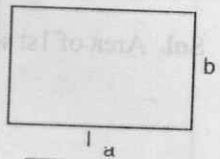
Chapter 21 PERIMETER AND AREA

KEY FACTS

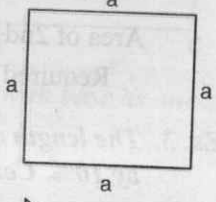
1. Rectangle

(i) Perimeter $= 2(l + b)$ (ii) Area $= l \times b$ (iii) Diagonal $= \sqrt{l^2 + b^2}$



2. Square

(i) Perimeter $= 4a$ (ii) Diagonal $(d) = a\sqrt{2}$ (iii) Area $= a^2 = \frac{1}{2}d^2$

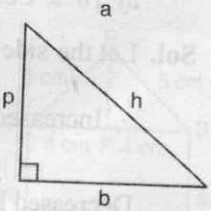


3. Right-angled triangle

(i) Perimeter $= p + b + h$ (ii) Area $= \frac{1}{2} \times b \times p$

(iii) Hypotenuse $(h) = \sqrt{(\text{perp})^2 + (\text{base})^2}$

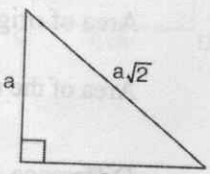
$= \sqrt{p^2 + b^2}$



4. Right-angled isosceles Δ.

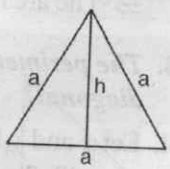
(i) Hypotenuse $= \sqrt{a^2 + a^2} = a\sqrt{2}$ (ii) Perimeter $= 2a + \sqrt{2}a$

(iii) Area $= \frac{1}{2} \times a \times a = \frac{1}{2}a^2$



5. Equilateral triangle

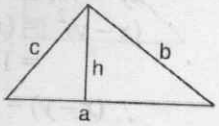
(i) Perimeter $= 3a$ (ii) Height $= \frac{\sqrt{3}}{2}a$ (iii) Area $= \frac{\sqrt{3}}{4}a^2$



6. Scalene triangle

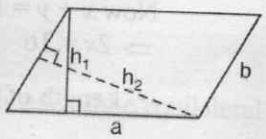
(i) Perimeter $(2s) = a + b + c$ (ii) Area $= \sqrt{s(s-a)(s-b)(s-c)}$,

where a, b, c are the sides of the triangle and semi-perimeter $(s) = \frac{a+b+c}{2}$.



7. Parallelogram

(i) Perimeter $= 2(a + b)$ (ii) Area $=$ base $\times$ height $= ah_1 = bh_2$



Solved Examples

Ex. 1. ***Expenditure incurred in cultivating a square field at the rate of ₹ 170 per hectare is ₹ 680. What would be the cost of fencing the field at the rate of ₹ 3 per metre?***

Sol. Area of the square field $= \frac{680}{170} = 4$ hectares $= (4 \times 10000)$ sq m $= 40000$ sq m

$\therefore$ Side of the square field $= \sqrt{40000\ \text{m}^2} = 200$ m

$\therefore$ Perimeter of the square field $= (4 \times 200)$ m $= 800$ m

$\therefore$ Cost of fencing the field $= ₹\,(3 \times 800) = ₹\,\mathbf{2400}$.

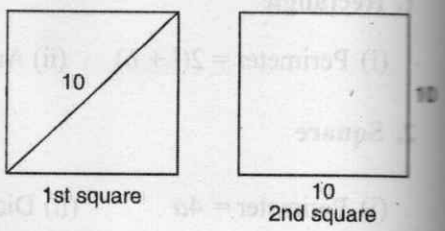
Ex. 2. ***The length of the diagonal of a square and that of the side of another square are both 10 cm. What is the ratio of the area of the first square to that of the second?***

Sol. Area of 1st square $= \frac{1}{2}d^2 = \frac{1}{2} \times 10^2\ \text{cm}^2$

$= \frac{100}{2}\ \text{cm}^2 = 50\ \text{cm}^2$

Area of 2nd square $= \text{side}^2 = (10)^2\ \text{cm}^2 = 100\ \text{cm}^2$

$\therefore$ Required ratio $= 50\ \text{cm}^2 : 100\ \text{cm}^2 = \mathbf{1 : 2}$.



Ex. 3. ***The length of one pair of opposite sides of a square is reduced by 10% and that of the other pair is increased by 10%. Compare the area of the new rectangle with the area of the original square.***

Sol. Let the side of the square be a

$\therefore$ Increased length $= a + 10\%$ of $a = \frac{11a}{10}$

Decreased length $= a - 10\%$ of $a = \frac{9a}{10}$

Area of original square $= a^2$

Area of the new rectangle $= \frac{11a}{10} \times \frac{9a}{10} = \frac{99a^2}{100}$, *i.e.*

Difference of the two areas $= a^2 - \frac{99a^2}{100} = \frac{a^2}{100}$

$\Rightarrow$ The area of the new rectangle is 1% less than the area of original square.

