

SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

HERON'S FORMULA

Class 09 - Mathematics

Time Allowed: 2 hours and 59 minutes Maximum Marks: 183 Section A 1. The sides of a triangle are 11 cm, 15 cm and 16 cm. The altitude to the largest side is _____ [1] a) $\frac{15\sqrt{7}}{4}$ cm b) 30 cm c) $\frac{15\sqrt{7}}{2}$ cm d) $30\sqrt{7}$ cm The base of an isosceles triangle is 8 cm long and each of its equal sides measures 6 cm. The area of the triangle 2. [1] is b) $8\sqrt{3}$ cm² a) $8\sqrt{5}$ cm² c) $16\sqrt{3}$ cm² d) $16\sqrt{5}\mathrm{cm}^2$ 3. Area of an equilateral triangle of side 10 cm is a [1] a) $50\sqrt{3}$ cm² b) $100\sqrt{3}$ cm d) $25\sqrt{3}$ cm c) $10\sqrt{3}$ cm² [1] If the sides of a triangular field measure 51 m, 37 m and 20 m, then find the cost of levelling it at \gtrless 7 per m². 4. b) ₹ 2412 a) ₹ 2142 c) ₹ 2562 d) ₹ 2241 Each side of an equilateral triangle is 10 cm long. The height of the triangle is 5. [1] a) $10\sqrt{3}$ cm b) $10\sqrt{2}$ cm c) $5\sqrt{3}$ cm d) 5 cm 6. The perimeter of a triangle is 300 m and its sides are in the ratio 3 : 5 : 7. Find its area. [1] a) $1800\sqrt{3} \text{ m}^2$ b) 4500 m^2 d) $1500\sqrt{3} \text{ m}^2$ c) 2500 m² 7. The base of a right triangle is 8 cm and hypotenuse is 10 cm. Its area will be : [1] b) $_{24} \text{ cm}^2$ a) 48 cm² c) 80 cm^2 d) 40 cm² Each side of an equilateral triangle is 2x cm. If $x\sqrt{3} = \sqrt{48}$, then area of the triangle is : 8. [1] a) $\sqrt{48} \text{ cm}^2$ b) $48\sqrt{3}$ cm² c) $16\sqrt{3}$ cm² d) 16 cm²

9. Suman made a picture with some white paper and a single coloured paper as shown in figure. White paper is **[1]** available at her home and free of cost. The cost of coloured paper used is at the rate of 10p per cm². Find the total cost of the coloured paper used. (Take $\sqrt{3}$ = 1.732 and $\sqrt{11}$ = 3.32)



c) 10 cm	d) 20 cm

The sides of a triangle are 35 cm, 54 cm and 61 cm respectively, and its area is $420\sqrt{5}$ cm². The length of its 15. longest altitude is b) $10\sqrt{5}$ cm a) $24\sqrt{5}$ cm c) $21\sqrt{5}$ cm d) 28 cm 16. The sides of a triangle are in ratio 3:4:5. If the perimeter of the triangle is 84 cm, then area of the triangle is : [1] b) 252 cm² a) 274 cm² c) 294 cm² d) 290 cm² 17. The base of an isosceles right triangle is 30 cm. Its area is [1] a) $225\sqrt{3}$ cm² b) 450 cm² c) 225 cm² d) $_{225\sqrt{2}}$ cm² 18. The sides of a triangle are 7 cm, 9 cm and 14 cm. Its area is [1] a) $24\sqrt{5}$ cm² b) $12\sqrt{3}$ cm² d) 63 cm² c) $12\sqrt{5}$ cm² [1] The base of an isosceles triangle measures 24 cm and its area is 192 cm². Find its perimeter. 19. b) 64 cm a) 54 cm c) 46 cm d) 84 cm The difference between the semi-perimeter and the sides of \triangle ABC are 7 cm, 5 cm and 3 cm respectively. The 20. [1] perimeter of the triangle is b) 25 cm a) 30 cm d) 10 cm c) 15 cm [1] **Assertion** (A): If the area of an equilateral triangle is $81\sqrt{3}$ cm², then the semi perimeter of triangle is 20 cm. 21. **Reason (R):** Semi perimeter of a triangle is $s = \frac{a+b+c}{2}$, where a, b, c are sides of triangle. a) Both A and R are true and R is the correct b) Both A and R are true but R is not the explanation of A. correct explanation of A. c) A is true but R is false. d) A is false but R is true. [1] 22. **Assertion (A):** The sides of a triangle are 3 cm, 4 cm and 5 cm. Its area is 6 cm². **Reason (R):** If 2s = (a + b + c), where a, b, c are the sides of a triangle, then area = $\sqrt{(s - a)(s - b)(s - c)}$. a) Both A and R are true and R is the correct b) Both A and R are true but R is not the explanation of A. correct explanation of A. c) A is true but R is false. d) A is false but R is true. **Assertion (A):** The height of the triangle is 18 cm and its area is 72 cm². Its base is 8 cm. [1] 23. **Reason (R):** Area of a triangle = $\frac{1}{2} \times$ base \times height a) Both A and R are true and R is the correct b) Both A and R are true but R is not the explanation of A. correct explanation of A. c) A is true but R is false. d) A is false but R is true.

