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PERIOD 5

MATHEMATICS

CHAPTER NUMBER :~ 6
CHAPTER NAME :~ LINES AND ANGLES

PREVIOUS KNOWLEDGE TEST

1. What do you mean by co-interior angles?
2. What is the sum of the co-interior angles if the given lines are parallel?

LEARNING OUTCOME:-

1. Students will be able to learn about the concept of co-interior angles.

2. Students will be able to know about the sum of co-interior angles.

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THEOREM 6.4

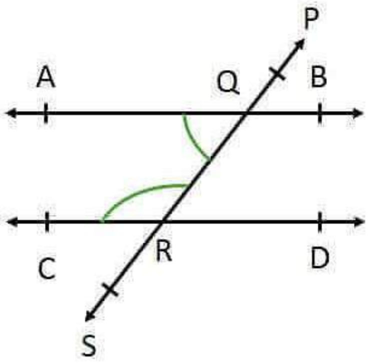
If a transversal intersects two parallel lines, then each pair of interior angles on the same side of the transversal is supplementary.

Given :- Two parallel lines AB and CD and a transversal PS intersecting AB at Q and CD at R.

To Prove :- Sum of interior angle on same side of transversal is supplementary.

i.e, $\angle AQR + \angle CRQ = 180°$

and $\angle BQR + \angle DRQ = 180°$



Proof:-

For lines AB & CD, with transversal PS		For lines PS	
$\angle AQP = \angle CRQ$	(Corresponding angles) ...(1)	$\angle AQP + \angle AQR = 180°$	(Linear pair) ...(2)

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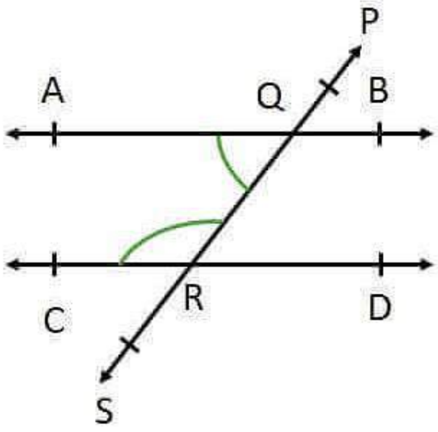
Putting (1) in (2)

$\angle AQR + \angle CRQ = 180°$



Similarly,

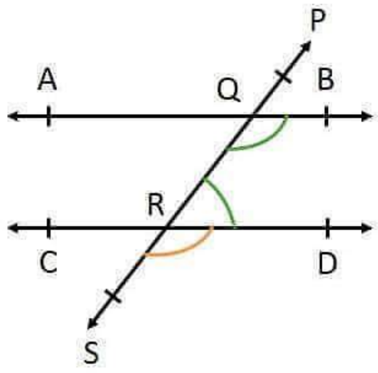
we can prove $\angle BQR + \angle DRQ = 180°$

Hence, sum of interior angles on same side of transversal is 180°

Hence proved

THEOREM 6.5 If a transversal intersects two lines, such that the pair of interior angles on the same side of the transversal is supplementary, then the two lines are parallel.

Given :- Two parallel lines AB and CD and a transversal PS intersecting AB at Q and CD at R such that $\angle BQR + \angle DRQ = 180°$



To Prove :- AB || CD.

Proof :-

For lines PS

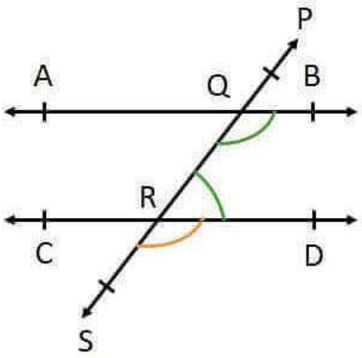
$\angle DRQ + \angle DRS = 180°$ (Linear pair) ...(1)

But, $\angle BQR + \angle DRQ = 180°$ (Given) ...(2)

From (1) & (2)

$\angle DRQ + \angle DRS = \angle BQR + \angle DRQ$

$\angle DRS = \angle BQR$



But they are corresponding angles.

