

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, $\theta = 60^\circ$



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

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

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

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 $r = 14 \text{ cm}$

Angle $\theta = 75^\circ$

Arc length

$$\begin{aligned}
 \text{Arc length} &= \frac{75}{360} \times 2 \times \frac{22}{7} \times 14 \\
 &= \frac{75}{360} \times 88 \\
 &= \frac{75 \times 88}{360} \\
 &= \frac{6600}{360} = 18.33 \text{ cm}
 \end{aligned}$$

$$\begin{aligned}
 \text{Perimeter} &= 18.33 + 2 \times 14 \\
 &= 18.33 + 28 \\
 &= 46.33 \text{ cm}
 \end{aligned}$$

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):



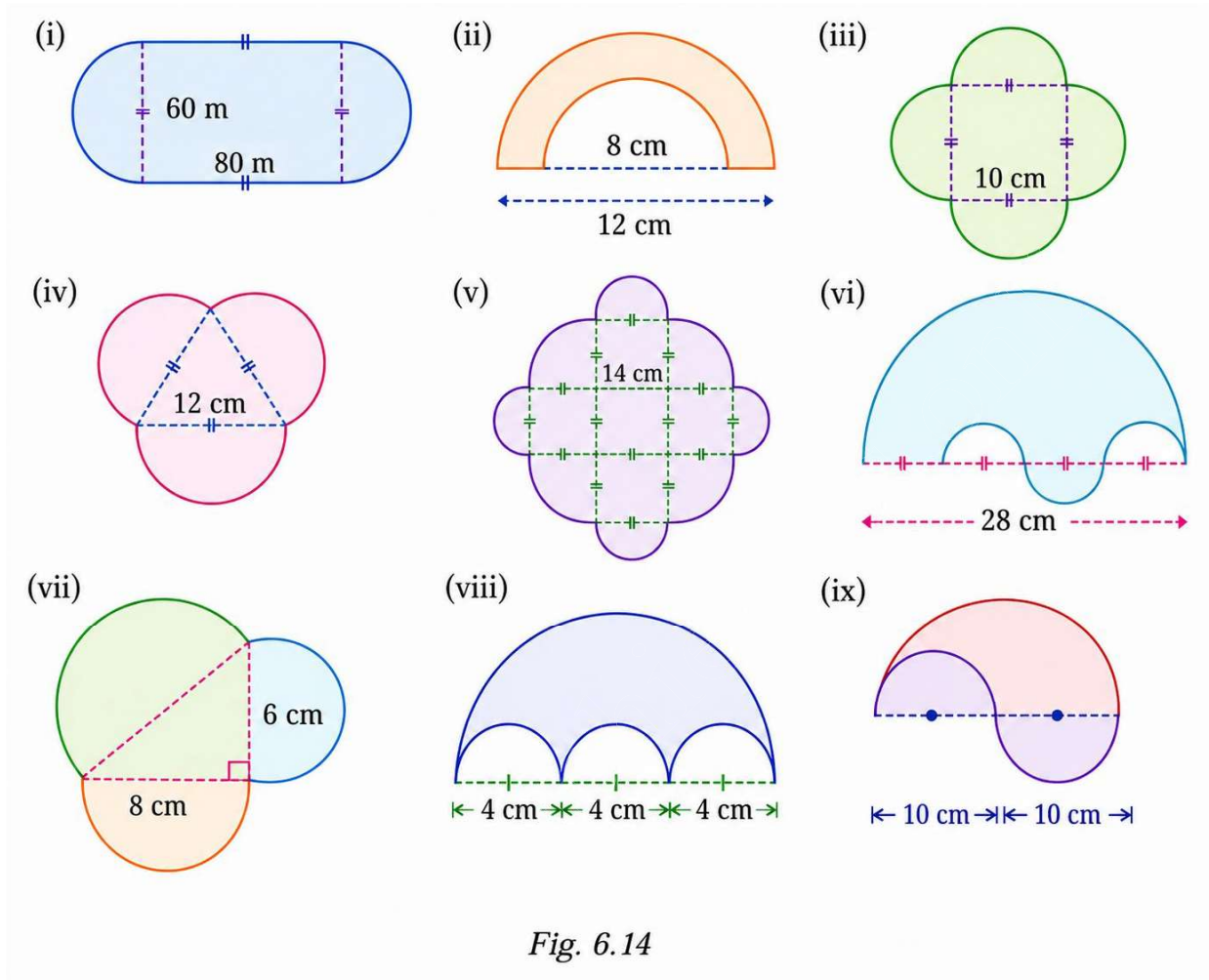


Fig. 6.14

Sol.- We know:

$$\text{Circumference of a circle} = \pi d$$

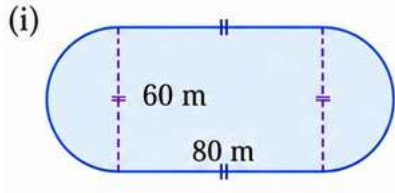
$$\text{Length of a semicircle} = \frac{1}{2} \pi d$$

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

(i)

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

The two semicircles together make one complete circle.



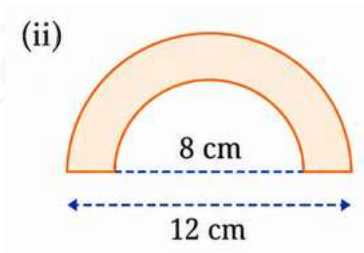
Diameter of circle:

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

Perimeter:

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

(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:

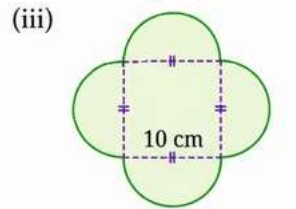
$$12 - 8 = 4 \text{ cm}$$

Perimeter:

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

(iii)

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



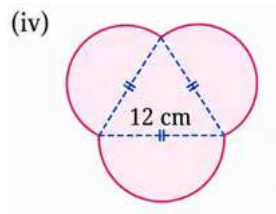
Perimeter:

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

(iv)

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

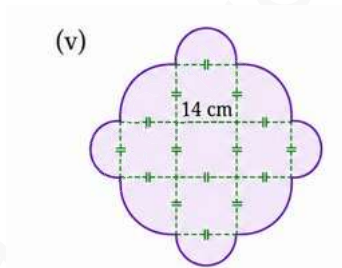




Perimeter:

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

(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.

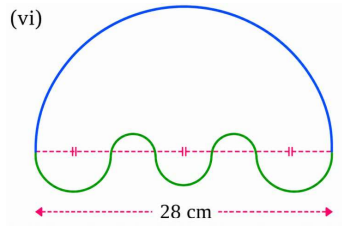
Perimeter:

$$\begin{aligned}
 &= 4 \times \pi \times 7 \\
 &= 4 \times \frac{22}{7} \times 7 \\
 &= 88 \text{ cm} \\
 &\boxed{88 \text{ cm}}
 \end{aligned}$$



(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:

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

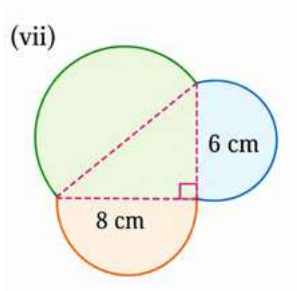
Perimeter:

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

(vii)

The figure contains three semicircles.





Their diameters are:

6 cm, 8 cm, 10 cm

Here, 10 cm is found using Pythagoras theorem:

$$10^2 = 6^2 + 8^2$$

$$10^2 = 36 + 64 = 100$$

$$10 = 10 \text{ cm}$$

Perimeter:

$$= \frac{1}{2}\pi(6) + \frac{1}{2}\pi(8) + \frac{1}{2}\pi(10)$$

$$= \frac{1}{2}\pi(6 + 8 + 10)$$

$$= \frac{1}{2}\pi(24)$$

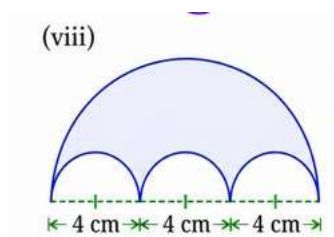
$$= 12\pi$$

$$= 12 \times \frac{22}{7}$$

$$= 37.71 \text{ cm}$$

37.71 cm

(viii)



The large semicircle has diameter:



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

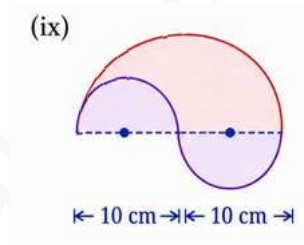
There are 3 smaller semicircles, each of diameter 4 cm.

