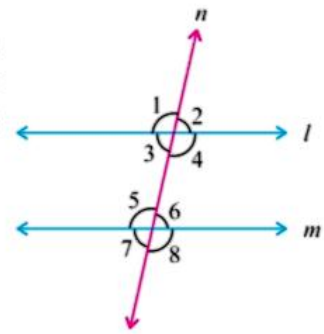
Sol.

$$\begin{aligned} \angle BMN + \angle DNM &= 180^\circ && \text{(co-interior angles)} \\ 2x + x &= 180^\circ \\ 3x &= 180^\circ \\ x &= 60^\circ \\ \angle BMN &= 2x = 2 \times 60 = 120^\circ \\ \angle DNM &= x = 60^\circ \end{aligned}$$

EXERCISE - 5.2

1. In the figure question identify the pair of angles as corresponding angles alternate interior angles, exterior alternate angles, adjacent angles, vertically opposite angles and co-interior angles, linear pairs.



(*i*) $\angle 3$ and $\angle 6$ (*ii*) $\angle 3$ and $\angle 7$

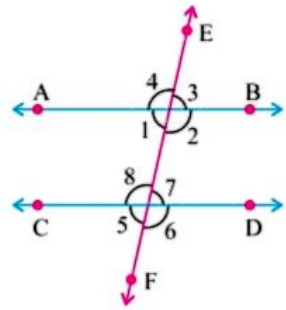
(*iii*) $\angle 2$ and $\angle 4$ (*iv*) $\angle 2$ and $\angle 7$

(*v*) $\angle 1$ and $\angle 8$ (*vi*) $\angle 4$ and $\angle 6$

(*vii*) $\angle 1$ and $\angle 5$ (*viii*) $\angle 1$ and $\angle 4$

(*ix*) $\angle 5$ and $\angle 7$

2. In the figure identify



(*i*) The pairs of corresponding angle.

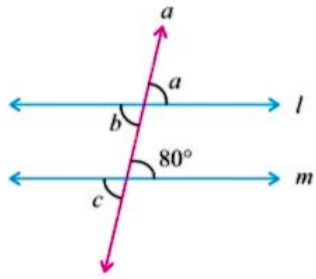
(*ii*) The pairs of alternate interior angles.

(*iii*) The pairs of interior angles on the same side of the transversal.

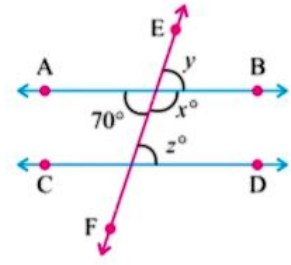
(*iv*) The pairs of vertically opposite angles

3. In the given figures, the intersected lines are parallel to each other. Find the unknown angles.

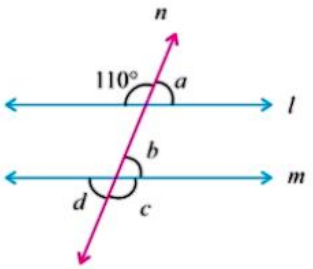
(*i*)



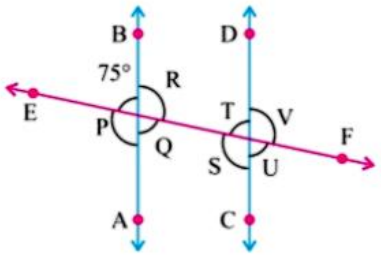
(*ii*)



(*iii*)

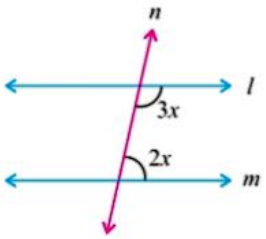


(*iv*)

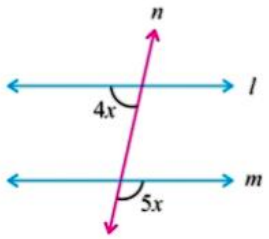


4. Find the value of x in the following figures if $l \parallel m$

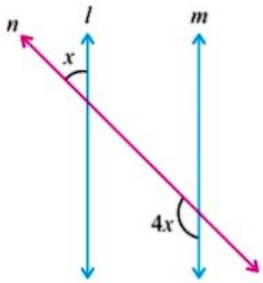
(*i*)



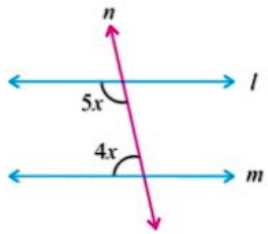
(*ii*)



