



SSC FOUNDATION



सम्यान 1.0 बैच

MATHS

MENSURATION-2D

TRIANGLE

CONCEPT FORMULAS & TRICKS



«» LIVE 11:00 AM-BY SHASHI SIR

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Triangle (त्रिभुज)

Side

- ~~(I)~~ (Scalane) विषमबाहु Δ
- ~~(II)~~ (Sisosceles) समद्विबाहु Δ
- ~~(III)~~ (Equilateral) समबाहु Δ

Angle

- ~~(I)~~ Acute Angled Triangle (न्यूनकोण Δ)
- ~~(II)~~ Right Angled Triangle (समकोण Δ)
- ~~(III)~~ Obtuse Angled Triangle (अधिककोण Δ)

Right Angle Triangle/समकोण त्रिभुज
Right Angles Triangle/ समकोण त्रिभुज

$$P^2 + b^2 = h^2 \text{ i.e. } AB^2 + BC^2 = AC^2$$

$$P = \sqrt{h^2 - b^2}, b = \sqrt{h^2 - p^2}, h = \sqrt{p^2 + b^2}$$

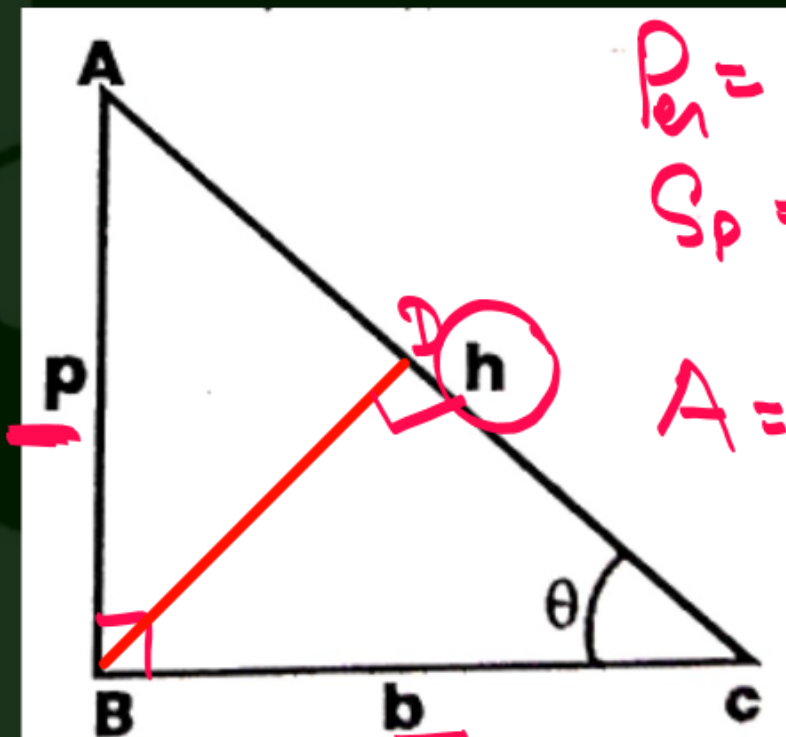
$$P^2 + b^2 = h^2 \text{ i.e. } AB^2 + BC^2 = AC^2$$

Area of triangle/त्रिभुज का क्षेत्रफल = $\frac{1}{2} \times p \times b$

Area of triangle/समकोण त्रिभुज का क्षेत्रफल

$$\frac{\text{Hypoteneous}}{4} \times \sin 2\theta$$

$$h^2 = p^2 + b^2$$



$$P_h = p + b + h$$

$$S_p = \frac{p + b + h}{2}$$

$$A = \frac{1}{2} \times b \times p$$

$$\frac{1}{2} \times h \times BD = \frac{1}{2} \times b \times p$$

$$BD = \frac{b \times p}{h}$$

Inradius/अंतःत्रिज्या

$$R = \frac{abc}{4\Delta}$$

$$= \frac{8 \times 6 \times 4}{2 \times 4 \times \frac{1}{2} \times 8 \times 6}$$

