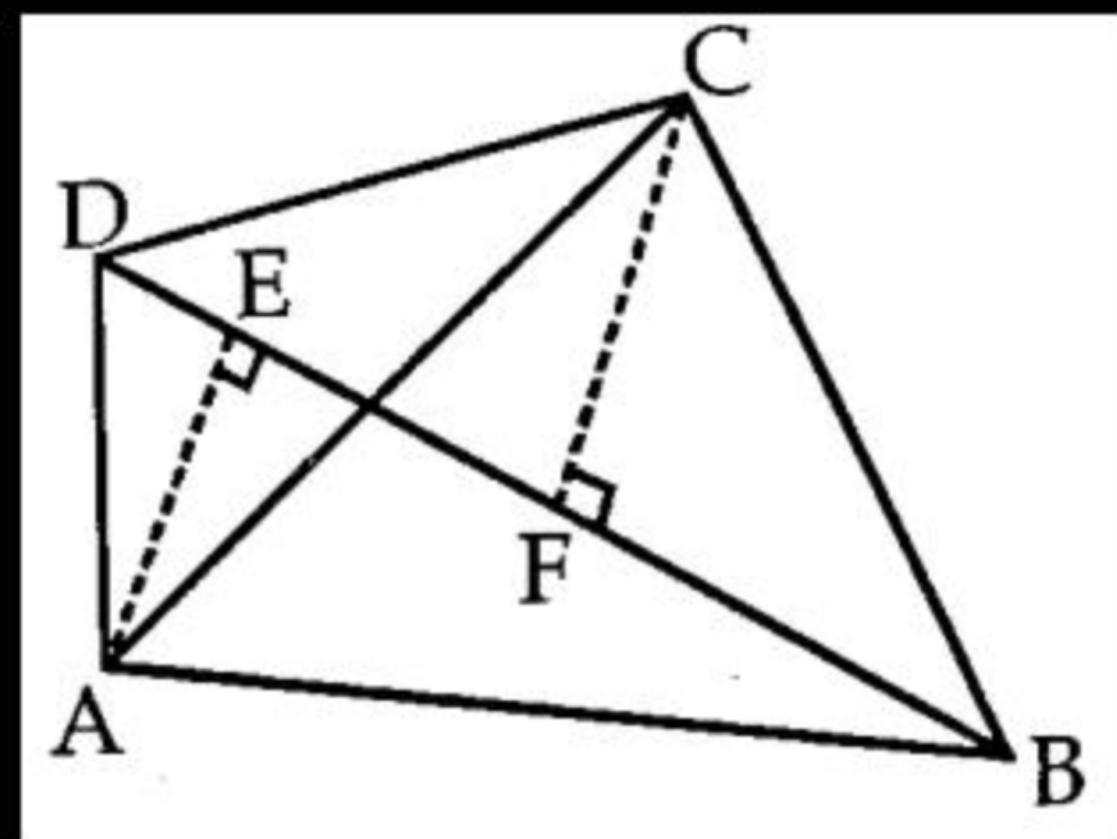


Quadrilateral (चतुर्भुज)

- A quadrilateral is a plane figure that has four sides or edges, and also have four corners or vertices.
- चतुर्भुज एक समतल आकृति है जिसमें चार भुजाएँ या किनारे होते हैं, और चार कोने या शीर्ष भी होते हैं।
- ABCD is a quadrilateral with sides AB, BC, CD and AD. AC and BD are the diagonals. AE and CF are the perpendiculars on diagonal DB.
- ABCD एक चतुर्भुज है जिसकी भुजाएँ AB, BC, CD और AD हैं। AC और BD विकर्ण हैं। AE और CF विकर्ण DB पर लम्ब हैं।



Types of Quadrilateral (चतुर्भुज के प्रकार)



SQUARE वर्ग



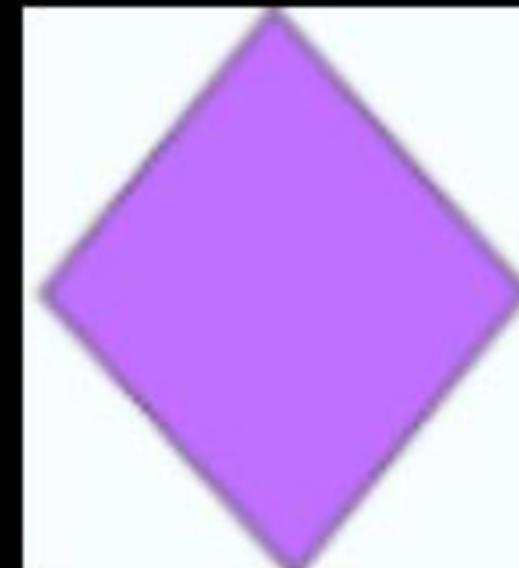
RECTANGLE आयत



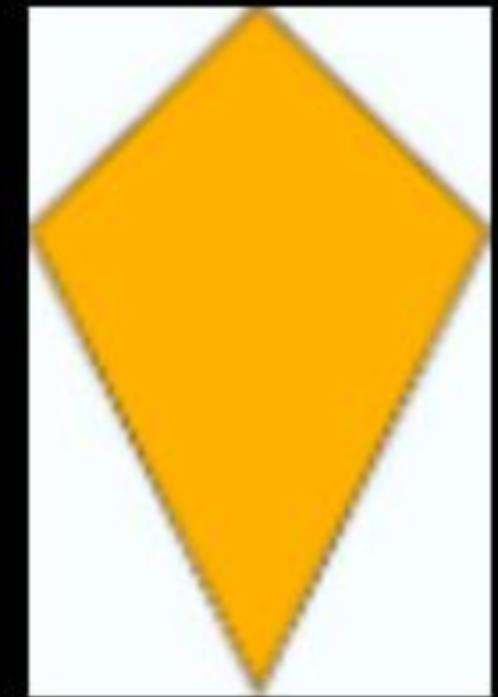
PARALLELOGRAM समानांतर चतुर्भुज



TRAPEZIUM समलम्ब



RHOMBUS समचतुर्भुज



KITE पतंग

types of Quadrilateral.

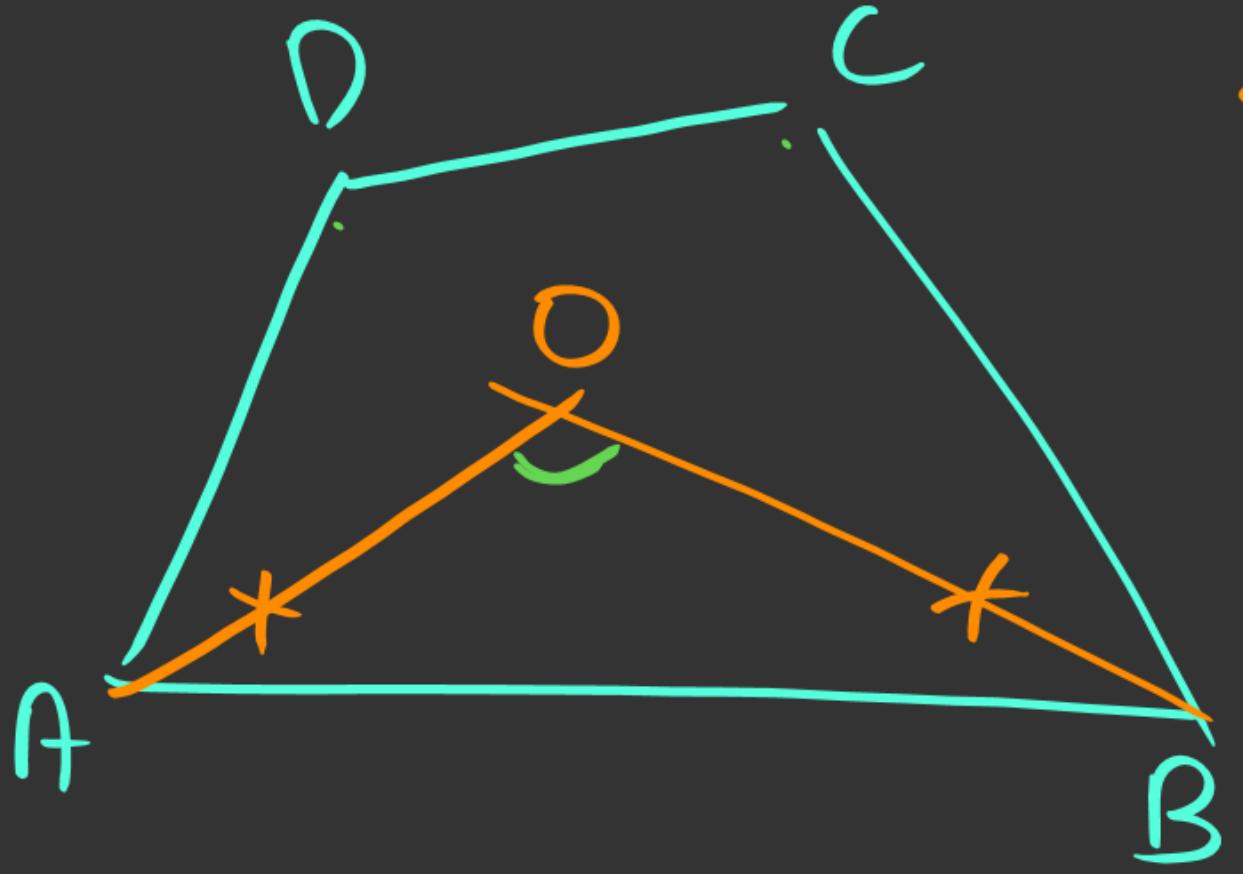
- (i) Square (वर्ग)
- (ii) Rectangle (आपत)
- (iii) parallelogram (समान्तर पतुर्भुज)
- (iv) Rhombus (समचतुर्भुज)
- (v) trapezium (समलम्ब)

(vi) cyclic Quadrilateral

(एकीप पतुर्भुज)