Ex. 4. ***The perimeter of the top of rectangular table is 28 m, whereas its area is 48 m^2. What is the length of its diagonal?***

Sol. Let x and y be the length and breadth of the rectangle.

$xy = 48,\ 2x + 2y = 28 \quad \Rightarrow \quad x + y = 14$

$(x-y)^2 = (x+y)^2 - 4xy = 14^2 - 4 \times 48$

$= 196 - 192 = 4$

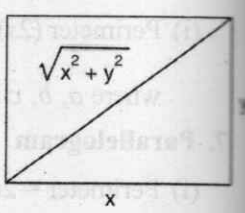
$\therefore (x-y) = \sqrt{4} = 2$

Now $x + y = 14$ and $x - y = 2$

$\Rightarrow 2x = 16 \quad \Rightarrow \quad x = 8 \quad \Rightarrow \quad y = 6$

$\therefore$ Length of diagonal $= \sqrt{x^2 + y^2} = \sqrt{64 + 36}$

$= \sqrt{100} = \mathbf{10\ cm}$.



Ex. 5. ***In the given diagram, ABCD is a rectangle. ADEF, CDHG, BCLM and ABNO are four squares. If the perimeter of ABCD is 16 cm and total area of the four squares is 68 cm^2, then what is the area of ABCD?***

Sol. Let $AD = a$ and $AB = b$. Then,

$2(a + b) = 16 \Rightarrow a + b = 8$ and

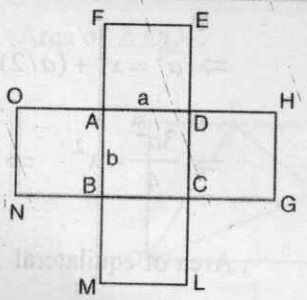
$2(a^2 + b^2) = 68 \Rightarrow a^2 + b^2 = 34$

$\therefore (a + b)^2 = a^2 + b^2 + 2ab$

$\Rightarrow 64 = 34 + 2ab$

$\Rightarrow 2ab = 30 \Rightarrow ab = 15$

Hence, area of rect. $ABCD$ = **15 cm^2**.

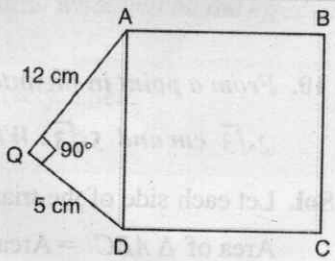


Ex. 6. ***What is the area of the square ABCD shown in the diagram?***

Sol. $AD = \sqrt{12^2 + 5^2}$ cm $= \sqrt{144 + 25}$ cm

$= \sqrt{169}$ cm $= 13$ cm

$\therefore$ Area of square $ABCD = (13)^2$ cm^2 = **169 cm^2**.



Ex. 7. ***What is the area of a figure formed by a square of side 8 cm and an isosceles triangle with base as one side of the square and the perimeter as 18 cm?***

Sol. Each of the equal sides of the isosceles $\Delta = \dfrac{18 - 8}{2}$ cm $= 5$ cm

$\because$ In the isosceles ΔEAB, altitude EF bisects the base AB, $AF = FB = 4$ cm

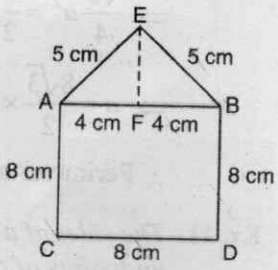
$\therefore$ In ΔEFA, $EF = \sqrt{EA^2 - AF^2} = \sqrt{25 - 16}$ cm

$= \sqrt{9}$ cm $= 3$ cm

$\therefore$ Area of the figure = Area of ΔEAB + Area of square $ABCD$

$= \dfrac{1}{2} \times 8 \times 3$ cm^2 + (8 × 8) cm^2

$= 12$ cm^2 + 64 cm^2 = **76 cm^2**.



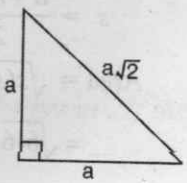
Ex. 8. ***If the perimeter of a right angled isosceles triangle is $\sqrt{2} + 1$, then what is the length of the hypotenuse?***

Sol. Given, $a + a + a\sqrt{2} = \sqrt{2} + 1$

$\Rightarrow 2a + a\sqrt{2} = \sqrt{2} + 1 \Rightarrow a\sqrt{2}(\sqrt{2} + 1) = \sqrt{2} + 1$

$\Rightarrow a = \dfrac{(\sqrt{2} + 1)}{\sqrt{2}(\sqrt{2} + 1)} \Rightarrow a = \dfrac{1}{\sqrt{2}}$

$\therefore$ Hypotenuse $= a\sqrt{2} = \dfrac{1}{\sqrt{2}} \times \sqrt{2}$ cm = **1 cm**.