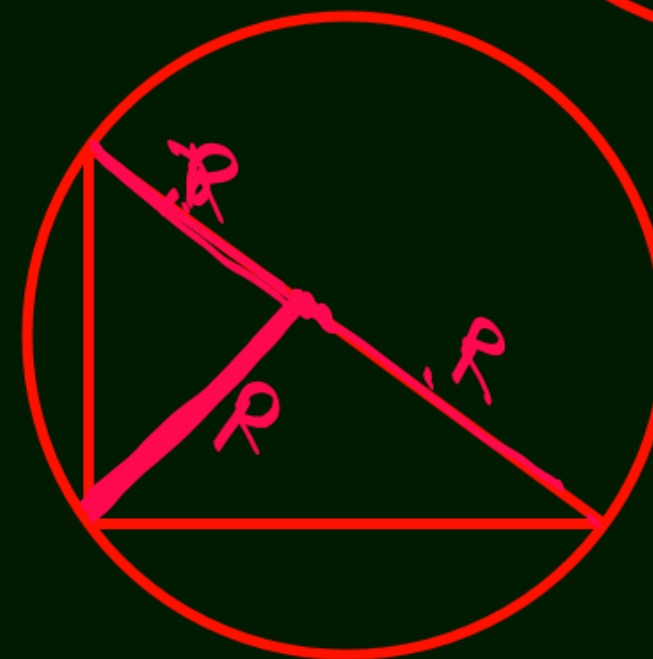
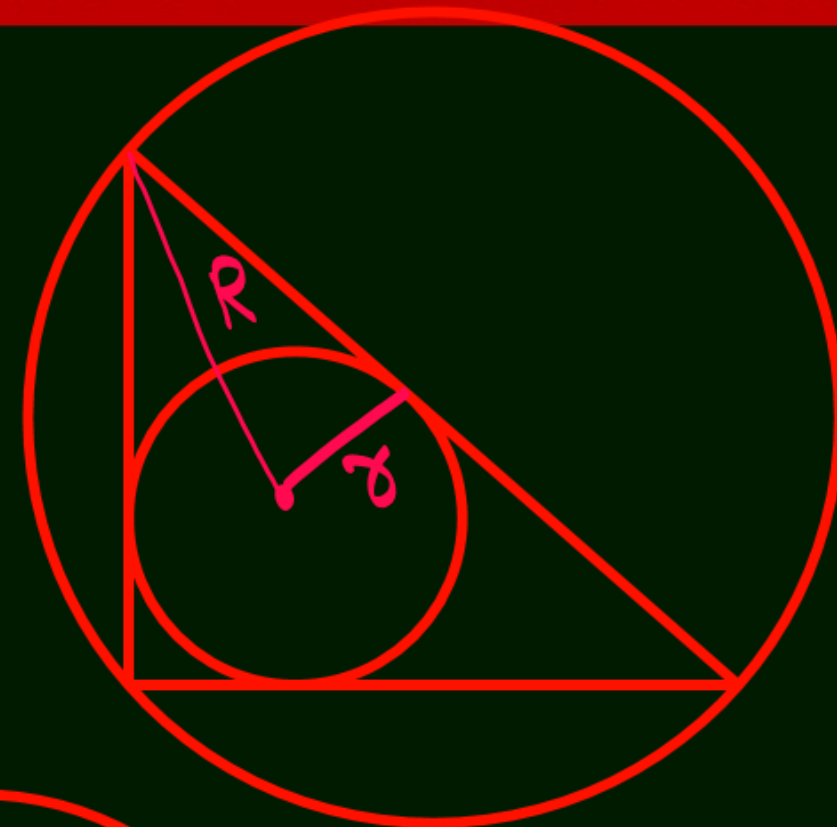
$$= \frac{192}{192} = 1$$

$$r = \frac{p + b - h}{2} \text{ or }'$$

$$\left[\frac{\text{Perpendicular} + \text{Base} - \text{Hypotenuse}}{2} \right]$$

Circumradius/बाह्य त्रिज्या

$$R = \frac{h'}{2} \text{ or } \left[\frac{\text{Hypotenuse}}{2} \right]$$

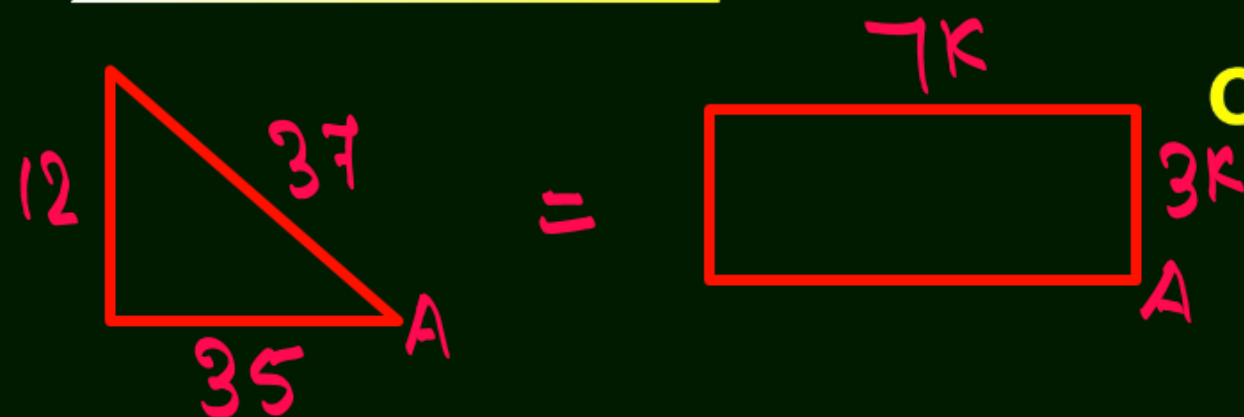


most Important

Some Pythagorean Triplets

(3, 4, 5)	(5, 12, 13)	(7, 24, 25)	(8, 15, 17)
(9, 40, 41)	(11, 60, 61)	(12, 35, 37)	(13, 84, 85)
(16, 63, 65)	(20, 21, 29)	(28, 45, 53)	(33, 56, 65)
(36, 77, 85)	(39, 80, 89)	(48, 55, 73)	(65, 72, 97)
(20, 99, 101)			





$$\frac{1}{2} \times 12 \times 35 = 35 \times 6 = 210 \text{ cm}^2$$

$$21K^2 = 210$$

$$K^2 = 10$$

$$K = \sqrt{10}$$

$$P = 2(7K + 3K) = 20K$$

$$= 20\sqrt{10}$$

Q. The area of a triangular plot having sides 12m, 35 m and 37 m is equal to the area of a rectangular field whose sides are in the ratio 7: 3. The perimeter (in cm) of the field is:

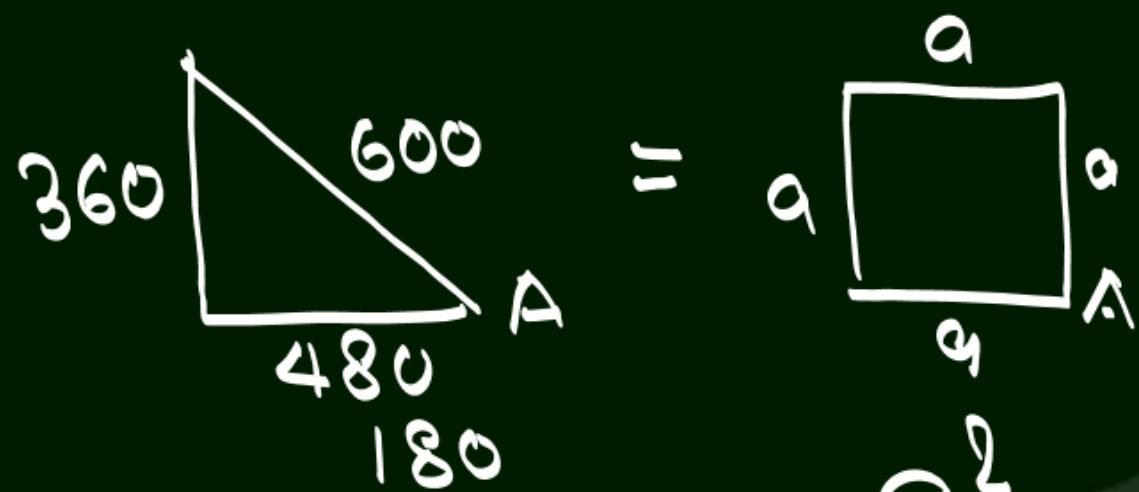
12 मी., 35 मी., और 37 मी. भुजाओं वाले त्रिभुजाकार भूखंड का क्षेत्रफल एक आयताकार मैदान के क्षेत्रफल के बराबर है, जिसकी भुजाओं का अनुपात 7 : 3 है। मैदान का परिमाण (मी. में) ज्ञात करें?

(a) $24\sqrt{10}$

☒ (b) $20\sqrt{10}$

(c) $20\sqrt{5}$

(d) $24\sqrt{5}$



$$\frac{1}{2} \times 360 \times 480 = a^2$$

$$a^2 = \sqrt{9 \times 2 \times 10 \times 16 \times 3 \times 10}$$

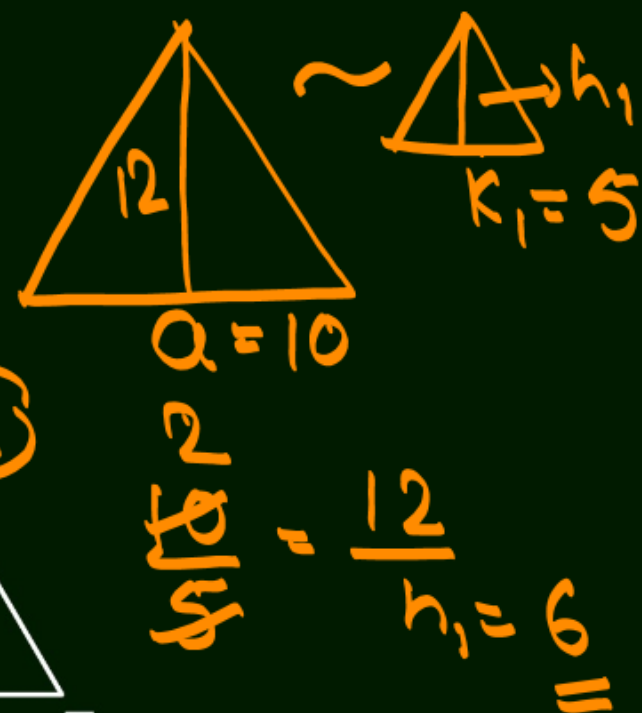
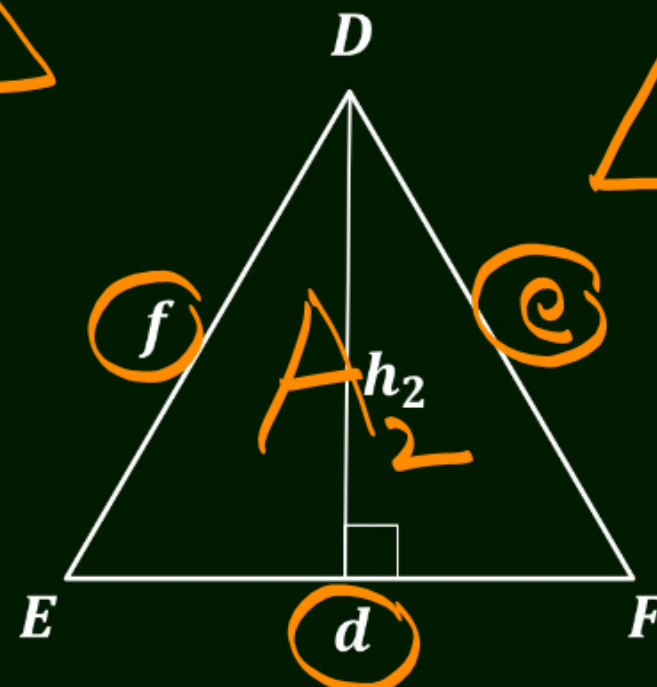
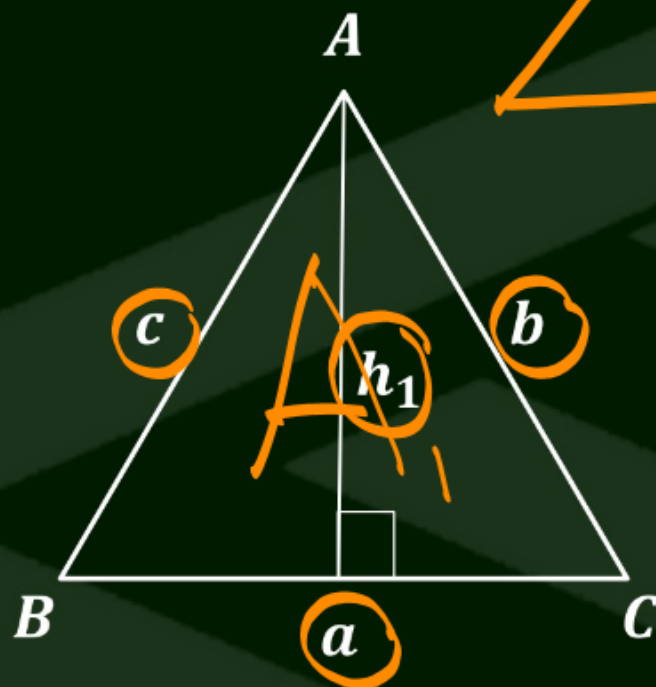
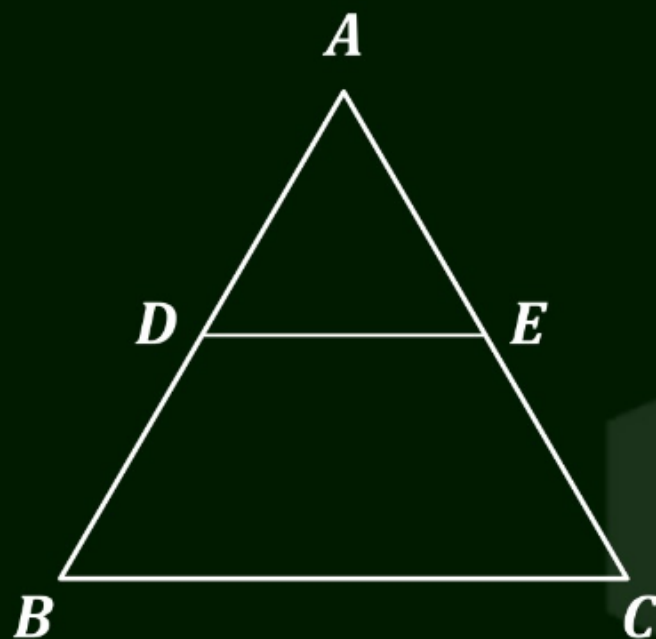
$$a = 3 \times 10 \times 4 \sqrt{6}$$