(vii) Kite (फूंगा)

point



$$\angle AOB = 180 - \frac{\angle A}{2} - \frac{\angle B}{2}$$

$$= \frac{360 - \angle A - \angle B}{2}$$

$$\angle AOB = \frac{\angle C + \angle D}{2}$$

or

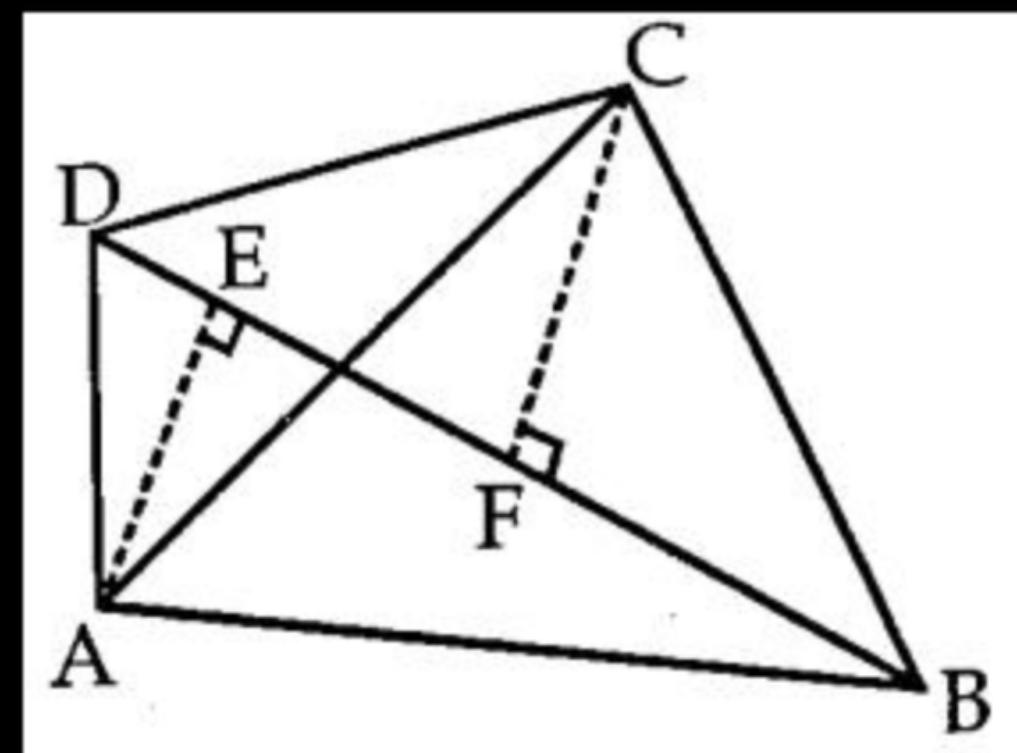
$$\angle C + \angle D = 360 - \angle A - \angle B$$

$$\underline{\angle C + \angle D = 360 - \angle A - \angle B}$$

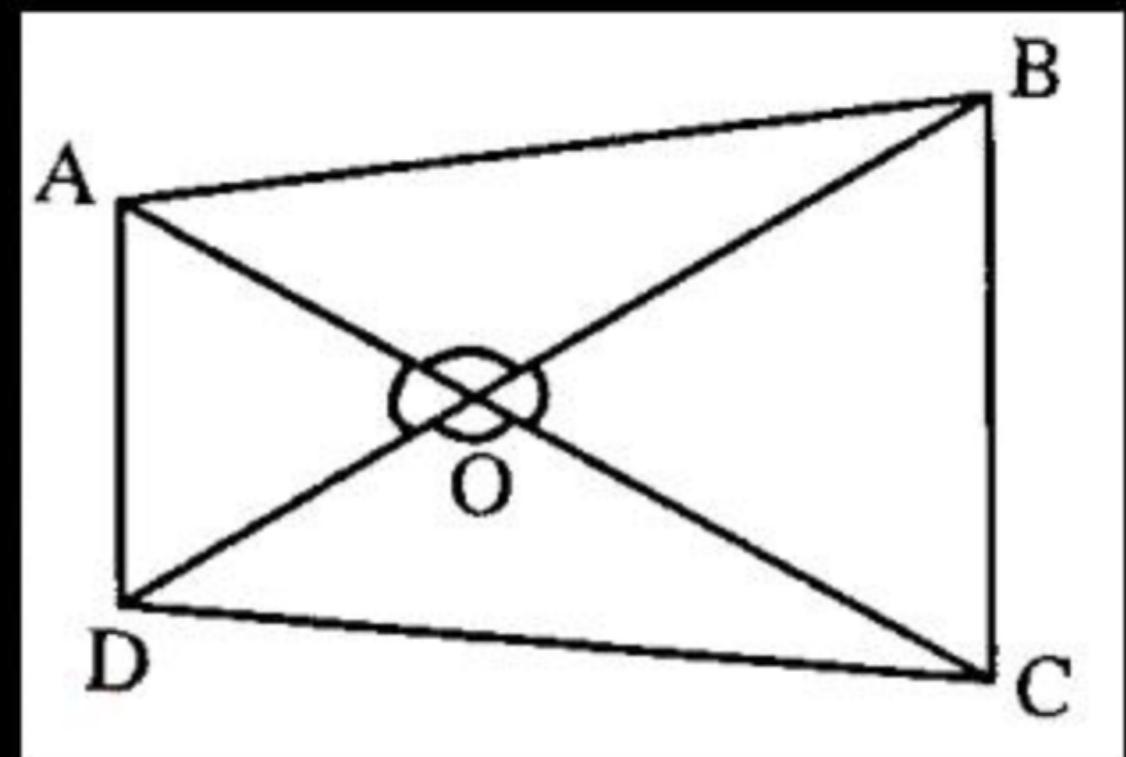
$$\underline{\angle C + \angle D = 2\angle AOB}$$

Properties of Quadrilateral (चतुर्भुज के गुण)

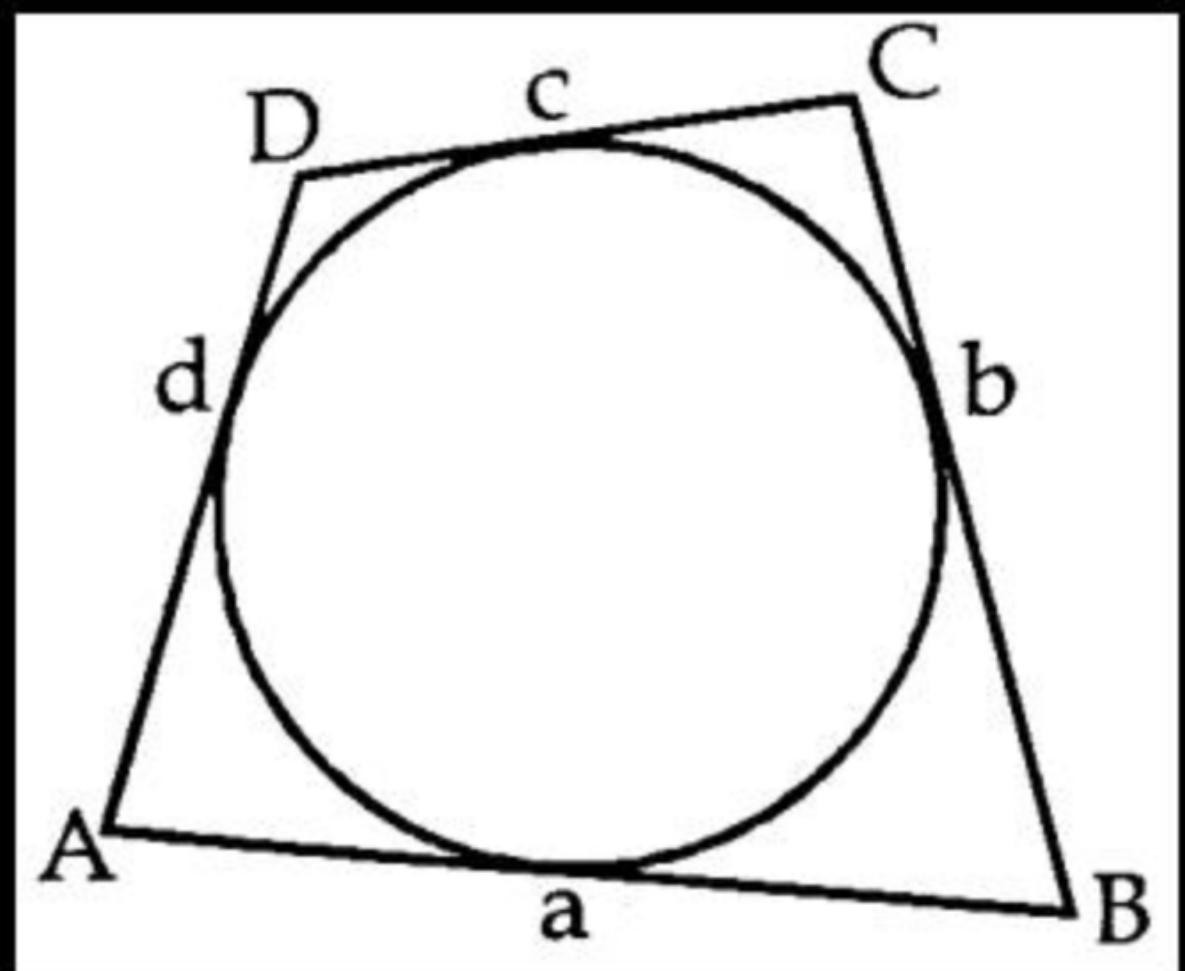
- Sum of all four interior angle is equal to 360° .
- चारों कोणों का योग 360° के बराबर होता है।
- Area = $\frac{1}{2} \times (\text{one diagonal}) \times (\text{sum of perpendiculars to the diagonal from opposite vertexes})$
 $= \frac{1}{2} \times BD \times (AE + CF)$
- Area = $\frac{1}{2} \times (\text{product of diagonal}) \times \text{sine of angle between them}$
 $= \frac{1}{2} \times AC \times DB \times \sin\theta$



- Figure formed by joining the midpoint of a quadrilateral is a parallelogram.
- किसी चतुर्भुज के मध्य बिन्दु को मिलाने से बनने वाली आकृति एक समांतर चतुर्भुज होती है।
- If the diagonals intersect at right angles then sum of square of opposite sides are equal.
- यदि विकर्ण समकोण पर प्रतिच्छेद करते हैं तो विपरीत भुजाओं के वर्गों का योग बराबर होता है।
- $AB^2 + CD^2 = AD^2 + BC^2$



