CHAPTER: 6 - Measuring Space: Perimeter and Area

Exercise set 6.1 (Solution)

1. The perimeter of a circle is 44 cm. What is its radius?
   Sol.-
   Given: Circumference of circle $= 44$ cm
   Formula:
   $$C = 2\pi r$$
   Substitute values:
   $$2 \times \frac{22}{7} \times r = 44$$
   Simplify:
   $$\frac{44}{7} \times r = 44$$
   $$r = \frac{44 \times 7}{44}$$
   $$r = 7 \text{ cm}$$
2. Calculate, correct to 3 significant figures, the circumference of a circle with: (i) radius 7 cm (ii) radius 10 cm (iii) radius 12 cm.
   Sol.
   (i) Radius $r = 7$ cm
   $$C = 2 \times 3.1416 \times 7$$
   $$C = 43.982 \text{ cm}$$
   Correct to 3 significant figures:
   $$C = 44.0 \text{ cm}$$
   (ii) Radius $r = 10$ cm
   $$C = 2 \times 3.1416 \times 10$$
   $$C = 62.832 \text{ cm}$$
   Correct to 3 significant figures:
   $$C = 62.8 \text{ cm}$$
   (iii) Radius $r = 12$ cm
   $$C = 2 \times 3.1416 \times 12$$
   $$C = 75.398 \text{ cm}$$
   Correct to 3 significant figures:
   $$C = 75.4 \text{ cm}$$
3. Calculate the length of the arc of a circle if: (i) the radius is 3.5 cm and the angle at the centre is 60°, and (ii) the radius is 6.3 m and the angle at the centre is 120°.
   Sol.
   $$\text{Arc length} = \frac{\theta}{360^\circ} \times 2\pi r$$
   (i) Radius $r = 3.5$ cm, $\theta = 60^\circ$

$$\text{Arc length} = \frac{60}{360} \times 2 \times \frac{22}{7} \times 3.5$$
$$= \frac{1}{6} \times 2 \times \frac{22}{7} \times 3.5$$
$$= \frac{1}{6} \times 22$$
$$= \frac{22}{6} = 3.67 \text{ cm}$$

(ii) Radius $r = 6.3$ m, $\theta = 120^\circ$

$$\text{Arc length} = \frac{120}{360} \times 2 \times \frac{22}{7} \times 6.3$$
$$= \frac{1}{3} \times 2 \times \frac{22}{7} \times 6.3$$
$$= \frac{1}{3} \times \frac{277.2}{7}$$
$$= \frac{1}{3} \times 39.6$$
$$= 13.2 \text{ m}$$

4. Find the perimeter of a sector (i.e., the curved portion as well as the two straight portions) of a circle of radius 14 cm and sector angle 75°.

Sol.-

perimeter of sector $=$ Arc length $+ 2r$

Arc length:

$$\text{Arc length} = \frac{\theta}{360^\circ} \times 2\pi r$$

Given:

Radius $r = 14$ cm

Angle $\theta = 75^\circ$

Arc length

$$\text{Arc length} = \frac{75}{360} \times 2 \times \frac{22}{7} \times 14$$
$$= \frac{75}{360} \times 88$$
$$= \frac{75 \times 88}{360}$$
$$= \frac{6600}{360} = 18.33 \text{ cm}$$
$$\text{Perimeter} = 18.33 + 2 \times 14$$
$$= 18.33 + 28$$
$$= 46.33 \text{ cm}$$

5. Find the perimeters of the following shapes (taking the arcs to be quarter or half or three-quarters of a circle, as appropriate) (Fig. 6.14 i to 6.14 ix):

