

LESSON - 12

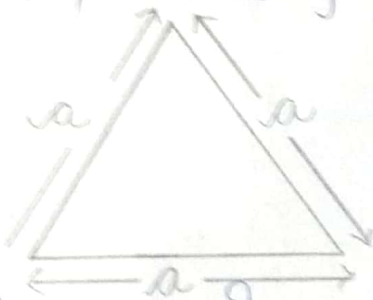
ਜੀਵੇ ਦਾ ਸੂਤਰ ①
(Heron's Formula)

ਸਮਤਿਕਮ - 12.1

Q1.

ਉਹ $\longrightarrow$ ਸਮਤੁਲੀ ਤ੍ਰਿਭੁਜ ਦੀ ਹਰੇਕ ਭੁਜਾ $= a$
(Solution) (Each side of Equilateral triangle)

$\therefore$ ਤ੍ਰਿਭੁਜ ਦਾ ਅਰਧ ਪਰਿਮਾਪ $S = \frac{a+b+c}{2}$
(Semi-perimeter of triangle)



$$S = \frac{a+a+a}{2}$$

$$\text{or } S = \frac{3a}{2}$$

ਹੁਣ, ਤ੍ਰਿਭੁਜ ਦਾ ਖੇਤਰ $= \sqrt{s(s-a)(s-b)(s-c)}$
(Now, Area of triangle)

$$= \sqrt{s(s-a)(s-a)(s-a)}$$

$$= \sqrt{s(s-a)^3}$$

$$= \sqrt{\frac{3a}{2} \left(\frac{3a}{2} - \frac{a}{1} \right)^3}$$

$$= \sqrt{\frac{3a}{2} \left(\frac{3a-2a}{2} \right)^3}$$

$$= \sqrt{\frac{3a}{2} \times \left(\frac{a}{2} \right)^3}$$

$$= \sqrt{\frac{3a \times a^3}{2 \times 2^3}} = \sqrt{\frac{3a^4}{2^4}}$$

ਖੇਤਰ
(Area)

$$= \frac{\sqrt{3}}{4} a^2$$

①

ਹੁਣ, ਤ੍ਰਿਭੁਜ ਦਾ ਘੇਰਿਆਵ
(Now, Perimeter of triangle) = 180 cm

$$\therefore a + a + a = 180$$

$$3a = 180$$

$$a = \frac{180}{3}$$

$$\boxed{a = 60 \text{ cm}}$$

ਹੁਣ, ਤ੍ਰਿਭੁਜ ਦਾ ਖੇਤਰ
(Now) (Area of triangle) = $\frac{\sqrt{3}}{4} a^2$ ---- (1, 3)

$$= \frac{\sqrt{3}}{4} (60)^2$$

$$= \frac{\sqrt{3}}{4} \times \overset{15}{\cancel{60}} \times 60$$

$$= \sqrt{3} \times 15 \times 60$$

$$= 900\sqrt{3} \text{ cm}^2$$

Question 2.
(ਪ੍ਰਸ਼ਨ) ਤ੍ਰਿਭੁਜ ਦੀਆਂ ਤਿਹਾੜਾਂ, $a = 122 \text{ m}$, $b = 120 \text{ m}$,
(Sides of triangle) $c = 22 \text{ m}$

$$\therefore S = \frac{a+b+c}{2} = \frac{122+120+22}{2}$$

$$= \frac{264}{2}$$

$$\therefore \boxed{S = 132 \text{ m}}$$

ਹੁਣ ਤ੍ਰਿਭੁਜ ਦਾ ਖੇਤਰ
(Now, Area of triangle) = $\sqrt{S(S-a)(S-b)(S-c)}$
= $\sqrt{132(132-122)(132-120)(132-22)}$

$$= \sqrt{132(10)(12)(110)}$$

$$= \sqrt{132 \times 10 \times 12 \times 110}$$

$$= \sqrt{1320 \times 1320}$$

∴ $\text{Area} = 1320 \text{ m}^2$

∴, ਇੱਕ ਸਾਲ (12 ਮਹੀਨੇ) ਦਾ ਕਿਰਾਇਆ = Rs. 5000
(Now, Rent for 1 year (12 Months) = Rs. 5000)

ਇੱਕ ਮਹੀਨੇ ਦਾ ਕਿਰਾਇਆ = $\frac{5000}{12}$
(Rent for One month) = $\frac{5000}{12}$

∴, ਤਿੰਨ ਮਹੀਨੇ ਦਾ ਕਿਰਾਇਆ = $\frac{5000}{12} \times 3$
(Rent for three months) = $\frac{5000}{12} \times 3$
= 1250 ₹