Thus, for lines AB & CD with transversal PS, corresponding angles are equal

Hence AB and CD are parallel.

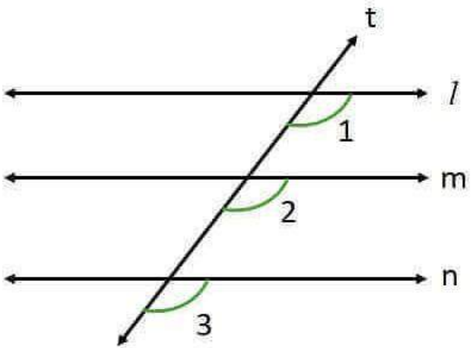
Hence proved

Theorem 6.6 :-

Lines which are parallel to the same lines are parallel to each other.

Given :- Three lines l, m, n and a transversal t such that

$l \parallel m$ and $m \parallel n$.



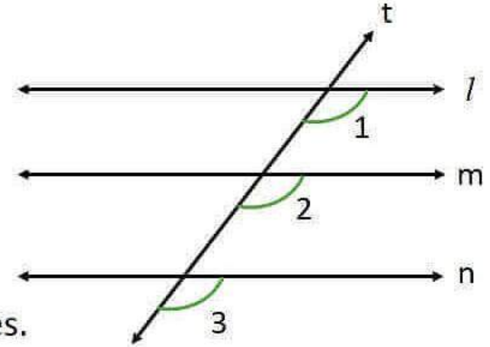
To Prove :- $l \parallel n$.

Proof :-

For lines l & m,	For lines m & n,
with transversal t	with transversal t
$\angle 1 = \angle 2$ (Corresponding angles) ...(1)	$\angle 2 = \angle 3$ (Corresponding angles) ...(2)

From (1) and (2)

$\angle 1 = \angle 3$



But they are corresponding angles.

For lines *l* & n with transversal t, corresponding angles are equal

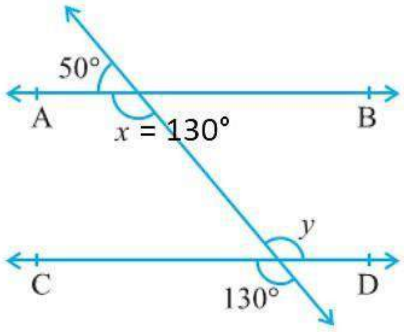
Hence *l* and n are parallel.

Hence *l* || n

Hence proved

Ex 6.2, 1

In the given figure, find the values of x and y and then show that AB || CD.



Now,

$50° + x = 180°$ (Linear pair)

$x = 180° - 50°$

$x = 130°$

Also,

$y = 130°$ (Vertically opposite angles)

$\therefore$ x = y

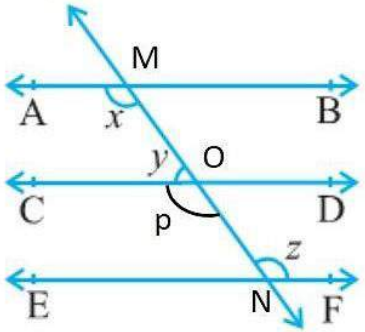
So, alternate angles are equal

From theorem 6.3: *If a transversal intersects two lines such that pair of alternate interior angles are equal, then lines are parallel.*

$\therefore$ AB || CD

Ex 6.2, 2

In figure, if AB || CD, CD || EF and y: z= 3 : 7, find x.



