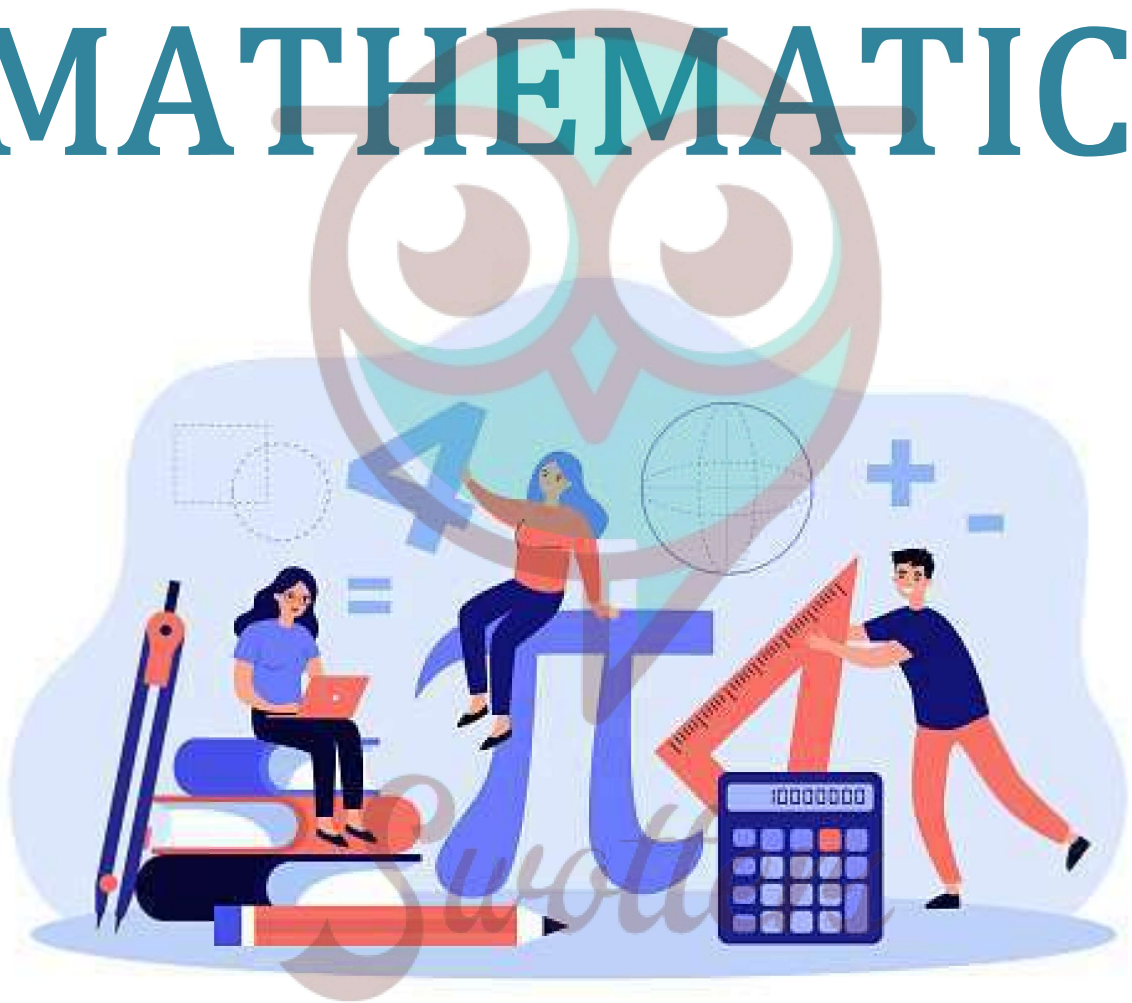# MATHEMATICS

Important Questions

Multiple Choice questions-

Question 1. An isosceles right triangle has area 8cm². The length of its hypotenuse is

(a) √32cm

(b) √16cm

(c)√48cm

(d) √24cm

Question 2. The perimeter of an equilateral triangle is 60m. The area is

(a) 10√3m²

(b) 15√3m²

(c) 20√3m²

(d) 100√3m²

Question 3. The sides of a triangle are 56cm, 60cm and 52cm long. Then the area of the triangle is