$$= 120\sqrt{6}$$

Q. The sides of a triangular field are 360 m, 480m and 600 m. its area is equal to the area of square field. What is the side (in m) of the square field ?/एक त्रिभुजाकार मैदान की भुजाएं 360 मी., और 480 मी और 600 मी है। इसका क्षेत्रफल एक वर्गाकार मैदान के क्षेत्रफल के बराबर है। वर्गाकार मैदान की भुजा (मी. में.) क्या है?

- (a) $120\sqrt{6}$
 (b) $160\sqrt{6}$
 (c) $160\sqrt{3}$
 (d) $120\sqrt{3}$

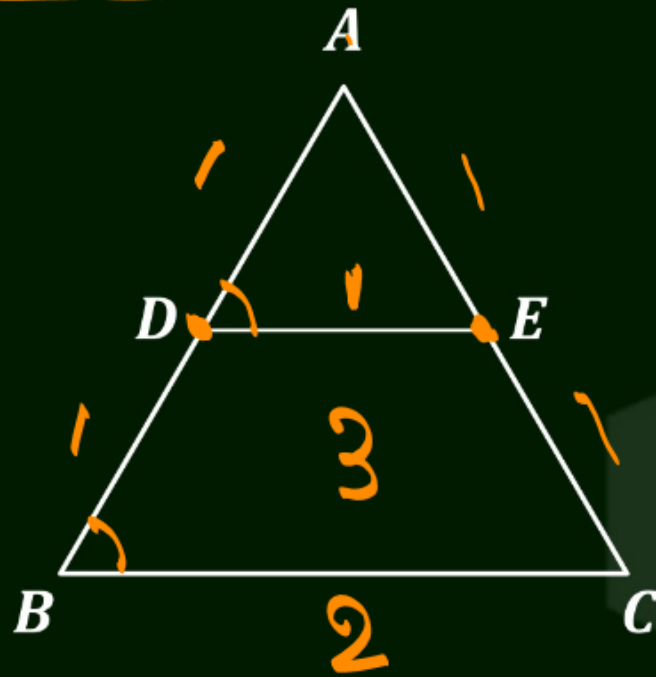
Concept: [समरूपता (Similarity)]



$$\frac{a^2}{d^2} = \frac{b^2}{e^2} = \frac{c^2}{f^2} = \frac{h_1^2}{h_2^2} = \frac{m_1^2}{m_2^2} = \frac{A_{b_1}^2}{A_{b_2}^2} = \frac{p_1^2}{p_2^2}$$

$$\frac{a^2}{d^2} = \frac{A_1}{A_2} \rightarrow \text{Area Area}$$

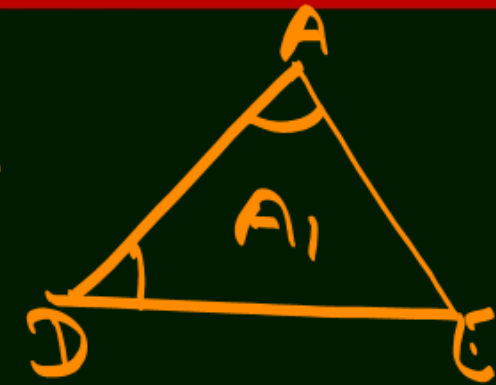
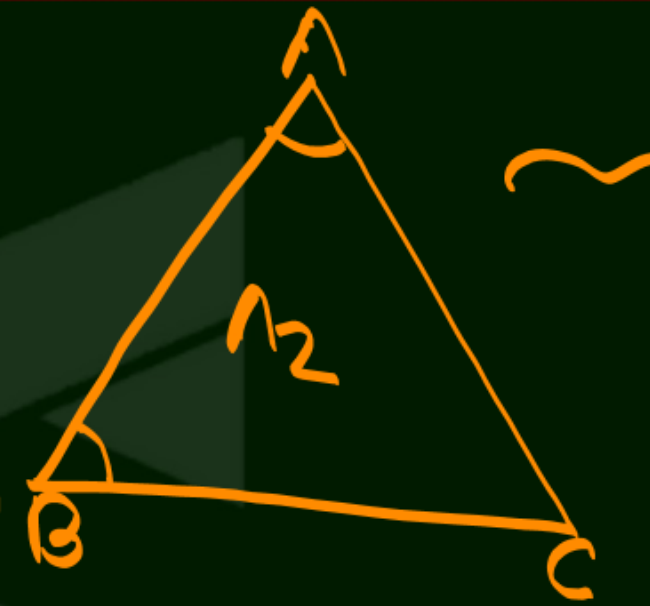
[थेल्स प्रमेय]