(*iii*)



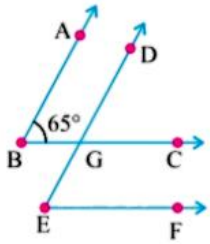
(*iv*)

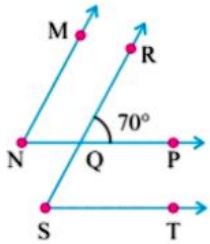


5. In the given figures arms of two angles are parallel find the following.

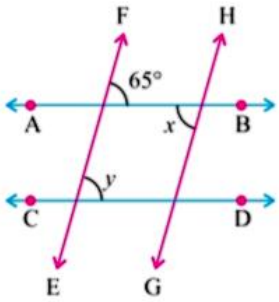
(*a*) (*i*) ∠DGC
(*ii*) ∠DEF

(*b*) (*i*) ∠MNP
(*ii*) ∠RST

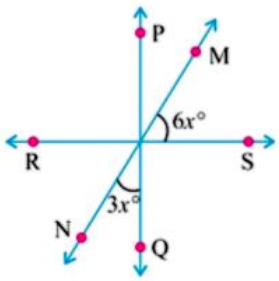




6. In the following figure AB ∥ CD and EF ∥ GH, find the measure of $\angle x$ and $\angle y$.

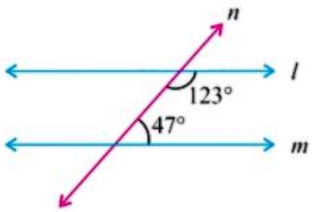


7. PQ ⊥ RS find the value of x in the following figure.

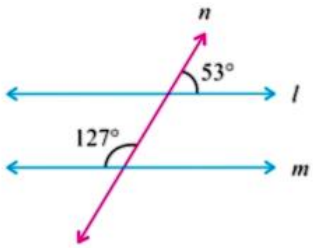


8. In the given figure below, decide whether l is parallel to m.

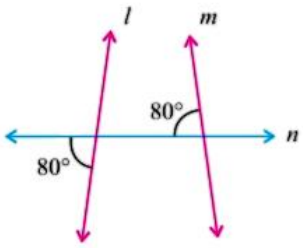
(*i*)



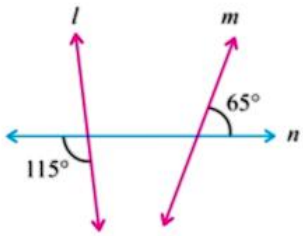
(*ii*)



(*iii*)



(*iv*)



9. Multiple Choice Questions

(*i*) A pair of complementary angles is

(*a*) 130°, 50° (*b*) 35°, 55°

(*c*) 25°, 75° (*d*) 27°, 53°

(*ii*) A pair of supplementary angles is

(*a*) 55°, 115° (*b*) 65°, 125°

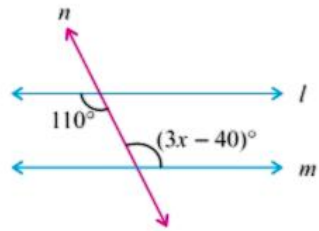
(*c*) 47°, 133° (*d*) 40°, 50°

(*iii*) If one angle of a linear pair is acute, then the other angle is

(*a*) acute (*b*) obtuse

(*c*) right (*d*) straight

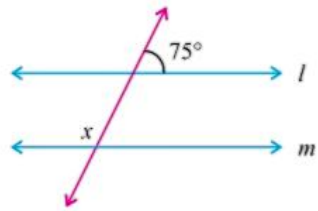
(*iv*) In the adjoining figure, if $l \parallel m$ then the value of x is.



(*a*) 50° (*b*) 60°

(*c*) 70° (*d*) 45°

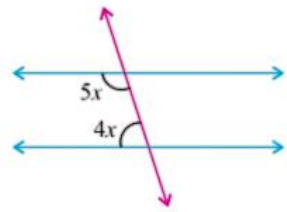
(*v*) In the adjoining figure, if $l \parallel m$, then



(*a*) 75° (*b*) 95°

(*c*) 105° (*d*) 115°

(*vi*) In the adjoining figure, the value of x that will make the lines l and m parallel is.



(*a*) 20 (*b*) 30

(*c*) 60 (*d*) 80

AIM : To introduce the properties of parallel lines cut by a transversal.

