Mensuration
Exercise 20G

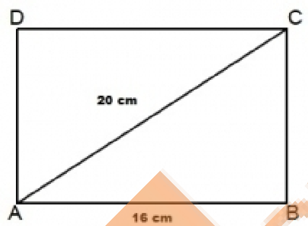
Mensuration RS Aggarwal Class 7 Maths Solutions Exercise 20G

Q1

Answer :

(c) 192 cm^2

Let ABCD be the rectangular plot.
Then, AB = 16 cm
AC = 20 cm



Let BC = x cm
From right triangle ABC:
$AC^2 = AB^2 + BC^2$
$\Rightarrow (20)^2 = (16)^2 + x^2$
$\Rightarrow x^2 = (20)^2 - (16)^2 \Rightarrow \{400 - 256\} = 144$
$\Rightarrow x = \sqrt{144} = 12$
$\therefore$ BC = 12 cm
$\therefore$ Area of the plot = (16 × 12) cm^2 = 192 cm^2

Q2

Answer :

(b) 72 cm^2

Given:

Diagonal of the square = 12 cm

∴ Area of the square = $\left\{\frac{1}{2} \times (\text{Diagonal})^2\right\}$ sq. units.

= $\left\{\frac{1}{2} \times (12)^2\right\}$ cm^2

= 72 cm^2

Q3

Answer :

(b) 20 cm

Area of the square = $\left\{\frac{1}{2} \times (Diagonal)^2\right\}$ sq. units.

Area of the square field = 200 cm^2

Diagonal of a square = $\sqrt{2 \times \text{Area of the square}}$

= $\left(\sqrt{2 \times 200}\right)$ cm = $\left(\sqrt{400}\right)$ cm = 20 cm

∴ Length of the diagonal of the square = 20 cm

Q4

Answer :

(a) 100 m

Area of the square = $\left\{\frac{1}{2} \times (Diagonal)^2\right\}$sq. units.

Given:

Area of square field = 0.5 hectare

= (0.5×10000) m^2 [since 1 hectare = 10000 m^2]

= 5000 m^2

Diagonal of a square = $\sqrt{2 \times \text{Area of the square}}$

= $\left(\sqrt{2 \times 5000}\right)$ m = 100 m

Hence, the length of the diagonal of a square field is 100 m.

Q5

Answer :

(c) 90 m

Let the breadth of the rectangular field be *x* m.
Length = 3*x* m
Perimeter of the rectangular field = 2(*l* + *b*)
⇒ 240 = 2(*x* + 3*x*)
⇒ 240 = 2(4*x*)
⇒ 240 = 8*x* ⇒ *x* = $\left(\frac{240}{8}\right) = 30$
∴ Length of the field = 3*x* = (3 × 30) m = 90 m

Q6

Answer :

(d) 56.25%

Let the side of the square be *a* cm.
Area of the square = $(a)^2$ cm^2
Increased side = (*a* + 25% of *a*) cm
= $\left(a + \frac{25}{100}a\right)$ cm = $\left(a + \frac{1}{4}a\right)\text{cm} = \left(\frac{5}{4}a\right)$ cm
Area of the square = $\left(\frac{5}{4}a\right)^2 \text{cm}^2 = \left(\frac{25}{16}a^2\right)$ cm^2
Increase in the area = $\left[\left(\frac{25}{16}a^2\right) - a^2\right]$ cm^2= $\left(\frac{25a^2 - 16a^2}{16}\right)$ cm^2 = $\left(\frac{9a^2}{16}\right)$ cm^2
% increase in the area = $\frac{\text{Increased area}}{\text{Old area}} \times 100$
= $\left[\frac{\left(\frac{9}{16}a^2\right)}{a^2} \times 100\right]$ = $\left(\frac{9 \times 100}{16}\right) = 56.25$

Q7

Answer :

(b) 1:2

Let the side of the square be *a*.
Length of its diagonal = $\sqrt{2}a$
∴ Required ratio = $\frac{a^2}{(\sqrt{2}a)^2} = \frac{a^2}{2a^2} = \frac{1}{2} = 1:2$

Q8

Answer :

(c) *A* > *B*

We know that a square encloses more area even though its perimeter is the same as that of the rectangle.