$$\left(\frac{1}{2}\right)^2 = \frac{A_1}{A_2} = \frac{1}{4}$$

DE || BC

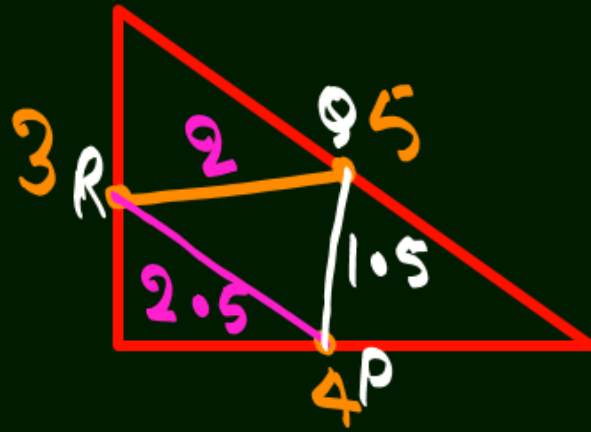
$$\frac{1}{2} = \frac{AD}{AB} = \frac{AE}{AC} = \frac{DE}{BC}$$



If D is a mid point of AB, and E is mid point of AC then,
 $BC \times \frac{1}{2} = DE$

Area of $\triangle ADE : \triangle ABC : \triangle DECB$

$$1 : 4 : 3$$



$$\begin{aligned} \text{PQR Area} &= \frac{1}{2} \times 3 \times 1.5 \\ &= 1.5 \text{ cm}^2 \end{aligned}$$

Q. The sides of a triangle are 3cm, 4 cm and 5 cm. The area (in cm²) of the triangle formed by joining the mid points of this triangle is:

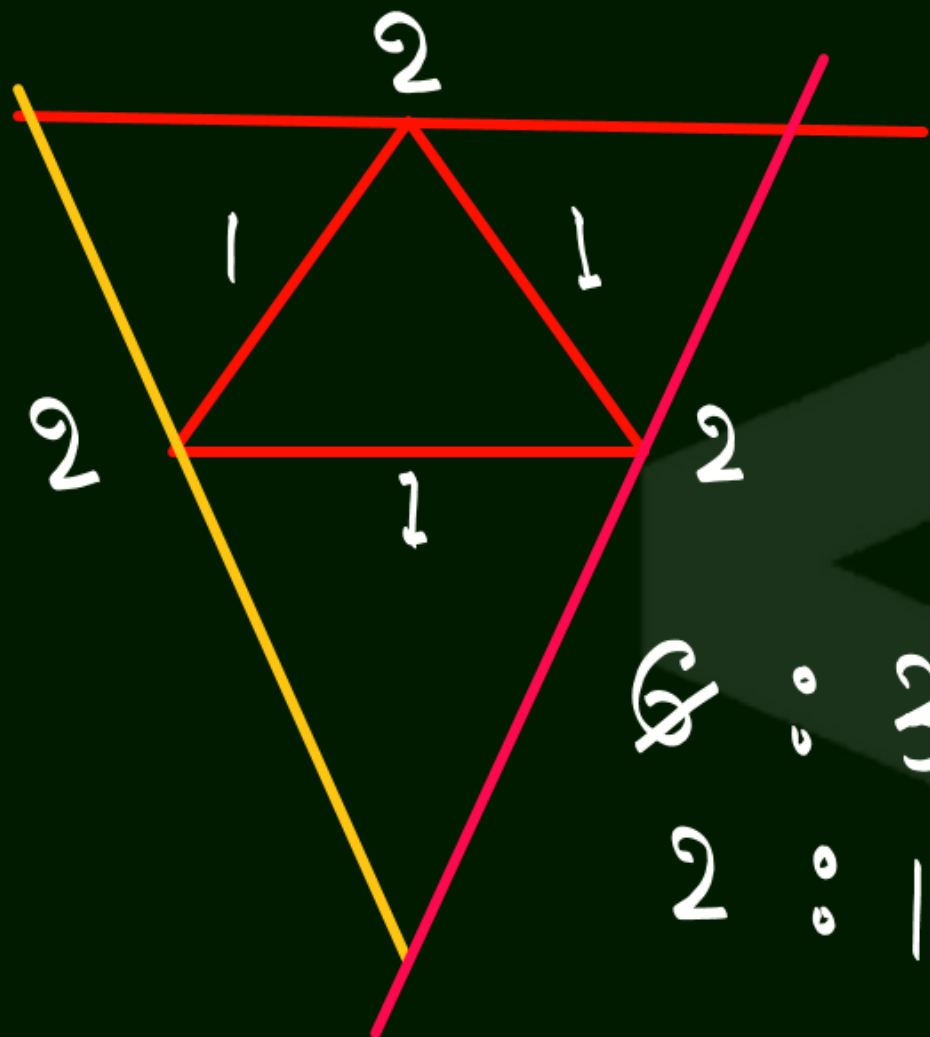
एक त्रिभुज की भुजायें 3 सेमी. 4 सेमी. तथा 5 सेमी. हैं। इस त्रिभुज की भुजाओं के मध्यबिन्दुओं को मिलाने से बने त्रिभुज का क्षेत्रफल (सेमी.2) है।

(a) 6

(b) 3

✓ (c) $\frac{3}{2}$

(d) $\frac{3}{4}$



Q. Through each vertex of a triangle, a line parallel to the opposite side is drawn. the ratio of the perimeter of the new triangle. thus formed, with that of the original triangle is.