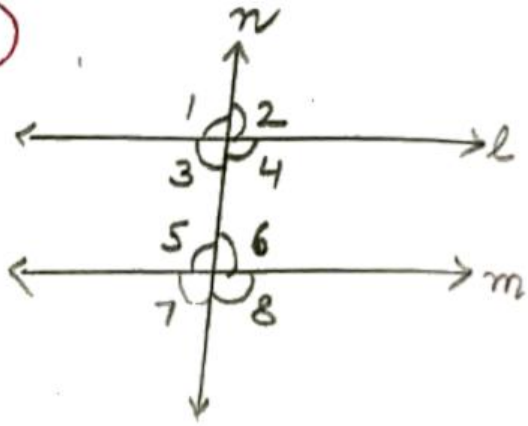
Objective : To verify the equality of alternate interior angles and corresponding angles made by a transversal on parallel lines through paper cutting and pasting.

Previous Knowledge :

(*i*) Concept of alternate interior, corresponding and vertically opposites angles.

(*ii*) Concept of parallel lines

Exercise - 5.2
(ਅਭਿਆਸ - 5.2)



Question ਪ੍ਰਸ਼ਨ 1 →

(i) ∠3, ∠6
Alternate interior angles
(ਇਕਾਂਤਰ ਅੰਦਰੂਨੀ ਕੋਣ)

(ii) ∠3, ∠7
Corresponding angles. (ਸੰਗਤ ਕੋਣ)

(iii) ∠2, ∠4
Adjacent angles (ਸਲਗਵੇ ਕੋਣ)

(iv) ∠2, ∠7
Alternate exterior angles (ਇਕਾਂਤਰ ਬਾਹਰਲੇ ਕੋਣ)

(v) ∠1, ∠8
Alternate exterior angles (ਇਕਾਂਤਰ ਬਾਹਰਲੇ ਕੋਣ)

(vi) ∠4, ∠6
Co-interior angles (ਇਕ ਪਾਸੇ ਦੇ ਅੰਦਰੂਨੀ ਕੋਣ)

(vii) ∠1, ∠5
Corresponding angles (ਸੰਗਤ ਕੋਣ)

(viii) ∠1, ∠4
Vertically opposite angles (ਸਿਖਰ ਸਨਮੁੱਖ ਕੋਣ)

(ix) ∠5, ∠7
Linear pair (ਰੇਖੀ ਜੋੜ)

× × × ×

Question
प्रश्न २ →

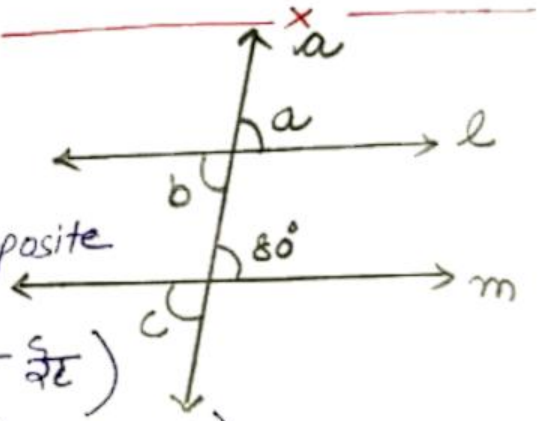
(i) $(\angle 1, \angle 5)$, $(\angle 2, \angle 6)$, $(\angle 3, \angle 7)$, $(\angle 4, \angle 8)$

(ii) $(\angle 1, \angle 7)$, $(\angle 2, \angle 8)$

(iii) $(\angle 1, \angle 8)$, $(\angle 2, \angle 7)$

(iv) $(\angle 1, \angle 3)$, $(\angle 2, \angle 4)$, $(\angle 5, \angle 7)$, $(\angle 6, \angle 8)$

Question
प्रश्न ३ →



(i) $\angle c = 80°$ (vertically opposite angle
मिलत भगभ्रस रेह)

$\angle b = 80°$ (Alternate interior angle
दिशउंड भरिहुती रेह)