(a) 1322cm²

(b) 1311cm²

(c) 1344cm²

(d) 1392cm²

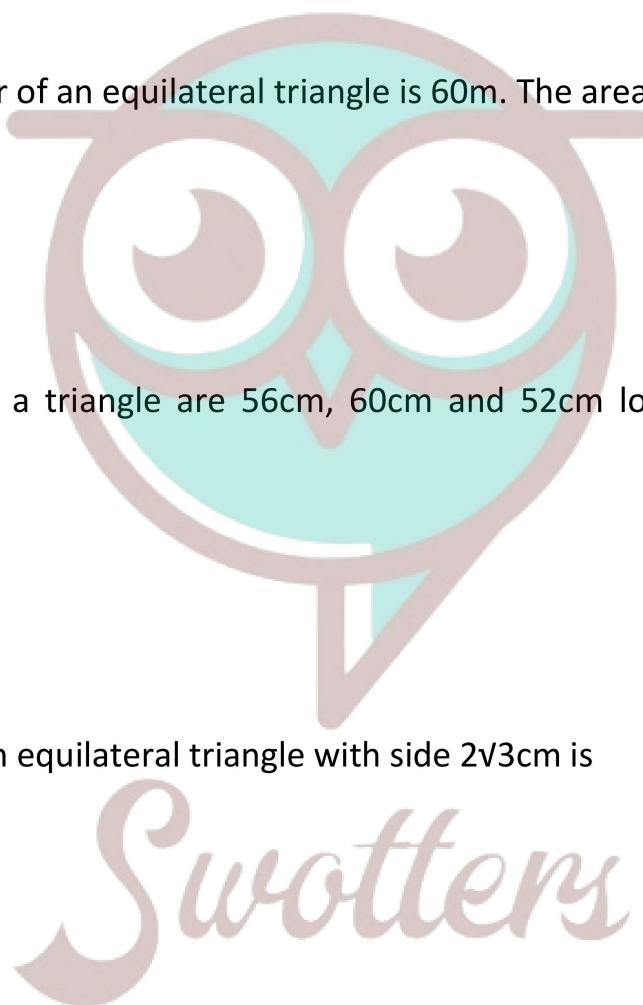Question 4. The area of an equilateral triangle with side 2√3cm is

(a) 5.196cm²

(b) 0.866cm²

(c) 3.496cm²

(d) 1.732cm²

Question 5. The length of each side of an equilateral triangle having an area of 9√3cm² is

(a) 8cm

(b) 36cm

(c) 4cm

(d) 6cm

Question 6. If the area of an equilateral triangle is 16√3cm², then the perimeter of the triangle is

(a) 48cm

(b) 24cm

(c) 12cm

(d) 36cm

Question 7. The sides of a triangle are 35cm, 54cm and 61cm. The length of its longest altitude is

(a) 16√5cm

(b) 10√5cm

(c) 24√5cm

(d) 28cm

Question 8. The area of an isosceles triangle having base 2cm and the length of one of the equal sides 4 cm is

