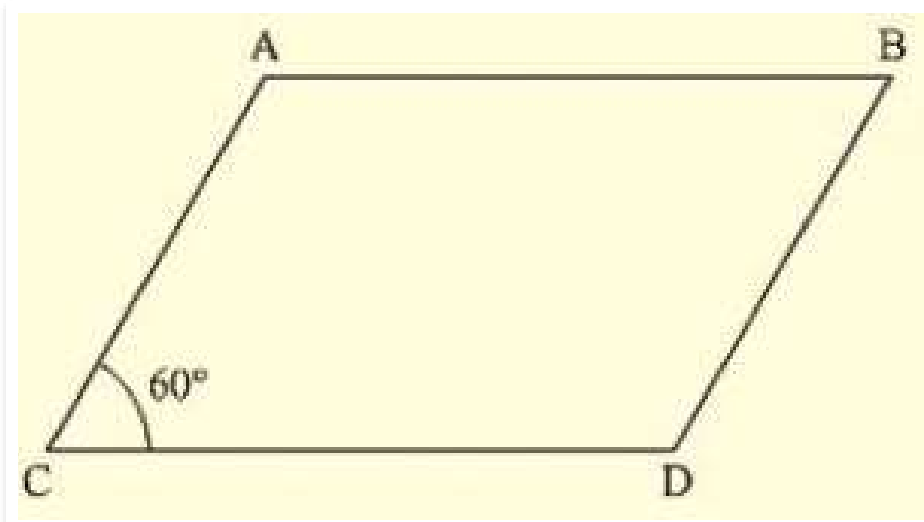
$\angle ABD = 90°$ [AB is perpendicular to MN] −−(i)

$\angle CON = 90°$ [CD is perpendicular to MN] −−(ii)

Now,

$\angle ABD = \angle CDN = 90°$ [From (i) and (ii)]

Therefore, AB||CD, Since corresponding angles are equal.

Q 18 : The opposite sides of a quadrilateral are parallel. If one angle of the quadrilateral is 601. Find the other angles.

Ans :   Given AB || CD

AD|| BC

Since AB || CD and AD is the transversal

Therefore, A + D = 180 (Co-interior angles are supplementary)

60 + D = 180

D = 180 − 60

D = 120

Now. AD || BC and AB is the transversal

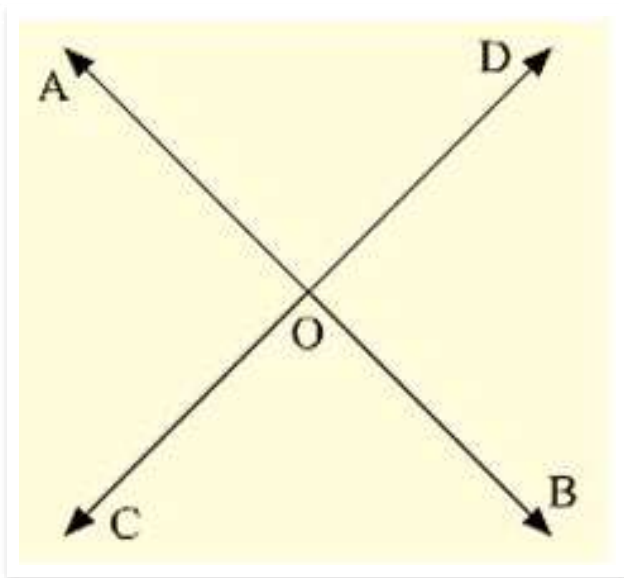A + B = 180   (Co-interior angles are supplementary)

60 + B = 180

B = 180 − 60

= 120

Hence, $\angle A = \angle C = 60°$ and $\angle B = \angle D = 120°$

Q 19 : Two lines AB and CD intersect at O. If $\angle AOC + \angle COB + \angle BOD = 270°$, find the measures of $\angle AOC, \angle COB, \angle BOD, \angle DOA$

Ans :

Given : $\angle AOC + \angle COB + \angle BOD = 270°$

To find : $\angle AOC, \angle COB, \angle BOD, \angle DOA$

Here, $\angle AOC + \angle COB + \angle BOD = 270°$ [Complete angle]

=>   270 + AOD = 360

=>   AOD = 360 − 270

=>   AOD = 90

Now, AOD + BOD = 180   [Linear pair]

90 + BOD = 180

=> BOD = 180 − 90

=> BOD = 90

AOD = BOC = 90   [Vertically opposite angles]

BOD = AOC = 90   [Vertically opposite angles]

