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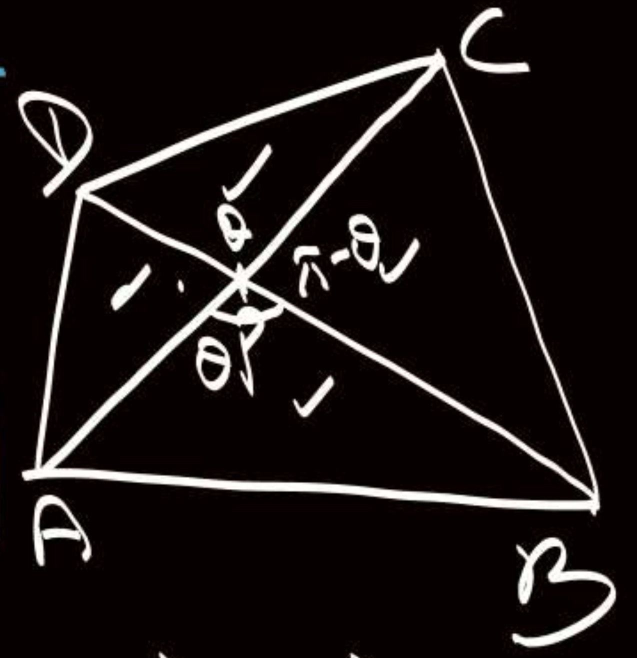
Quadrilateral

$$\boxed{\text{Area} = \frac{1}{2}\left|\vec{AC}\times\vec{BD}\right|}$$



$$= \frac{\sin\theta}{2}\Big(\underline{(AP)(PB)+(PB)(PC)}+\underline{(PC)(PD)+(PD)(PA)}\Big)$$

$$= \frac{1}{2}\sin\theta\Big((PB)(AC)+(PD)AC\Big)$$

$$= \frac{1}{2}\sin\theta\,(AC)(BD)$$

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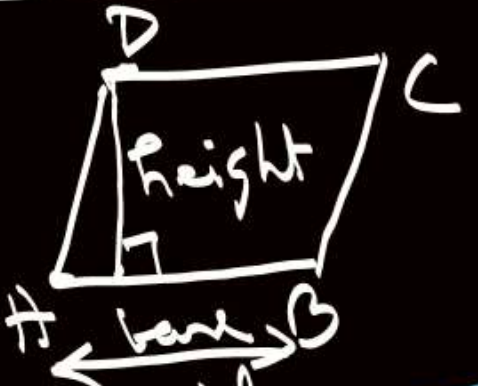
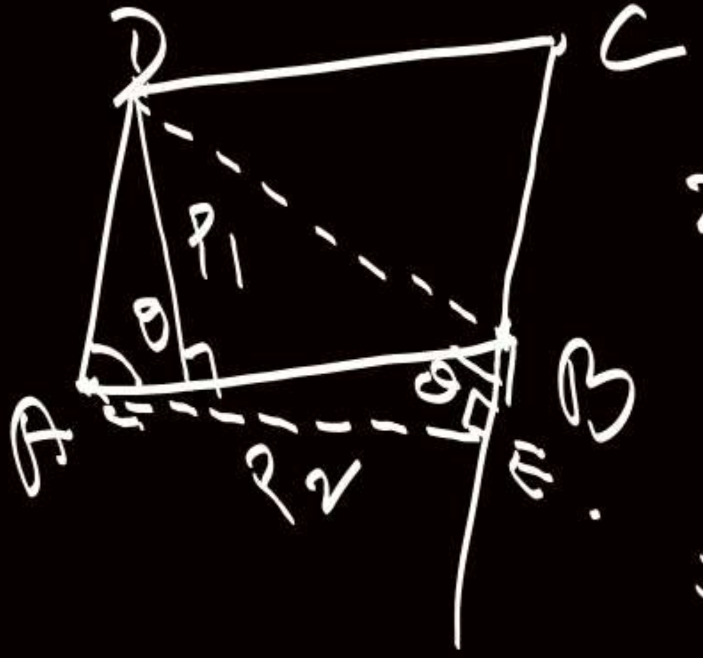
Quadrilateral