∴ Area of a square > Area of a rectangle

Q9

Answer :

(b) 13500 m^2

Let the length of the rectangular field be 5*x*.
Breadth = 3*x*
Perimeter of the field = 2(*l* + *b*) = 480 m (given)
⇒ 480 = 2(5*x* + 3*x*) ⇒ 480 = 16*x*
⇒ *x* = $\frac{480}{16}$ = 30
∴ Length = 5*x* = (5 × 30) = 150 m
Breadth = 3*x* = (3 × 30) = 90 m
∴ Area of the rectangular park = 150 m × 90 m = 13500 m^2

Q10

Answer :

(a) 6 m

Total cost of carpeting = Rs 6000
Rate of carpeting = Rs 50 per m
∴ Length of the carpet = $\left(\frac{6000}{50}\right)$ m = 120 m
∴ Area of the carpet = $\left(120 \times \frac{75}{100}\right)$ m^2 = 90 m^2 [since 75 cm = $\frac{75}{100}$ m]
Area of the floor = Area of the carpet = 90 m^2
∴ Width of the room = $\left(\frac{\text{Area}}{\text{Length}}\right) = \left(\frac{90}{15}\right)$ m = 6 m

Q11

Answer :

(a) 84 cm^2

Let a = 13 cm, b = 14 cm and c = 15 cm
Then, $s = \frac{a+b+c}{2} = \left(\frac{13+14+15}{2}\right)$ cm = 21 cm
∴ Area of the triangle = $\sqrt{s(s-a)(s-b)(s-c)}$ sq. units
= $\sqrt{21(21-13)(21-14)(21-15)}$ cm^2
= $\sqrt{21 \times 8 \times 7 \times 6}$ cm^2
= $\sqrt{3 \times 7 \times 2 \times 2 \times 2 \times 7 \times 2 \times 3}$ cm^2
= (2 × 2 × 3 × 7) cm^2
= 84 cm^2

Q12

Answer :

(b) 48 m^2

Base = 12 m
Height = 8 m
Area of the triangle = $\left(\frac{1}{2} \times \text{Base} \times \text{Height}\right)$ sq. units
= $\left(\frac{1}{2} \times 12 \times 8\right)$ m^2
= 48 m^2

Q13

Answer :

(b) 4 cm

Area of the equilateral triangle = $4\sqrt{3}$ cm^2

We know:
Area of an equilateral triangle = $\frac{\sqrt{3}}{4}(\text{side})^2$ sq. units
∴ Side of the equilateral triangle = $\left[\sqrt{\left(\frac{4 \times \text{Area}}{\sqrt{3}}\right)}\right]$ cm
= $\left[\sqrt{\left(\frac{4 \times 4\sqrt{3}}{\sqrt{3}}\right)}\right]$ cm = $\left(\sqrt{4 \times 4}\right)$ cm = $\left(\sqrt{16}\right)$ cm = 4 cm

Q14

Answer :

(c) $16\sqrt{3}$ cm^2

It is given that one side of an equilateral triangle is 8 cm.
∴ Area of the equilateral triangle = $\frac{\sqrt{3}}{4}(\text{Side})^2$ sq. units
= $\frac{\sqrt{3}}{4}(8)^2$ cm^2
= $\left(\frac{\sqrt{3}}{4} \times 64\right)$ cm^2 = $16\sqrt{3}$ cm^2

Q15

Answer :

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

Let ΔABC be an equilateral triangle with one side of the length *a* cm.

Diagonal of an equilateral triangle = $\frac{\sqrt{3}}{2}\boldsymbol{a}$ cm

$\Rightarrow \frac{\sqrt{3}}{2}\boldsymbol{a} = \sqrt{6}$

$\Rightarrow a = \frac{\sqrt{6}\times 2}{\sqrt{3}} = \frac{\sqrt{3}\times\sqrt{2}\times 2}{\sqrt{3}} = 2\sqrt{2}$ cm

Area of the equilateral triangle = $\frac{\sqrt{3}}{4}\boldsymbol{a}^2$

$= \frac{\sqrt{3}}{4}\left(2\sqrt{2}\right)^2$ cm^2 = $\left(\frac{\sqrt{3}}{4}\times 8\right)$cm^2 = $2\sqrt{3}$ cm^2