∴, 1 m^2 ਦੇ ਲਈ ਕਿਰਾਇਆ = 1250 ₹
(Now, Rent for 1 m^2) = 1250 ₹

∴ 1320 m^2 ਦੇ ਲਈ ਕਿਰਾਇਆ = 1320×1250
(Rent for 1320 m^2) = 16,50,000 ₹

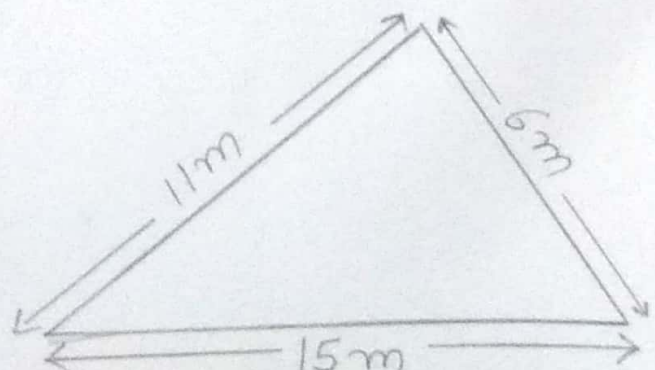
Q3.

Solution → ਮੰਨ ਲਵੋ, $a = 15 \text{ m}$, $b = 11 \text{ m}$, $c = 6 \text{ m}$
(Let)

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

$$= \frac{15+11+6}{2}$$

$$= \frac{32}{2} = 16 \text{ m}$$



$$\therefore \boxed{S = 16\text{m}}$$

(4)

ત્રિજુલનું કા ચૈત્રગુણ

$$\begin{aligned} \text{(Area of triangle)} &= \sqrt{S(S-a)(S-b)(S-c)} \\ &= \sqrt{16(16-15)(16-11)(16-6)} \\ &= \sqrt{16 \times 1 \times 5 \times 10} \\ &= \sqrt{4 \times 4 \times 1 \times 5 \times 5 \times 2} \\ &= 4 \times 5 \sqrt{2} \\ &= 20\sqrt{2} \text{ મી}^2 (\text{m}^2) \end{aligned}$$

$\therefore$ રંગ રંગમાં લીટી કા કા ચૈત્રગુણ

$$\text{(Area painted in colour)} = 20\sqrt{2} \text{ m}^2$$

Q4.

જાણ $\rightarrow$ મારું છેલ્લું ત્રિજુલની રીતમાં ગુણાદાં જાણ
(Solution) (Let the sides of the triangle be) $\begin{aligned} a &= 18\text{cm} \\ b &= 10\text{cm} \\ c &= x\text{cm} \end{aligned}$

મારું ત્રિજુલનું કા પરિમિતર
(And perimeter of triangle) $= 42\text{cm}$

$$\begin{aligned} \text{i.e. } a + b + c &= 42 \\ 18 + 10 + x &= 42 \\ x &= 42 - 18 - 10 \end{aligned}$$

$$x = 14\text{cm}$$

$$\therefore \boxed{c = 14\text{cm}}$$

(5)

$$\begin{aligned} \text{JE (Now)}, S &= \frac{a+b+c}{2} \\ &= \frac{18+10+14}{2} \\ &= \frac{42}{2} \end{aligned}$$

$$S = 21 \text{ cm}$$

ਤ੍ਰਿਭੁਜ ਦਾ ਖੇਤਰ (Area of triangle)

$$\begin{aligned} &= \sqrt{S(S-a)(S-b)(S-c)} \\ &= \sqrt{21(21-18)(21-10)(21-14)} \\ &= \sqrt{21 \times 3 \times 11 \times 7} \\ &= \sqrt{7 \times 3 \times 3 \times 11 \times 7} \\ &= 7 \times 3 \sqrt{11} \\ &= 21\sqrt{11} \text{ cm}^2 \end{aligned}$$

Q5
ਹੱਲ (Solution) $\rightarrow$ ਮੰਨ ਲਵੋ ਤ੍ਰਿਭੁਜ ਦੀਆਂ ਭੁਜਾਂ ਹਨ $a=12x$,
(Let sides of triangle are) $b=17x$,
 $c=25x$