(a) $15\sqrt{}$cm²

(b) $\sqrt{\frac{15}{2}}$ cm²

(c) 2 $\sqrt{15}$ 5cm²

(d) 4 $\sqrt{15}$cm²

Question 9. The edges of a triangular board are 6 cm, 8cm and 10cm. The cost of painting it at the rate of 9 paise per cm² is
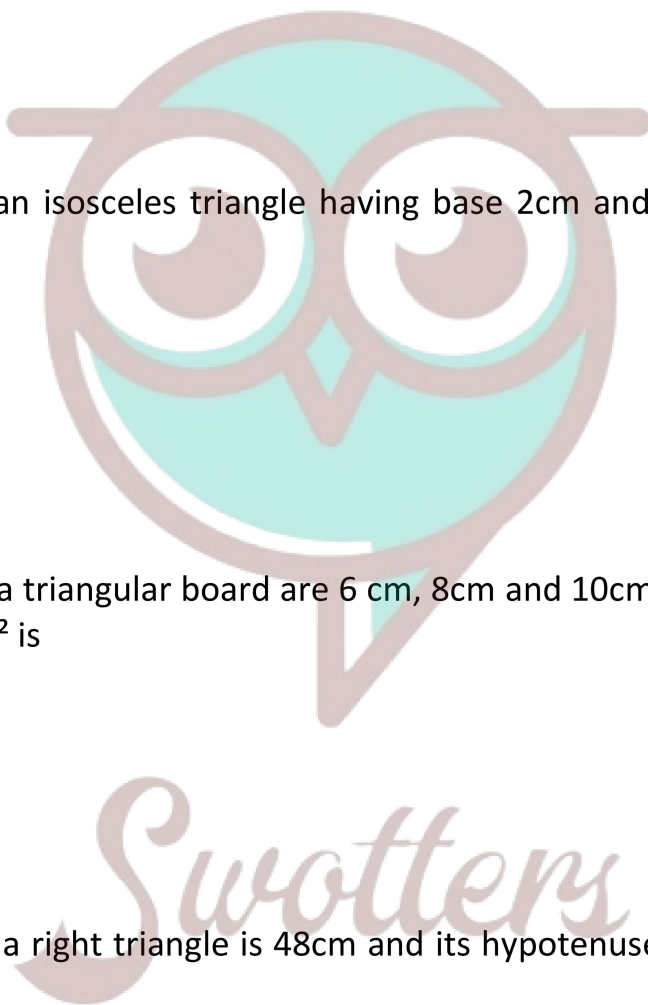
(a) Rs 2.00

(b) Rs 2.16

(c) Rs 2.48

(d) Rs 3.00

Question 10. The base of a right triangle is 48cm and its hypotenuse is 50cm. The area of the triangle is

(a) 168cm²

(b) 252cm²

(c) 336cm²

(d) 504cm²

Very Short:

1. Find the area of an equilateral triangle having side 6cm.

2. If the perimeter of an equilateral triangle is 90m, then find its area.

3. If every side of a triangle is doubled, then find the percent increase in area of triangle so formed.

4. If the length of a median of an equilateral triangle is x cm, then find its area.

Short Questions:

1. Find the area of a triangle whose sides are 11m, 60m and 61m.

2. Suman has a piece of land, which is in the shape of a rhombus. She wants her two sons to work the land and produce different crops. She divides the land in two equal parts by drawing a diagonal. If its perimeter is 400 m and one of the diagonals is of length 120 m, how much area each of them will get for his crops?

3. The perimeter of a triangular field is 144m and its sides are in the ratio 3 : 4 : 5. Find the length of the perpendicular from the opposite vertex to the side whose length is 60m.

4. Find the area of the triangle whose perimeter is 180 cm and two of its sides are of lengths 80 cm and 18 cm. Also, calculate the altitude of the triangle corresponding to the shortest side.

Long Questions:

1. Calculate the area of the shaded region.

2. The sides of a triangular park are 8m, 10m and 6m respectively. A small circular area of diameter 2m is to be left out and the remaining area is to be used for growing roses. How much area is used for growing roses? (Use n = 3.14)

3. OPQR is a rhombus, whose three vertices P, Q and R lie on the circle with Centre 0. If the radius of the circle is 12cm, find the area of the rhombus.

4. How much paper of each shade is needed to make a kite given in the figure, in which ABCD is a square with diagonal 60cm?
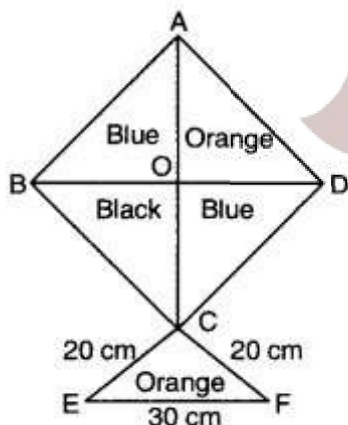
Assertion and Reason Questions-

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

Assertion: the area of a triangle is 6 cm² whose sides are 3 cm, 4 cm and 5 cm respectively.