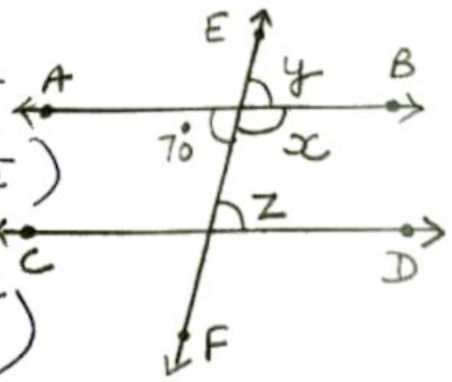
Now (हवे), $\angle a = \angle b$ (मिलत भगभ्रस रेह
Vertically opposite angle)

and (अने) $\angle b = 80°$

$\therefore \angle a = 80°$

$\therefore \angle a = 80°$, $\angle b = 80°$, $\angle c = 80°$ Ans

(ii) $\angle y = 70°$ (vertically opposite angle
मिलत भगभ्रस रेह)



And (अने) $70 + x = 180°$ (linear pair
जेडी भड़ा)

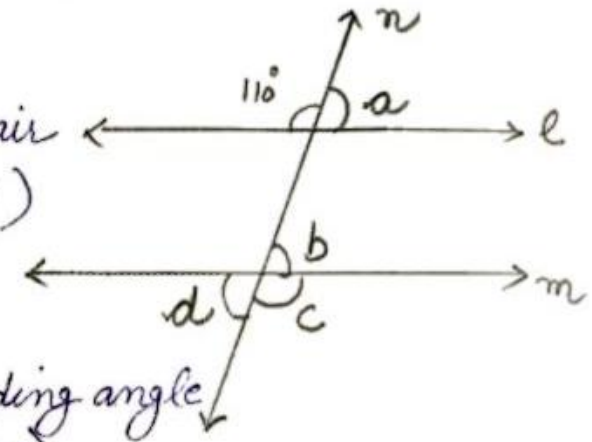
$\therefore x = 180° - 70°$

$x = 110°$

Also $z = 70^\circ$ (Alternate interior angle વિરુદ્ધ અંદરની જોડ)

$\therefore \angle x = 110^\circ$, $\angle y = 70^\circ$, $\angle z = 70^\circ$ Ans

(iii)



$\angle a + 110^\circ = 180^\circ$ (linear pair જોડી જોડ)

$\angle a = 180^\circ - 110^\circ$

$\boxed{\angle a = 70^\circ}$

$\angle a = \angle b$ (corresponding angle સંગત જોડ)

But (પણ) $\angle a = 70^\circ$

$\therefore \boxed{\angle b = 70^\circ}$

Also (વળી) $\angle b = \angle d$ (vertically opposite angle વિરુદ્ધ અંદરની જોડ)

$\therefore \boxed{\angle d = 70^\circ}$

$\angle d + \angle c = 180^\circ$ (linear pair જોડી જોડ)

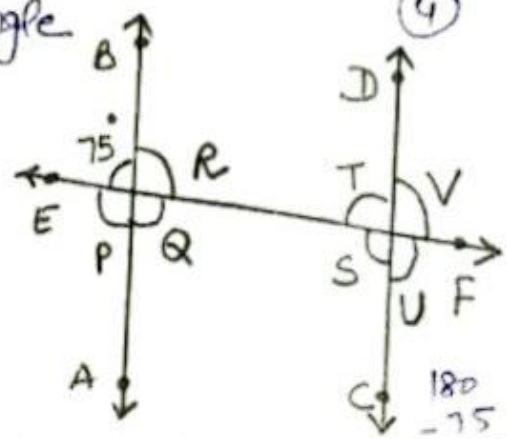
$70^\circ + \angle c = 180^\circ$

$\angle c = 180^\circ - 70^\circ$

$\boxed{\angle c = 110^\circ}$

$\therefore \angle a = 70^\circ$, $\angle b = 70^\circ$, $\angle c = 110^\circ$, $\angle d = 70^\circ$ Ans

(4)



iv) $\boxed{\angle Q = 75^\circ}$ (vertically opposite angle મિયા મનમુખ હોય)

$\angle P + \angle Q = 180^\circ$ (linear pair જોડી બેઠક)

$\angle P + 75^\circ = 180^\circ$

$\angle P = 180^\circ - 75^\circ$

$\boxed{\angle P = 105^\circ}$

180
−75
105

And (માટે) $\angle P = \angle R$ (vertically opposite angle મિયા મનમુખ હોય)

$\therefore \boxed{\angle R = 105^\circ}$

જુઓ (Now), $\angle R = \angle S$ (Alternate interior angle વિકલ્પ અંદરની હોય)

$\therefore \boxed{\angle S = 105^\circ}$

And (માટે) $\angle S = \angle V$ (vertically opposite angle મિયા મનમુખ હોય)