Q16

Answer :

(b) 72 cm^2

Base of the parallelogram = 16 cm

Height of the parallelogram = 4.5 cm

∴ Area of the parallelogram = Base × Height

= (16 × 4.5) cm^2 = 72 cm^2

Q17

Answer :

(b) 216 cm^2

Length of one diagonal = 24 cm

Length of the other diagonal = 18 cm

∴ Area of the rhombus = $\frac{1}{2}$ × (Product of the diagonals)

= $\left(\frac{1}{2}\times 24\times 18\right)$ cm^2 = 216 cm^2

Q18

Answer :

(c) 154 cm^2

Let the radius of the circle be *r* cm.

Circumference = $2\pi\mathbf{r}$

(Circumference) - (Radius) = 37

∴ $(2\pi\mathbf{r} - \mathbf{r}) = 37$

$\Rightarrow \boldsymbol{r}(2\pi - 1) = 37$

$\Rightarrow r = \frac{37}{(2\pi-1)} = \frac{37}{\left(2\times\frac{22}{7}-1\right)} = \frac{37}{\left(\frac{44}{7}-1\right)} = \frac{37}{\left(\frac{44-7}{7}\right)} = \left(\frac{37\times 7}{37}\right) = 7$

∴ Radius of the given circle is 7 cm.

∴ Area = $\pi\mathbf{r}^2$ = $\left(\frac{22}{7}\times 7\times 7\right)$ cm^2 = 154 cm^2

Q19

Answer :

(c) 54 m^2

Given:
Perimeter of the floor = $2(l + b)$ = 18 m
Height of the room = 3 m

∴ Area of the four walls = $\{2(l + b) \times h\}$
= Perimeter × Height
= 18 m × 3 m = 54 m^2

Q20

Answer :

(a) 200 m

Area of the floor of a room = 14 m × 9 m = 126 m^2

Width of the carpet = 63 cm = 0.63 m (since 100 cm = 1 m)

∴ Required length of the carpet = $\frac{\text{Area of the floor of a room}}{\text{Width of the carpet}}$
= $\left(\frac{126}{0.63}\right) \mathrm{m} = 200 \mathrm{~m}$

Q21

Answer :

(c) 120 cm^2

Let the length of the rectangle be x cm and the breadth be y cm.
Area of the rectangle = xy cm^2
Perimeter of the rectangle = $2(x + y)$ = 46 cm (given)
⇒ $2(x + y) = 46$
⇒ $(x + y) = \left(\frac{46}{2}\right)$ cm = 23 cm

Diagonal of the rectangle = $\sqrt{x^2 + y^2}$ = 17 cm
⇒ $\sqrt{x^2 + y^2} = 17$

Squaring both the sides, we get:
⇒ $x^2 + y^2 = (17)^2$
⇒ $x^2 + y^2 = 289$

Now, $(x^2 + y^2) = (x + y)^2 - 2xy$
⇒ $2xy = (x + y)^2 - (x^2 + y^2)$
$= (23)^2 - 289$
$= 529 - 289 = 240$
∴ $xy = \left(\frac{240}{2}\right)$ cm^2 = 120 cm^2

Q22

Answer :

(b) 3:1

Let a side of the first square be a cm and that of the second square be b cm.
Then, their areas will be a^2 and b^2, respectively.
Their perimeters will be $4a$ and $4b$, respectively.

According to the question:
$\frac{a^2}{b^2} = \frac{9}{1} \Rightarrow \left(\frac{a}{b}\right)^2 = \frac{9}{1} = \left(\frac{3}{1}\right)^2 \Rightarrow \frac{a}{b} = \frac{3}{1}$

∴ Required ratio of the perimeters = $\frac{4a}{4b} = \frac{4 \times 3}{4 \times 1} = \frac{3}{1}$ = 3:1

Q23

Answer :

(d) 4:1

Let the diagonals be 2*d* and *d*.
Area of the square = sq. units
Required ratio =

Q24

Answer :

(c) 49 m

Let the width of the rectangle be *x* m.

Given:
Area of the rectangle = Area of the square
⇒ Length × Width = Side × Side
⇒ (144 × *x*) = 84 × 84
∴ Width (*x*) = $\left(\frac{84\times84}{144}\right)$m = 49 m
Hence, width of the rectangle is 49 m.