Reason: area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

Assertion: the area of an equilateral triangle having each side 4 cm is $4\sqrt{3}$ cm²

Reason: Area of an equilateral triangle = $(\sqrt{3}/4) \times a^2$

Answer Key:

MCQ:

1. (a) $\sqrt{32}$cm

2. (d) $100\sqrt{3}$m²

3. (c) 1344cm²

4. (a) 5.196cm²

5. (d) 6cm

6. (b) 24cm

7. (c) $24\sqrt{5}$cm

8. (a) $15\sqrt{}$cm²

9. (b) Rs 2.16

10. (c) 336cm²

Very Short Answer:

1. Area of an equilateral triangle = $\frac{\sqrt{3}}{4} \times$ (side)^2 = $\frac{\sqrt{3}}{4} \times 6 \times 6 = 9\sqrt{3}$cm^2

2.

Side of an equilateral triangle = $\frac{\text{Perimeter}}{3}$ = $\frac{90}{3}$ = 30 m

∴   Its area = $\frac{\sqrt{3}}{4} \times$ (side)^2 = $\frac{\sqrt{3}}{4} \times (30)^2$

= $\frac{\sqrt{3}}{4} \times 30 \times 30$ = $225\sqrt{3}$ m^2

3. Let the sides of the given triangle be, a units, b units and c units.

∴   Its area = $\sqrt{s(s-a)(s-b)(s-c)}$ sq. units
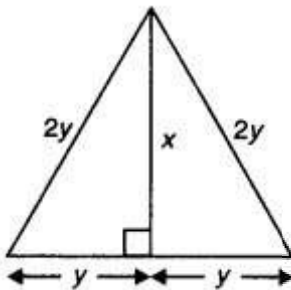
Now, new sides of the triangle are 2a units, 2b units and 2c units.

Thus,   its area = $\sqrt{2s(2s-2a)(2s-2b)(2s-2c)}$

= $4\sqrt{s(s-a)(s-b)(s-c)}$ sq. units

Total increase in area = $3\sqrt{s(s-a)(s-b)(s-c)}$ sq. units

Hence, percent increase = 300%

4.

Let each equal sides of given equilateral triangle be 2y^2. We know that median is also perpendicular bisector.

∴ y^2 + x^2 = 4y^2

⇒ x^2 = 3y^2

⇒ x = √3y

or

⇒ y = $\frac{x}{\sqrt{3}}$

Now, area of given triangle = $\frac{1}{2}$

$\times 2y \times X = y \times x = \dfrac{x}{\sqrt{3}} \times x = \dfrac{x2}{\sqrt{3}}$

Short Answer:

Ans: 1. Let a = 11m, b = 60m and c = 61m:

$$\therefore \quad s = \frac{a+b+c}{2} = \frac{11+60+61}{2} = \frac{132}{2} = 66 \text{ m}$$

Now, $\quad s-a = 66 - 11 = 55 \text{ m}$
$\quad\quad\quad s-b = 66 - 60 = 6 \text{ m}$
$\quad\quad\quad s-c = 66 - 61 = 5 \text{ m}$

$$\therefore \text{ Area of given triangle} = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{66(55)(6)(5)}$$
$$= \sqrt{108900} = 330 \text{ sq. m.}$$

Ans: 2. Here, perimeter of the rhombus is 400m.

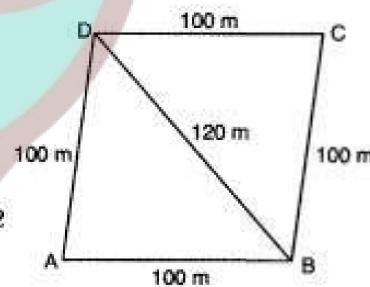$\therefore$ Side of the rhombus $= \dfrac{400}{4} = 100$m

Let diagonal BD = 120m and this diagonal divides the rhombus ABCD into two equal parts.