It is given that

$\frac{y}{z} = \frac{3}{7}$

$y = \frac{3}{7} z$

Let ∠ CON = p

Now CD || EF

So, p = z (Alternate interior angles) ...(1)

Also,

$y + p = 180°$ (Linear pair)

$y + z = 180°$ (From (1))

$y + z = 180°$

Putting $y = \frac{3}{7} z$

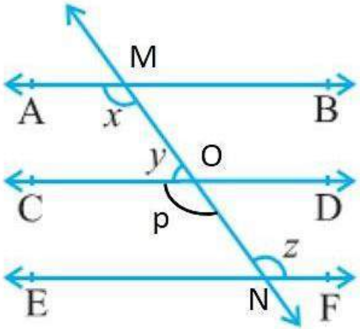
$\frac{3}{7} z + z = 180°$

$\frac{3z + 7z}{7} = 180°$

$\frac{10z}{7} = 180°$

$z = \frac{7}{10} \times 180°$

$z = 126°$



Now,

$y = \frac{3}{7} z$

Putting $z = 126°$

$y = \frac{3}{7} \times 126°$

$y = 54°$

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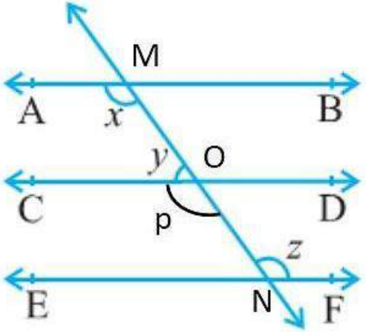
Also,

AB || CD & MN is transversal

We know that sum of interior angles on the same side of transversal is supplementary



$x + y = 180°$

$x + 54° = 180°$

$x = 180° – 54°$

$x = 126°$

Alternatively,

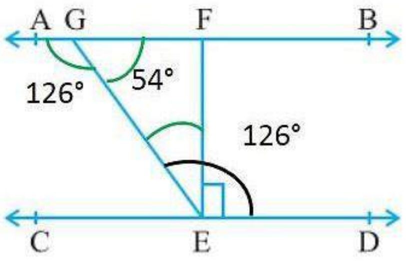
AB || EF & MN is transversal

$\therefore x = z$ (Alternate interior angles)

$x = 126°$

Ex 6.2, 3

In the given figure, If AB || CD, EF ⊥ CD and ∠GED = 126°, find ∠AGE, ∠GEF and ∠FGE.



Now,

AB || CD & GE is transversal,

Hence,

∠ AGE = ∠ GED (Alternate angles)

∠ AGE = 126°

Now,

Since AB is a line

∠ AGE + ∠ FGE = 180° (Linear Pair)

126° + ∠ FGE = 180°

∠ FGE = 180° – 126°

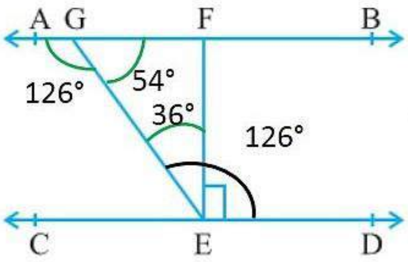
∠ FGE = 54°

Now,

$\angle GEF = \angle GED - \angle FED$

$\angle GEF = 126° - 90°$

$\angle FGE = 36°$

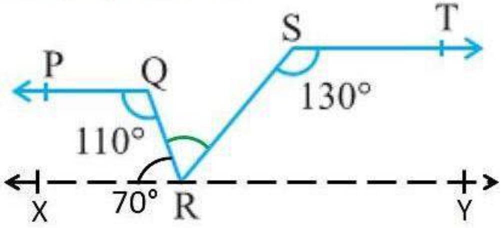


$\therefore \angle AGE = 126°, \angle GEF = 36°, \angle FGE = 54°$

Ex 6.2, 4

In the given figure, if PQ || ST, ∠PQR = 110° and ∠RST = 130°, find ∠QRS.

(**Hint**: Draw a line parallel to ST through point R.)