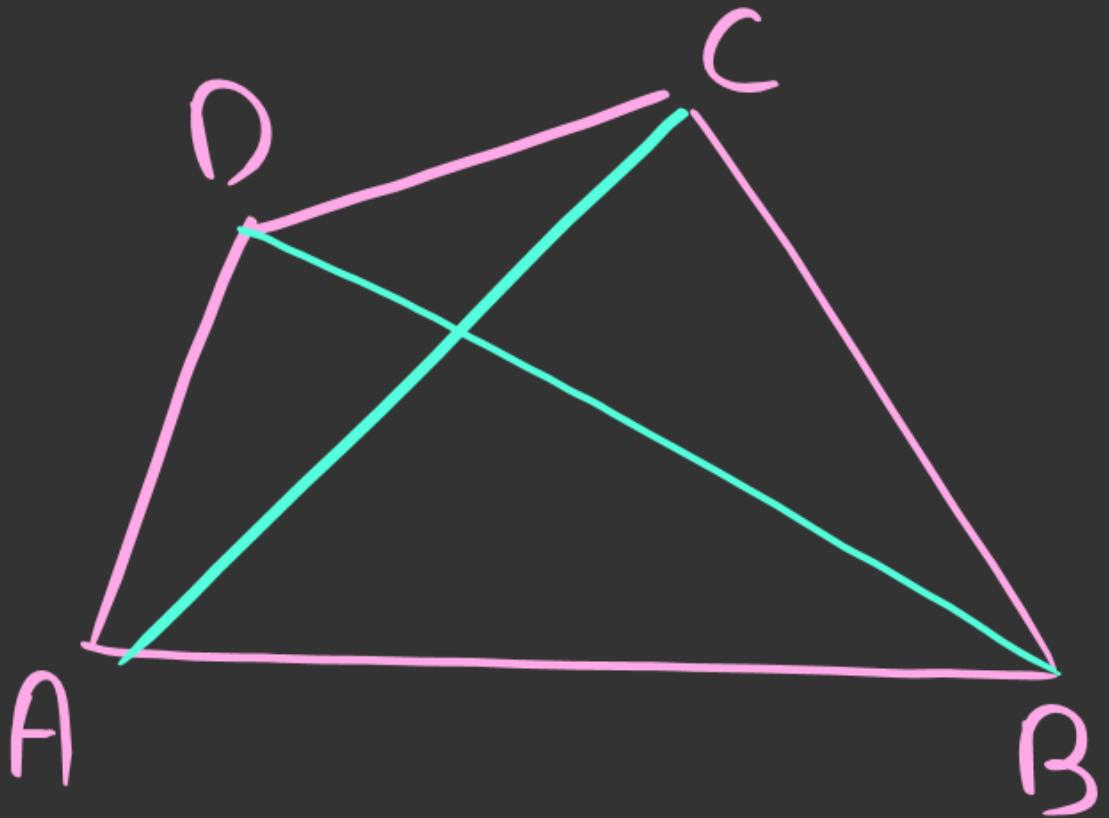
- Sum of opposite side of a circumscribed quadrilateral are equal / एक परिबद्ध चतुर्भुज की विपरीत भुजा का योग बराबर होता है
- $(a + c) = (b + d)$



Quadrilateral . (ਪਤੁਸੂਜ)

region covered by four lines.

$$\angle A + \angle B + \angle C + \angle D = 360^\circ$$



Sides - AB, BC, CD, DA

AC, BD - diagonal

If three angles of a quadrilateral are 120° , 70° and 60° respectively, then write the fourth angle-

किसी चतुर्भुज के तीन कोण क्रमशः 120° , 70° और 60° के हों तो चौथा कोण लिखिए—

- (a) 115°
- (b) 110°
- (c) 120°
- (d) 125°

$$= 360 - 120 - 70 - 60$$

$$= \underline{\underline{110}}$$

The angles of a quadrilateral are in the ratio 1:2:3:4. What is the difference between the largest and the smallest angle?

एक चतुर्भुज के कोणों का अनुपात 1: 2:3:4 है। सबसे बड़े और सबसे छोटे कोण का अंतर कितना है?

$$180^\circ = \pi$$

$$360^\circ = 2\pi$$

- a) $\frac{\pi}{5}$
- b) $\frac{5\pi}{3}$
- c) $\frac{3\pi}{5}$
- d) None



$$\begin{aligned}10 &\rightarrow 2\pi \\1 &\rightarrow \frac{\pi}{5}\end{aligned} \quad \begin{aligned}3 &\rightarrow 3\pi \\S &\end{aligned}$$

In quadrilateral ABCD, AO and BO bisect angles A and B. The value of $\angle AOB$ will be

चतुर्भुज ABCD में AO और BO कोण A और B को समद्विभाजित करती है। $\angle AOB$ का मान होगा

- a) $\frac{\angle C + \angle D}{2}$
- b) $(\angle C + \angle D)$
- c) $\frac{\angle B + \angle D}{2}$
- d) $\frac{\angle A + \angle D}{2}$

$$= \frac{(\angle C + \angle D)}{2}$$

In quadrilateral ABCD, the bisectors of $\angle A$ and $\angle B$ meet at O and $\angle AOB = 64^\circ$.
Find $\angle C + \angle D$?

चतुर्भुज ABCD में, $\angle A$ और $\angle B$ के द्विभाजक O पर मिलते हैं और $\angle AOB = 64^\circ$, Find $\angle C + \angle D$ ज्ञात कीजिये?