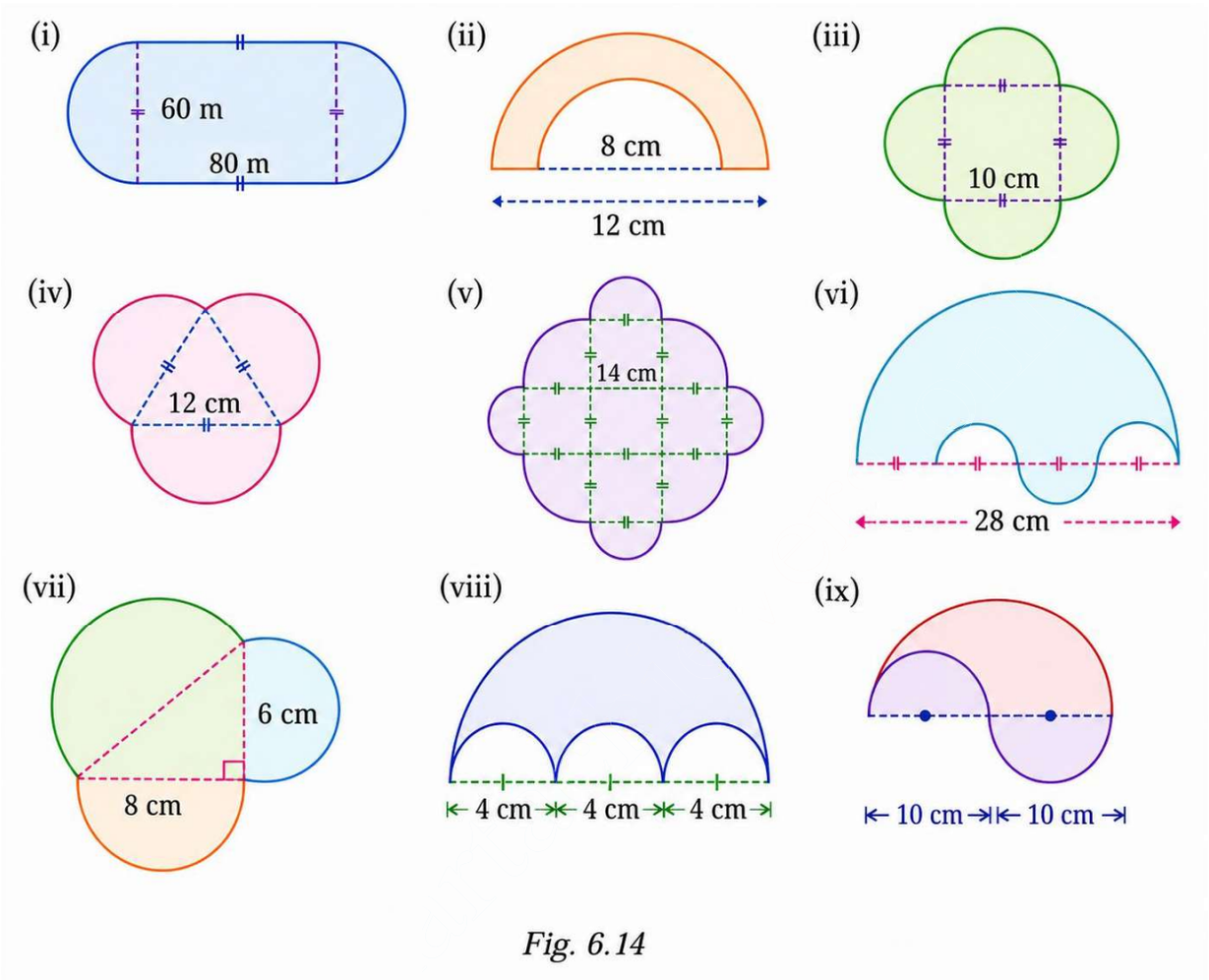


Fig. 6.14

Sol.- We know:

Circumference of a circle $= \pi d$

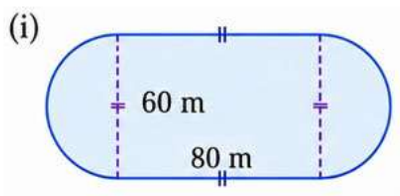
Length of a semicircle $= \frac{1}{2}\pi d$

$$\pi = \frac{22}{7}$$

(i)

The shape consists of a rectangle of length 80 mand two semicircles at the ends.

The two semicircles together make one complete circle.