Q 20. In the below figure, p is a transversal to lines m and n, $\angle 2 = 120°$ and $\angle 5 = 60°$. Prove that m|| n.
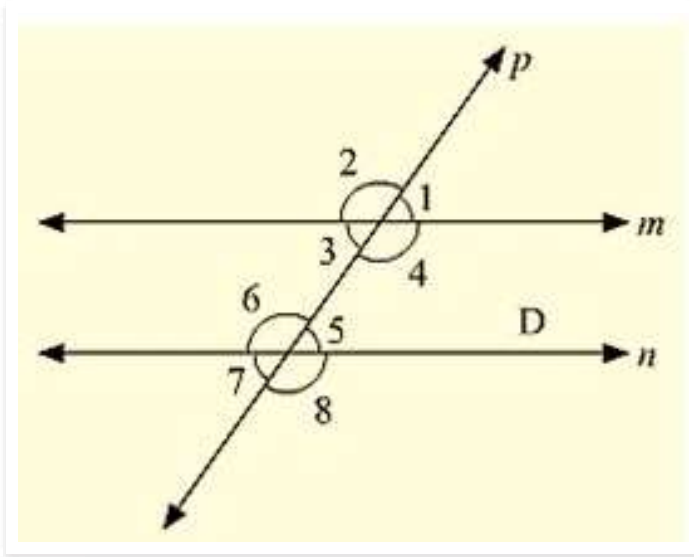
Ans :

Given that

$\angle 2 = 120°$ and $\angle 5 = 60°$

To prove,

$\angle 2 + \angle 1 = 180°$ [Linear pair]

$120 + \angle 1 = 180$

$\angle 1 = 180 - 120$

$\angle 1 = 60°$

Since $\angle 1 = \angle 5 = 60°$

Therefore, m||n [As pair of corresponding angles are equal]

Q 21 : In the below fig. transversal t intersects two lines m and n, $\angle 4 = 110°$ and $\angle 7 = 65°$ Is m||n ?
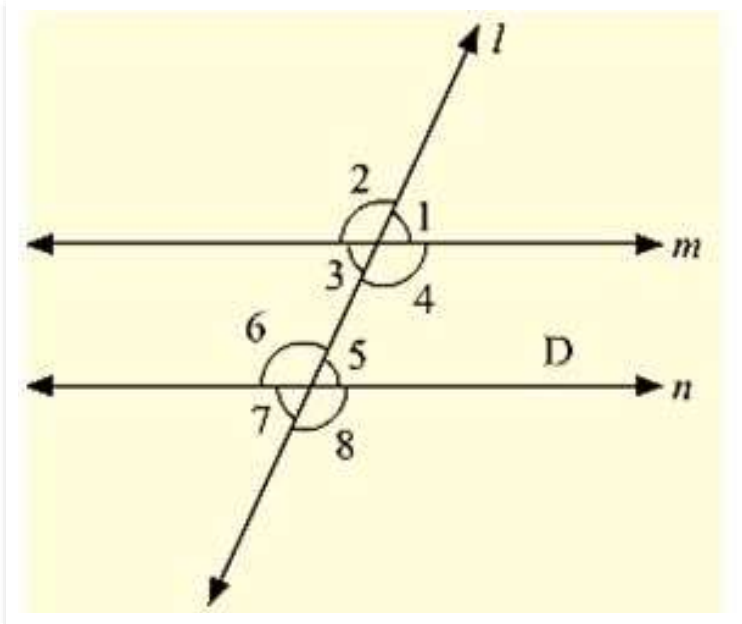
Ans : Given :

$\angle 4 = 110°$ and $\angle 7 = 65°$
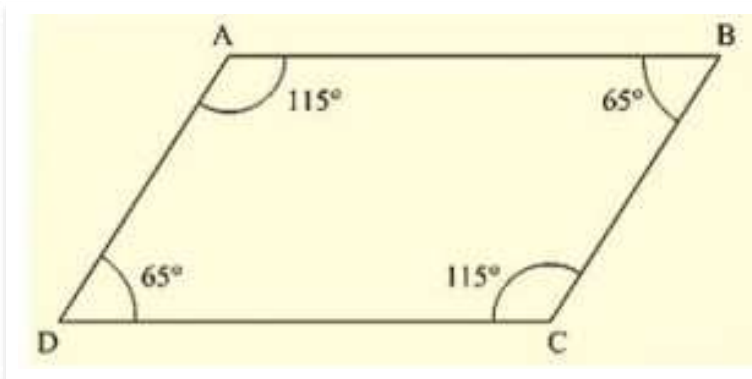
To find : Is m||n

Here. $\angle 7 = \angle 5 = 65°$ [Vertically opposite angle]

Now. $\angle 4 + \angle 5 = 110 + 65 = 175°$

Therefore, m is not parallel to n as the pair of co interior angles is not supplementary.