त्रिभुज के प्रत्येक शीर्ष से, विपरीत भुजा के समानान्तर रेखाएँ खींची गयी। नये त्रिभुज के परिमाप का वास्तविक त्रिभुज के परिमाप से अनुपात ज्ञात करें ?

(a) 3 : 2

(b) 1 : 2

(c) 2 : 1

(d) 2 : 3

~~6 : 3~~
2 : 1

(SSC CPO SI 2017)



$$A = \pi r^2 \times \frac{\theta}{360}$$

$$A = \pi \times 7 (O_1 + O_2 + O_3)$$

$$= \frac{22}{7} \times 7 \times \frac{1}{2} = 77$$

Q. At each corner of a triangular field of sides 26 m, 28 m and 30 m, a cow is tethered by a rope of length 7m, the area (in m²-) ungrazed by the cows is.

किसी त्रिभुजनुमा क्षेत्र की भुजायें 26 मीटर, 28 मीटर, तथा 30 मीटर हैं। प्रत्येक शीर्ष पर 7 मी. लम्बी रस्सी द्वारा गायों को बाँधा गया। गायों द्वारा बिना चरा हुआ भाग का क्षेत्रफल ज्ञात करें?

- (a) 336
- (b) 259
- (c) 154
- (d) 77

$$S = \frac{26 + 28 + 30}{2} = \frac{84}{2} = 42$$

$$A = \sqrt{42 \times 16 \times 14 \times 12}$$

(SSC CGL Tier-I 2017)

$$= \sqrt{14 \times 3 \times 16 \times 11 \times 4 \times 3} = 14 \times 3 \times 4 \times 2 = 56 \times 6 = 336 \text{ m}^2$$

$$\begin{array}{r} \text{Rest} = 336 \\ - 77 \\ \hline 259 \end{array}$$

$$8 = a$$



$$b = 15$$

$$= 4$$

$$A = \frac{1}{2} \times 8 \times 15 = 60$$

$$\text{Smallest} = 8 \text{ cm}$$

$$A = 60 \text{ cm}^2$$

$$p = 40 \text{ cm}$$

$$a + b = 23$$

Q.

The perimeter of a triangle is 40cm and its area is 60 cm². If the largest side measures 17 cm, then the length (in cm) of the smallest side of the triangle is.

किसी त्रिभुज का परिमाप 40 cm तथा क्षेत्रफल 60cm² है। त्रिभुज की सबसे लम्बी भुजा 17cm हो, तब सबसे छोटी भुजा की लम्बाई ज्ञात करें?

(a) 4

(b) 6

(c) 8

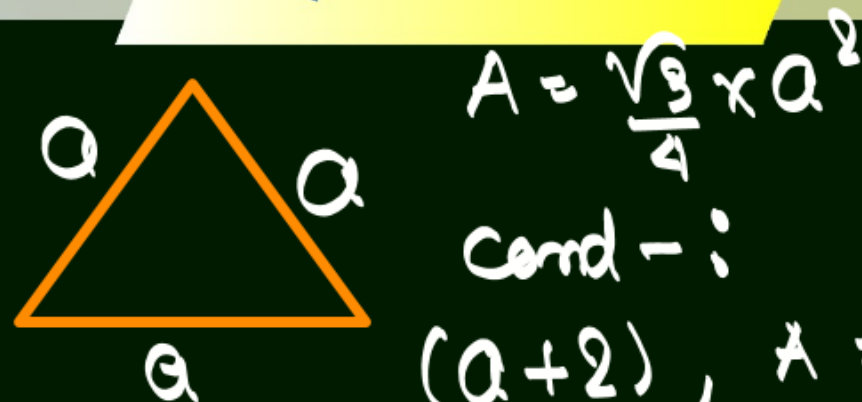
(d) 15

$$15, 8, 17$$

$$\downarrow \quad \downarrow \quad \downarrow$$

$$225 - 64 = 289$$

(SSC CGL Tier-I 2017)



cond-:

$$(a+2), A = \frac{\sqrt{3}}{4} (a+2)^2$$

$$\frac{\sqrt{3}}{4} [(a+2)^2 - a^2] = 3 + \sqrt{3}$$

$$\frac{\sqrt{3}}{4} [a^2 + 4 + 4a - a^2] = \sqrt{3}(\sqrt{3} + 1)$$

$$a + 1 = \sqrt{3} + 1$$

$$a = \sqrt{3}$$

Q. If the length of each side of an equilateral triangle is increased by 2 units, the area is found to be increased by $3 + \sqrt{3}$ square unit.

The length of each side of the triangle is

यदि किसी समबाहु त्रिभुज की भुजा को 2unit बढ़ा दिया जाये, तब क्षेत्रफल $3 + \sqrt{3} \text{ unit}^2$ बढ़ जाता है। त्रिभुज की प्रत्येक भुजा ज्ञात करें?

