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# PERIOD 6

# MATHEMATICS

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



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# PREVIOUS KNOWLEDGE TEST

1. What do mean by transversal of lines?
2. Can there be a transversal for non parallel lines?

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# LEARNING OUTCOME:~

1. Students will be able to learn and prove angle sum property of triangles .

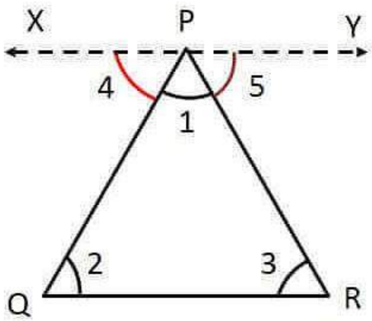
2. Students will develop a relation between interior angles and exterior angles of a triangle.

**Theorem 6.7 :-**

The sum of all angles are triangle is 180°.

Given :- Δ PQR with angles ∠1, ∠2 and ∠3

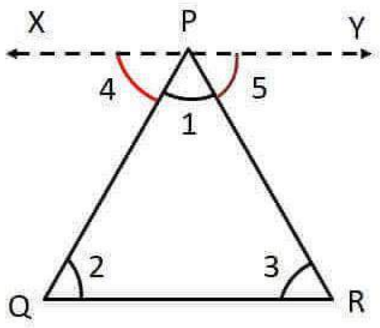
Prove :- ∠1 + ∠2 + ∠3 = 180°




Construction:- Draw a line XY passing through P parallel to QR

Proof:

| For lines **XY & QR**, with **transversal PQ** | For lines **XY & QR**, with **transversal PR** |
| --- | --- |
| ∠ 2 = ∠ 4 (Alternate angles) ...(1) | ∠ 3 = ∠ 5 (Alternate angles) ...(2) |




Also, for line XY

$\angle 1 + \angle 4 + \angle 5 = 180°$ *(Linear pair)*

$\angle 1 + \angle 2 + \angle 3 = 180°$ *(From (1) and (2))*

Hence, sum of all angle of a triangles are equal.

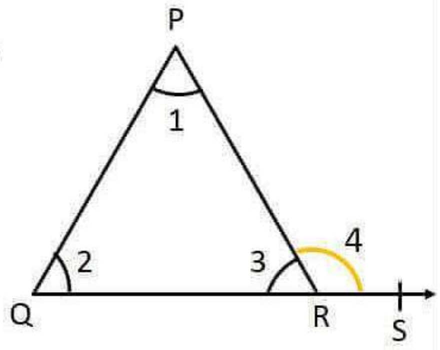
Hence proved

**Theorem 6.8 :-**

If a side of a triangle is produced, then the exterior angle so formed is equal to the sum of the two interior opposite angles.

Given :- A $\triangle PQR$ ,QR is produced to point S.

where $\angle PRS$ is exterior angle of $\triangle PQR$.




To Prove :- $\angle 4 = \angle 1 + \angle 2$

Proof:-

**For line QS**

$\angle 3 + \angle 4 = 180°$ (Linear pair)..(1)

**In ΔPQR**

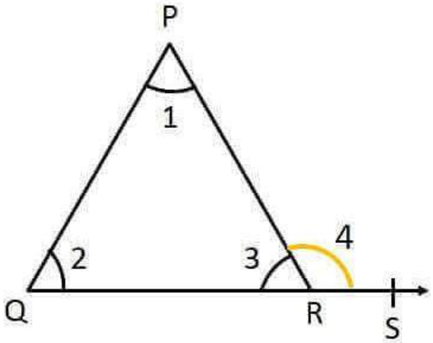
$\angle 1 + \angle 2 + \angle 3 = 180°$ (Angle sum property of triangle)..(2)

From (1) and (2)

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

$\angle 4 = \angle 1 + \angle 2$

$\angle PRS = \angle RPQ + \angle PQR$

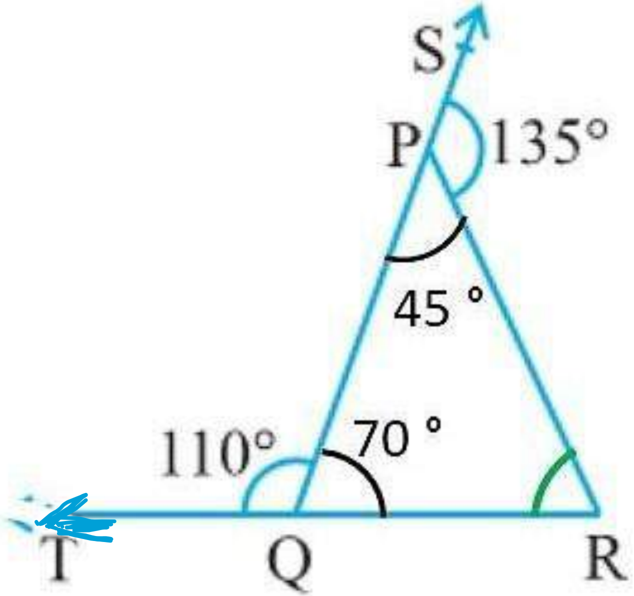



Hence, exterior angle is sum of two opposite interior angles.

