PERIOD 4

MATHEMATICS

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

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Previous Knowledge Test

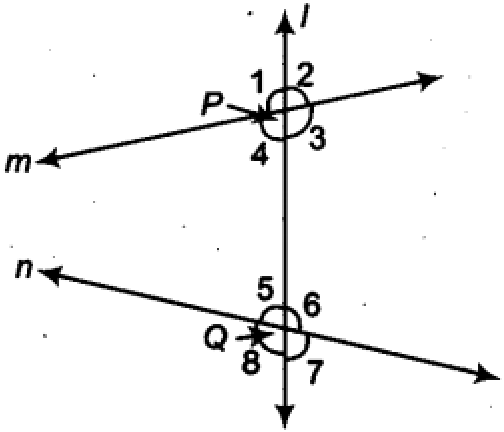
1.If 2 lines intersect each other then 2 pairs of vertically opposite angles are produced. If one of the angles measures 60°, then find the measurements of other angles.

LEARNING OUTCOME:-

1. Students will be able to know the relationship between pairs of corresponding angles and interior opposite angles.

2. Students will be able to learn about the co-interior angles.

Parallel Lines and a Transversal: A line which intersects two or more lines at distinct points is called a transversal.



Here, line l is a transversal of the lines m and n, respectively.

Line l intersects m and n at P and Q respectively, then four angles are formed at each of the points P and Q namely

$\angle 1, \angle 2, \angle 3, \ldots, \angle 8$

$\angle 1$, $\angle 2$, $\angle 7$ and $\angle 8$ are called exterior angles.

$\angle 3$, $\angle 4$, $\angle 5$ and $\angle 6$ are called interior angles.

We classify these eight angles in the following groups

(i) Corresponding angles.

- $\angle 1$ and $\angle 5$
- $\angle 2$ and $\angle 6$
- $\angle 4$ and $\angle 8$
- $\angle 3$ and $\angle 7$

(ii) Alternate interior angles

$\angle 4$ and $\angle 6$

$\angle 3$ and $\angle 5$

(iii) Alternate exterior angles

$\angle 1$ and $\angle 7$

$\angle 2$ and $\angle 8$

(iv) Interior angles on the same side of the transversal

$\angle 4$ and $\angle 5$

$\angle 3$ and $\angle 6$

Note: Interior angles on the same side of the transversal are also referred to as consecutive interior angles or allied angles or co-interior angles.

Theorem 6.2 :-

If a transversal intersects two parallel lines, then each pair of alternate interior angles are equal.

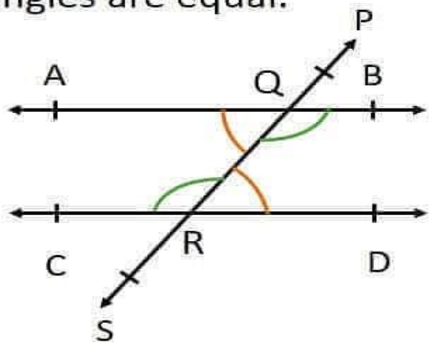
Given :- Two parallel lines AB and CD.

Let PS be the transversal intersecting AB at Q and CD at R.

To Prove :- Each pair of alternate interior angles are equal.

i.e, ∠ BQR = ∠ CRQ

and ∠ AQR = ∠ QRD



Proof :- First, we will prove ∠ BQR = ∠ CRQ

For lines AB & CD,

with transversal PS

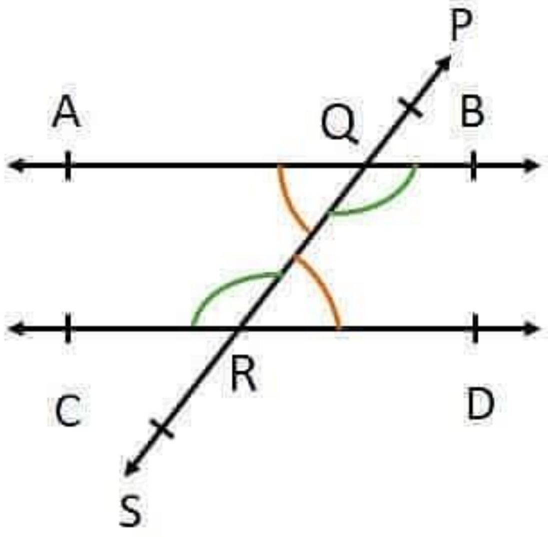
∠AQP = ∠ CRQ (Corresponding angles) ...(1)

For lines AB & PS

∠AQP = ∠ BQR (Vertically opposite angles) ...(2)

From (1) and (2)

$\angle BQR = \angle CRQ$



Similarly we can prove

$\angle AQR = \angle QRD$

Hence, pair of alternate interior angles are equal.

Hence proved.