Now, $\quad s = \dfrac{100+120+100}{2} = \dfrac{320}{2} = 160$

$\therefore$ Area of $\triangle$ABD $= \sqrt{160\,(160-100)\,(160-100)\,(160-120)}$

$\quad\quad = \sqrt{160 \times 60 \times 60 \times 40} = 80 \times 60 = 4800 \text{ m}^2$

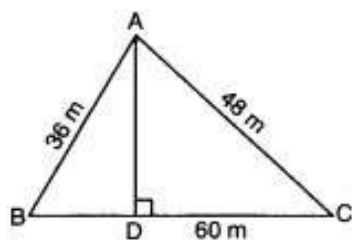Hence, area of land allotted to two sons for their crops is 4800m² each.

Ans: 3.

Let the sides of the triangle be 3x, 4x and 5x

$\therefore$ The perimeter of the triangular field = 144m

$\Rightarrow$ 3x + 4x + 5x = 144

$\Rightarrow$ 12x = 144

$$\Rightarrow \quad x = \frac{144}{12} = 12 \text{ m}$$

∴ Sides of the triangle are 3 × 12 m, 4 × 12 m, 5 × 12 m *i.e.*, 36 m, 48 m, 60 m

$$\therefore \quad s = \frac{a+b+c}{2} = \frac{36+48+60}{2} = \frac{144}{2} = 72 \text{ m}$$

Area of the ΔABC $= \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{72(72-36)(72-48)(72-60)}$

$$= \sqrt{72(36)(24)(12)} = \sqrt{746496} = 864 \text{ m}^2$$

∴ Also, ar (ΔABC) $= \frac{1}{2} \times AD \times BC = \frac{1}{2} \times AD \times 60 = 30 \times AD$

∴ $30 \times AD = 864$

$$AD = \frac{864}{30} = 28.8 \text{ m}$$

Ans: 4. Perimeter of given triangle = 180cm

Two sides are 18cm and 80cm

∴ Third side = 180 - 18 - 80 = 82cm

$$s = \frac{180}{2} = 90 \text{ cm}$$

Area of triangle $= \sqrt{90(90-18)(90-80)(90-82)}$

$$= \sqrt{90 \times 72 \times 10 \times 8} = \sqrt{518400} = 720 \text{ cm}^2$$
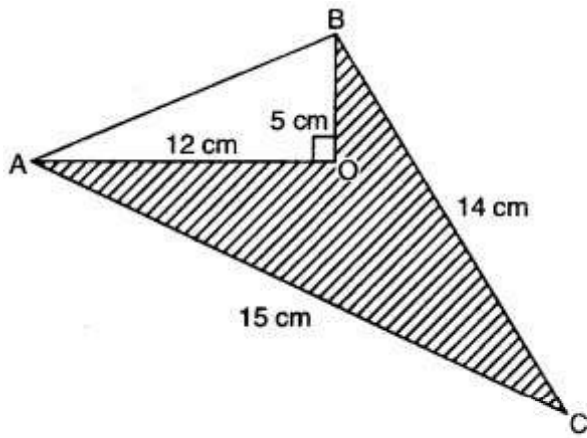
Also, $\frac{1}{2} \times 18 \times h = 720$

$$h = \frac{720}{9} = 80 \text{ cm}$$

Hence, area of triangle is 720cm² and altitude of the triangle corresponding to the shortest side is 80cm.

Long Answer:

Ans: 1

$$\text{Area of } \triangle AOB = \frac{1}{2} \times OA \times OB$$

$$= \frac{1}{2} \times 12 \times 5 = 30 \text{ cm}^2$$

Also,

$$AB^2 = OA^2 + OB^2$$
$$= 12^2 + 5^2$$
$$= 144 + 25 = 169$$

$$\Rightarrow \quad AB = \sqrt{169} = 13 \text{ cm}$$

Now, in $\triangle ABC$, we have

$$a = BC = 14 \text{ cm}, b = CA = 15 \text{ cm}, c = AB = 13 \text{ cm}$$

$$s = \frac{a+b+c}{2} = \frac{14+15+13}{2} = \frac{42}{2} = 21 \text{ cm}$$

$$\text{Area of } \triangle ABC = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{21(21-14)(21-15)(21-13)}$$

$$= \sqrt{21 \times 7 \times 6 \times 8}$$

$$= \sqrt{3 \times 7 \times 7 \times 2 \times 3 \times 2 \times 2 \times 2}$$

Ans: 2. The sides of the triangular park are 8m, 10m and 6m.