Hence proved

## Ex 6.3, 1

In the given figure, sides QP and RQ of ΔPQR are produced to points S and T respectively. If ∠SPR = 135° and ∠PQT = 110°, find ∠PRQ.



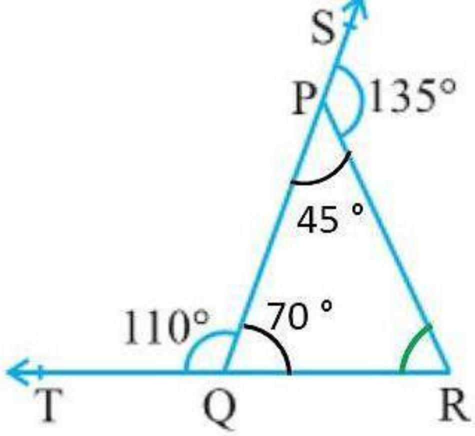
Since TR is a line

$\angle PQT + \angle PQR = 180°$ *(Linear Pair)*

$110° + \angle PQR = 180°$

$\angle PQR = 180° - 110°$

$\angle PQR = 70°$




Since QS is a line

$\angle SPR + \angle QPR = 180°$ *(Linear Pair)*

$135° + \angle QPR = 180°$

$\angle QPR = 180° - 135°$

$\angle QPR = 45°$

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In $\Delta$ PQR,

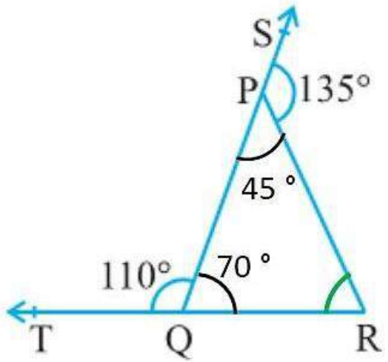
$\angle QPR + \angle PQR + \angle PRQ = 180°$ *(Angle sum property of triangle)*

$45° + 70° + \angle PRQ = 180°$

$115° + \angle PRQ = 180°$

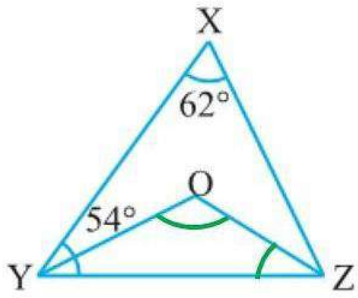
$\angle PRQ = 180° - 115°$

$\angle PRQ = 65°$



**Ex 6.3, 2**

In the given figure, $\angle X = 62°$, $\angle XYZ = 54°$. If YO and ZO are the bisectors of $\angle XYZ$ and $\angle XZY$ respectively of $\Delta XYZ$, find $\angle OZY$ and $\angle YOZ$.




Given,

OY is the angle bisector of $\angle XYZ$

So, $\angle XYO = \angle OYZ = \frac{1}{2}(\angle XYZ)$

$\angle XYO = \angle OYZ = \frac{1}{2}(54°)$

$\angle XYO = \angle OYZ = 27°$ ...(1)

Also,

OZ is the angle bisector of $\angle XZY$

So, $\angle XZO = \angle OZY = \frac{1}{2}(\angle XZY)$ ...(2)

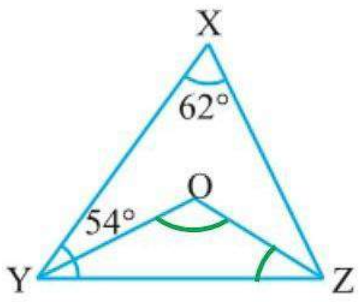
In $\Delta XYZ$,

$\angle YXZ + \angle XYZ + \angle XZY = 180°$ *(Angle sum property of triangle)*

$62° + 54° + \angle XZY = 180°$

$\angle XZY = 180° - 116°$

$\angle XZY = 64°$




From (2)