$\therefore \boxed{\angle V = 105^\circ}$

Now (જુઓ) $\angle S + \angle U = 180^\circ$ (linear pair જોડી બેઠક)

$105^\circ + \angle U = 180^\circ$

$\angle U = 180^\circ - 105^\circ$

$\boxed{\angle U = 75^\circ}$

And (માટે) $\angle U = \angle T$ (vertically opposite angle મિયા મનમુખ હોય)

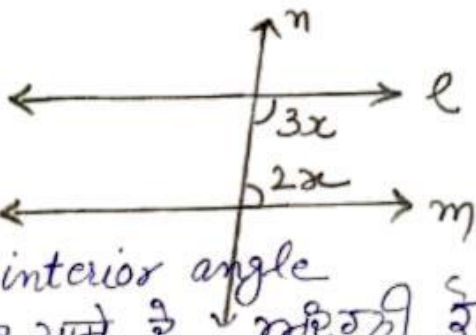
$\therefore \boxed{\angle T = 75^\circ}$

$\therefore \angle P = 105^\circ, \angle Q = 75^\circ, \angle R = 105^\circ, \angle S = 105^\circ, \angle T = 75^\circ, \angle U = 75^\circ$

$\angle V = 105^\circ$ ans

× × × × ×

Question 4 → (प्रश्न 4 →)



(i) We know that (माहीत आहे की)

$3x + 2x = 180^\circ$ (Co-interior angle हिंव याने रे मरिहूनी रेह)

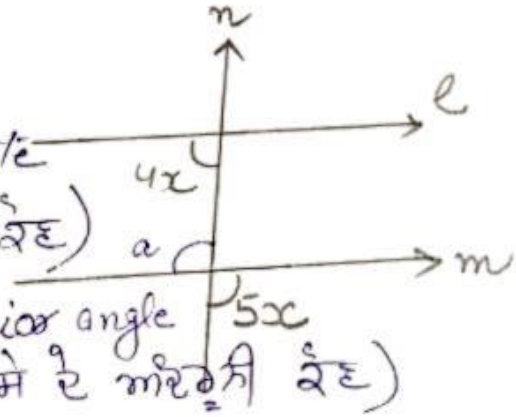
$\therefore \quad 5x = 180^\circ$

$x = \frac{180}{5}$

$5\overline{)180}\ (36$, 15, 30, 30, x

$\therefore \boxed{x = 36^\circ}$ Ans

(ii) We know that (माही आहे ज रि)



$\angle a = 5x$ (vertically opposite angle मिसव मरुमुस रेह)

And (आणि) $4x + a = 180^\circ$ (Co-interior angle हिंव याने रे मरिहूनी रेह)

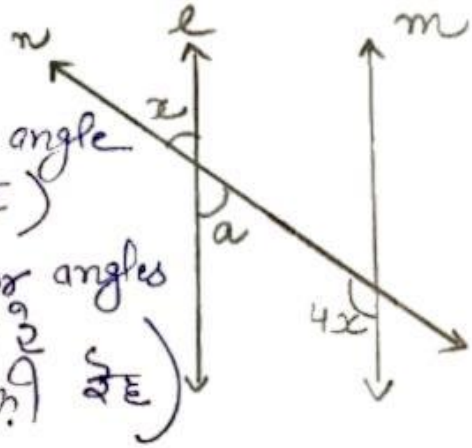
$4x + 5x = 180^\circ$

$9x = 180^\circ$

$x = \frac{\cancel{180}^{20}}{\cancel{9}_{1}}$

$\boxed{x = 20^\circ}$ Ans

(iii) We know that (माही आहे ज रि)



$\angle x = \angle a$ (vertically opposite angle मिसव. मरुमुस रेह)

And (आणि) $a + 4x = 180^\circ$ (Co-interior angles हिंव याने रे मरिहूनी रेह)

$x + 4x = 180^\circ$

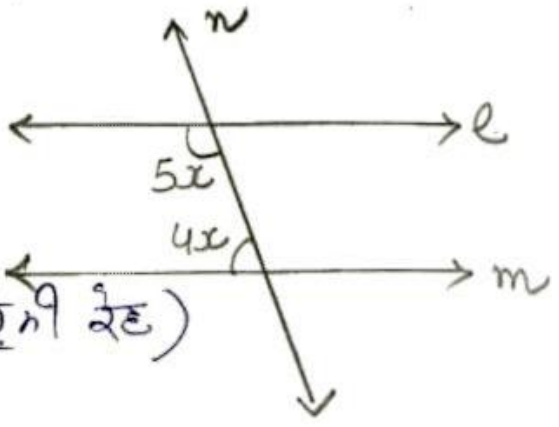
$5x = 180^\circ$

$x = \frac{180}{5}$

$\boxed{x = 36}$ Ans

5) 180 (36
15
30
30
×

(iv) We know
(આપણે જાણીએ છીએ)