- Parallelogram
- Trapezium
  - Isosceles
  - Others
- Cyclic Quadrilateral
- Others



- Both opposite pair of sides are parallel
- Both —— || —— are equal
- One opposite pair of sides is || & equal
- Diagonals bisect each other

$$\text{Area} = |\vec{AB} \times \vec{AD}|$$
$$= \text{base} \times \text{height}$$
$$= P_1 P_2 \operatorname{cosec} \theta$$



$2 \times \frac{1}{2} \times P_1 (AB)$

$2 \times \frac{1}{2} P_1 \frac{P_2}{\sin\theta}$

$=$

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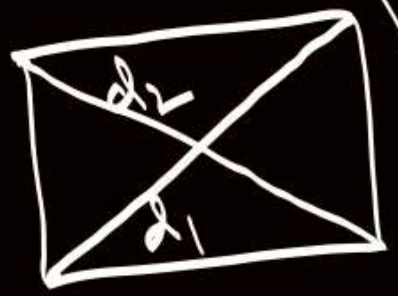
Parallelogram

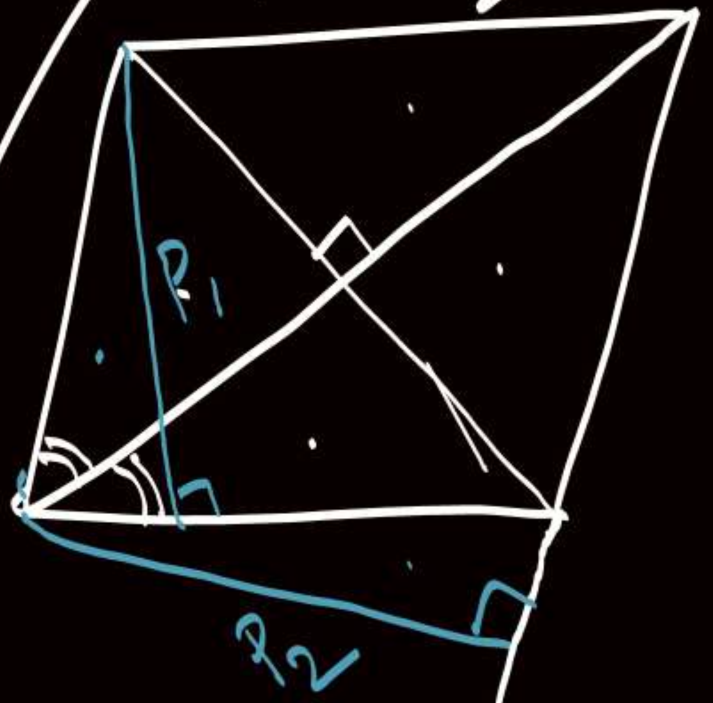
Rectangle



$d_1 = d_2$

Rhombus

Area $= \frac{1}{2} d_1 d_2$



$P_1 = P_2$

Diagonal is $\angle$ bisector

Others

Square

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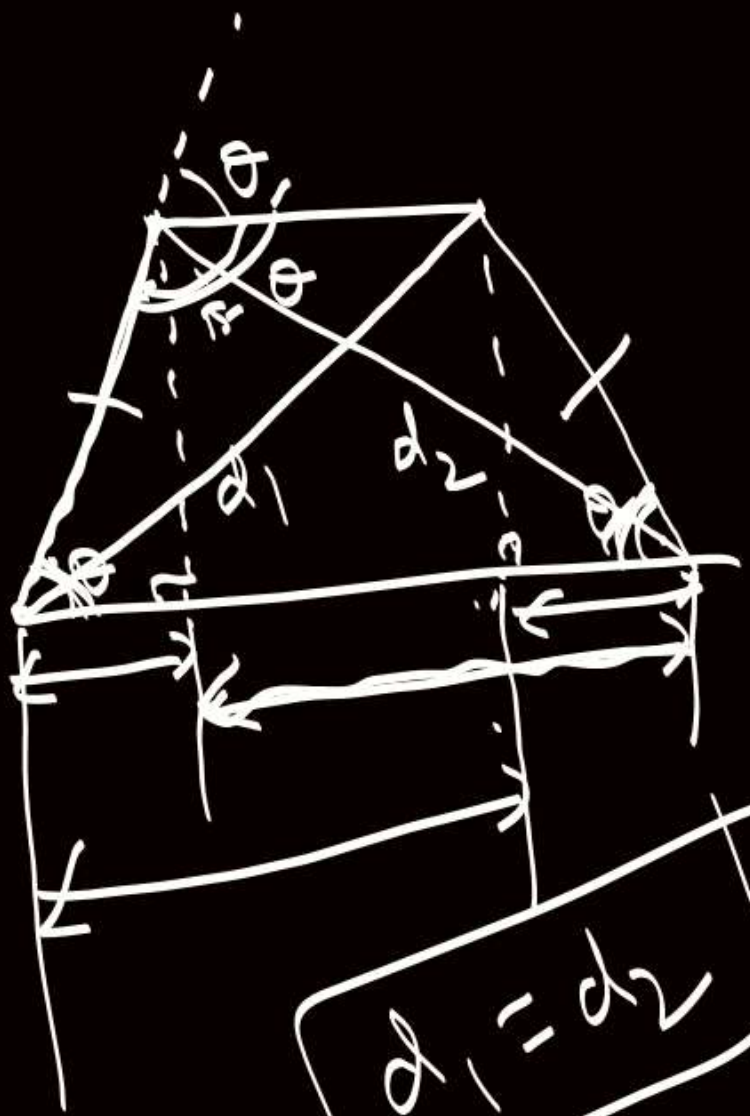
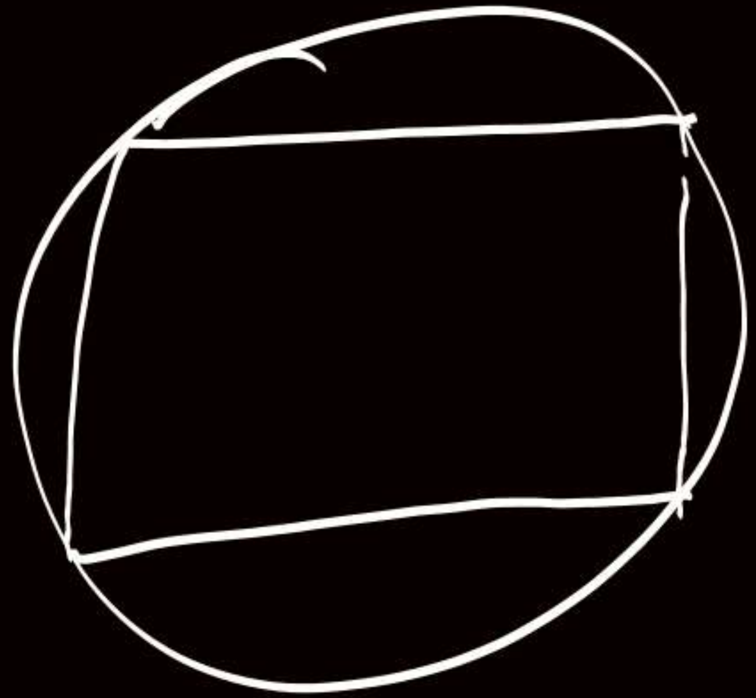
Isosceles Trapezium