Diameter of circle:

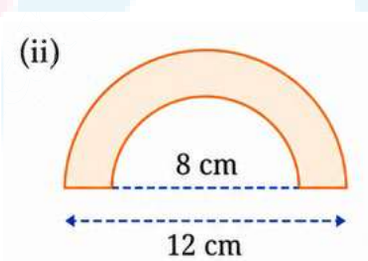
$$d = 60 \text{ m}$$

Perimeter:

$$\begin{aligned} &= 2 \times 80 + \pi \times 60 \\ &= 160 + \frac{22}{7} \times 60 \\ &= 160 + 188.57 \\ &= 348.57 \text{ m} \end{aligned}$$

$\boxed{348.57 \text{ m}}$

(ii)



The shape is made of two semicircular arcs.

Outer diameter:

$$12 \text{ cm}$$

Inner diameter:

$$8 \text{ cm}$$

The two straight parts together are:

$$12 - 8 = 4 \text{ cm}$$

Perimeter:

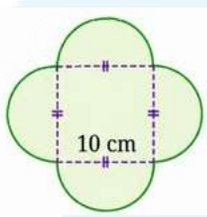
$$\begin{aligned}
&= \frac{1}{2}\pi(12) + \frac{1}{2}\pi(8) + 4 \\
&= 6\pi + 4\pi + 4 \\
&= 10\pi + 4 \\
&= 10 \times \frac{22}{7} + 4 \\
&= 31.43 + 4 \\
&= 35.43 \text{ cm}
\end{aligned}$$

$\boxed{35.43 \text{ cm}}$

(iii)

The figure has 4 semicircles, each having diameter 10 cm.

(iii)



Perimeter:

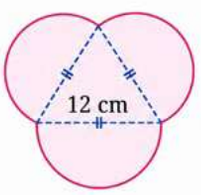
$$\begin{aligned}
&= 4 \times \frac{1}{2}\pi(10) \\
&= 2\pi \times 10 \\
&= 20\pi \\
&= 20 \times \frac{22}{7} \\
&= 62.86 \text{ cm}
\end{aligned}$$

$\boxed{62.86 \text{ cm}}$

(iv)

The figure consists of 3 semicircles, each of diameter 12 cm.

(iv)

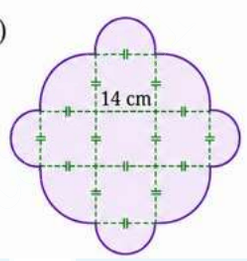


Perimeter:

$$= 3 \times \frac{1}{2}\pi(12)$$
$$= 18\pi$$
$$= 18 \times \frac{22}{7}$$
$$= 56.57 \text{ cm}$$
$$\boxed{56.57 \text{ cm}}$$

(v)

(v)



The given length is 14 cm.
Each small arc has diameter:

$$\frac{14}{2} = 7 \text{ cm}$$

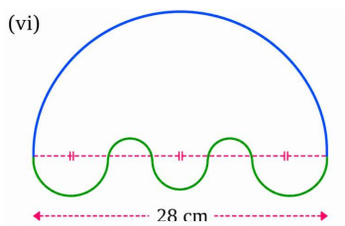
The total boundary is equal to the circumference of 4 circles of diameter 7 cm.

Perimeter:

$$= 4 \times \pi \times 7$$
$$= 4 \times \frac{22}{7} \times 7$$
$$= 88 \text{ cm}$$
$$\boxed{88 \text{ cm}}$$

(vi)

The outer arc is a semicircle of diameter 28 cm.



The lower boundary has 4 semicircles of equal diameter.

Diameter of each small semicircle:

$$\frac{28}{4} = 7 \text{ cm}$$

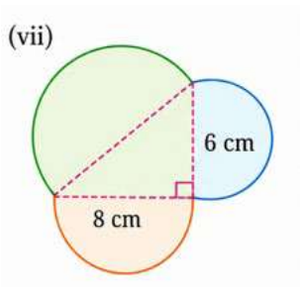
Perimeter:

$$= \frac{1}{2}\pi(28) + 4 \times \frac{1}{2}\pi(7)$$
$$= 14\pi + 14\pi$$
$$= 28\pi$$
$$= 28 \times \frac{22}{7}$$
$$= 88 \text{ cm}$$

$\boxed{88 \text{ cm}}$

(vii)

The figure contains three semicircles.