$5x + 4x = 180^\circ$

(Co-interior angles
કિંમત સરવાળો 180°)

$9x = 180^\circ$

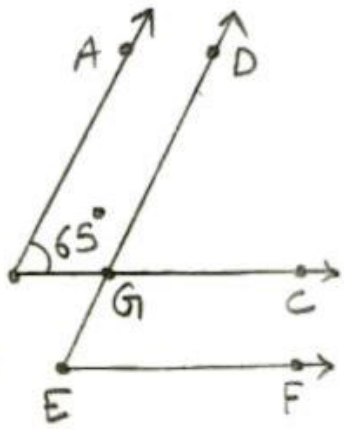
$x = \frac{180^\circ}{9} = 20$

$\boxed{x = 20}$ Ans

Question
પ્રશ્ન 5 →

(a) (i) $\angle DGC = ?$

$\angle DGC = \angle ABC$ (Corresponding angles
કિંમત સરખે)



But $\angle ABC = 65^\circ$
(આપ)

$\therefore \boxed{\angle DGC = 65^\circ}$ Ans

(ii) $\angle DEF = ?$ (Corresponding angle
કિંમત સરખે)

$\angle DEF = \angle DGC$

But $\angle DGC = 65^\circ$

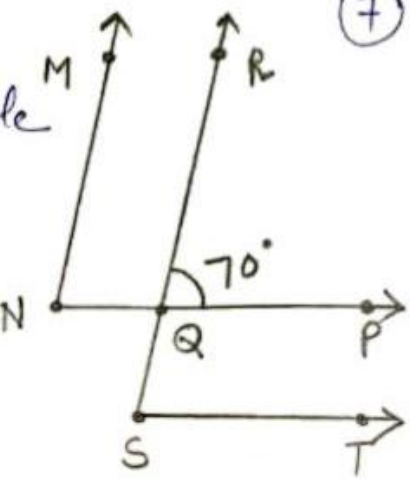
$\therefore \boxed{\angle DEF = 65^\circ}$ Ans

(b) i) $\angle MNP = ?$

$\angle MNP = \angle PQR$ (Corresponding angle મંગાત વેદ)

(But) પણ $\angle PQR = 70^\circ$ (Given દિયું છે)

$\therefore \boxed{\angle MNP = 70^\circ}$ Ans



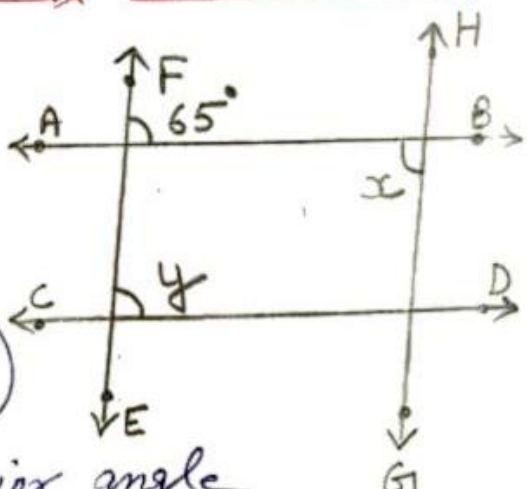
(ii) $\angle RST = ?$

$\angle RST = \angle RQP$ (Corresponding angle મંગાત વેદ)

But (પણ) $\angle RQP = 70^\circ$ (Given દિયું છે)

$\therefore \boxed{\angle RST = 70^\circ}$ Ans

Question 6 → પ્રશ્ન



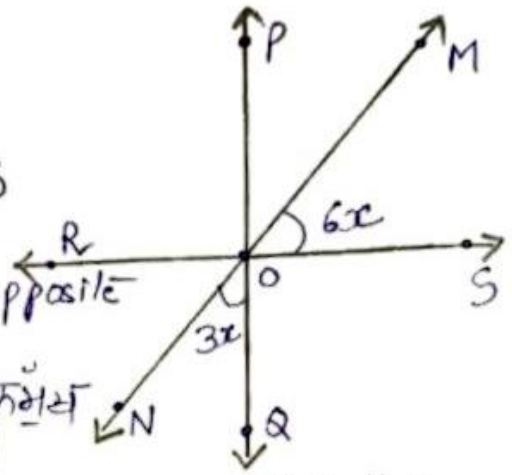
We know that (આપણે જાણીએ છીએ)

