MATHEMATICS ONLINE CLASS X ON 11-08-2021

CIRCLES

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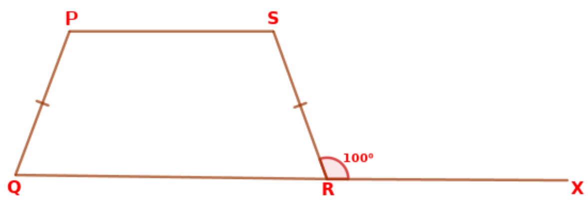
Answer to assignment of previous class

Question

1) PQRS is an isosceles trapezium and QR extended to X. If $\angle SRX = 100°$. Find all angles of PQRS.

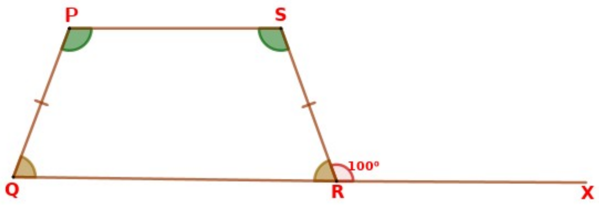


Answer

Given $\angle SRX = 100°$

$\angle SRX + \angle SRQ = 180^0$

[linear pair]



$100° + \angle SRQ = 180^0$

$\angle SRQ = 180^0 - 100° = 80^0$

Since PQRS is an isosceles trapezium in which PQ = SR

$\angle SRQ = \angle PQR = 80^0$

All isosceles trapeziums are cyclic

$\angle QPS = 180^0 - \angle QRS = 180^0 - 80^0 = 100°$

Also $\angle PSR = 180^0 - \angle PQR = 180^0 - 80^0 = 100°$

Angles of PQRS are $\angle P = 100°$, $\angle Q = 80°$, $\angle R = 80°$, $\angle S = 100°$

Question

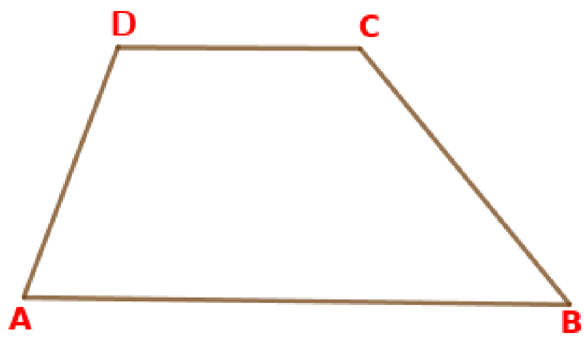
2) Prove that any non-isosceles trapezium is not cyclic.

Answer

In a trapezium, a pair of opposite sides are parallel.

Here, AB ∥ CD.

ABCD is a non-isosceles trapezium.



$\therefore \angle A \neq \angle B$ 1

Since AB ∥ CD,

$\angle A + \angle D = 180°$ 2

From equations 1 and 2

$\angle B + \angle D \neq 180°$

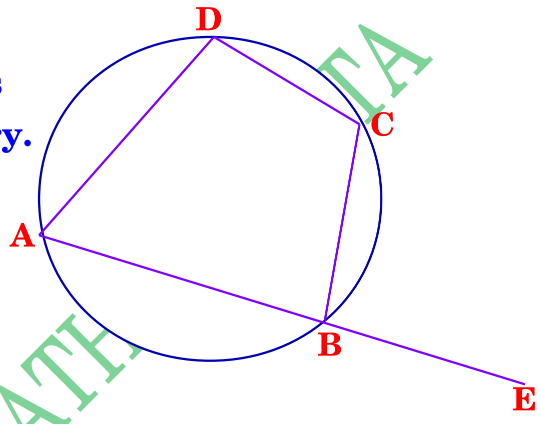
$\therefore \angle A + \angle C \neq 180°$

Since opposite angles are not supplementary, a non-isosceles trapezium ABCD is not cyclic.