Ex. 9. ***If x is the length of a median of an equilateral triangle, then what is its area?***

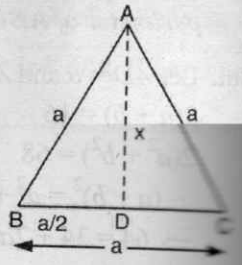
Sol. In an equilateral triangle, the median and the altitude coincide. Let a be the length of each side of the equilateral triangle.

In rt. $\angle d\ \Delta\ ADB$,

$$AB^2 = AD^2 + BD^2$$

$$\Rightarrow\ a^2 = x^2 + (a/2)^2 \quad \Rightarrow\quad a^2 - \frac{a^2}{4} = x^2$$

$$\Rightarrow\ \frac{3a^2}{4} = x^2 \quad \Rightarrow\quad a^2 = \frac{4x^2}{3}$$



Area of equilateral $\Delta = \frac{\sqrt{3}}{4}a^2$

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

Ex. 10. ***From a point in the interior of an equilateral triangle the perpendicular distances of the sides are $\sqrt{3}$ cm, $2\sqrt{3}$ cm and $5\sqrt{3}$. What is the perimeter (in cm) of the triangle?***

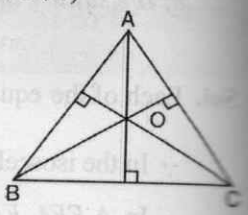
Sol. Let each side of the triangle be a cm.

Area of ΔABC = Area of ΔAOB + Area of ΔAOC + Area of ΔBOC

$$\Rightarrow\ \frac{\sqrt{3}}{4}a^2 = \frac{1}{2} \times a \times \sqrt{3} + \frac{1}{2} \times a \times 2\sqrt{3} + \frac{1}{2} \times a \times 5\sqrt{3} \quad \Rightarrow\ \frac{\sqrt{3}}{4}a^2 = \frac{1}{2}a(\sqrt{3} + 2\sqrt{3} + 5\sqrt{3})$$

$$\Rightarrow\ \frac{\sqrt{3}}{4}a^2 = \frac{1}{2} \times a \times 8\sqrt{3} \quad \Rightarrow\ \frac{\sqrt{3}}{4}a = \frac{1}{2} \times 8\sqrt{3}$$

$$\Rightarrow\ a = \frac{8\sqrt{3}}{2} \times \frac{4}{\sqrt{3}} \quad \Rightarrow\quad a = 16$$



$\therefore$ Perimeter of the triangle = $16 \times 3 =$ **48 cm**.

Ex. 11. ***The sides of a triangle are 3 cm, 4 cm and 5 cm. What is the area (in cm^2) of a triangle formed by joining the midpoints of this triangle?***

Sol. ABC is the given triangle. PQR is the triangle formed by joining the midpoints of ΔABC.

Area of $\Delta PQR = \frac{1}{4}$ (Area of ΔABC)

For area of ΔABC,

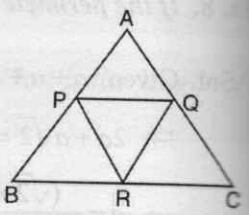
$$s = \frac{a+b+c}{2} = \frac{3\text{cm} + 4\text{cm} + 5\text{cm}}{2} = 6 \text{ cm}$$

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

$$= \sqrt{6(6-3)(6-4)(6-5)}\ \text{cm}^2$$

$$= \sqrt{6 \times 3 \times 2 \times 1}\ \text{cm}^2$$

$$= \sqrt{36}\ \text{cm}^2 = 6\ \text{cm}^2$$



$\therefore$ Area of $\Delta PQR = \frac{1}{4} \times 6\,\text{cm}^2 =$ **1.5 cm²**.