Perimeter:

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

(ix)

The figure has three semicircular arcs.



Their diameters are:

10 cm, 10 cm, 20 cm

Perimeter:

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



62.86 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,

$$\begin{aligned} C &= \frac{22}{7} \times 56 \\ &= 22 \times 8 \\ &= 176 \text{ cm} \end{aligned}$$

Therefore, the car travels

176 cm

in one revolution.

(ii) Number of revolutions in 10 km

Distance travelled by car

10 km

Convert into centimetres:

$$\begin{aligned} 10 \text{ km} &= 10 \times 1000 \times 100 \\ &= 1000000 \text{ cm} \end{aligned}$$

Distance covered in one revolution

$$= 176 \text{ cm}$$

Number of revolutions



$$\begin{aligned}
 &= \frac{1000000}{176} \\
 &= 5681.82 \\
 &\approx 5682
 \end{aligned}$$

Therefore, the tyre makes

5682 revolutions (approximately)

while travelling 10 km.

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

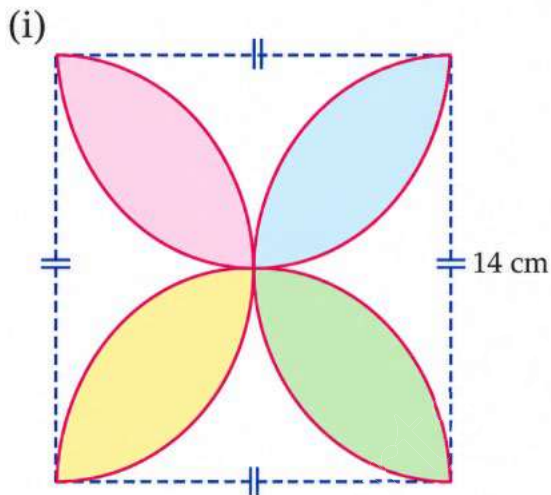


Fig. 6.15A: The centres of the arcs are the midpoints of the sides of the square

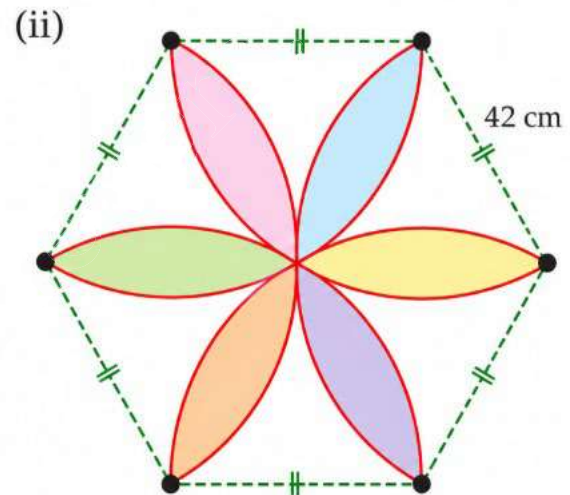


Fig. 6.15B: The centres of the arcs are the vertices of the hexagon

Sol.-

Given: Find total perimeter of all petals

Take:

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

(i) Square flower

Side of square:

14 cm



Each arc has radius:

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

Each petal is made of **two quarter-circles**.

So, perimeter of 1 petal:

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

There are 4 petals.

Total perimeter of all petals:

$$\begin{aligned} &= 4 \times 22 \\ &= 88 \text{ cm} \\ &\boxed{88 \text{ cm}} \end{aligned}$$

(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:

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

Perimeter of 1 petal:

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



There are 6 petals.

Total perimeter of all petals:

$$\begin{aligned} &= 6 \times 88 \\ &= 528 \text{ cm} \\ &\boxed{528 \text{ cm}} \end{aligned}$$

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

Sol.-

We know that:

$$\begin{aligned} \text{Perimeter (Circumference) of a circle} &= 2\pi r \\ C &= 2\pi r \end{aligned}$$

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

Given:

$$\text{Perimeters ratio} = 5:4$$

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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