- (a) $\sqrt{3}$ units
- (b) 3 units
- (c) $3\sqrt{3}$ units
- (d) $3\sqrt{2}$ units

(SSC CHSL DEO & LDC 2017)



$$r = \frac{p+b-h}{2} = \frac{3+4-5}{2} = \frac{2}{2} = 1$$

$$R = \frac{h}{2} = \frac{5}{2}$$

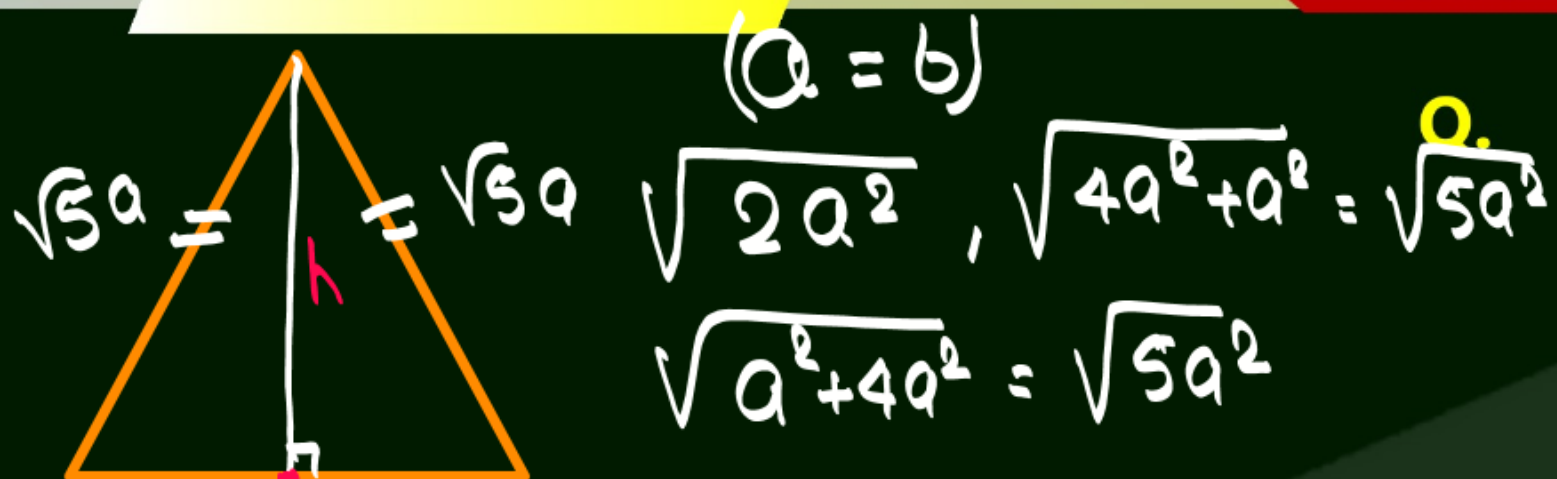
$$\frac{r}{R} = \frac{1 \times 2}{5} = \frac{2}{5}$$

$$\frac{A_{C_1}}{A_{C_2}} = \left(\frac{2}{5}\right)^2 = \frac{4}{25}$$

Q. Let C_1 and C_2 be the inscribed and circumscribed circles of a triangle with sides 3 cm, 4 cm and 5 cm then $\frac{\text{area of } C_1}{\text{area of } C_2}$ is

मान लें कि C_1 और C_2 एक त्रिभुज के अंतवृत्त तथा परिवृत्त हैं और त्रिभुज की भुजाएँ 3 सेमी, 4 सेमी तथा 5 सेमी हैं। तो $\frac{C_1 \text{ का क्षेत्रफल}}{C_2 \text{ का क्षेत्रफल}} = ?$

- (a) $\frac{9}{25}$
- (b) $\frac{16}{25}$
- (c) $\frac{9}{16}$
- ✓ (d) $\frac{4}{25}$



$$\frac{a}{\sqrt{2}} \quad \sqrt{2}a \quad \frac{a}{\sqrt{2}}$$

$$h = \sqrt{(\sqrt{5}a)^2 - \left(\frac{a}{\sqrt{2}}\right)^2}$$

$$= \sqrt{5a^2 - \frac{a^2}{2}}$$

$$= \sqrt{\frac{9a^2}{2}} = \frac{3a}{\sqrt{2}}$$

$$A = \frac{1}{2} \times \sqrt{2}a \times \frac{3a}{\sqrt{2}}$$

$$= \frac{3}{2}a^2$$

$$= \boxed{\frac{3}{2}a \times b}$$

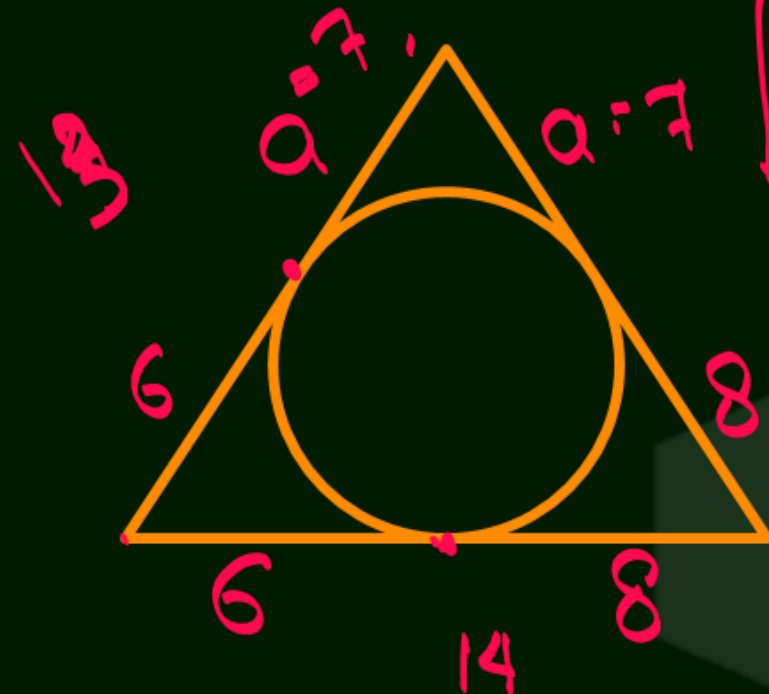
Three sides of a triangle are $\sqrt{a^2 + b^2}$, $\sqrt{(2a)^2 + b^2}$ and $\sqrt{a^2 + (2b)^2}$ units. What is the area (in unit squares) of the triangle?