$\angle y = 65^\circ$ (Corresponding angle મંગાત વેદ)

Also, $\angle x = 65^\circ$ (Alternate interior angle વિરોધાંત અંદરની વેદ)

$\therefore \angle x = 65^\circ$, $\angle y = 65^\circ$ Ans

Question 7 → ਪ੍ਰਸ਼ਨ 7 →



Given (ਦਿੱਤਾ ਹੈ) — $PQ \perp RS$

$\angle POM = 3x$ [vertically opposite angle ਸਿਖਰ ਸਮਕੋਣ ਹੈ]

Now (ਹੁਣ), $\angle POM + \angle MOS = 90°$ ($PQ \perp RS$ ਦਿੱਤਾ ਹੈ Given)

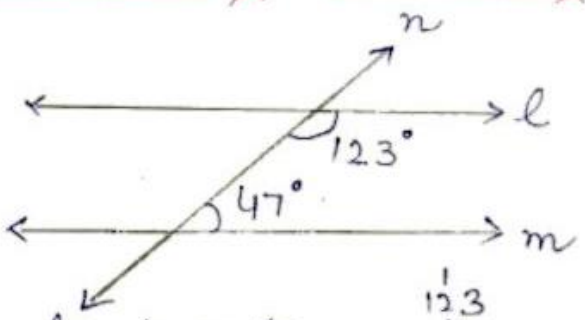
$3x + 6x = 90$

$9x = 90$

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

$\boxed{x = 10}$

Question 8 → ਪ੍ਰਸ਼ਨ 8 →



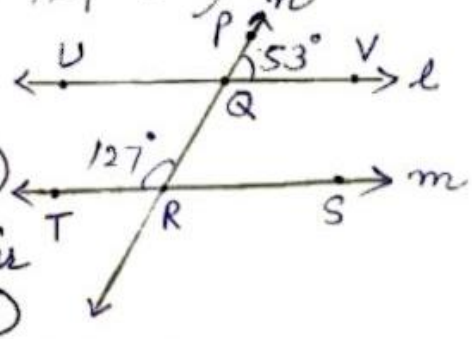
(i) $123° + 47°$

$= 170°$

As sum of co-interior angles is not equal to 180°. Therefore l is not parallel to m

(ਕਿਉਂਕਿ ਦਿੱਤੇ ਹੋਏ ਕੋਣਾਂ ਦੇ ਅੰਦਰਲੀ ਜੋੜਾ ਦਾ ਜੋੜ 180° ਨਹੀਂ ਹੈ ਇਸ ਲਈ l, m ਦੇ ਸਮਾਂਤਰ ਨਹੀਂ ਹੈ)

1 1 2 3
47
170



(iii) $\angle PQR = 53°$, $\angle QRT = 127°$ (Given, ਦਿੱਤਾ ਹੈ)

Now (ਹੁਣ) $\angle PQV + \angle VQR = 180°$ (Linear pair ਰੇਖੀ ਜੋੜੇ)

$53 + \angle VQR = 180°$

$\angle VQR = 180 - 53^\circ$

$\boxed{\angle VQR = 127^\circ}$

$$\begin{array}{r} 180 \\ 53 \\ \hline 127 \end{array}$$

(9)

And (ਅਤੇ) $\angle TRQ + \angle QRS = 180^\circ$ (linear pair ਰੈਖਕ ਜੋੜੇ)

$127^\circ + \angle QRS = 180^\circ$

$\angle QRS = 180 - 127$

$\boxed{\angle QRS = 53^\circ}$

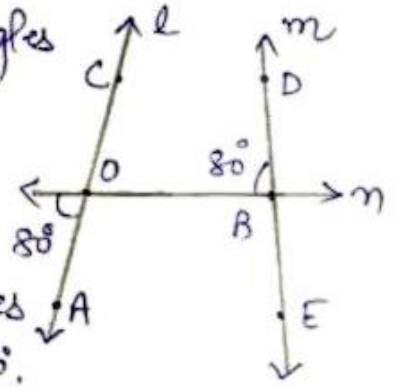
Now (ਹੁਣ) $\angle QRS + \angle VQR = 53 + 127$

$= 180^\circ$

As $\angle QRS$ and $\angle VQR$ are co-interior angles and their sum is 180°. Therefore l is parallel to m.