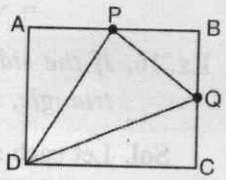
Ex. 12. ***ABCD is a square of area 1 m^2. P and Q are the midpoints of AB and BC respectively. What is the area of ΔDPQ ?***

Sol. Area of ΔDPQ = Area of square $ABCD$ – Area of ΔAPD – Area of ΔBPQ – Area of ΔDQC

$$= 1-\left(\frac{1}{2}\times AP\times AD\right)-\left(\frac{1}{2}\times BP\times BQ\right)-\left(\frac{1}{2}\times QC\times DC\right)$$

$$= 1\,\text{m}^2-\left(\frac{1}{2}\times\frac{1}{2}\times 1\right)\text{m}^2-\left(\frac{1}{2}\times\frac{1}{2}\times\frac{1}{2}\right)\text{m}^2-\left(\frac{1}{2}\times\frac{1}{2}\times 1\right)\text{m}^2$$

$$= \left(1-\frac{1}{4}-\frac{1}{8}-\frac{1}{4}\right)\text{m}^2 = \left(1-\frac{5}{8}\right)\text{m}^2 = \mathbf{\frac{3}{8}\,m^2}.$$



Ex. 13. ***If the height of a triangle is decreased by 40% and its base is increased by 40%, what will be the effect on its area?***

Sol. Let the original base and height of the triangle be b units and h units respectively. Then,

Original area $= \frac{1}{2}bh = 0.5bh$

New base $= b + 40\%$ of $b = 1.4b$,

New height $= h - 40\%$ of $h = 0.6h$

$\therefore$ New area $= \frac{1}{2}\times 1.4b\times 0.6h = \frac{0.84bh}{2} = 0.42bh$

Decrease in area $= 0.5bh - 0.42bh = 0.08bh$

$\therefore$ % decrease $= \frac{0.08bh}{0.5bh}\times 100 = \mathbf{16\%}$.

Ex. 14. ***If an equilateral triangle of area X and a square of area Y have the same perimeter, then X is:***

(a) equal to Y ***(b) greater than Y***

(c) less than Y ***(d) less than or equal to Y***

Sol. Let each side of the equilateral triangle be x cm and that of square be y cm. Then, $X = \frac{\sqrt{3}}{4}x^2$ and $Y = y^2$

Also given, $3x = 4y$, *i.e.*, $y = \frac{3x}{4}$

$\therefore$ $X = \frac{\sqrt{3}}{4}x^2$ and $Y = \left(\frac{3x}{4}\right)^2 = \frac{9x^2}{16}$ $\Rightarrow$ $X = \frac{1.732}{4}x^2 = 0.433x^2$ and $Y = 0.5625x^2$

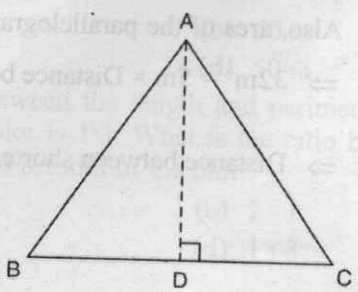
$\Rightarrow$ X is less than Y.

Ex. 15. ***A lawn is in the form of an isosceles triangle. The cost of turfing it come to ₹ 1200 at ₹ 4 per m^2. If the base be 40 m long, find the length of each side.***

Sol. Area of the lawn $= \frac{₹1200}{₹4} = 300\ \text{m}^2$

$\Rightarrow$ $\frac{1}{2}\times$ base $\times$ altitude $= 300$

$\Rightarrow$ altitude $= \frac{300\times 2}{40}\ \text{m} = 15\ \text{m}$.



In an isosceles triangle the altitude bisects the base, so $BD = DC = 20$ cm

In rt. $\angle d$ ΔABD, $AD = 15$ m, $BD = 20$ cm

$\therefore AB = \sqrt{15^2 + 20^2}$ cm $= \sqrt{225 + 400}$ cm

$= \sqrt{625}$ cm $=$ **25 cm.**

Ex. 16. ***If the sides of an equilateral triangle are increased by 20%, 30% and 50% respectively to form a new triangle, what is the percentage increase in the perimeter of the equilateral triangle?***

Sol. Let each side of the equilateral triangle be x cm. Then, after increase the three sides are

$$x + \frac{20}{100}x,\ x + \frac{30}{100}x \text{ and } x + \frac{50}{100}x,$$

i.e., $x + 0.2x$, $x + 0.3x$ and $x + 0.5x$,

i.e., $1.2x$, $1.3x$ and $1.5x$.

$\therefore$ Original perimeter $= 3x$,

Increased perimeter $= 1.2x + 1.3x + 1.5x = 4x$

$$\% \text{ increase in perimeter} = \frac{\text{Increase in perimeter}}{\text{Original perimeter}} \times 100 = \left(\frac{4x - 3x}{3x}\right) \times 100\%$$

$$= \frac{100}{3}\% = \mathbf{33\frac{1}{3}\%}.$$

Ex. 17. ***The base of a triangular field is three times its height. If the cost of cultivating the field at ₹ 26.38 per hectare is ₹ 356.13, find the base and height of the field.***

Sol. Area of the field $= \frac{356.13}{26.38}$ hectares $= 13.5 \times 10000\ \text{m}^2$

$= 135000\ \text{m}^2$.