24.	Assertion (A): The side of an equilateral triangle is	5 cm then the height of the triangle is 9 cm.	[1]
	Reason (R): The height of an equilateral triangle is	$\frac{\sqrt{3}}{2}a$.	
	a) Both A and R are true and R is the correct explanation of A.	b) Both A and R are true but R is not the correct explanation of A.	
	c) A is true but R is false.	d) A is false but R is true.	
25.	Assertion (A): The side of an equilateral triangle is Reason (R): All the sides of an equilateral triangle a	5 cm then the area of the triangle is 9 cm ² . re equal.	[1]
	a) Both A and R are true and R is the correct explanation of A.	b) Both A and R are true but R is not the correct explanation of A.	
	c) A is true but R is false.	d) A is false but R is true.	
26.	Assertion (A): The perimeter of a right angled trians	gle is 60 cm and its hypotenuse is 26 cm. The other sides of	[1]
	the triangle are 10 cm and 24 cm. Also, area of the tr	iangle is 120 cm ² .	
	Reason (R): $(Base)^2 + (Perpendicular)^2 = (Hypoten)$	use) ²	
	a) Both A and R are true and R is the correct	b) Both A and R are true but R is not the correct explanation of A.	
	c) A is true but R is false	d) A is false but R is true	
27	Assertion (A) . The sides of a triangle are in the ratio	$0.0125 \cdot 14 \cdot 12$ and its perimeter is 510 cm. Then the area of	[1]
27.	the triangle is 4449.08 cm^2	of 20 - 11 - 12 and 15 permitter is 010 cm. Then the area of	[-]
	Reason (R): Perimeter of a triangle = $a + b + c$, whe	re a, b, c are sides of a triangle.	
	a) Both A and R are true and R is the correct	b) Both A and R are true but R is not the	
	explanation of A.	correct explanation of A.	
	c) R is not the correct explanation of A.	d) A is false but R is true.	
	Se	cction B	
28.	Find the area of an isosceles triangle each of whose e	equal sides measures 13 cm and whose base measures 20	[2]
	cm.	7	
29.	The base of an isosceles triangle measures 80 cm and	l its area is 360 cm ² . Find the perimeter of the triangle.	[2]
30.	An isosceles right triangle has area 8 cm ² . Find the le	ength of its hypotenuse.	[2]
31.	If the area of an equilateral triangle is $36\sqrt{3}{ m cm}^2$, find its perimeter.		[2]
32.	The perimeter of an isosceles triangle is 42 cm and it of the triangle. (Given, $\sqrt{7}$ = 2.64.)	is base is $1\frac{1}{2}$ times each of the equal sides. Find the height	[2]
33.	The base of an isosceles triangle measures 24 cm and	l its area is 192 cm ² . Find its perimeter.	[2]
34.	The sides of a triangle are 8 cm, 15 cm, and 17 cm. Find its area.		[2]
35.	Find the area of a triangle, two sides of which are 8 c	cm and 11 cm and the perimeter is 32 cm.	[2]
	A B		

^{36.} Find the area of an isosceles triangles, the measure of one of its equal sides being 10 cm and the third side is 6 [2] cm.