It is given that PQ || ST,

We draw a line XY || ST ,

So, XY || PQ , i.e. PQ || ST || XY

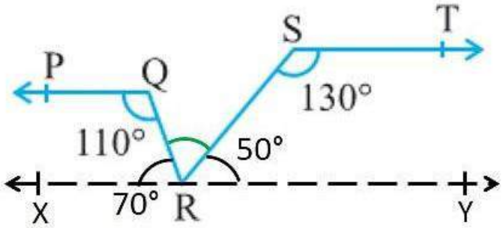
Since PQ || XY & QR is the transversal

So, ∠PQR + ∠QRX = 180° *(Interior angles on the same side of the transversal are supplementary)*

110° + ∠ QRX = 180°

∠ QRX = 180° – 110°

∠ QRX = 70°



Also,

ST || XY & SR is the transversal

$\angle SRY + \angle RST = 180^\circ$ *(Interior angles on the same side of the transversal are supplementary)*

$130^\circ + \angle SRY = 180^\circ$

$\angle SRY = 180^\circ - 130^\circ$

$\angle SRY = 50^\circ$

Since XY is a line

$\angle QRX + \angle QRS + \angle SRY = 180^\circ$ (Linear pair)

$70^\circ + \angle QRS + 50^\circ = 180^\circ$

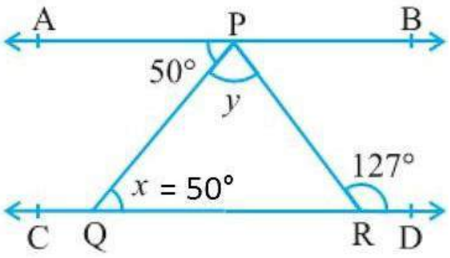
$120^\circ + \angle QRS = 180^\circ$

$\angle QRS = 180^\circ - 120^\circ$

$\angle QRS = 60^\circ$

Ex6.2, 5

In the given figure, if AB || CD, ∠APQ = 50° and ∠PRD = 127°, find *x* and *y*.



Now, AB ∥ CD

and PQ is the transversal

Hence, ∠ APQ = x (Alternate angles)

$50° = x$

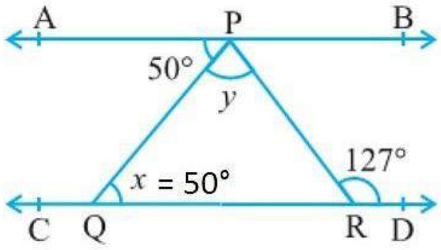
$x = 50°$

Similarly,

AB ∥ CD

and PR is the transversal

Hence, ∠ APR = ∠ PRD (Alternate angles)



$\angle APR = \angle PRD$

$50° + y = 127°$

$y = 127° – 50°$

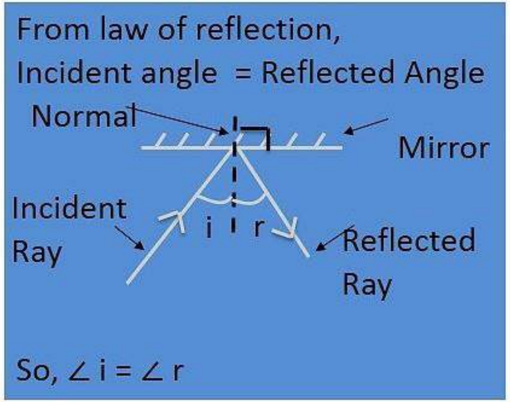
$y = 77°$

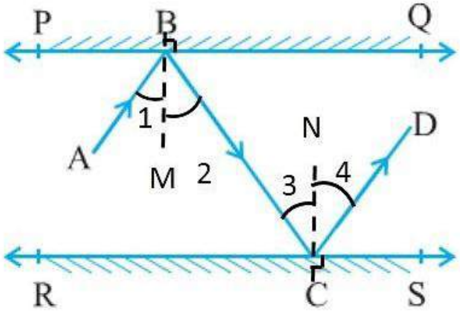
Hence, $x = 50°$ and $y = 77°$

Ex6.2, 6

In the given figure, 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.