Question

Prove that any outer angle of a cyclic quadrilateral is equal to the inner angle at the opposite vertex

Answer



We have to prove $\angle CBE = \angle ADC$.

ABCD is a cyclic quadrilateral, its opposite angles are supplementary.

$\therefore \angle ABC + \angle ADC = 180°$ 1

$\angle ABC$ and $\angle CBE$ are linear pairs.

$\therefore \angle ABC + \angle CBE = 180°$ 2

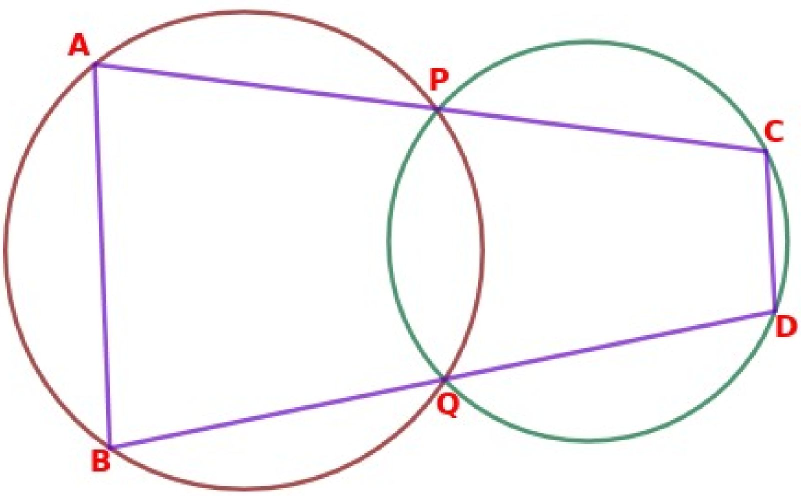
From equations 1 and 2

$\cancel{\angle ABC} + \angle CBE = \cancel{\angle ABC} + \angle ADC$

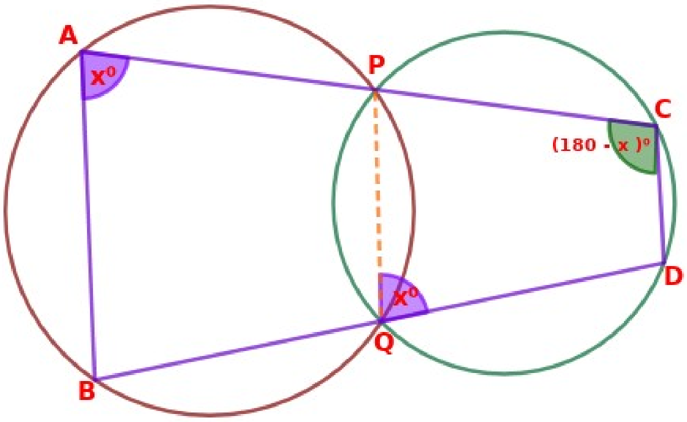
We get $\angle CBE = \angle ADC$

Question

The two circles below intersect at P , Q and lines through these points meet the circles at A , B , C , D . The lines AC and BD are not parallel . Prove that if these lines are of equal length , then ABDC is a cyclic quadrilateral.



Answer



In the figure, Join PQ.
ABQP and QDCP are cyclic quadrilaterals.
Let ∠A = x° ,then
∠PQD = x° (Any outer angle of a cyclic quadrilateral is equal to the inner angle at the opposite vertex)
∠C = 180 – x° (Opposite angles of a cyclic quadrilateral are supplementary)
∠A +∠C = x° + 180 – x° = 180°.
AB and CD are parallel. (∠A and ∠C are co-interior angles)
If AC = BD, ABDC become an isosceles trapezium.
We know that an isosceles trapezium is always cyclic.
∴ ABDC is a cyclic quadrilateral.

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ASSIGNMENT

In the picture, the circles on the left and right intersect the middle circle at P, Q, R, S; the lines joining them meet the left and right circles at A, B, C, D. Prove that $ABDC$ is a cyclic quadrilateral.