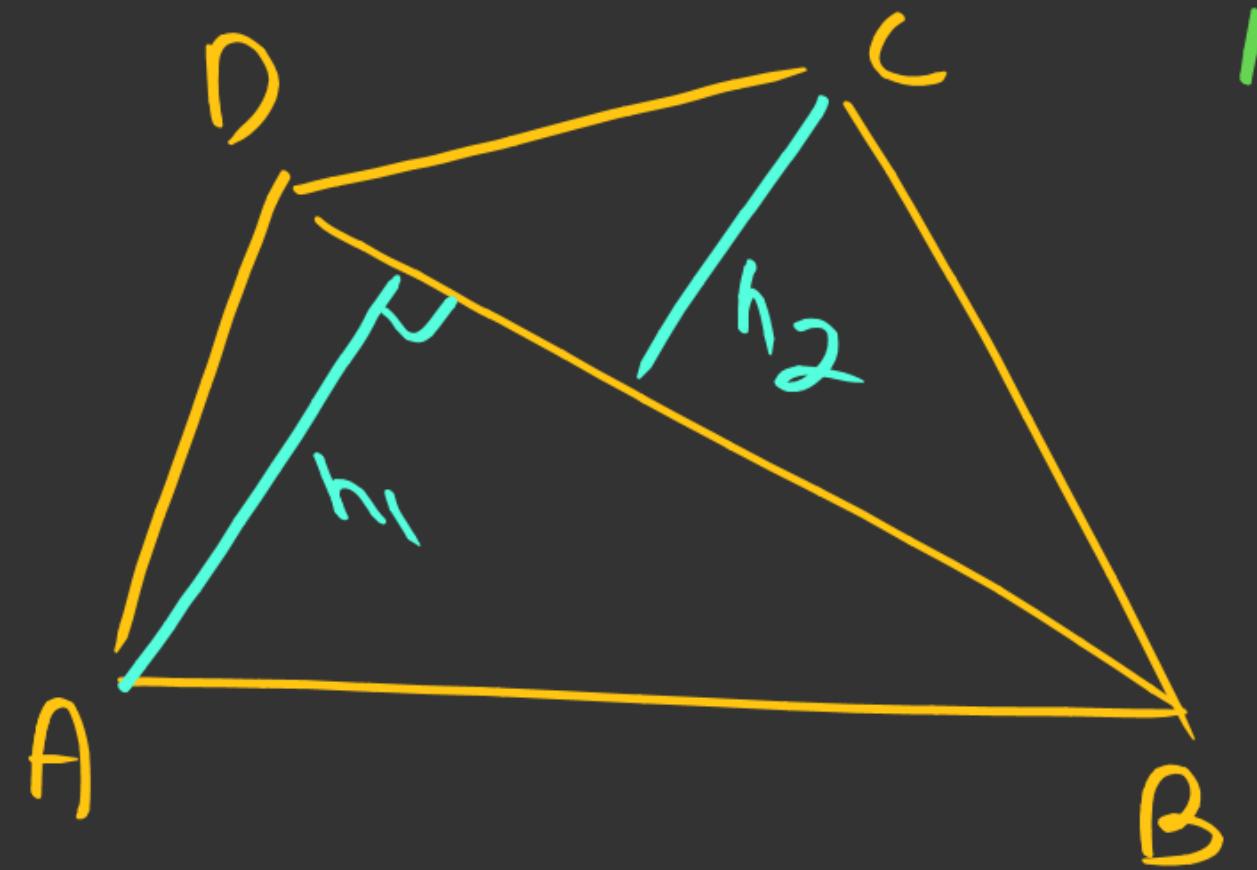
- (a) 128°
(b) 148°
(c) 116°
(d) 136°

$$\begin{array}{r} \\ \times 2 \\ \hline \end{array}$$

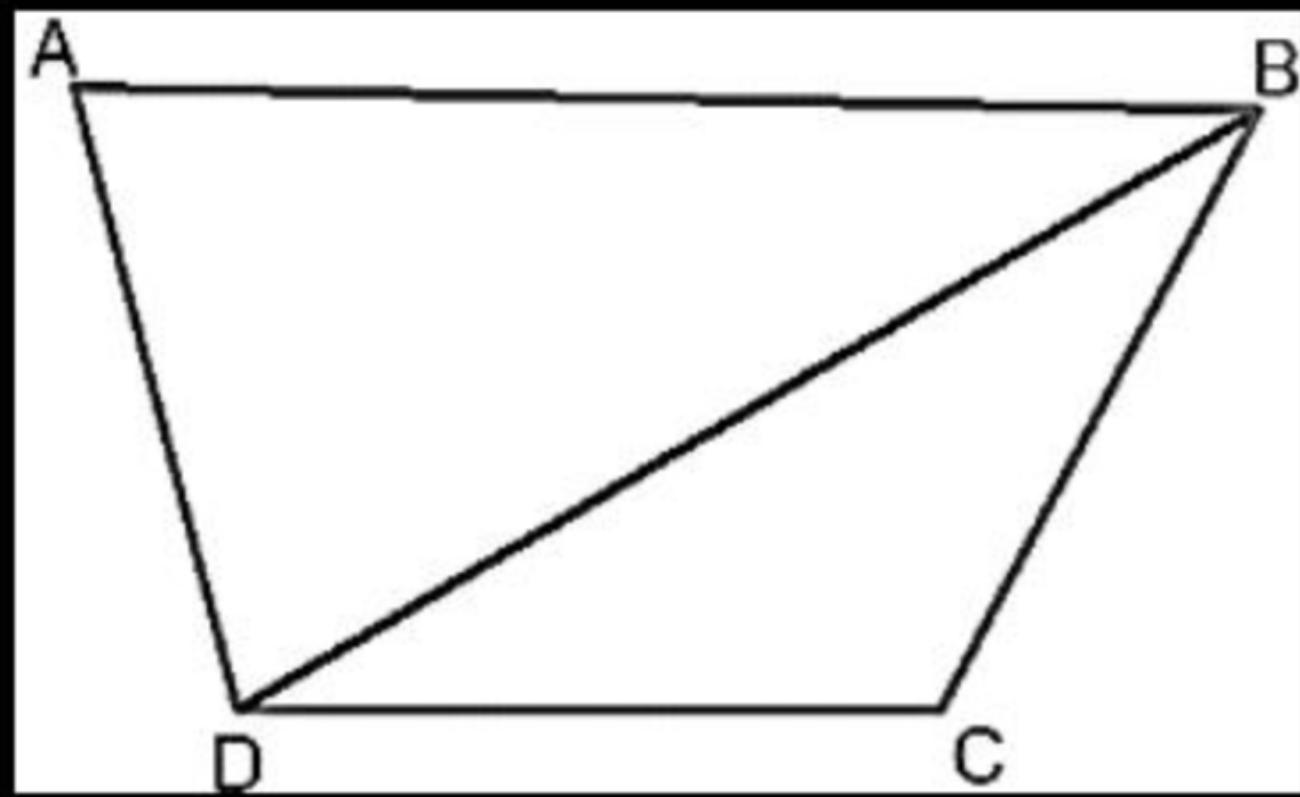
MPIM 2018

$$= 2 \times 64$$

$$\begin{array}{r} \\ \times 2 \\ \hline \end{array}$$



$$\begin{aligned} \text{Quadrilateral } ABCD \text{ का क्षेत्रफल} &= \Delta ABD + \Delta BCD \\ &= \frac{1}{2} BD \cdot h_1 + \frac{1}{2} BD \cdot h_2 \\ &= \frac{1}{2} BD (h_1 + h_2) \end{aligned}$$



In quadrilateral ABCD,
AB + BC + CD + DA is-
चतुर्भुज ABCD में, AB + BC + CD +

DA के बराबर होगा?

- (a) Greater than 2BD
- (b) Equal to 2BD
- (c) less than 2BD
- (d) none of these

ΔBCD में,

$$BC + CD > BD$$

ΔABD में,

$$AB + AD > BD$$

$$AB + BC + CD + AD > 2BD$$

$$\frac{\angle A + \angle C}{\angle B + \angle D} = \frac{2}{1} \rightarrow 240^\circ$$

$$3 \rightarrow 360$$

$$1 - 120$$

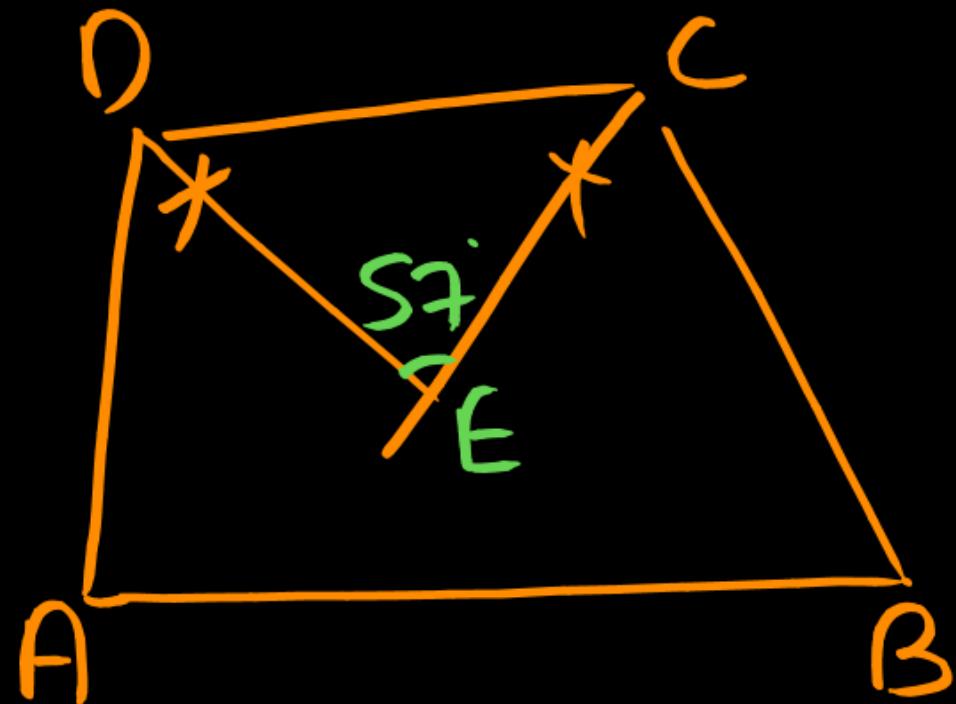
$$\angle C = 240^\circ - 120^\circ$$

$$= \underline{\underline{120}}$$

If in a Quadrilateral ABCD, $\angle A + \angle C = 2(\angle B + \angle D)$ and $\angle A = 50^\circ$, then what is the value of $\angle C$?

यदि एक चतुर्भुज ABCD में, $\angle A + \angle C = 2(\angle B + \angle D)$ और $\angle A = 50^\circ$ है, तो $\angle C$ का मान क्या है?

- (a) 120°
- (b) 180°
- (c) 140°
- (d) 190°



$$\angle A + \angle B = Q \times S7 \\ = 114^\circ$$

$$47^\circ \\ \angle B = 114 - 47^\circ \\ = 67^\circ$$

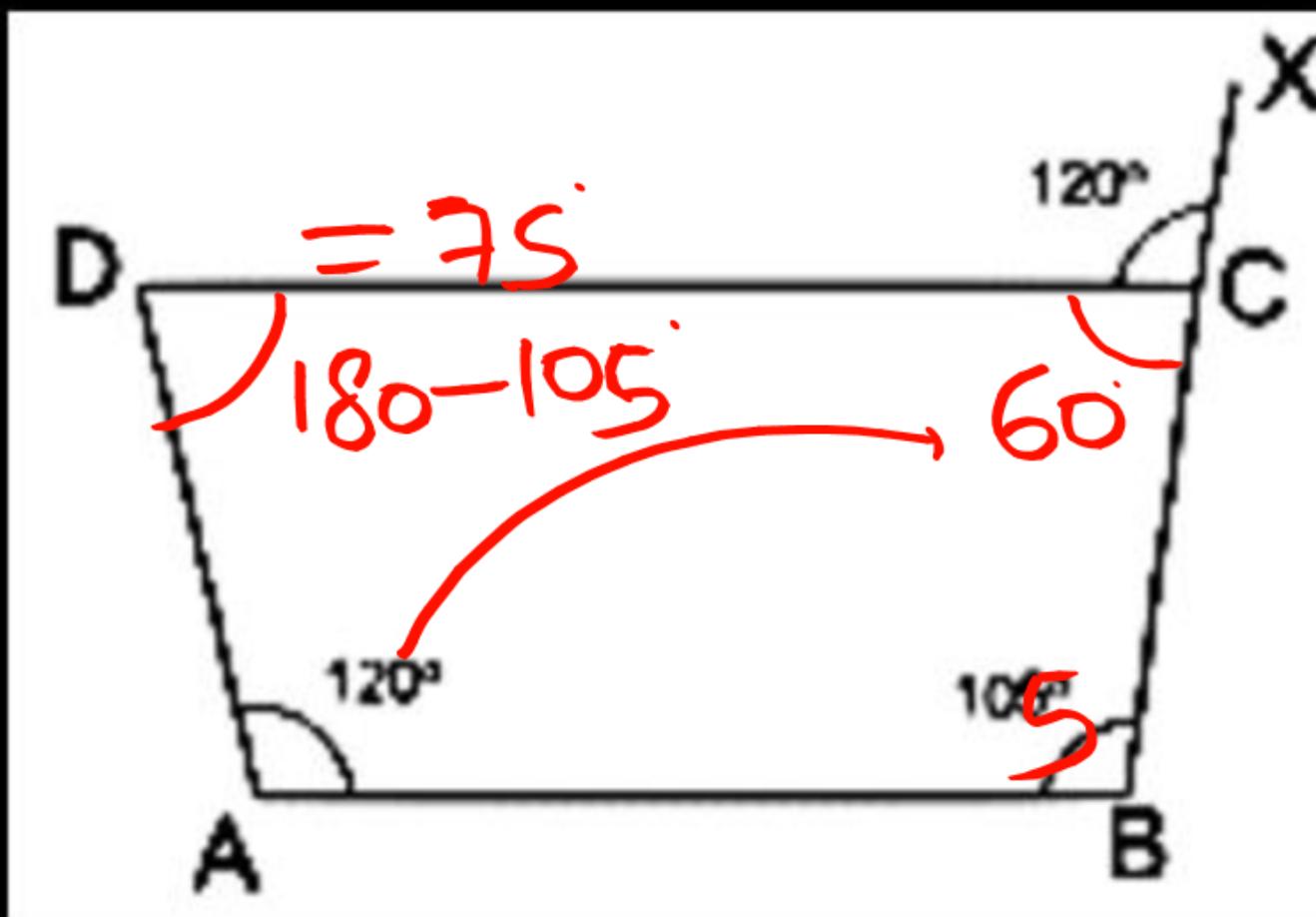
In a quadrilateral ABCD, the bisectors of $\angle C$ and $\angle D$ meet at point E. If $\angle CED = 57^\circ$ and $\angle A = 47^\circ$, then the measure of $\angle B$ is:

एक चतुर्भुज ABCD में, $\angle C$ और $\angle D$ के समद्विभाजक बिंदु E पर मिलते हैं। यदि $\angle CED = 57^\circ$ और

$\angle A = 47^\circ$, तो $\angle B$ का माप है:

- (a) 47°
- (b) 77°
- (c) 67°
- (d) 57°

SSC CGL 12.04.2022 (2nd Shift)



In the quadrilateral ABCD shown above, $\angle DAB = \angle DCX = 120^\circ$. If $\angle ABC = 105^\circ$, what is $\angle ADC$ equal to ?

ऊपर दिखाए गए चतुर्भुज ABCD में,
 $\angle DAB = \angle DCX = 120^\circ$ । यदि $\angle ABC = 105^\circ$ है, तो $\angle ADC$ किसके बराबर है?

- (a) 45°
- (b) 60°
- (c) 75°
- (d) 95°

ABCD is a quadrilateral. The length of diagonal AC is 24 cm. the sum of perpendicular drawn from vertex B and D on the diagonal AC is 10 cm. What is the area of the quadrilateral?

ABCD एक चतुर्भुज है। विकर्ण AC की लम्बाई 24 सेमी है। विकर्ण AC पर शीर्ष B तथा D से बनाए गए लंब का योग 10 सेमी है। चतुर्भुज का क्षेत्रफल क्या है ?