$$\therefore s = \frac{a+b+c}{2} = \frac{8+10+6}{2} = \frac{24}{2} = 12 \text{ m}$$

$$\text{Area of the park} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{12(12-8)(12-10)(12-6)}$$

$$= \sqrt{12 \times 4 \times 2 \times 6}$$

$$= \sqrt{2 \times 2 \times 3 \times 2 \times 2 \times 2 \times 2 \times 3}$$

$$= 2 \times 2 \times 2 \times 3 = 24 \text{ m}^2$$

Radius of the circle $= \frac{2}{2} = 1$m

Area of the circle $= \pi r^2 = 3.14 \times 1 \times 1 = 3.14$m^2

$\therefore$ Area to be used for growing roses = Area of the park - area of the circle

= 24 - 3.14 = 20.86m^2

Ans: 3. Since diagonals bisect each other at 90°.

∴ In right ΔQLR, $(LR)^2 + (LQ)^2 = (QR)^2$

$$\Rightarrow \left(\frac{PR}{2}\right)^2 + \left(\frac{OQ}{2}\right)^2 = (QR)^2$$

$$\Rightarrow \left(\frac{PR}{2}\right)^2 = (12)^2 - \left(\frac{12}{2}\right)^2 \ [\because OQ = r = 12 \text{ cm}]$$
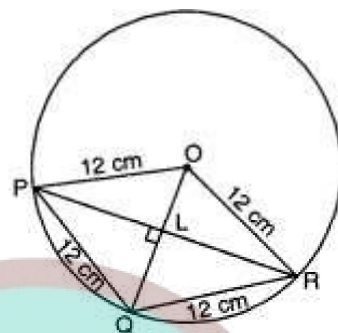
$$\Rightarrow \frac{PR^2}{4} = 144 - 36$$

$$\Rightarrow PR^2 = 4 \times 108 = 432$$

$$PR = \sqrt{144 \times 3} = 12\sqrt{3} \text{ cm}$$

Area of rhombus OPQR = $\frac{1}{2}$ × product of diagonals

$$= \frac{1}{2} \times OQ \times PR = \frac{1}{2} \times 12 \times 12\sqrt{3}$$

$$= 72\sqrt{3} \text{ cm}^2$$

Ans: 4. Since diagonals of a square are of equal length and bisect each other at right angles, therefore,

Area of ΔAOD = $\frac{1}{2}$ × 30 × 30 = 450cm^2

Area of ΔAOD = Area of ΔDOC = Area of ΔBOC

= Area of ΔAOB = 450cm^2

[∵ ΔAOD = ΔAOB ≅ ΔBOC ≅ ΔCOD,

∵ they^2 have equal area]

Now, area of ACEF (by Heron's formula)

Here a = 20cm, b = 20cm and c = 30cm

$$\Rightarrow s = \frac{20 + 20 + 30}{2} = \frac{70}{2} = 35 \text{ cm}$$

Area of ΔCEF = $\sqrt{s(s-a)(s-b)(s-c)}$

$$= \sqrt{35(35-20)(35-20)(35-30)}$$

$$= \sqrt{35(15)(15)(5)} = 75\sqrt{7} \text{ cm}^2 \cong 198.4 \text{ cm}^2$$

Now, area of orange shaded paper in kite

= Area of ΔAOD + Area of ΔCEF

= 450cm^2 + 198.4cm^2

= 648.4cm^2

Area of blue shaded paper in kite

= Area of ΔAOB + Area of ΔCOD

= 450cm^2 + 450cm^2 = 900cm^2

Area of black shaded paper in kite = Area of ΔBOC = 450cm^2.

Assertion and Reason Answers-

1. a)   Assertion and reason both are correct statements and reason is correct explanation for assertion.

2. a)   Assertion and reason both are correct statements and reason is correct explanation for assertion.