(ਕਿਉਂਕਿ $\angle QRS$ ਅਤੇ $\angle VQR$ ਇੱਕ ਰਾਸ਼ੇ ਦੇ ਅੰਦਰਲੀ ਵੱਲ ਦੇ ਕੋਣ ਹਨ ਅਤੇ ਇਹਨਾਂ ਦਾ ਜੋੜ 180° ਹੈ ਇਸ ਲਈ l, m ਦੇ ਸਮਾਂਤਰ ਹੈ)

(iii) $\angle COB = 80^\circ$ (vertically opposite angles ਸਿਖਰ ਸਮਸ਼ਾਲ ਕੋਣ)



Now, ਹੁਣ $\angle COB + \angle OBD = 80 + 80$

$= 160^\circ$

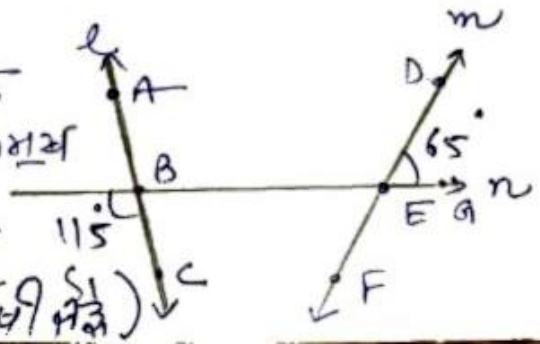
As $\angle COB$ and $\angle OBD$ are co-interior angles and their sum is not equal to 180°.

Therefore l is not parallel to m.

(ਕਿਉਂਕਿ $\angle COB$ ਅਤੇ $\angle OBD$ ਇੱਕ ਰਾਸ਼ੇ ਦੇ ਅੰਦਰਲੀ ਵੱਲ ਦੇ ਕੋਣ ਹਨ ਅਤੇ ਇਹਨਾਂ ਦਾ ਜੋੜ 180° ਨਹੀਂ ਹੈ ਇਸ ਲਈ l, m ਦੇ ਸਮਾਂਤਰ ਨਹੀਂ ਹੈ।)

(iv) $\angle ABE = 115^\circ$ (vertically opposite angle, ਸਿਖਰ ਸਮਸ਼ਾਲ ਕੋਣ)

ਅਤੇ $\angle DEB + \angle DEG = 180^\circ$ (linear pair ਰੈਖਕ ਜੋੜੇ)



$65^\circ + \angle DEB = 180^\circ$

$\angle DEB = 180 - 65^\circ$

$\angle DEB = 115^\circ$

180
65
115

As $\angle ABE$ and $\angle DEB$ are co-interior angles and their sum i.e $115 + 115 = 230^\circ$ ਹੈ।

115
115
230°

If sum of co-interior angles are 180° then lines are parallel. Here sum is not equal to 180°. Therefore l is not parallel to m.

(ਕਿਉਂਕਿ $\angle ABE$ and $\angle DEB$ ਇਕ ਪਾਸੇ ਦੇ ਅੰਦਰਲੀ ਕੋਣ ਯਾ ਅੰਦਰਲੇ ਦੋਨਾਂ ਦੇ ਮੇਲ 230° ਹੈ, ਸਾਨੂੰ ਪਤਾ ਹੈ ਕਿ ਮੇਲ ਦਾ ਮੇਲ ਇਕ ਪਾਸੇ ਦੇ ਅੰਦਰਲੀ ਕੋਣ ਦਾ ਮੇਲ 180° ਹੈ ਤਾਂ ਇਹ ਕੋਣ ਦੇ ਸਮਾਂਤਰ ਰੇਖਾਵਾਂ ਦੇ ਵਿਚਕਾਰ ਹੁੰਦੇ ਹਨ, ਇਥੇ ਮੇਲ 180° ਨਹੀਂ ਹੈ ਇਸ ਕਰਕੇ ਰੇਖਾਵਾਂ l ਅਤੇ m ਸਮਾਂਤਰ ਨਹੀਂ ਹਨ।)

Question ਪ੍ਰਸ਼ਨ 9 →

(i) (b)

(ii) (c)

(iii) (b)

(iv) (a)

(v) (c)

(vi) (a)

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