- (a) 120 cm^2
- (b) 240 cm^2
- (c) 90 cm^2
- (d) 180 cm^2

$\frac{1}{2}$ diagonal (Sum of लम्ब)

SSC CGL Mains 2021 (08/08/2022)

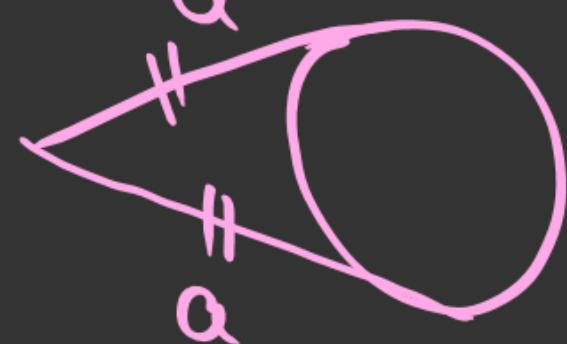
$$\frac{1}{2} \times 24 (10) = 120$$

II.Y.Imp. \rightarrow When a circle touch all the sides of a Quadrilateral ABCD, then

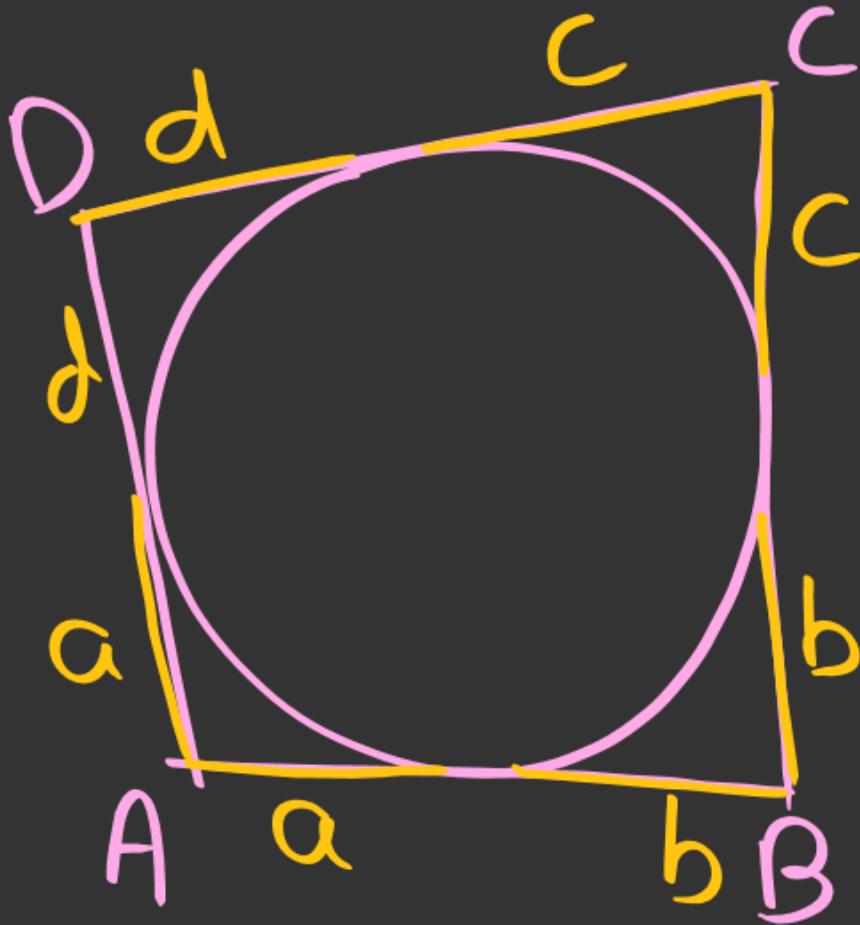
(i)* Sum of opposite sides will be equal.

$$AB + CD = BC + AD$$

Proof

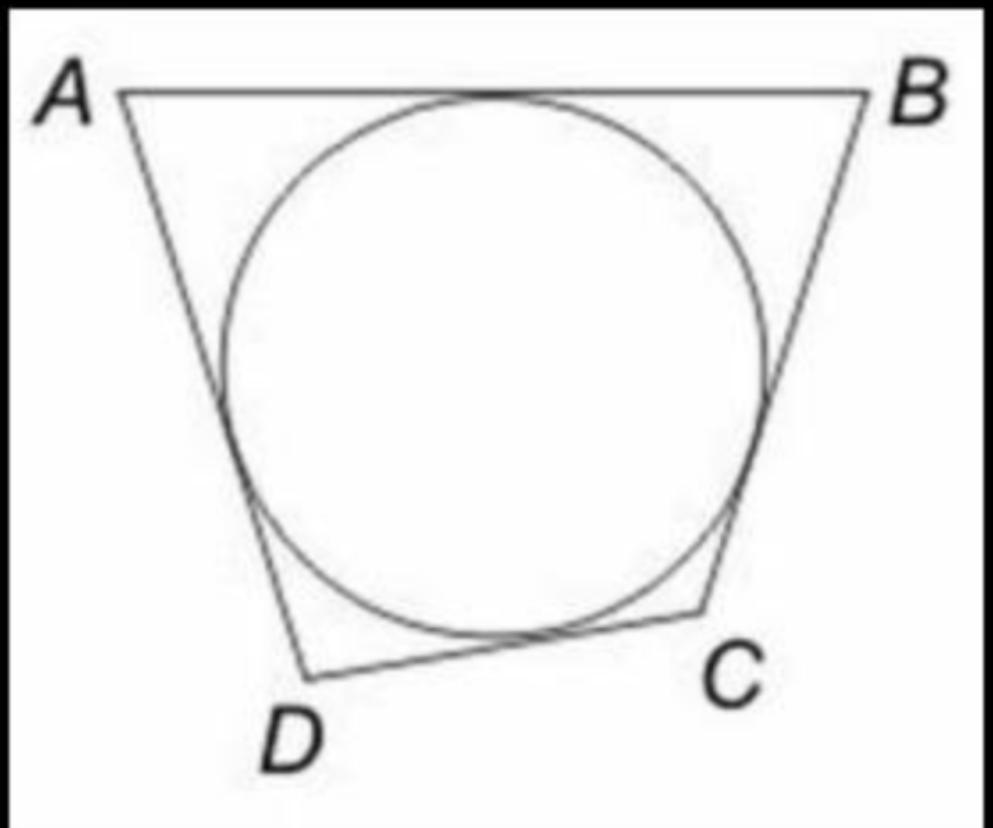


equat.



$$AB + CD = a + b + c + d$$

$$BC + AD = b + c + a + d$$



In the given figure, a circle touches quadrilateral ABCD. If $AB = 2x + 3$, $BC = 3x - 1$, $CD = x + 6$ and $DA = x + 4$, then what is the value of x ?

दी गई आकृति में एक व्रत चतुर्भुज ABCD को स्पर्श कर रहा है। यदि $AB = 2x + 3$, $BC = 3x - 1$, $CD = x + 6$ तथा $DA = x + 4$ हो, तो x का मान क्या है?