- 37. The perimeter of an equilateral triangle is 60 cm. Find its area.
- 38. Using Heron's formula, find the area of an equilateral triangle the length of whose one side is a.
- 39. The difference between the semiperimeter and the sides of a △ABC are 8 cm, 7 cm and 5 cm respectively. Find [2] the area of the triangle.
- 40. If the area of an equilateral triangle is $81\sqrt{3}$ cm², find its height.
- 41. In the given figure, ABCD is a quadrilateral in which diagonal BD = 64 cm, AL \perp BD and CM \perp BD such that [2] AL = 16.8 cm and CM = 13.2 cm. Calculate the area of the quadrilateral ABCD.



42. A triangular park ABC has sides 120 m, 80 m and 50 m (in a given figure). A gardener Dhania has to put a fence [2] all around it and also plant grass inside. How much area does she need to plant? Find the cost of fencing it with barbed wire at the rate of ₹ 20 per metre leaving a space 3m wide for a gate on one side.



43. There is a slide in a park. One of its side walls has been painted in some colour with a message KEEP THE [2]
 PARK GREEN AND CLEAN, (see figure). If the sides of the wall are 15 m, 11 m and 6 m, find the area painted in colour.



The wall consists of 15 such solid structures.

KEEP THE PARK GREEN AND CLEAN

i. Which of the following calculations shows the total area (in square meters) of the solid structures?

- a. $\sqrt{50}$ imes 50 imes 30
- b. $\sqrt{130} \times 50 \times 50 \times 30$
- c. $15\sqrt{130}$ imes 50 imes 50 imes 30
- d. $15\sqrt{260}$ 50 × 50 × 30

ii. What is the area of a triangle with side lengths 20 cm, 20 cm and 8 cm?

45. A zoo is in the shape of an isosceles trapezium.

It is divided into three zones-Zone 1, Zone 2 and Zone 3.

Animals are kept without cages in Zone 1. Zone 2 is for visitors and Zone 3 is reserved for park authorities.

[2]

[2]

[2]

[2]

[2]



To avoid the entry of animals in zones 2 and 3, a 1.8 km long wired fencing is installed.

i. Which of the following calculations shows the area for animals?

a. $\sqrt{1.35 imes 0.65 imes 1.15}$

b. 2.15 \times 0.35 \times 0.65 \times 1.15

- c. $\sqrt{3}.15 imes 1.35 imes 1.65 imes 1.15$
- d. $\sqrt{4}.30 \times 1.35 \times 1.65 \times 1.15$
- ii. The area reserved for animals is twice the area reserved for the zoo authorities. Do you have enough information to support this statement? Explain your answer:

Section C

46. Calculate the area of the shaded region in Fig.



- 47. The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 13 m, 14 m [3] and 15 m. The advertisements yield an earning of Rs2000 per m² a year. A company hired one of its walls for 6 months. How much rent did it pay?
- 48. The cost of leveling the ground in the form of a triangle having the sides 51m, 37m and 20m at the rate of Rs.3 [3] per m² is Rs.918. State whether the statement is true or false and justify your answer.
- 49. The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 122 m, 22 m [3] and 120 m (see Fig.). The advertisements yield an earning of ₹ 5000 per m² per year. A company hired one of its walls for 3 months. How much rent did it pay?



- 50. A traffic signal board, indicating 'SCHOOLAHEAD', is an equilateral triangle with side 'a'. Find the area of the [3] signal board, using Heron's Formula. If its perimeter is 180 cm,
- 51. The sides of a triangular plot are in the ratio of 3 : 5 : 7 and its perimeter is 300 m. Find its area.