Here AB is incident ray and BC is reflected ray.



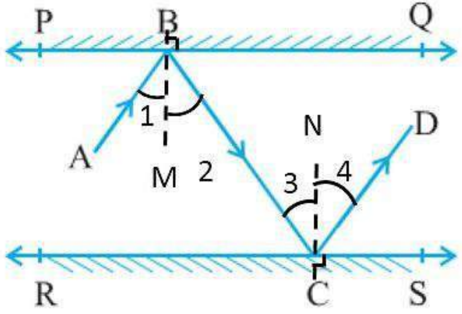


From laws of reflection,

$\angle 1 = \angle 2$

$\angle 3 = \angle 4$

$\angle 1 = \angle 2$ & $\angle 3 = \angle 4$



So, $\angle 1 = \angle 2 = \frac{1}{2} \angle ABC$

and $\angle 3 = \angle 4 = \frac{1}{2} \angle BCD$

We have to prove AB || CD

Here, BM & CN are normal

So, $BM \perp PQ$ and $CN \perp RS$.

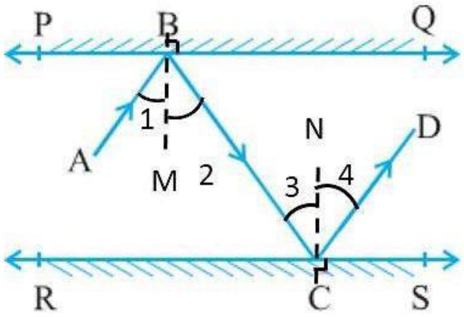
But PQ || RS,

So, BM || CN

Now, BM || CN & BC is the transversal

$\therefore \angle 2 = \angle 3$ (Alternate interior angles)

$\angle 2 = \angle 3$



$\frac{1}{2}\angle ABC = \frac{1}{2}\angle BCD$

$\angle ABC = \angle DCB$

Since, $\angle ABC = \angle DCB$

But $\angle ABC$ & $\angle DCB$ are alternate interior angles for lines AB & CD with transversal BC

From theorem 6.3: *If a transversal intersects two lines such that pair of interior angles is equal, then lines are parallel.*

Since alternate interior angles are equal,

$\therefore AB \parallel CD$

HOMEWORK ASSIGNMENT

EXERCISE 6.2 Q no-4,5,6

AHA

In the given figure, PQ || RS and EF || QS. If ∠PQS = 60°, then find the measure of ∠RFE

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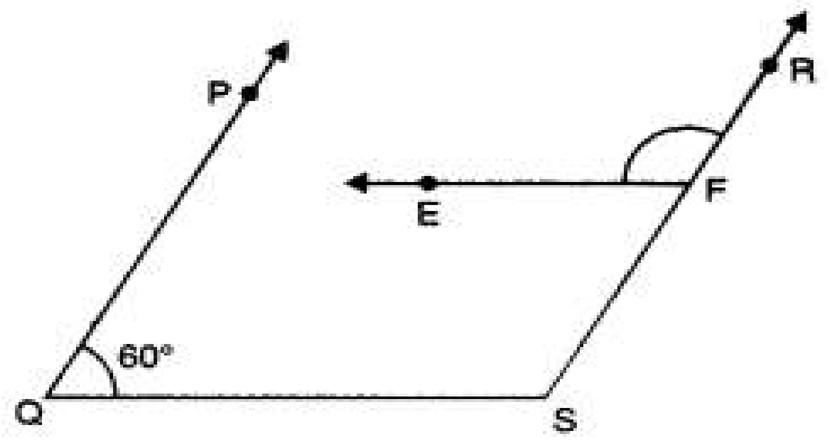

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