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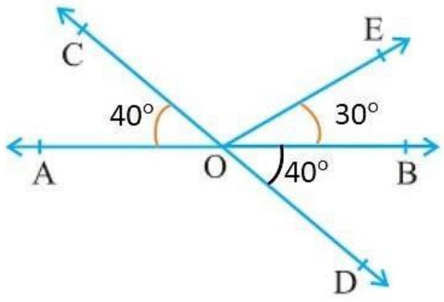
Theorem 6.3~ If a transversal intersects two lines such that a pair of interior opposite angles is equal then the two lines are parallel.

Ex 6.1, 1

In the given figure, lines AB and CD intersect at O. If ∠AOC + ∠BOE = 70° and ∠BOD = 40° find ∠BOE and reflex ∠COE.



Given

∠ BOD = 40°

Since AB & CD intersect,

∠AOC = ∠BOD (Vertically opposite angles)

∠AOC = 40°

Also, ∠AOC + ∠BOE = 70° (Given)

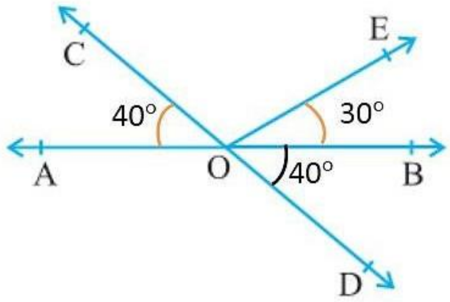
40° + ∠BOE = 70°

∠BOE = 70° - 40°

∠BOE = 30°

We need to find reflex ∠COE

Reflex ∠COE = 360° – ∠COE



First we finding ∠ COE

Now,

∴ ∠AOC + ∠ COE + ∠BOE = 180° (Linear pair)

∠COE + (∠AOC + ∠BOE) = 180°

∠COE + (40° + 30°) = 180°

∠COE + (70°) = 180°

∠COE = 180° – 70°

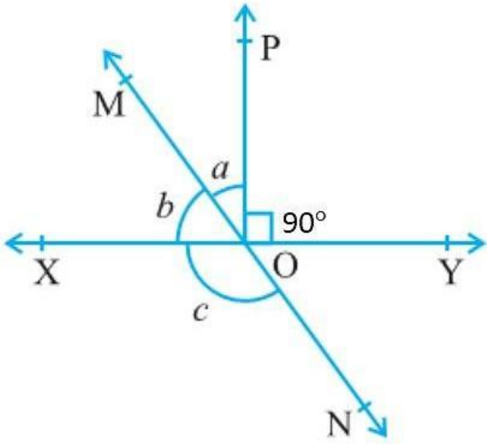
∠COE = 110°

Reflex ∠COE = 360° - 110°

= 250°

Ex 6.1, 2

In the given figure, lines XY and MN intersect at O. If ∠POY = 90° and *a*:*b* = 2 : 3, find *c*.



Given

a: b = 2 : 3

Let a = 2x

& b = 3x, where x is some number

Now,

$\angle$ POX + $\angle$ POY = 180° (Linear pair)

a + b + 90° = 180°

a + b = 180° – 90°

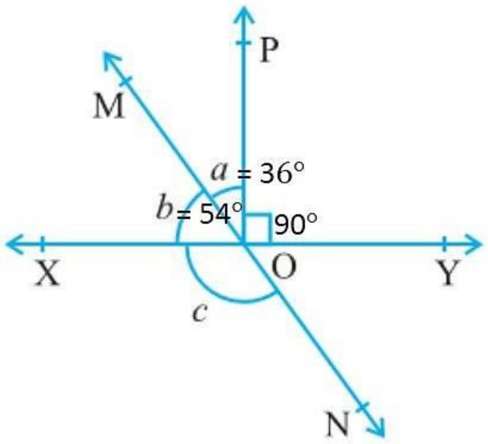
2x + 3x = 90°

5x = 90°

$x = \frac{90^\circ}{5} = 18^\circ$

$a = 2x = 2 \times 18^\circ = 36^\circ$

$b = 3x = 3 \times 18^\circ = 54^\circ$



We need to find c,

Since MN is a line, we can use linear pair

$\angle MOX + \angle XON = 180^\circ$ (Linear pair)

$b + c = 180^\circ$

$54^\circ + c = 180^\circ$

$c = 180^\circ - 54^\circ$

$c = 126^\circ$

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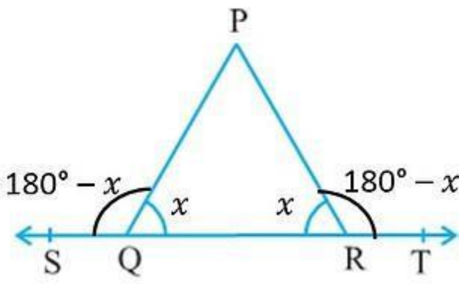
Ex6.1, 3

In the given figure, ∠PQR = ∠PRQ, then prove that ∠PQS = ∠PRT.