Cyclic Quadrilateral



$\boxed{d_1 = d_2}$



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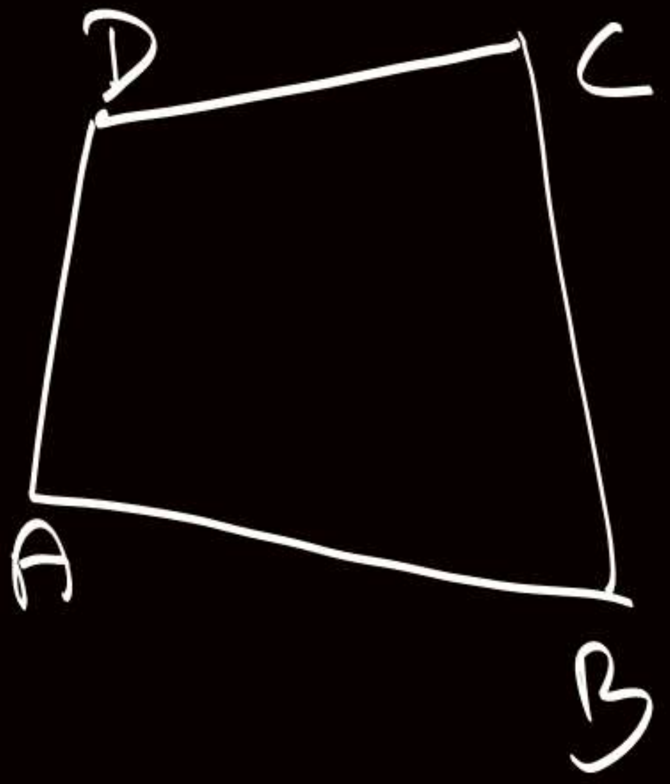
Cyclic Quadrilateral



$A + C = \pi = B + D$

Ptolemy's Theorem

$$(AB)(CD) + (BC)(AD) = (AC)(BD)$$

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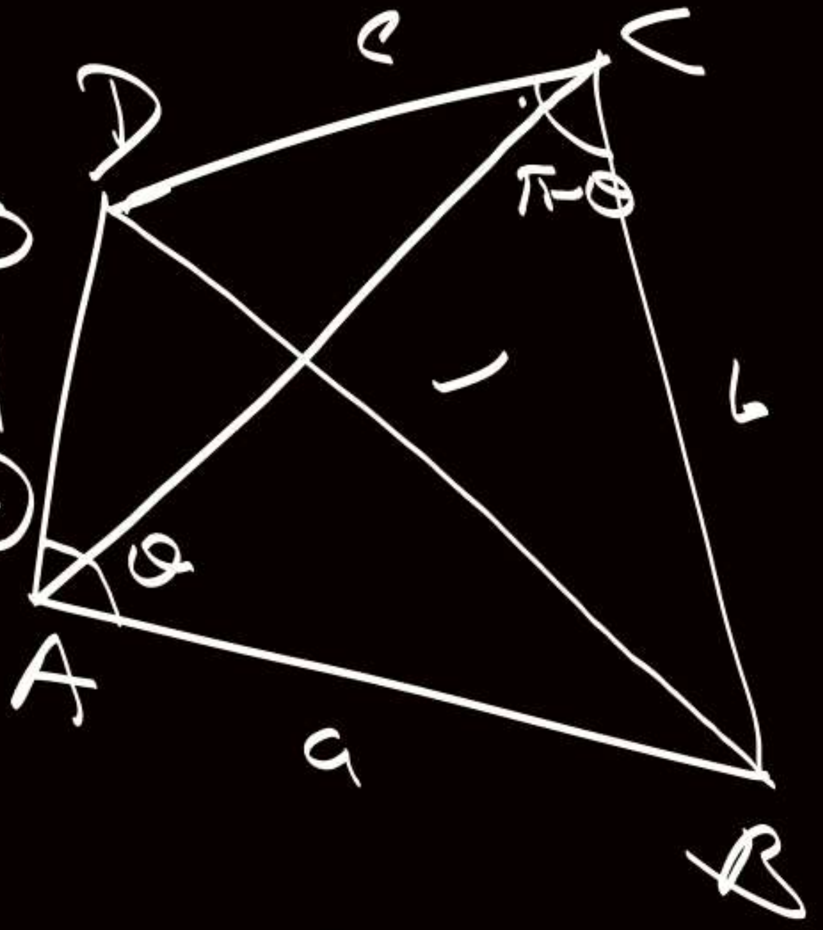
$$BD^2 = a^2 + d^2 - 2ad\cos\theta \quad - (1)$$