ਤ੍ਰਿਭੁਜ ਦਾ ਪਰਿਮਾਪ (Perimeter of triangle) $= 540 \text{ cm}$ (ਦਿੱਤਾ ਹੈ) (Given)

i.e. $a+b+c = 540$

$$12x + 17x + 25x = 540$$

$$54x = 540$$

$$\frac{54x}{54} = \frac{540}{54} = 10$$

$$\therefore \boxed{x = 10 \text{ cm}}$$

⑥

જાહે (Now),

$$\begin{aligned} a &= 12x = 12 \times 10 = 120 \text{ cm} \\ b &= 17x = 17 \times 10 = 170 \text{ cm} \\ c &= 25x = 25 \times 10 = 250 \text{ cm} \end{aligned}$$

અહીં (And)

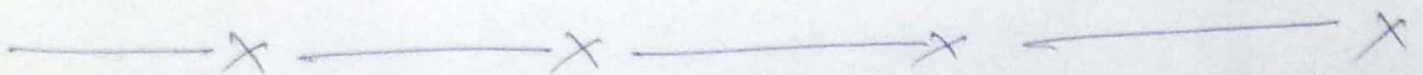
$$s = \frac{a+b+c}{2} = \frac{120+170+250}{2} = \frac{540}{2}$$

$$\therefore \boxed{s = 270 \text{ cm}}$$

જાહે, ત્રિકોણ ના ધૃતગતિ (Now, Area of triangle)

$$\begin{aligned} &= \sqrt{s(s-a)(s-b)(s-c)} \\ &= \sqrt{270(270-120)(270-170)(270-250)} \\ &= \sqrt{270 \times 150 \times 100 \times 20} \\ &= \sqrt{\frac{3 \times 3 \times 3 \times 5 \times 2 \times 5 \times 3 \times 5 \times 2 \times 10 \times 10}{2 \times 2 \times 5}} \\ &= 3 \times 3 \times 5 \times 2 \times 2 \times 10 \times 5 \\ &= 9000 \text{ cm}^2 \end{aligned}$$

$\therefore$ ત્રિકોણ ના ધૃતગતિ (Area of triangle) = 9000 મમ² અથવા cm²



Q6
 ਹੱਲ $\rightarrow$ ਕਿਉਂਕਿ ਦਿੱਤੀ ਹੋਈ ਤ੍ਰਿਭੁਜ ਸਮਦੋਣੁਸੀ ਤ੍ਰਿਭੁਜ ਹੈ।
 (Solution) (Because the given triangle is isosceles Δ)

$$\therefore \text{ਹਰੇ ਦੋ ਬਰਾਬਰ ਭੁਜਾਂ} = 12 \text{ cm}$$

(Both equal sides)

ਮੰਨ ਲੈਂਦੇ, a, b, c ਤ੍ਰਿਭੁਜ ਦੀ ਭੁਜਾਂ ਹਨ।
 (Let a, b, c be the sides of triangle)

$$\therefore a = 12 \text{ cm}, b = 12 \text{ cm}, c = ?$$

ਹੁਣ, ਤ੍ਰਿਭੁਜ ਦਾ ਘੇਰਿਆਵਰ = 30 cm (ਦਿੱਤਾ ਹੈ)
 (Perimeter of triangle) (Given)

$$\therefore a + b + c = 30$$

$$12 + 12 + c = 30$$

$$24 + c = 30$$

$$c = 30 - 24$$

$$\boxed{c = 6 \text{ cm}}$$

ਅਤੇ
 (And) $S = \frac{a+b+c}{2} = \frac{12+12+6}{2}$
 $= \frac{30}{2}$

$$\therefore \boxed{S = 15} \text{ cm}$$

ਹੁਣ, ਤ੍ਰਿਭੁਜ ਦਾ ਖੇਤਰ
 (Now, Area of triangle) $= \sqrt{S(S-a)(S-b)(S-c)}$
 $= \sqrt{15(15-12)(15-12)(15-6)}$

$$= \sqrt{15 \times 3 \times 3 \times 9}$$

$$= \sqrt{5 \times \underbrace{3 \times 3} \times \underbrace{3 \times 3} \times 3 \times 3}$$

$$= 9\sqrt{15} \text{ cm}^2$$

$$\therefore \text{ਪ੍ਰਤੀਕਾ ਦਾ ਖੇਤਰਫਲ} \\ (\text{Area of triangle}) = 9\sqrt{15} \text{ ਸਮ}^2 (\text{cm}^2)$$

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