Let the height of the field $= x$ m

Then, base $= 3x$ m

Given, $\frac{1}{2} \times 3x \times x\ \text{m}^2 = 135000\ \text{m}^2$

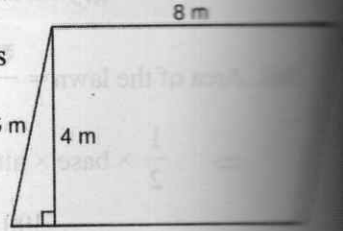
$\Rightarrow \quad x^2 = 90000\ \text{m}^2 \quad \Rightarrow \quad x = \sqrt{90000\ \text{m}^2} = 300$ m

$\therefore$ Height $= 300$ m and Base $= 900$ m.

Ex. 18. ***The adjacent sides of a parallelogram are 8 m and 5 m. The distance between the longer sides is 4 m. What is the distance between the shorter sides?***

Sol. Area of the parallelogram = Longer side × Distance between them

$= 8\ \text{m} \times 4\ \text{m} = 32\ \text{m}^2$



Also, area of the parallelogram = Shorter side × Distance between shorter sides

$\Rightarrow 32\text{m}^2 = 5\text{m} \times$ Distance between shorter sides

$$\Rightarrow \text{Distance between shorter sides} = \frac{32\ \text{m}^2}{5\ \text{m}}$$

$$= \mathbf{6.4\ m}.$$

Ex. 19. ***If the base of a parallelogram is (x + 4), altitude to the base is (x – 3) and the area is $(x^2 - 4)$, then what is the actual area equal to?***

Sol. Area of the parallelogram = base × altitude

$$= (x+4) \times (x-3) \quad = x^2 + 4x - 3x - 12$$
$$= x^2 + x - 12$$

Given, $x^2 + x - 12 = x^2 - 4 \quad \Rightarrow \quad x = 8.$

$\therefore$ Actual area $= (8)^2 - 4 = 64 - 4 =$ **60 sq units.**

Question Bank–21(a)

1. The length of a rectangle is increased by 60%. By what per cent would the width have to be reduced to maintain the same area?

(a) $37\frac{1}{2}\%$ (b) 60%

(c) 75% (d) 120%

2. A rectangular field has dimensions 25 m by 15 m. Two mutually perpendicular passages of 2 m width have been left in its central part and the grass has been grown in the rest of the field. The area under grass is:

(a) 295 m^2 (b) 299 m^2

(c) 300 m^2 (d) 375 m^2

3. The diagonal of a square is $4\sqrt{2}$ cm. The diagonal of another square whose area is double that of the first square is

(a) 8 cm (b) $8\sqrt{2}$ cm

(c) 16 cm (d) $4\sqrt{2}$ cm

4. If the length and breadth of a rectangular plot are each increased by 1 m, then the area of the floor is increased by 21 sq m. If the length is increased by 1 m and breadth is decreased by 1 m, then the area is decreased by 5 sq m. What is the perimeter of the floor?

(a) 30 m (b) 32 cm

(c) 36 m (d) 40 m

5. A typist uses a sheet measuring 20 cm by 30 cm lengthwise. If a margin of 2 cm is left on each side and a 3 cm margin on top and bottom, then the per cent of page used for typing is

(a) 40 (b) 60

(c) 64 (d) 72

6. A rectangular farm has to be fenced on one long side, one short side and the diagonal. If the cost of fencing is ₹ 100 per metre, the area of the farm is 1200 cm^2 and the short side is 30 m long, how much would the job cost?

(a) ₹ 14,000 (b) ₹ 12,000

(c) ₹ 7000 (d) ₹ 15,000

7. The diagonal of a rectangle is $\sqrt{41}$ cm and its area is 20 sq cm. The perimeter of the rectangle must be

(a) 9 cm (b) 18 cm

(c) 41 cm (d) 20 cm

8. The length and breadth of a rectangle are in the ratio 3:2 respectively. If the sides of the rectangle are extended on each side by 1 m, the ratio of length to breadth becomes 10:7. Find the area of the original rectangle in square metres.

(a) 2350 m^2 (b) 1150 m^2

(c) 1350 m^2 (d) 1000 m^2

9. The area of a 6 metres wide road outside a garden in all its four sides is 564 sq metres. If the length of the garden is 20 metres, what is its breadth?

(a) 18 metres (b) 16 metres

(c) 15 metres (d) 19 metres

10. The ratio between the length and breadth of a rectangular garden is 5:3. If the perimeter of the garden is 160 metres, what will be the area of 5 metre wide road around its outside?