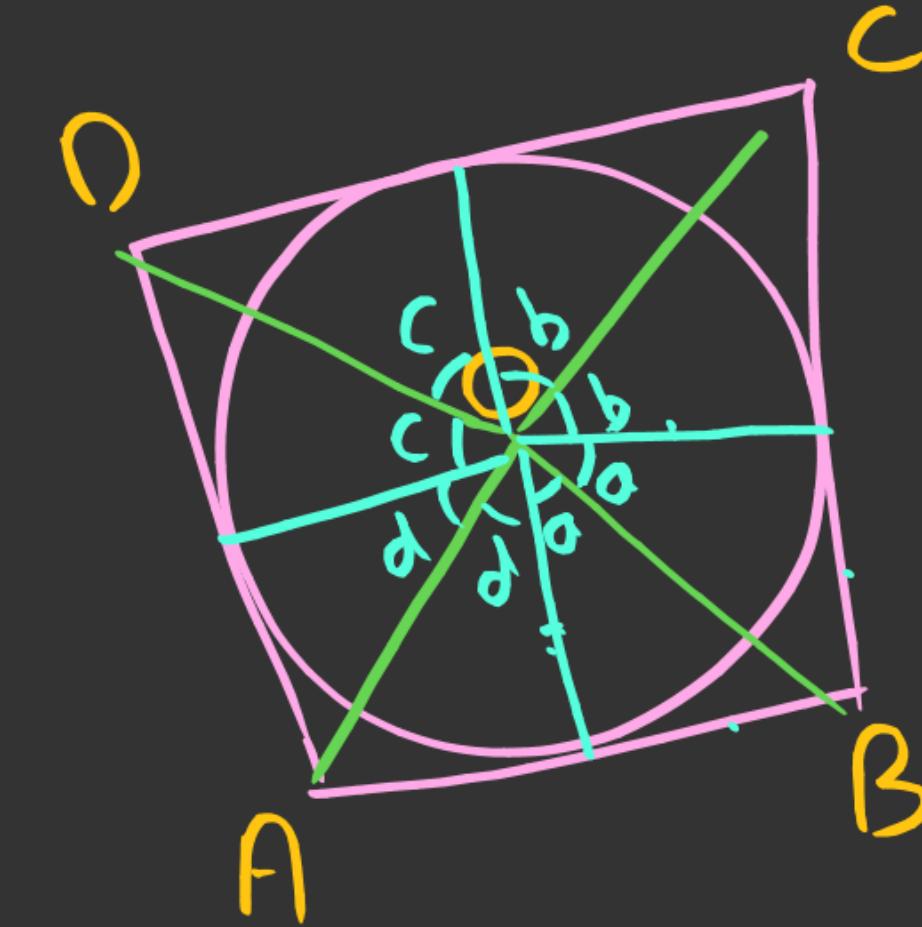
- (a) 7
- (b) 5
- (c) 6
- (d) 8

$$AB + CD = BC + AD$$

$$2x + 3 + x + 6 = 3x - 1 + x + 4$$
$$6 = x$$

point-2

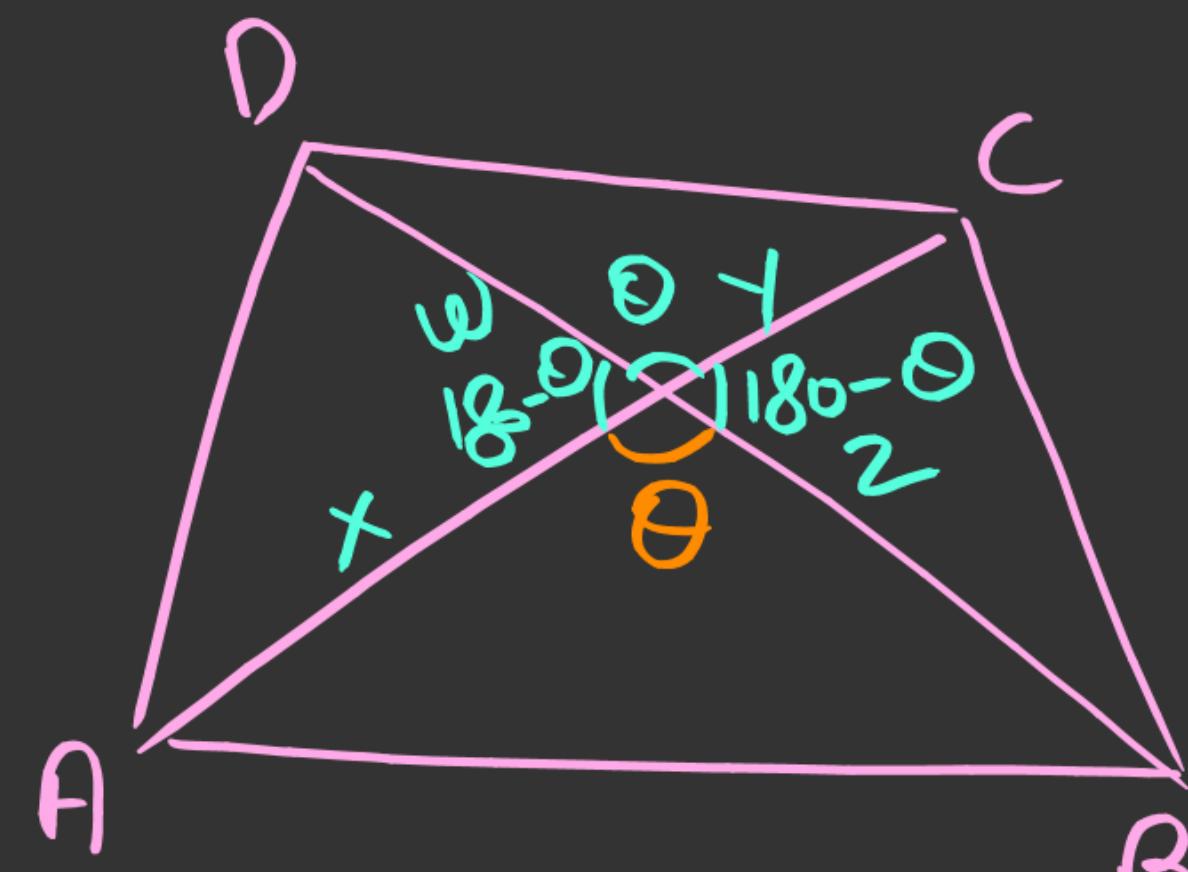
$$\begin{aligned} & \angle AOB + \angle COD \\ &= \angle BOC + \angle AOD = 180^\circ \end{aligned}$$



O - centre of circle
not intersection point of diagonal.

$$2a + 2b + 2c + 2d = 360^\circ$$

$$2(a+b+c+d) = 360^\circ \Rightarrow a+b+c+d = 180^\circ$$



$$\text{Area} = \frac{1}{2} (AC)(BD) \cdot \sin\theta$$

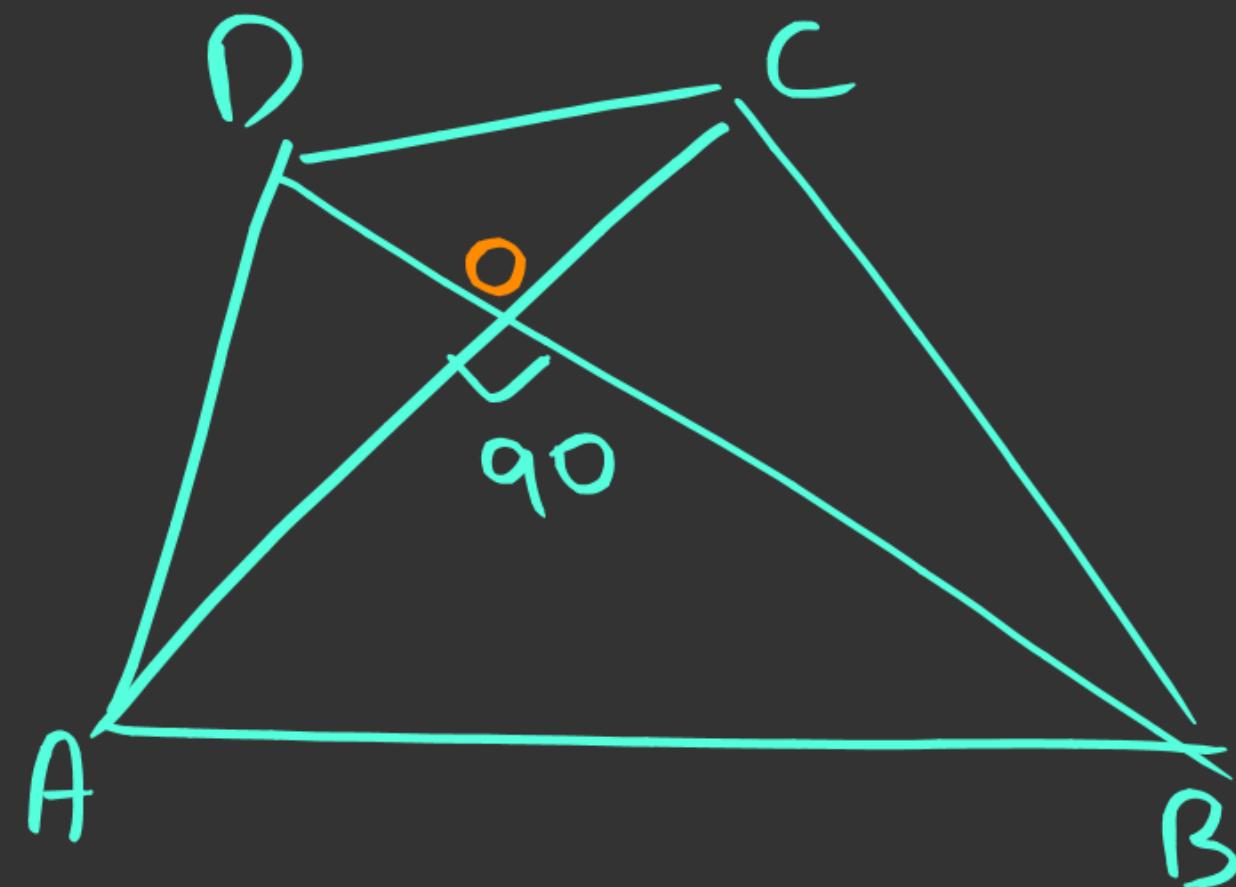
$$= \frac{1}{2} d_1 d_2 \sin\theta$$

$$\sin(180 - \theta) = \sin\theta$$

$$\frac{1}{2} \widehat{xz} \sin\theta + \frac{1}{2} \widehat{zy} \sin\theta + \frac{1}{2} \omega y \sin\theta + \frac{1}{2} \omega x \sin\theta$$

$$\frac{1}{2} \sin\theta (z(x+y) + \omega(x+y)) = \frac{1}{2} \sin\theta (x+y)(z+\omega)$$

If diagonals are perpendicular to each other.



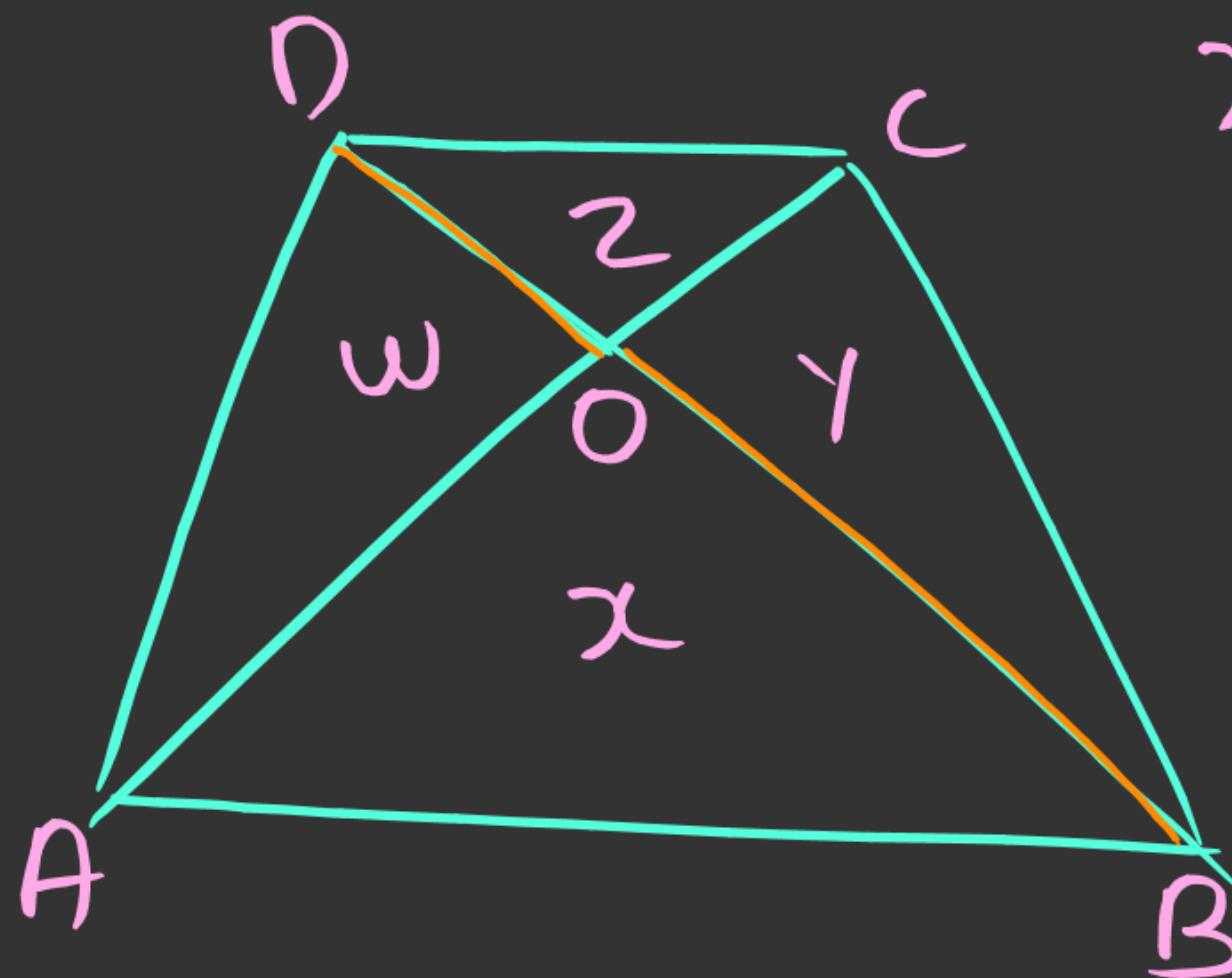
$$\text{area} = \frac{1}{2} AC \cdot BD \sin 90^\circ = \frac{1}{2} d_1 d_2$$

$$(b) \cdot \vec{AB}^2 + \vec{CD}^2 = \vec{BC}^2 + \vec{AD}^2$$

proof

$$\begin{aligned} \vec{OA}^2 + \vec{OB}^2 &= \vec{AB}^2 \\ \vec{OC}^2 + \vec{OD}^2 &= \vec{CD}^2 \end{aligned}$$

$$\begin{aligned} \vec{OA}^2 + \vec{OB}^2 &= \vec{BC}^2 \\ \vec{OD}^2 + \vec{OA}^2 &= \vec{AD}^2 \end{aligned}$$

