

Heron's formula Formative assessment

1. Calculate the area in each case

- a) Triangle have sides as $a=5$ cm , $b=4$ cm, $c=3$ cm
- b) Equilateral triangle having side $a=2$ cm
- c) Right angle triangle have base= 4 cm and Height = 3 cm
- d) Square whose diagonal is 10 cm
- e) Rectangle whose length and breath are 6 and 4 cm
- f) Parallelogram whose two sides are 10 cm and 16 cm and diagonal is 14 cm
- g) Parallelogram whose base is 10 cm and height is 14 cm
- h) Rhombus of diagonals to 10 and 24 cm
- i) Two sides of trapezium are 36 and 24 cm and its altitude is 12 cm.

Solution

$$a) s = \frac{a+b+c}{2} = \frac{5+4+3}{2} = 6$$

Area

$$A = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{6.1.2.3} = 6 \text{ cm}^2$$

b) Area of equilateral

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

c) Area of triangle

$$A = \frac{1}{2} bh = \frac{1}{2} \times 4 \times 3 = 6 \text{ cm}^2$$

d) Area of square in terms diagonal

$$A = \frac{1}{2}d^2 = \frac{1}{2}10 \times 10 = 50 \text{ cm}^2$$

e) Rectangle area is given by

$$A = L \times B = 6 \times 4 = 24 \text{ cm}^2$$

f) In parallelogram whose two sides and diagonal are given, Area is given by

$$A = 2\sqrt{s(s-a)(s-b)(s-d)}$$

$$\text{Where } s = \frac{a+b+d}{2}$$

$$\text{So } s = \frac{10+16+14}{2} = 20$$

$$A = 2\sqrt{20(20-10)(20-16)(20-14)} = 80\sqrt{3} \text{ cm}^2$$

g) Area is given by

$$A = \text{Base} \times \text{height} = 10 \times 14 = 140 \text{ cm}^2$$

h) Area is given by

$$A = \frac{1}{2}d_1 d_2 = \frac{1}{2} \times 10 \times 24 = 120 \text{ cm}^2$$

i) Area of trapezium is given by

$$A = \frac{1}{2} \text{Altitude} (\text{Sum of parallel sides}) = \frac{1}{2} \times 12(36 + 24) = 360 \text{ cm}^2$$

2) True or False statement

a) Heron formula for area of triangle is not valid of all triangles

- b) If each side of the triangles is tripled, the area will become 9 times
 c) Base and corresponding altitude of the parallelogram are 8 and 5 cm respectively. Area of parallelogram is 40 cm^2
 d) If each side of triangle is doubled, the perimeter will become 4 times
 e) If p is the perimeter of the triangle of sides a, b, c , the area of triangle is

$$A = \frac{1}{4} \sqrt{p(p-2a)(p-2b)(p-2c)}$$

- f) When two triangles are congruent, their areas are same
 g) Heron's formula belongs to America
 h) If the side of the equilateral triangle is a rational number, the area would always be an irrational number

Solution

- a) False
 b) True
 c) True
 d) False
 e) True
 f) True
 g) False
 h) True

Multiple choice Questions

- 3) The difference between sides at right angles in a right-angled triangle is 14 cm. The area of the triangle is 120 cm^2 . The perimeter of the triangle is
 a) 80
 b) 45
 c) 60
 d) 64

Solution (c)

Let y be one of the sides at right angle, then another side will be $y-14$

Now we know that

$$A = \frac{1}{2} \text{Base} \times \text{height}$$

$$120 = \frac{1}{2} \cdot y \cdot (y - 14)$$

$$\Rightarrow y^2 - 14y - 240$$

$$\Rightarrow (y-24)(y+10) = 0$$

$$\Rightarrow y = 24$$

$$\Rightarrow \text{So other side is } 10$$

From pythagorous theorem

$$\text{hypotenuse} = \sqrt{10^2 + 24^2} = 26 \text{ cm}$$

So perimeter will be =10+24+26=60 cm

4. Find the area of the equilateral triangle whose perimeter is 180 cm?

Which of the following is true?