(a) 600 m^2 (b) 1200 m^2

(c) 900 m^2 (d) 1000 m^2

11. A square S_1 encloses another square S_2 in such a manner that each corner of S_2 is at the midpoint of the side of S_1. If A_1 is the area of S_1 and A_2 is the area of S_2, then

(a) $A_1 = A_2$ (b) $A_2 = 2A_1$

(c) $A_1 = 2A_2$ (d) $A_1 = 4A_2$

12. The perimeter of a rectangle and a square are 160 m each. The area of the rectangle is less than that of the square by 100 square metre. The length of the rectangle is

(a) 30 m (b) 60 m

(c) 40 m (d) 50 m

13. The ratio between the length and perimeter of a rectangular plot is 1:3. What is the ratio between the length and breadth of the plot?

(a) 1 : 2 (b) 2 : 1

(c) 3 : 2 (d) 1 : 3

14. A rectangular paper, when folded into two congruent parts had a perimeter of 34 cm for each part folded along one set of sides and the same is 38 cm when folded along the other set of sides. What is the area of the paper?

(a) 140 cm^2 (b) 240 cm^2
(c) 560 cm^2 (d) 646 cm^2

15. 50 square stone slabs of equal size were needed to cover a floor area of 72 sq m. The length of each stone slab is

(a) 102 cm (b) 120 cm
(c) 201 cm (d) 210 cm

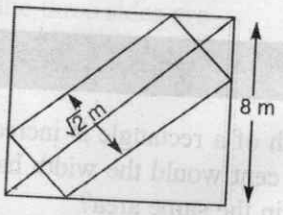
16. In a rectangle, the difference between the sum of adjacent sides and the diagonal is half the length of longer side. What is the ratio of the shorter to the longer side?

(a) $\sqrt{3}:2$ (b) $1:\sqrt{3}$
(c) 2 : 5 (d) 3 : 4

17. *A* took 15 seconds to cross a rectangular field diagonally walking at the rate of 52 m/min and *B* took the same time to cross the same field along its sides walking at the rate of 68 m/min. The area of the field is

(a) 30 m^2 (b) 40 m^2
(c) 50 m^2 (d) 60 m^2

18. A rectangular plank $\sqrt{2}$ m wide is placed symmetrically on the diagonal of a square of side 8 metres as shown. What is the area of the plank?



(a) $(16\sqrt{2}-3)$ sq m (b) $7\sqrt{2}$ sq m
(c) 98 sq m (d) 14 sq m

19. Four sheets of 50 cm × 5 cm are to be arranged in such a manner that a square could be formed. What will be the area of inner part of the square so formed?

(a) 2000 cm^2 (b) 2025 cm^2
(c) 1800 cm^2 (d) 2500 cm^2

Answers

1. (a)	**2.** (b)	**3.** (a)	**4.** (d)	**5.** (c)	**6.** (b)	**7.** (b)	**8.** (c)	**9.** (c)	**10.** (c)
11. (c)	**12.** (d)	**13.** (b)	**14.** (a)	**15.** (b)	**16.** (d)	**17.** (d)	**18.** (d)	**19.** (b)	

Hints and Solutions

1. (a) Let the original length and width of the rectangle be l and w respectively.

Original area = lw

New length = $l_1 = l + 60\%$ of $l = l + \frac{60l}{100} = 1.6l$

New width = b_1

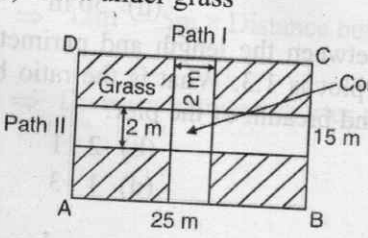
Given, $l_1 w_1 = lw \Rightarrow 1.6l \times w_1 = lw$

$\Rightarrow w_1 = \frac{lw}{1.6l} = \frac{10w}{16} = \frac{5}{8}w$

$\therefore$ % reduction in width = $\left(\frac{w - 5/8w}{w} \times 100\right)\%$.

$= \left(\frac{3}{8} \times 100\right)\% = 37\frac{1}{2}\%$.

2. (b) Area under grass



= Area of field – (Area of path I + Area of path II + Area of common path

= 25 m × 15 m – (15 m × 2 m + 25 m × 2 m) + 2 m × 2 m

= 375 m^2 – (30 m^2 + 50 m^2) + 4 m^2

= 379 m^2 – 80 m^2

= **299 m^2**.