Let ∠PQR = x

Hence,

∠PRQ = x *(Given ∠ PQR = ∠ PRQ)*

Now,

∠PQS + ∠PQR = 180° (Linear pair)

∠PQS = 180° – ∠PQR

∠PQS = 180° – x ...(1)

Also, we can say

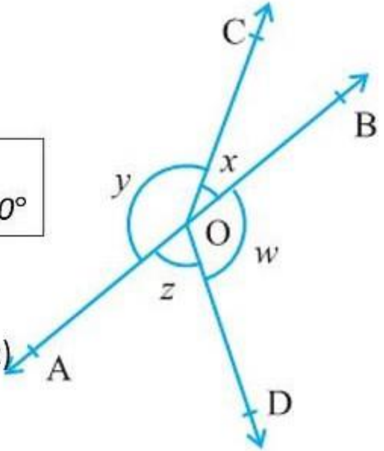
∠PRT + ∠PRQ = 180° (Linear pair)

∠PRT = 180° – ∠PRQ

∠PRT = 180° – x ...(2)

Ex 6.1, 4

In the given figure, if x + y = w + z, then prove that AOB is a line.



We know that

$x + y + w + z = 360°$

Sum all angles round a point is equal to 360°

$(x + y) + (w + z) = 360°$

$(x + y) + (x + y) = 360°$ (Given x + y = w + z)

$2(x + y) = 360°$

$(x + y) = \frac{360°}{2}$

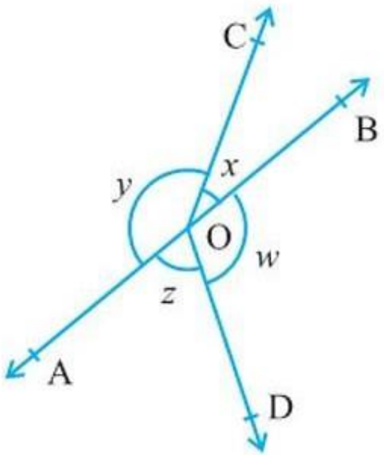
$x + y = 180°$

Since,

$w + z = x + y$

$w + z = 180°$

Now, $x + y = 180°$ & $w + z = 180°$



From Axiom 6.2: If the sum of two adjacent angles is 180° , then non-common arms form a line *(Reverse Linear Pair)*

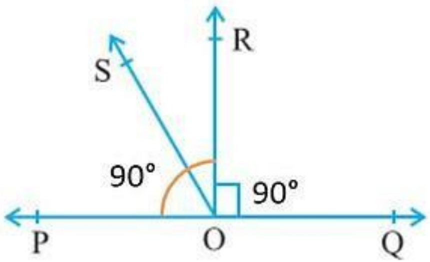
∴ AOB is a straight line

Hence proved

Ex 6.1, 5

In the given figure, POQ is a line. Ray OR is perpendicular to line PQ. OS is another ray lying between rays OP and OR. Prove that

$\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$



Since OR ⊥ PQ

Hence, $\angle ROP = 90°$

$\& \angle ROQ = 90°$

We can say that

$\angle ROP = \angle ROQ$

$\angle POS + \angle ROS = \angle ROQ$

$\angle POS + \angle ROS = \angle QOS - \angle ROS$

$\angle SOR + \angle ROS = \angle QOS - \angle POS$

$2(\angle ROS) = \angle QOS - \angle POS$

$\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$

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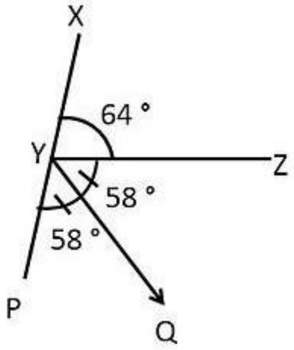
Ex 6.1, 6

It is given that ∠XYZ = 64° and XY is produced to point P. Draw a figure from the given information. If ray YQ bisects ∠ZYP, find ∠XYQ and reflex ∠QYP.



XYP is a straight line,

$\angle XYZ + \angle ZYP = 180°$ (Linear pair)

$\angle ZYP = 180° - \angle XYZ$

$\angle ZYP = 180° - 64°$

$\angle ZYP = 116°$

Since YQ bisects ∠ ZYP

$\angle ZYQ = \angle QYP = \frac{1}{2} \angle ZYP$

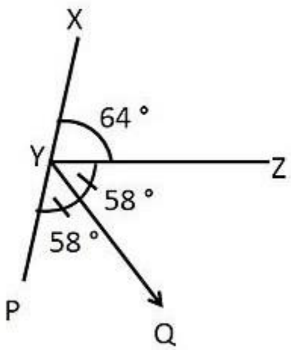
$= \frac{1}{2} \times 116°$

$= 58°$

$\angle XYQ = \angle XYZ + \angle ZYQ$

$= 64° + 58°$

$= 122°$



We have to find Reflex $\angle QYP$

Reflex $\angle QYP = 360° - \angle QYP$

Reflex $\angle QYP = 360° - 58°$

$= 302°$

HOMEWORK ASSIGNMENT

EXERCISE 6.2 Q No 1,2,3

AHA

1.The exterior angles obtained on producing the base of a triangle both ways are 100° and 120°. Find the angles.

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