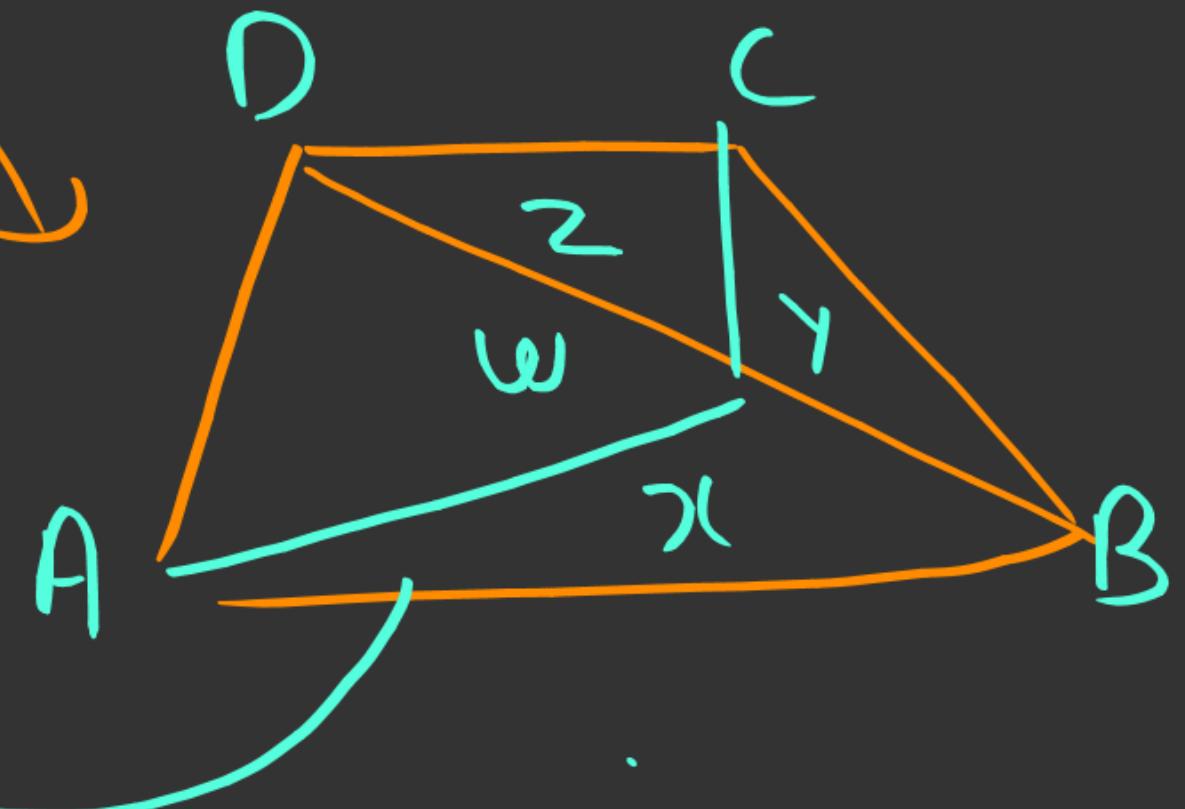


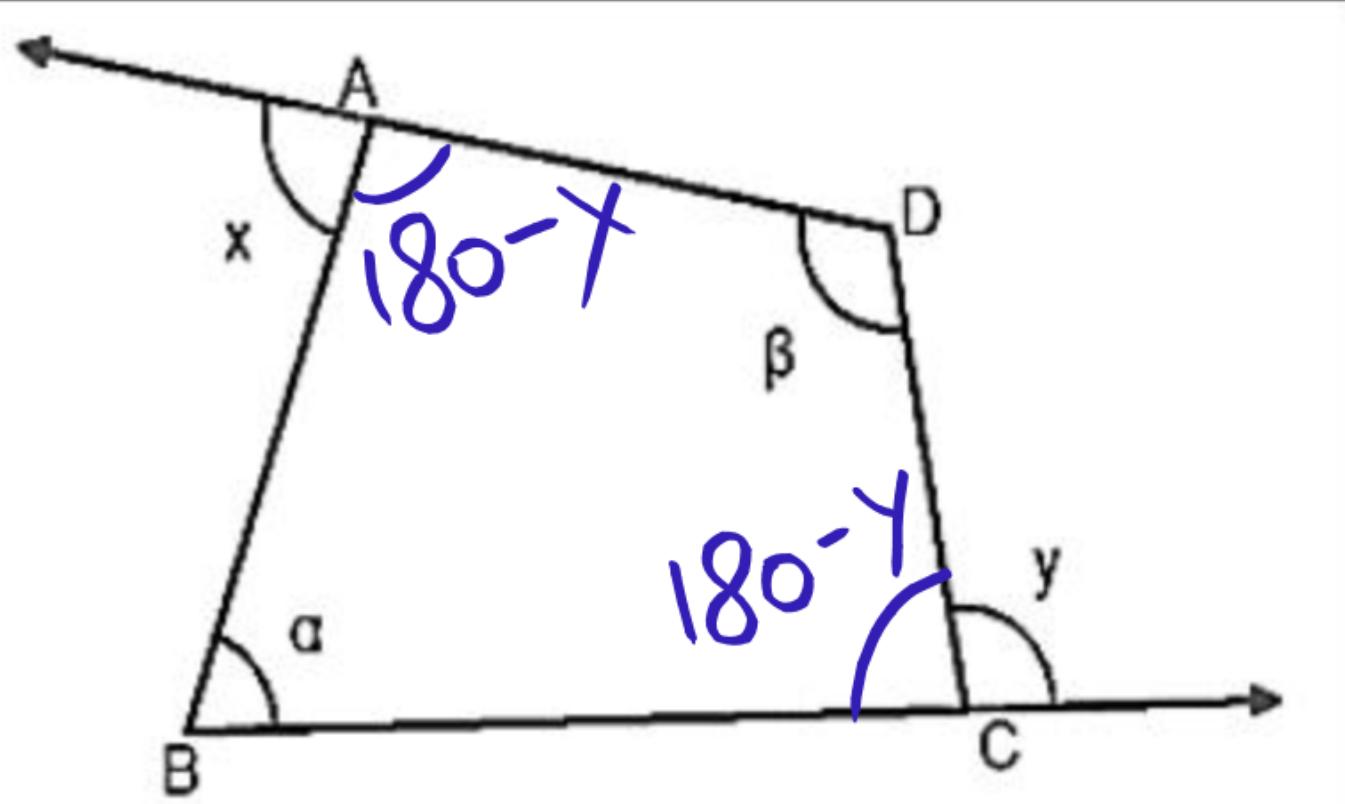
$$\frac{OB}{OD} = \frac{x}{w} \times \frac{y}{z}$$

$$z \times c = y \times w$$

x, y, z, w are area of $\triangle OAB, \triangle OBC$,
 $\triangle OCD, \triangle OAD$.

$$OAB \cdot OCD = OBC \cdot OAD$$





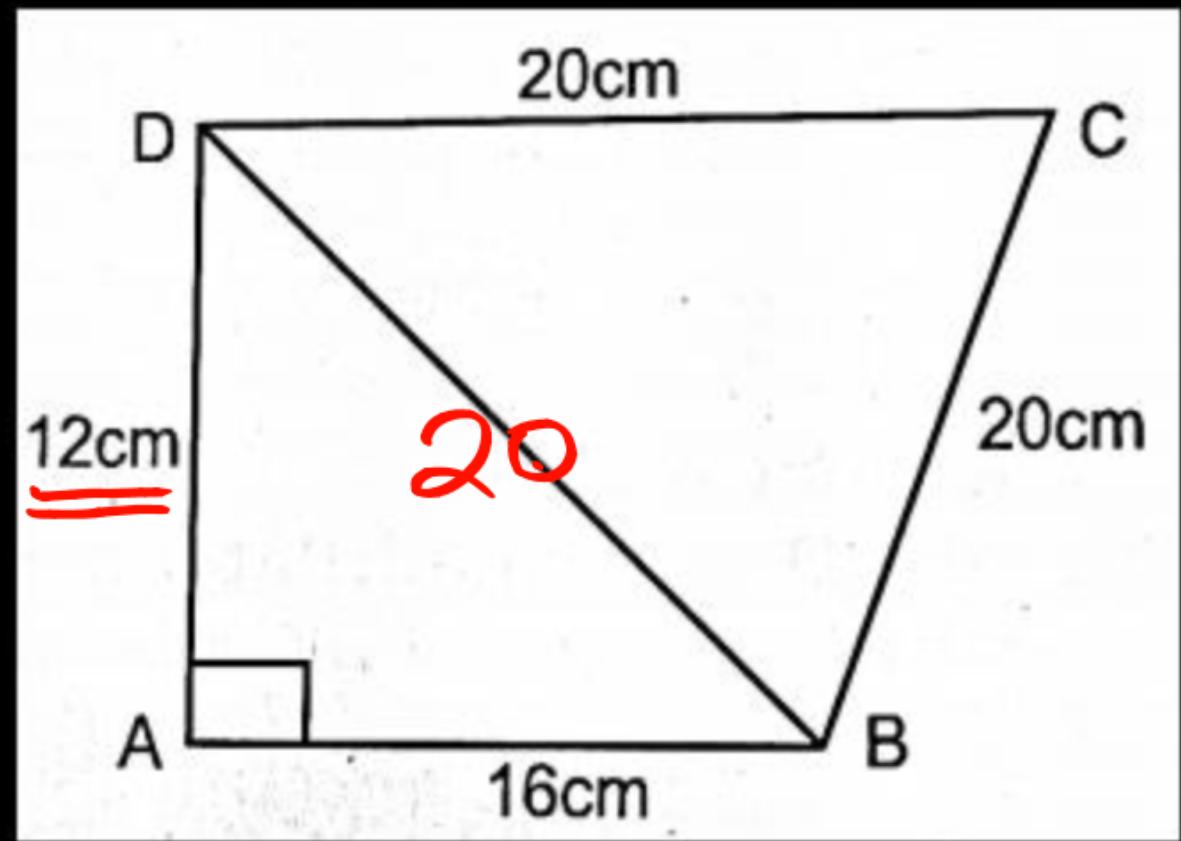
$$\alpha + \beta + (\cancel{180 - x}) + (\cancel{180 - y}) = 360$$

$$\underline{\alpha + \beta = x + y}$$

In the given figure, sides BC and DA of quadrilateral ABCD are extended then which statement is correct?