3. (a) Area of square with diagonal $4\sqrt{2}$ cm

$= \frac{1}{2} \times (\text{diagonal})^2 = \frac{1}{2} \times (4\sqrt{2})^2 \text{ cm}^2 = 16 \text{ cm}^2$

Area of the second square = 2 × 16 cm^2 = 32 cm^2

Let d cm be diagonal of the second square. Then

$\frac{1}{2}d^2 \text{ cm}^2 = 32 \text{ cm}^2 \Rightarrow d^2 = 2 \times 32 \text{ cm}^2$

$\Rightarrow d = \sqrt{64 \text{cm}^2} = \mathbf{8 \text{ cm}}$.

4. (d) Let the length and breadth of the rectangle be x m and y m respectively.

Then, $(x + 1)(y + 1) = xy + 21$ ...(*i*)

$\Rightarrow AF^2 + AE^2 = EF^2$ (By Pythagoras Th.)

$\Rightarrow a^2 + a^2 = (\sqrt{2})^2 \Rightarrow 2a^2 = 2 \Rightarrow a = 1$

$\therefore AF = CG = 1$ m

$\Rightarrow FB = BG = 8$ m $- 1$ m $= 7$ m

$\Rightarrow$ In ΔFGB,

$FG^2 = FB^2 + BG^2$ (Pythagoras Theorem)

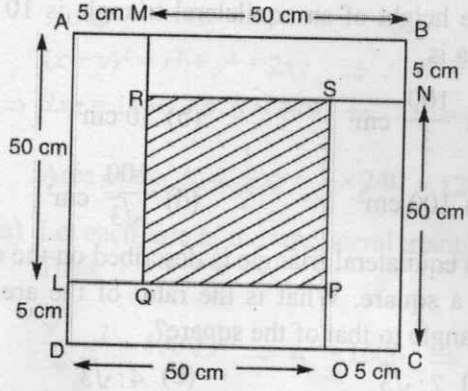
$\Rightarrow FG^2 = 7^2 + 7^2 = 98 \Rightarrow FG = 7\sqrt{2}$

$\therefore$ Area of the plank $= FG \times FE$

$= (7\sqrt{2} \times \sqrt{2})$ m^2 $=$ **14 m^2**.

19. (b) The four sheets are *MBNR*, *SNCO*, *PODL* and *QLAM*.

Side of the new square sheet *ABCD* $= (50 + 5)$ cm $= 55$ cm.



Side of the square sheet *PQRS* $= (55 - 10)$ cm

$= 45$ cm

$\therefore$ Area of *PQRS* $= (45 \times 45)$ cm^2

$=$ **2025 cm^2**.

Question Bank–21(b)

1. The base of a triangle is 15 cm and height is 12 cm. The height of another triangle of double the area having the base 20 cm is:

(a) 8 cm (b) 9 cm

(c) 12.5 cm (d) 18 cm

2. If the area of a triangle is 1176 m^2 and base : corresponding altitude is 3 : 4, then the altitude of the triangle is:

(a) 42 m (b) 52 m

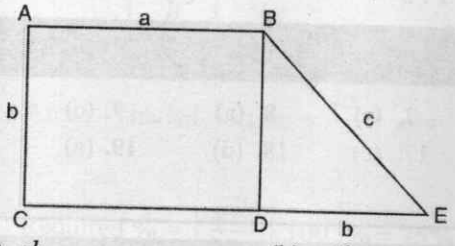
(c) 54 m (d) 56 m

3. The hypotenuse of a right-angled isosceles triangle is 5 cm. The area of the triangle is

(a) 5 cm^2 (b) 6.25 cm^2

(c) 6.5 cm^2 (d) 12.5 cm^2

4. What is the area of the given figure? *ABCD* is a rectangle and *BDE* is an isosceles right triangle.



(a) ab (b) ab^2

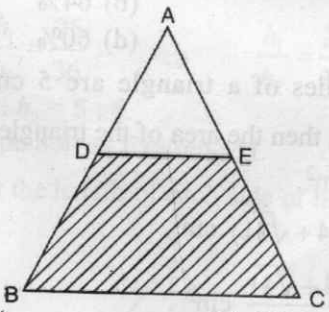
(c) cab (d) $b(a + b/2)$

5. The ratio of the bases of two triangles is $x : y$ and that of their areas is $a : b$. The ratio of their corresponding altitudes will be

(a) $\frac{a}{x} : \frac{b}{y}$ (b) $ax : by$

(c) $ay : bx$ (d) $\frac{x}{a} : \frac{b}{y}$

6. If *D* and *E* are the midpoints of the sides *AB* and *AC* respectively of ΔABC in the figure given here, the shaded region is what per cent of the whole triangular region?