$$BD^2 = b^2 + c^2 + 2bc\cos\theta \quad - (2)$$

$$(1) \times bc + (2) \times ad$$



$$(bc + ad)\,BD^2 = (a^2 + d^2)\,bc + (b^2 + c^2)\,ad$$

$$= (ab + cd)(ac + bd)$$

$$BD = \sqrt{\frac{(ab+cd)(ac+bd)}{(bc+ad)}}$$

$$AC = \sqrt{\frac{(bc+ad)(ac+bd)}{(ab+cd)}}$$

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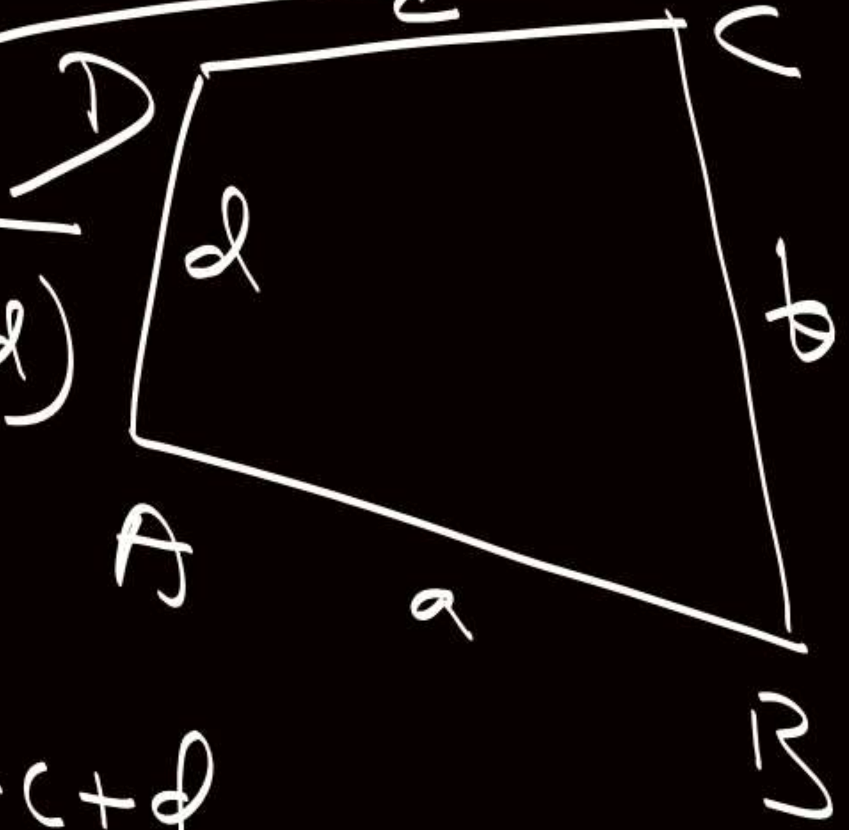
Area of Cyclic Quadrilateral

$$= \sqrt{(s-a)(s-b)(s-c)(s-d)}$$



$$s = \frac{a+b+c+d}{2}$$

Determinant

↓

$$\boxed{Ex - 1}$$