दिए गए चित्र में, चतुर्भुज ABCD के भुजा BC और DA को बढ़ाया गया है, तो कौन सा कथन सही है?

- (a) $x + y = \alpha + \beta$
- (b) $2(x + y) = \alpha + \beta$
- (c) $x + \alpha = y + \beta$
- (d) $x + y = 2(\alpha + \beta)$



Find the area of quadrilateral ABCD ?

चतुर्भुज ABCD का क्षेत्रफल ज्ञात कीजिए?

- (a) $4(24 + 25\sqrt{3}) \text{ cm}^2$
- (b) $4(25 + 24\sqrt{3}) \text{ cm}^2$
- (c) $2(24 + 25\sqrt{3}) \text{ cm}^2$
- (d) None of these

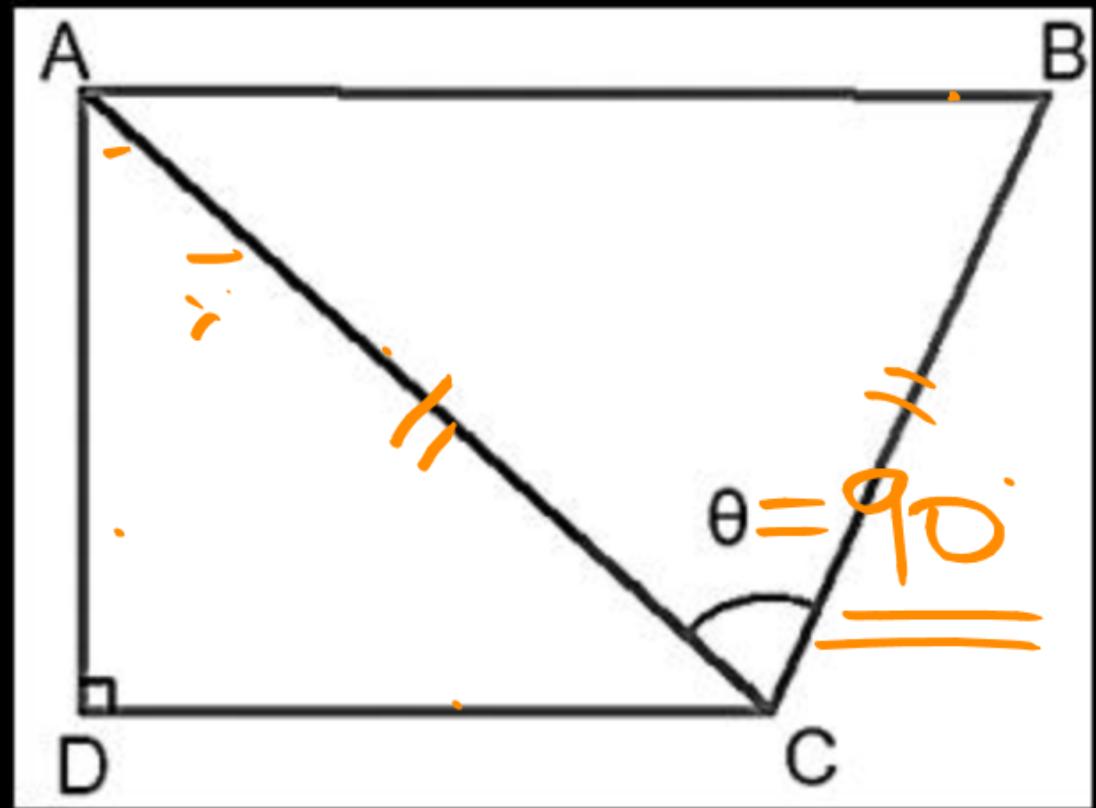
$12:16:20$

$3:4:5$

$A\beta\gamma$

$$= \Delta ABD + \Delta BCD$$

$$= \frac{1}{2} \times 12 \times 16 + \frac{\sqrt{3}}{4} \times (20)^2 = 96 + 100\sqrt{3}$$



In Quadrilateral ABCD, $\angle D = 90^\circ$
and $AB^2 = AD^2 + CD^2 + BC^2$ then find
 $\angle ACB$?

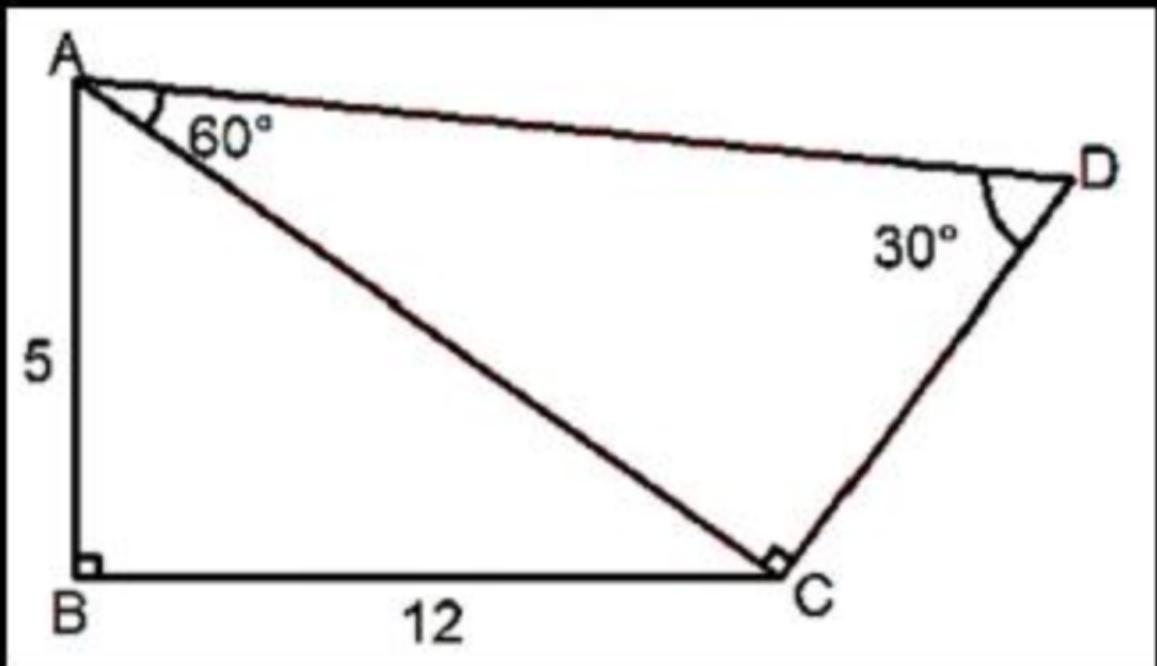
चतुर्भुज ABCD में, $\angle D = 90^\circ$ और $AB^2 = AD^2 + CD^2 + BC^2$ तो $\angle ACB$ ज्ञात कीजिए।

- (a) 60°
- (b) 80°
- (c) 75°
- (d) 90°

$$AB^2 = \underbrace{AD^2 + CD^2}_{\text{in right-angled triangle } ADC} + BC^2$$

$$AB^2 = AC^2 + BC^2$$

∴



In the given figure, side $AB = 5\text{cm}$, $BC = 13\text{cm}$, $\angle CAD = 60^\circ$ and $\angle ADC = 30^\circ$ then find the area of quadrilateral ABCD?

दी गई आकृति में, भुजा $AB = 5$ सेमी, $BC = 13$ सेमी, $\angle CAD = 60^\circ$ और $\angle ADC = 30^\circ$ है, तो चतुर्भुज ABCD का क्षेत्रफल जाते हीजिए।

R.W.

- (a) $30 + \frac{5}{2\sqrt{3}} \text{ cm}^2$
- (c) $30 + \frac{169\sqrt{3}}{2} \text{ cm}^2$
- (b) $30 + \frac{25\sqrt{3}}{2} \text{ cm}^2$
- (d) $30 + 169 \text{ cm}^2$

A circle touches all four sides of a quadrilateral PQRS. If $PQ = 11$ cm, $QR = 12$ cm and $PS = 8$ cm, then what is the length of RS?

कोई वृत्त, चतुर्भुज PQRS की सभी चार भुजाओं को स्पर्श करता है। यदि $PQ = 11$ cm, $QR = 12$ cm और $PS = 8$ cm है, तो RS की लंबाई ज्ञात करें।

R.W.

- (a) 7 cm
- (b) 7.3 cm
- (c) 15 cm
- (d) 9 cm

SSC CHSL 13/04/2021 (Shift- 3)

6:30 CI

8-9:30- algebra.

ABCD is a Quadrilateral where BD = 64cm, AL \perp BD and CM \perp BD, AL = 13.2cm and CM = 16.8cm then area of quad. ABCD will be?

ABCD एक चतुर्भुज है जहां BD = 64 सेमी, AL \perp BD और CM \perp BD, AL = 13.2 सेमी और CM = 16.8 सेमी फिर चतुर्भुज का क्षेत्रफल। ABCD होगी?

- (a) 422.4 sq. cm
- (b) 537.6 sq.cm
- (c) 690.0 sq. cm
- (d) 960.0 sq. cm

$$= \frac{1}{2} \times 64 (30)$$

$$= 32 \times 30$$

$$= \underline{960}$$

(G1 main 2022 (latest pattern)) - 2.03.2023

⑤ A circle touch all four sides of a quadrilateral

ABCD. If $AB = 18$, $BC = 21$, $AD = 15$. Find $CD = ?$

$$AB + CD = BC + AD$$

$$18 + CD = 21 + 15$$

$$\underline{CD = 18}$$