Q25

Answer :

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

Let one side of the square and that of an equilateral triangle be the same, i.e. *a* units.
Then, Area of the square = $(\text{Side})^2 = (a)^2$
Area of the equilateral triangle = $\frac{\sqrt{3}}{4}(\text{Side})^2 = \frac{\sqrt{3}}{4}(\text{a})^2$
∴ Required ratio = $\frac{a^2}{\frac{\sqrt{3}}{4}a^2} = \frac{4}{\sqrt{3}} = 4:\sqrt{3}$

Q26

Answer :

(a) $\sqrt{\pi}:1$

Let the side of the square be *x* cm and the radius of the circle be *r* cm.
Area of the square = Area of the circle
⇒ $(x)^2 = \pi r^2$
∴ Side of the square $(x) = \sqrt{\pi}r$
Required ratio = $\frac{\text{Side of the square}}{\text{Radius of the circle}}$
$= \frac{x}{r} = \frac{\sqrt{\pi}r}{r} = \frac{\sqrt{\pi}}{1} = \sqrt{\pi}:1$

Q27

Answer :

(b) $\frac{49\sqrt{3}}{4}$ cm^2

Let the radius of the circle be *r* cm.
Then, its area = πr^2 cm^2
∴ $\pi r^2 = 154$
⇒ $\frac{22}{7}\times r\times r = 154$
⇒ $r^2 = \left(\frac{154\times7}{22}\right) = 49$
⇒ $r = \sqrt{49}$ cm = 7 cm

Side of the equilateral triangle = Radius of the circle
= 7 cm
∴ Area of the equilateral triangle = $\frac{\sqrt{3}}{4}(\text{side})^2$ sq. units

$= \frac{\sqrt{3}}{4}(7)^2$ cm^2

$= \frac{49\sqrt{3}}{4}$ cm^2

Q28

Answer :

(c) 12 cm

Area of the rhombus = $\frac{1}{2}$ × (Product of the diagonals)
Given:
Length of one diagonal = 6 cm
Area of the rhombus = 36 cm^2

∴ Length of the other diagonal = $\left(\frac{36\times2}{6}\right)$ cm = 12 cm

Q30

Answer :

(c) 17.60 m

Let the radius of the circle be *r* m.
Area = πr^2 m^2
∴ πr^2 = 24.64
⇒ $\left(\frac{22}{7}\times r\times r\right)$ = 24.64
⇒ r^2 = $\left(\frac{24.64\times7}{22}\right)$ = 7.84
⇒ r = $\sqrt{7.84}$ = 2.8 m
⇒ Circumference of the circle = $(2\pi r)$ m
= $\left(2\times\frac{22}{7}\times2.8\right)$ m = 17.60 m

Q31

Answer :

(c) 3 cm

Suppose the radius of the original circle is *r* cm.
Area of the original circle = πr^2

Radius of the circle = (r +1) cm
According to the question:
$\pi(r+1)^2=\pi r^2+22$
⇒ $\pi(r^2+1+2r)=\pi r^2+22$
⇒ $\pi r^2+\pi+2\pi r=\pi r^2+22$
⇒ $\pi+2\pi r=22$ [cancel πr^2 from both the sides of the equation]
⇒ $\pi(1+2r)=22$
⇒ $(1+2r)=\frac{22}{\pi}=\left(\frac{22\times7}{22}\right)=7$
⇒ $2r$ = 7 -1 = 6
∴ r = $\left(\frac{6}{2}\right)$ cm = 3 cm
∴ Original radius of the circle = 3 cm

Q32

Answer :

(c) 1000

Radius of the wheel = 1.75 m
Circumference of the wheel = $2\pi r$
= $\left(2\times\frac{22}{7}\times1.75\right)$cm = (2 × 22 × 0.25) m = 11 m

Distance covered by the wheel in 1 revolution is 11 m.
Now, 11 m is covered by the car in 1 revolution.
(11 × 1000) m will be covered by the car in $\left(1\times\frac{1}{11}\times11\times1000\right)$ revolutions, i.e. 1000 revolutions.
∴ Required number of revolutions = 1000