a) $900\sqrt{3}\text{cm}^2$

b) $300\sqrt{3}\text{cm}^2$

c) $200\sqrt{3}\text{cm}^2$

d) None of these

Solution

$$P=3a \Rightarrow a=P/3=60 \text{ cm}$$

Area of equilateral

$$A = \frac{\sqrt{3}}{4} a^2 = \frac{\sqrt{3}}{4} \times 60 \times 60 = 900\sqrt{3}$$

5) One diagonal and side of the rhombus are 24 and 13 cm respectively, Find the Area and other diagonal size?

a) $160 \text{ cm}^2, 10 \text{ cm}$

b) $120 \text{ cm}^2, 20 \text{ cm}$

c) $120 \text{ cm}^2, 10 \text{ cm}$

d) None of the above

Solution (c)

6) ABCD is a trapezium with AB =10cm, AD=5 cm, BC=4 cm and DC =7 cm?

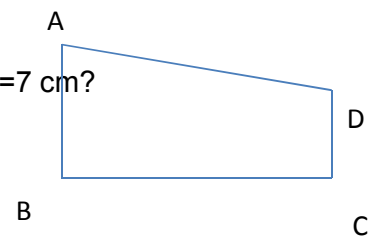
Find the area of the ABCD

a) 34 cm^2

b) 28cm^2

c) 20 cm^2

d) None of these



Solution a

BC is the altitude between the two parallel sides AB and DC

So Area of trapezium will be given by

$$A = \frac{1}{2} BC(AB + DC) = 34\text{cm}^2$$

7) Find the area and perimeter of the right angle triangle whose hypotenuse is 5 cm and Base is 4 cm

- a) 6 cm^2 , 12 cm
- b) 12 cm^2 , 14 cm
- c) 4 cm^2 , 6 cm
- d) 12 cm^2 , 6 cm

Solution (a)

By pythagorous theorem

$$\text{Height} = \sqrt{\text{hyp}^2 - \text{Base}^2} = \sqrt{25 - 16} = 3 \text{ cm}$$

$$\text{So Area} = (1/2) \times \text{Base} \times \text{height} = 6 \text{ cm}^2$$

$$\text{Perimeter} = 5 + 4 + 3 = 12 \text{ cm}$$

8) In an isosceles triangle $\triangle ABC$ with $AB = AC = 13 \text{ cm}$. D is mid point on BC. Also $BC = 10 \text{ cm}$. Which of the following is true?

- a) Area of Triangle ABD and ADC are equal
- b) Area of triangle ABD is 30 cm^2
- c) Area of triangle ABC is 60 cm^2
- d) All the above

Solution (d)

ABD and ADC are congruent triangles, So Area of Triangle ABD and ADC are equal

Also From pythagorous theorem, AD will be given as

$$AD = \sqrt{AB^2 - BD^2} = \sqrt{169 - 25} = 12 \text{ cm}$$

$$\text{So Area of triangle ABC} = (1/2) \times \text{base} \times \text{height} = 60 \text{ cm}^2$$

9) A triangle and a parallelogram have the same base and the same area. The sides of the triangle are 26 cm and 30 cm and parallelogram stands on the base 28 cm. Calculate the height of the parallelogram

- a) 12 cm
- b) 14 cm
- c) 10 cm
- d) 13 cm

Solution (a)

For triangle, all the sides are given, calculating the area using Heron formula

$$A = 336 \text{ cm}^2$$

Now for parallelogram, Area is given by

$$A = \text{Base} \times \text{Altitude}$$

$$336 = 28 \times H$$

Or $H=12$ cm

10) Find the percentage increase in size of the triangle if each side is doubled

- a) 200%
- b) 300%
- c) 400%
- d) None of the above

Solution (a)

Match the column

| | |
|---|-------|
| Perimeter of rectangle of length 24 cm and diagonal 26 cm | 22cm |
| Perimeter of the square of side 10 cm | 17 cm |
| Triangle of sides 4,5,6 cm respectively | 40 cm |
| Perimeter of parallelogram of two sides 5 and 6 cm respectively | 68 cm |