$\angle XZO = \angle OZY = \frac{1}{2}(\angle XZY)$

$\angle XZO = \angle OZY = \frac{1}{2} \times 64°$

$\angle XZO = \angle OZY = 32°$

In $\Delta$ OYZ

$\angle OYZ + \angle OZY + \angle YOZ = 180°$ *(Angle sum property of triangle)*

$27° + 32° + \angle YOZ = 180°$

$59° + \angle YOZ = 180°$

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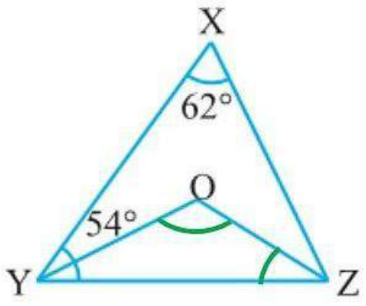
$59° + \angle YOZ = 180°$

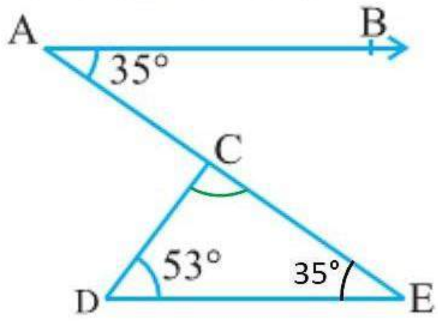
$\angle YOZ = 180° - 59°$

$\angle YOZ = 121°$



**Ex6.3, 3**

In the given figure, if AB || DE, ∠BAC = 35° and ∠CDE = 53°, find ∠DCE.




Since AB || DE and AE is a transversal.

∠BAC = ∠CED (*Alternate interior angles*)

35° = ∠CED

∴ ∠CED = 35°

In ΔCDE,

∠CDE + ∠CED + ∠DCE = 180° (*Angle sum property of a triangle*)

53° + 35° + ∠DCE = 180°

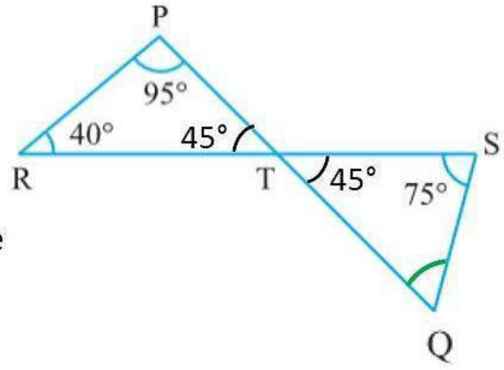
88° + ∠DCE = 180°

∠DCE = 180° – 88°

∠DCE = 92°

**Ex 6.3, 4**

In the given figure, if lines PQ and RS intersect at point T, such that ∠PRT = 40°, ∠RPT = 95° and ∠TSQ = 75°, find ∠SQT.




In Δ PRT

By angle sum property of triangle

∠ PRT + ∠ RPT + ∠ PTR = 180°

90° + 45° + ∠ PTR = 180°

135° + ∠ PTR = 180°

∠ PTR = 180° – 135°

∠ PTR = 45°

Also,

∠ STQ = ∠ PTR

∠ STQ = 45° *(Vertically opposite angles)*

In Δ SQT

By angle sum property of triangle

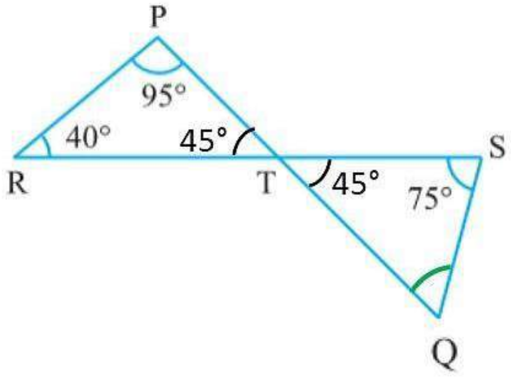
$\angle SQT + \angle STQ + \angle TSQ = 180°$

$\angle SQT + 75° + 45° = 180°$

$\angle SQT + 120° = 180°$

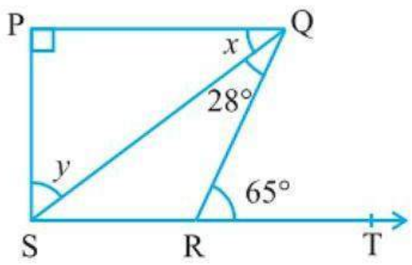
$\angle SQT = 180° - 120°$

$\angle SQT = 60°$



## Ex 6.3, 5

In the given figure, if PQ ⊥ PS, PQ || SR, ∠SQR = 28° and ∠QRT = 65°, then find the values of $x$ and $y$.