(a) 50% (b) 25%

(c) 75% (d) 60%

7. The perimeter of a right angled triangle is 60 cm. Its hypotenuse is 26 cm. The area of the triangle is

(a) 120 cm^2 (b) 240 cm^2

(c) 390 cm^2 (d) 780 cm^2

8. The area of an equilateral triangle is $400\sqrt{3}$ m^2. Its perimeter is

(a) 120 m (b) 150 m

(c) 90 m (d) 135 m

9. The areas of two equilateral triangles are in the ratio 25 : 36. Their altitudes will be in the ratio

(a) 36 : 25 (b) 25 : 36

(c) 5 : 6 (d) $\sqrt{5} : \sqrt{6}$

10. From a point within an equilateral triangle, perpendiculars drawn to the three sides are 6 cm, 7 cm and 8 cm respectively. The length of the side of the triangle is

(a) 7 cm (b) 10.5 cm

(c) $14\sqrt{3}$ cm (d) $\frac{14\sqrt{3}}{3}$ cm

11. The height of an equilateral triangle is 10 cm. Its area is

(a) $\frac{100}{3}$ cm^2 (b) 30 cm^2

(c) 100 cm^2 (d) $\frac{100}{\sqrt{3}}$ cm^2

12. An equilateral triangle is described on the diagonal of a square. What is the ratio of the area of the triangle to that of the square?

(a) $2:\sqrt{3}$ (b) $4:\sqrt{3}$

(c) $\sqrt{3}:2$ (d) $\sqrt{3}:4$

13. A square and an equilateral triangle have the same perimeter. If the diagonal of the square is $12\sqrt{2}$ cm, then the area of the triangle is

(a) $24\sqrt{3}$ cm^2 (b) $24\sqrt{2}$ cm^2

(c) $64\sqrt{3}$ cm^2 (d) $32\sqrt{3}$ cm^2

14. If the side of an equilateral triangle is decreased by 20%, its area is decreased by

(a) 36% (b) 64%

(c) 40% (d) 60%

15. If the sides of a triangle are 5 cm, 4 cm and $\sqrt{41}$ cm, then the area of the triangle is

(a) 20 cm^2

(b) $(5+4+\sqrt{41})$ cm^2

(c) $\frac{5+4+\sqrt{41}}{2}$ cm^2

(d) 10 cm^2

16. The area of a triangle is 216 cm^2 and its sides are in the ratio 3 : 4 : 5. The perimeter of the triangle is

(a) 6 cm (b) 12 cm

(c) 36 cm (d) 72 cm

17. In a triangular field having sides 30 m, 72 m and 78 m, the length of the altitude to the side measuring 72 m is

(a) 25 m (b) 28 m

(c) 30 m (d) 35 m

18. If every side of an equilateral triangle is doubled, the area of the new triangle is K times the area of the old one. K is equal to

(a) $\sqrt{2}$ (b) 2

(c) 3 (d) 4

19. If the perimeter of a right angled isosceles triangle is $(6+3\sqrt{2})$ m, then the area of the triangle will be

(a) 4.5 m^2 (b) 5.4 m^2

(c) 9 m^2 (d) 81 m^2

20. If A be the area of a right angled triangle and b is the length of one of the sides containing the right angle, then the length of the altitude on the hypotenuse is

(a) $\frac{2Ab}{\sqrt{b^2+4A^2}}$ (b) $\frac{2Ab}{b^2+4A^2}$

(c) $\frac{2Ab}{\sqrt{b^4+4A^4}}$ (d) $\frac{2Ab}{\sqrt{b^4+4A^2}}$

21. Inside an equiangular triangular park, there is a flower bed forming a similar triangle. Around the flower bed runs a uniform path of such a width that the sides of the park are exactly double the corresponding sides of the flower bed. The ratio of the areas of the path to the flower bed is

(a) 1 : 1 (b) 1 : 2

(c) 1 : 3 (d) 3 : 1

Answers

1. (d)	**2.** (d)	**3.** (b)	**4.** (d)	**5.** (a)	**6.** (c)	**7.** (a)	**8.** (a)	**9.** (c)	**10.** (c)
11. (d)	**12.** (c)	**13.** (c)	**14.** (a)	**15.** (d)	**16.** (d)	**17.** (c)	**18.** (d)	**19.** (a)	**20.** (d)
21. (d)									

Hints and Solutions

1. (d) Area of the given triangle $= \frac{1}{2} \times$ base $\times$ height

$= \frac{1}{2} \times 15$ cm $\times 12$ cm

$= 90$ cm^2.

Area of another triangle $= 180$ cm^2,

Base $= 20$ cm

$\therefore A = \frac{1}{2}bh \Rightarrow h = \frac{2A}{b} = \frac{2\times 180 \text{ cm}^2}{20 \text{ cm}} =$ **18 cm.**

2. (d) Let the base and altitude of the triangle be $3x$ and $4x$ respectively. Then,

$\frac{1}{2} \times 3x \times 4x = 1176 \Rightarrow 6x^2 = 1176$