एक त्रिभुज की तीन भुजाएं $\sqrt{a^2 + b^2}$, $\sqrt{(2a)^2 + b^2}$ और $\sqrt{a^2 + (2b)^2}$ इकाई हैं। त्रिभुज का क्षेत्रफल (वर्ग इकाई में) कितना होगा?

- (a) $3ab$
- (b) $\frac{3}{2}ab$
- (c) $4ab$
- (d) $\frac{5}{2}ab$

(SSC CGL Mains 2020, 03 feb. 2022)

$$S = (14 + a)$$



$$r = 4 \text{ cm}$$

$$r = \frac{\Delta}{S}$$

Q.

किसी त्रिभुज की अन्तःत्रिज्या 4cm है एवं इस त्रिभुज की एक भुजा अन्तःवृत्त के स्पर्श बिंदु से दो भागों 6cm और 8cm में बंट जाती है। त्रिभुज का परिमाण पता करो।

The inner radius of a triangle is 4cm and one side of this triangle is divided into two parts 6cm and 8cm from the point of touch of the inner circle. Find the perimeter of the triangle.

a) 39

b) 42

c) 56

d) 49

$$A = \sqrt{(14+a)(a)(6)(8)}$$

$$= \sqrt{(14+a)a \times 48}$$

$$P = 15 + 14 + 13$$

$$= 42$$

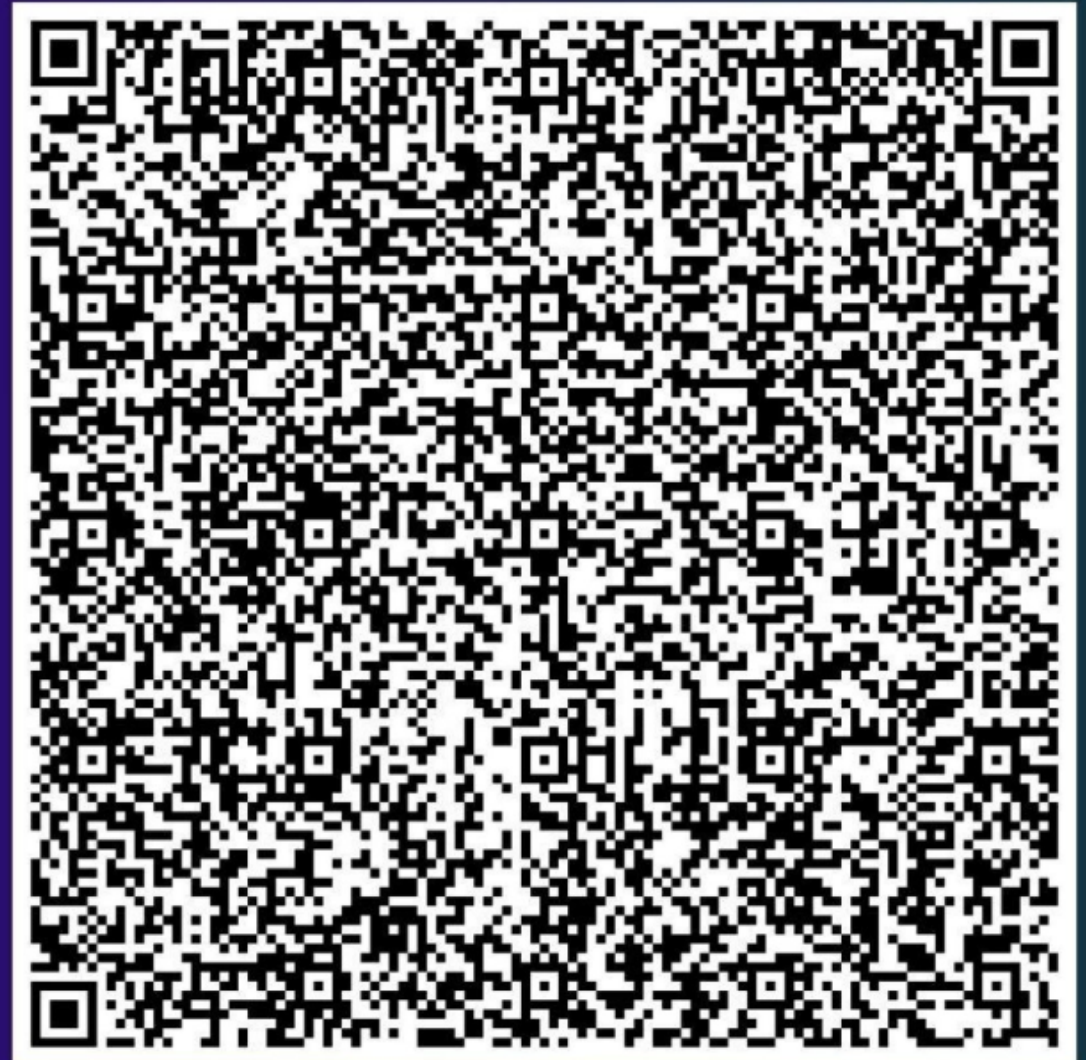
$$(4 \times (14+a))^2 = (\sqrt{(14+a) \times 48a})^2$$

$$16 \times (14+a)^2 = (14+a) \times 48a$$

$$2a = 14$$

$$a = 7$$

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