Since

PQ || SR and QR is a transversal.

$\angle PQR = \angle QRT$ *(Alternate interior angles)*

$x + 28° = 65°$

$x = 65° - 28°$

$x = 37°$

In ΔSPQ,

$\angle SPQ + x + y = 180°$ *(Angle sum property of a triangle)*

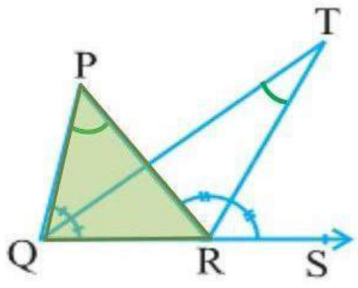
$90° + 37° + y = 180°$ *(Given ∠SPQ = 90° as PQ ⊥ PS)*

$y = 180° - 127°$

$y = 53°$

**Ex 6.3 ,6**

In the given figure, the side QR of ΔPQR is produced to a point S. If the bisectors of ∠PQR and ∠PRS meet at point T, then prove that $\angle QTR = \frac{1}{2} \angle QPR$




Given

TQ is the bisector of ∠ PQR.

So, $\angle PQT = \angle TQR = \frac{1}{2} \angle PQR$

Also,

TR is the bisector of ∠ PRS

So, $\angle PRT = \angle TRS = \frac{1}{2} \angle PRS$

In Δ PQR,

∠ PRS is the external angle

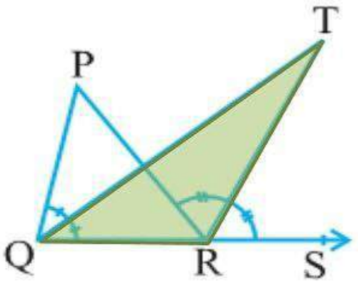
$\angle PRS = \angle QPR + \angle PQR$ (External angle is sumof two interior opposite angles) ...(1)

In $\Delta$ TQR,

$\angle$ TRS is the external angle

$\angle TRS = \angle TQR + \angle QTR$ $\left(\begin{array}{c}\text{External angle is sumof two}\\ \text{interior opposite angles}\end{array}\right)$ ...(2)

*Putting* $\angle TRS = \frac{1}{2}\angle PRS$ *&* $\angle TQR = \frac{1}{2}\angle PQR$




$\frac{1}{2}\angle PRS = \frac{1}{2}\angle PQR + \angle QTR$

$\frac{1}{2}\angle PRS = \frac{1}{2}\angle PQR + \angle QTR$

*Putting* $\angle PRS = \angle QPR + \angle PQR$ *from (1)*

$\frac{1}{2}(\angle QPR + \angle PQR) = \frac{1}{2}\angle PQR + \angle QTR$

$\frac{1}{2}\angle QPR + \frac{1}{2}\angle PQR = \frac{1}{2}\angle PQR + \angle QTR$

$\frac{1}{2}\angle QPR + \frac{1}{2}\angle PQR - \frac{1}{2}\angle PQR = \angle QTR$

$\frac{1}{2}\angle QPR = \angle QTR$

$\angle QTR = \frac{1}{2}\angle QPR$

Hence proved

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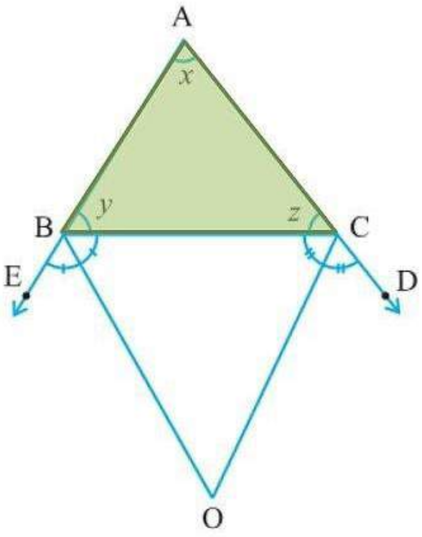
# HOMEWORK ASSIGNMENT

EXERCISE 6.3

# AHA

In figure, the sides AB and AC of $\Delta ABC$ are produced to points E and D respectively. If bisectors BO and CO of $\angle CBE$ and $\angle BCD$ respectively meet at point O, then prove that $\angle BOC = 90° - \frac{1}{2}\angle BAC$.



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