[3]

[3]

- 52. A traffic signal board indicating 'school ahead' is an equilateral triangle with side 'a' find the area of the signal [3] board using heron's formula. Its perimeter is 180 cm, what will be Its area?
- 53. The perimeter of an isosceles triangle is 32 cm. The ratio of the equal side to its base is 3: 2. Find the area of the **[3]** triangle.
- 54. The sides of a triangular field are 41m, 40m and 9m. Find the number of rose beds that can be prepared in the [3] field, if each rose bed on an average needs 900 cm² space.
- 55. The perimeter of a triangle is 480 meters and its sides are in the ratio of 1:2:3. Find the area of the triangle? [3]
- 56. One side of an equilateral triangle is 8 cm. Find its area by using Heron's Formula. Find its altitude also. [3]
- 57. A traffic signal board, indicating SCHOOLAHEAD is an equilateral triangle with side a Find the area of the [3] signal board, using Heron's formula. If its perimeter is 180 cm, what will be the area of the signal board?



- 58. The sides of a triangle are in the ratio of 13 : 14 : 15 and its perimeter is 84 cm. Find the area of the triangle. [3]
- 59. The perimeter of a triangular field is 540 m and its sides are in the ratio 25 : 17 : 12. Find the area of the triangle. [3]
- 60. Find the area of the shaded region in figure.



Section D

61.	Find the percentage increase in the area of a triangle if its each side is doubled.	[5]
62.	A traffic signal board, indicating SCHOOL AHEAD, is an equilateral triangle with side a. Find the area of the	[5]
	signal board, using Heron's formula. If its perimeter is 180 cm, what will be the area of the signal board?	
63.	The difference between the sides at right angles in a right-angled triangle is 14 cm. The area of the triangle is	[5]
	120 cm ² . Calculate the perimeter of the triangle.	
64.	The lengths of the sides of a triangle are 7 cm, 13 cm and 12 cm. Find the length of perpendicular from the	[5]
	opposite vertex to the side whose length is 12 cm.	
65.	The perimeter of a triangular field is 420 m and its sides are in the ratio 6 : 7 : 8. Find the area of the triangular	[5]
	field.	
66.	The perimeter of a right triangle is 24 cm. If its hypotenuse is 10 cm, find the other two sides. Find its area by	[5]
	using the formula area of a right triangle. Verify your result by using Heron's formula.	
67.	Calculate the area of the triangle whose sides are 18 cm, 24 cm and 30 cm in length. Also, find the length of the	[5]
	altitude corresponding to the smallest side.	
68.	Find the area of the triangle whose sides are 42 cm, 34 cm and 20 cm in length. Hence, find the height	[5]
	corresponding to the longest side.	
69.	The perimeter of a right triangle is 144 cm and its hypotenuse measures 65 cm. Find the lengths of other sides	[5]
	and calculate its area. Verify the result using Heron's Formula.	
70.	The base of a triangular field is three times its altitude. If the cost of sowing the field at Rs.58 per hectare is	[5]
	Rs.783, find its base and height.	

[3]

71.	Find the area of a triangular field whose sides are 91 m, 98 m and 105 m in length. Find the height	[5]
	corresponding to the longest side.	
72.	One side of a right triangle measures 126 m and the difference in lengths of its hypotenuse and other side is 42	[5]
	cm. Find the measures of its two unknown sides and calculate its area. Verify the result using Heron's Formula.	
73.	Two sides of a triangular field are 85 m and 154 m in length and its perimeter is 324 m. Find the area of the	[5]
	field.	
74.	The sides of a triangle are in the ratio 5: 12: 13 and its perimeter is 150 m. Find the area of the triangle.	[5]

75. If each side of a triangle is doubled, then find the ratio of area of new triangle thus formed and the given triangle. **[5]**