Q 22 : Which pair of lines in the below fig. is parallel ? give reasons.
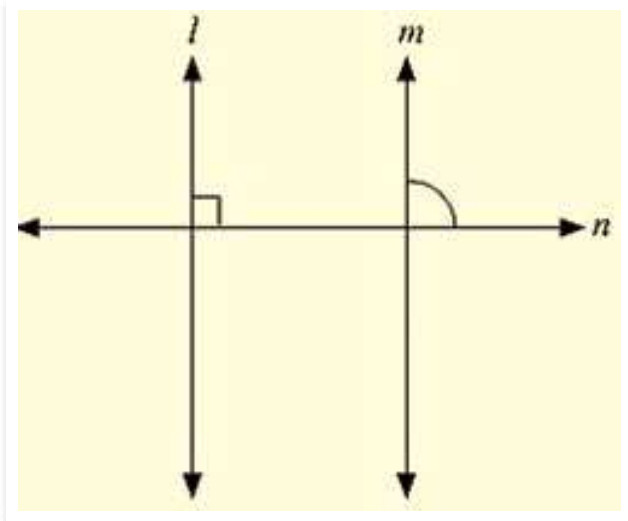

Ans : $\angle A + \angle B = 115 + 65 = 180°$

Therefore, AB || BC [As sum of co interior angles are supplementary]

$\angle B + \angle C = 65 + 115 = 180°$

Therefore, AB || CD (As sum of interior angles are supplementary]

Q 23 : If l, m, n are three lines such that l|| m and n perpendicular to l, prove that n perpendicular to m.

Ans :

Given, l||m, n perpendicular to l

To prove: n perpendicular to m

Since l||m and n intersects

$\therefore \angle 1 = \angle 2$ [Corresponding angles]

But, U = 90

$\Rightarrow \angle 2 = 90°$

Hence n is perpendicular to m

Q 24 : In the below fig, arms BA and BC of $\angle ABC$ are respectively parallel to arms ED and EF of $\angle DEF$. Prove that $\angle ABC = \angle DEF$.
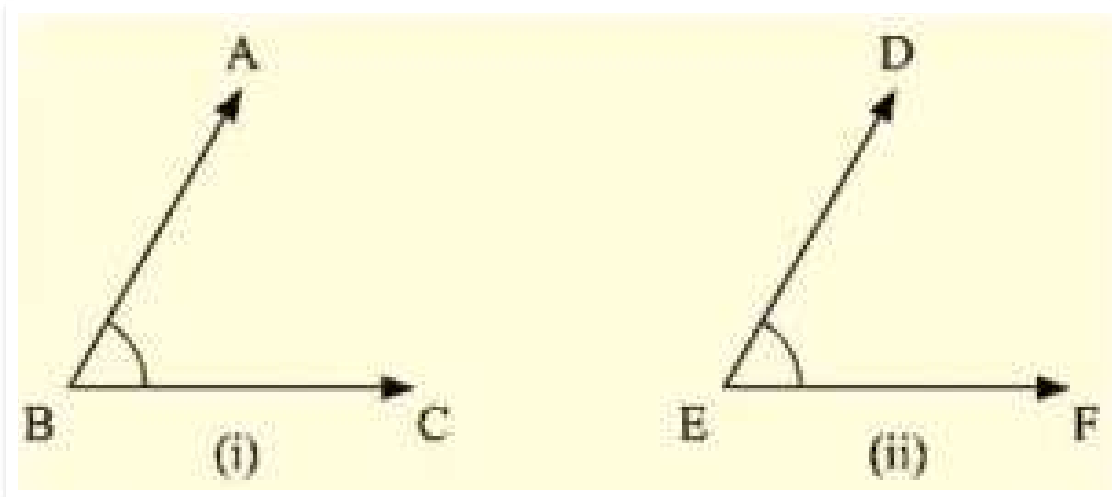
Ans :

Given

AB || DE and BC || EF

To prove : $\angle ABC = \angle DEF$

Construction: Produce BC to x such that it intersects DE at M.