Their diameters are:

$$6 \text{ cm}, \ 8 \text{ cm}, \ 10 \text{ cm}$$

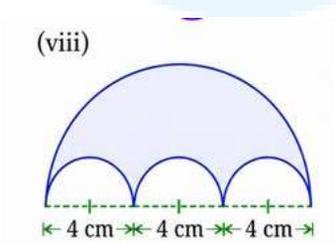
Here, 10 cmis found using Pythagoras theorem:

$$10^2 = 6^2 + 8^2$$
$$10^2 = 36 + 64 = 100$$
$$10 = 10 \text{ cm}$$

Perimeter:

$$= \frac{1}{2}\pi(6) + \frac{1}{2}\pi(8) + \frac{1}{2}\pi(10)$$
$$= \frac{1}{2}\pi(6 + 8 + 10)$$
$$= \frac{1}{2}\pi(24)$$
$$= 12\pi$$
$$= 12 \times \frac{22}{7}$$
$$= 37.71 \text{ cm}$$
$$\boxed{37.71 \text{ cm}}$$

(viii)



The large semicircle has diameter:

$$4 + 4 + 4 = 12 \text{ cm}$$

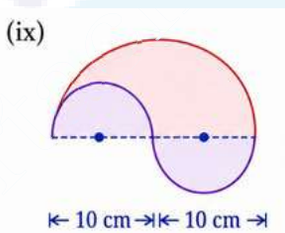
There are 3 smaller semicircles, each of diameter 4 cm.

Perimeter:

$$= \frac{1}{2}\pi(12) + 3 \times \frac{1}{2}\pi(4)$$
$$= 6\pi + 6\pi$$
$$= 12\pi$$
$$= 12 \times \frac{22}{7}$$
$$= 37.71 \text{ cm}$$
$$\boxed{37.71 \text{ cm}}$$

(ix)

The figure has three semicircular arcs.



Their diameters are:

$$10 \text{ cm},\ 10 \text{ cm},\ 20 \text{ cm}$$

Perimeter:

$$= \frac{1}{2}\pi(10) + \frac{1}{2}\pi(10) + \frac{1}{2}\pi(20)$$
$$= \frac{1}{2}\pi(40)$$
$$= 20\pi$$
$$= 20 \times \frac{22}{7}$$
$$= 62.86 \text{ cm}$$

$\boxed{62.86 \text{ cm}}$

6. If the diameter of a car tyre is 56 cm, then: (i) How far does the car need to travel for the tyre to complete one revolution? (ii) How many revolutions does the tyre make if the car travels 10 km?

Sol.-

Given:
Diameter of tyre

$$d = 56 \text{ cm}$$

We know that the distance travelled in one revolution is equal to the circumference of the tyre.

(i) Distance travelled in one revolution
Circumference of tyre

$$C = \pi d$$
$$C = \pi d$$

Substituting the values,

$$C = \frac{22}{7} \times 56$$
$$= 22 \times 8$$
$$= 176 \text{ cm}$$

Therefore, the car travels

$\boxed{176 \text{ cm}}$

in one revolution.

(ii) Number of revolutions in 10 km
Distance travelled by car

$$10 \text{ km}$$

Convert into centimetres:

$$10 \text{ km} = 10 \times 1000 \times 100$$
$$= 1000000 \text{ cm}$$

Distance covered in one revolution

$$= 176 \text{ cm}$$

Number of revolutions

$$= \frac{1000000}{176}$$
$$= 5681.82$$
$$\approx 5682$$

Therefore, the tyre makes

$$\boxed{5682 \text{ revolutions (approximately)}}$$

while travelling 10 km.

7. Find the total perimeter of all the petals in each of the given flowers.

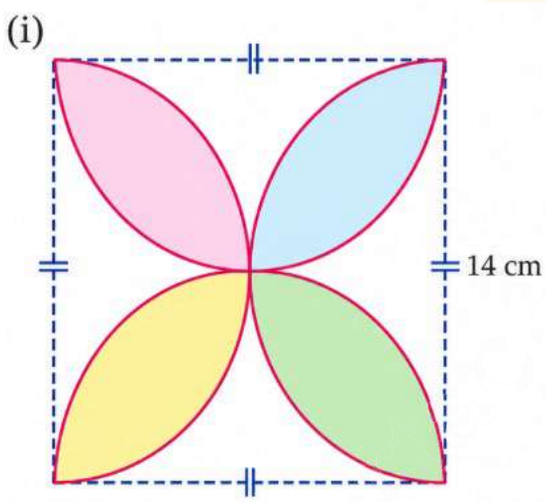


Fig. 6.15A: The centres of the arcs are the midpoints of the sides of the square

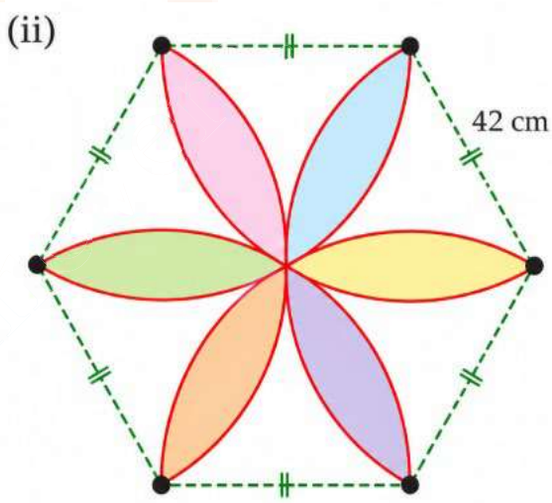


Fig. 6.15B: The centres of the arcs are the vertices of the hexagon

Sol.-

Given: Find total perimeter of all petals

Take:

$$\pi = \frac{22}{7}$$

(i) Square flower

Side of square:

$$14 \text{ cm}$$

Each arc has radius:

$$\frac{14}{2} = 7 \text{ cm}$$

Each petal is made of **two quarter-circles**.
So, perimeter of 1 petal:

$$= 2 \times \frac{1}{4} \times 2\pi r$$
$$= \pi r$$
$$= \frac{22}{7} \times 7$$
$$= 22 \text{ cm}$$

There are 4 petals.
Total perimeter of all petals:

$$= 4 \times 22$$
$$= 88 \text{ cm}$$
$$\boxed{88 \text{ cm}}$$

(ii) Hexagon flower
Side of hexagon:

$$42 \text{ cm}$$

Each arc has radius:

$$42 \text{ cm}$$

Each petal is made of **two arcs of** $60°$.
Length of one $60°$arc:

$$= \frac{60}{360} \times 2\pi r$$
$$= \frac{1}{6} \times 2\pi \times 42$$
$$= 14\pi$$
$$= 14 \times \frac{22}{7}$$
$$= 44 \text{ cm}$$

Perimeter of 1 petal:

$$= 2 \times 44 = 88 \text{ cm}$$

There are 6 petals.
Total perimeter of all petals:

$$= 6 \times 88$$
$$= 528 \text{ cm}$$
$$\boxed{528 \text{ cm}}$$

8. The ratio of the perimeters of two circles is 5:4. What is the ratio of their radii?

Sol.-
We know that:

Perimeter (Circumference) of a circle $= 2\pi r$
$C = 2\pi r$

Let the radii of the two circles be r_1 and r_2.
Given:

Perimeters ratio $= 5:4$

So,

$$\frac{2\pi r_1}{2\pi r_2} = \frac{5}{4}$$

Cancelling 2π from both numerator and denominator,

$$\frac{r_1}{r_2} = \frac{5}{4}$$

Therefore, the ratio of their radii is

$$\boxed{5:4}$$

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