Proof : Since AB || DE and BX is the transversal

ABC = DMX   [Corresponding angle]   −−(i)

Also, BX || EF and DE Is the transversal

DMX = DEF   [Corresponding angles]   −−(ii)

From (i) and (ii)

$\angle ABC = \angle DEF$

Q 25: In the below fig, arms BA and BC of ABC are respectively parallel to arms ED and EF of DEF Prove that $\angle ABC + \angle DEP = 180°$

Ans :
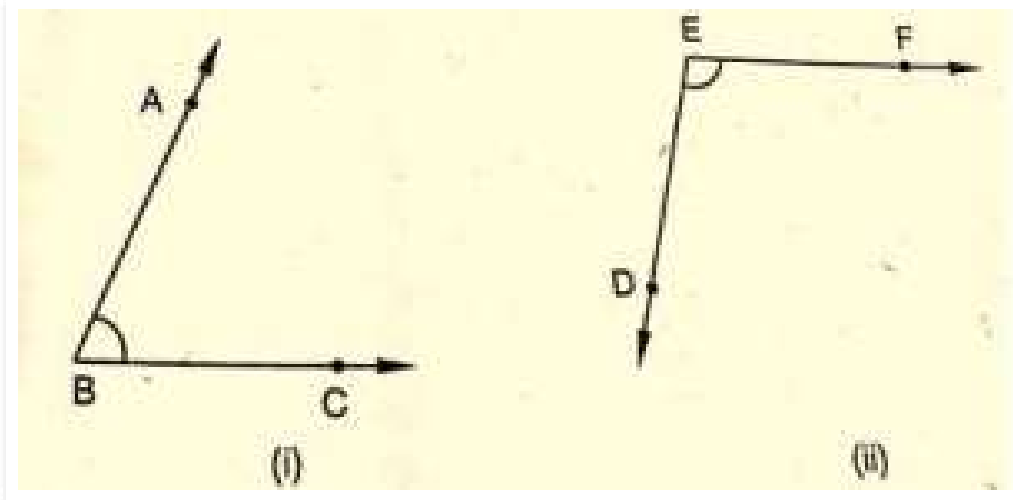
Given:

AB II DE, BC II EF

To prove: $\angle ABC + \angle DEF = 180°$

Construction: Produce BC to intersect DE at M

Proof :

Since AB || EM and BL is the transversal

$\angle ABC = \angle EML$ [Corresponding angle] −−(i)

Also,

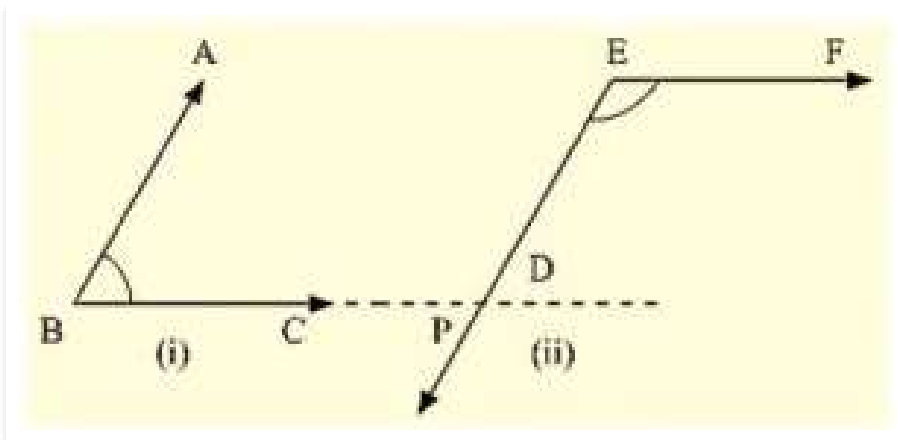EF || ML and EM is the transversal

By the property of co-interior angles are supplementary

$\angle DEF + \angle EML = 180°$ (ii)

From (i) and (ii) we have

Therefore $\angle DEF + \angle ABC = 180°$

Q 26 : With of the following statements are true (T) and which are false (F)? Give reasons.

(1) If two lines are intersected by a transversal, then corresponding angles are equal.

(ii) If two parallel lines are intersected by a transversal, then alternate interior angles are equal.

(ii) Two lines perpendicular to the same line are perpendicular to each other.

(iv) Two lines parallel to the same line are parallel to each other.

(v) If two parallel lines are intersected by a transversal, then the interior angles on the same side of the transversal are equal.

Ans :

(i) False

(ii) True

(iii) False

(iv) True

(v) False

Q 27: Fill in the blanks in each of the following to make the statement true:

(i) If two parallel lines are intersected by a transversal, then each pair of corresponding angles are _____

(ii) If two parallel lines are intersected by a transversal, then interior angles on the same side of the transversal are _____

(iii) Two lines perpendicular to the same line are _____ to each other

(Iv) Two lines parallel to the same line are _____ to each other.

(v) If a transversal intersects a pair of lines in such a way that a pair of alternate angles we equal. then the lines are _____

(vi) If a transversal intersects a pair of lines in such a way that the sum of interior angles on the seine side of transversal is 180'. then the lines are _____

Ans :

(i) Equal

(ii) Parallel

(iii) Supplementary

(iv) Parallel

(v) Parallel

(vi) Parallel