



Class 9 Maths – Chapter 6



End-of-Chapter Exercises – Important Questions with Answer Key

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The textbook has **27 End-of-Chapter Exercises**. Questions marked ★ are challenge/advanced questions in the textbook. Unless stated otherwise, use $\pi \approx 22/7$.

1. 🧩 Algebraic Identities as Area Models

Draw area models for:

$$(a + b)(a - b) = a^2 - b^2$$

and

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$



Answer:

These identities can be represented by dividing suitable squares/rectangles into smaller regions whose areas correspond to the terms on the right-hand side.

2. ▲ Isosceles Triangle

Question: An isosceles triangle has perimeter **40 cm**. Its equal sides are **15 cm each**. Find its area.

Solution:

Base:

$$40 - 15 - 15 = 10 \text{ cm}$$

Half-base = **5 cm**

Height:

$$\sqrt{(15^2 - 5^2)}$$

$$= \sqrt{200}$$

$$= 10\sqrt{2} \text{ cm}$$

Area:

$$= \frac{1}{2} \times 10 \times 10\sqrt{2}$$

$$= 50\sqrt{2} \text{ cm}^2$$

 **Answer:**

$$50\sqrt{2} \text{ cm}^2 \approx 70.71 \text{ cm}^2$$

3. Find Equal Sides

Question: An isosceles triangle has base **10 cm** and area **60 cm²**. Find the equal sides.

Solution:

$$60 = \frac{1}{2} \times 10 \times h$$

Therefore:

$$h = 12 \text{ cm}$$

Half-base = 5 cm.

Equal side:

$$\sqrt{(12^2 + 5^2)}$$

$$= \sqrt{169}$$

$$= 13 \text{ cm}$$

 **Answer:**

13 cm each

4. Right-Angled Triangle

Question: Area of a right-angled triangle is **54 cm²**. One leg is **12 cm**. Find its perimeter.

Solution:

$$54 = \frac{1}{2} \times 12 \times \text{other leg}$$

$$\text{Other leg} = \mathbf{9 \text{ cm}}$$

Hypotenuse:

$$\sqrt{(12^2 + 9^2)}$$

$$= \sqrt{225}$$

$$= \mathbf{15 \text{ cm}}$$

Perimeter:

$$12 + 9 + 15$$

$$= \mathbf{36 \text{ cm}}$$

 **Answer:**

36 cm

5. Heron's Formula

Question: The sides of a triangle are in the ratio **2 : 3 : 4** and its perimeter is **45 cm**. Find its area.

Sides:

10 cm, 15 cm, 20 cm

Semi-perimeter:

$$s = 45/2 = \mathbf{22.5 \text{ cm}}$$

Using Heron's formula:

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

$$= \sqrt{(22.5 \times 12.5 \times 7.5 \times 2.5)}$$

$$= \mathbf{75\sqrt{15/4} \text{ cm}^2}$$

 **Answer:**

$$\mathbf{75\sqrt{15/4} \text{ cm}^2 \approx 72.62 \text{ cm}^2}$$

6. Triangle in Two Ways

Question: The sides of a triangle are **7 cm, 24 cm and 25 cm**. Find its area in two different ways.

Method 1: Pythagoras

Since:

$$7^2 + 24^2 = 25^2$$

the triangle is right-angled.

Area:

$$= \frac{1}{2} \times 7 \times 24$$

$$= \mathbf{84 \text{ cm}^2}$$

Method 2: Heron's Formula

$$s = (7 + 24 + 25)/2$$

$$= \mathbf{28}$$

Area:

$$= \sqrt{(28 \times 21 \times 4 \times 3)}$$

$$= 84 \text{ cm}^2$$

✓ **Answer:**

$$84 \text{ cm}^2$$

7. Bicycle Wheel

Question: A bicycle wheel has diameter **60 cm**. How far does the cyclist travel after **100 rotations**?

Distance in one rotation:

$$= \pi d$$

$$= 22/7 \times 60$$

$$= 1320/7 \text{ cm}$$

For 100 rotations:

$$= 132000/7 \text{ cm}$$

$$= 18857.14 \text{ cm}$$

$$= 188.57 \text{ m approximately}$$

✓ **Answer:**

$$188.57 \text{ m approximately}$$

The textbook gives this as Question 7.

8. Quadrant

Question: Find the area of a quadrant of a circle whose circumference is **66 cm**.

Solution:

$$2\pi r = 66$$

Using $\pi = 22/7$:

$$r = 10.5 \text{ cm}$$

Area of quadrant:

$$= \frac{1}{4} \times \frac{22}{7} \times 10.5^2$$

$$= 86.625 \text{ cm}^2$$

✓ **Answer:**

$$86.625 \text{ cm}^2$$

9. Car Wheel

Question: A car wheel has outer radius 28 cm.

(i) Distance travelled in one complete turn

Circumference:

$$= 2\pi r$$

$$= 2 \times \frac{22}{7} \times 28$$

$$= 176 \text{ cm}$$

(ii) Revolutions in 1 km

$$1 \text{ km} = 100,000 \text{ cm}$$

Number of revolutions:

$$= 100000/176$$

$$\approx 568.18$$

✓ **Answers:**

(i) 176 cm

(ii) Approximately 568 revolutions

The textbook asks both parts in Question 9.

10. Same Area and Same Perimeter

Question: Two rectangles have the same area and the same perimeter. Does this mean that they are congruent?

 **Answer:**

Yes, for rectangles.

If two rectangles have the same perimeter and area, their side lengths are determined up to interchange of length and breadth.

Interchanging length and breadth does not produce a different rectangle in terms of congruence.

11. Area of a Trapezium – Proof

Question: Show that:

$$\text{Area} = \frac{1}{2}(a + b)h$$

where **a** and **b** are the parallel sides and **h** is the height.

 **Answer:**

A trapezium can be combined with a congruent copy to form a parallelogram.

The parallelogram has:

$$\text{Base} = a + b$$

$$\text{Height} = h$$

Therefore:

Area of parallelogram = $(a + b)h$

Since it consists of two identical trapeziums:

Area of trapezium = $\frac{1}{2}(a + b)h$

The textbook asks this proof directly in Question 11.

12. Trapezium as Two Triangles

Question: Show that the area of a trapezium is:

$\frac{1}{2}(a + b)h$

 **Answer:**

Divide the trapezium into two triangles.

Their areas add to:

$\frac{1}{2}ah + \frac{1}{2}bh$

$= \frac{1}{2}(a + b)h$

Therefore:

Area of trapezium = $\frac{1}{2}(a + b)h$

13. Two Identical Trapeziums

Question: Show how two identical trapeziums can form a parallelogram.

 **Answer:**

Place one trapezium next to a rotated copy of the other.

They form a parallelogram whose:

- Base = $a + b$

- Height = h

Therefore:

Area of two trapeziums = $(a + b)h$

Hence:

Area of one trapezium = $\frac{1}{2}(a + b)h$

14. Area of a Kite

Question: Show that the area of a kite is half the product of its diagonals.

 **Answer:**

The diagonals divide the kite into four triangles.

Adding the areas of the four triangles gives:

Area = $\frac{1}{2} \times d_1 \times d_2$

 **Formula:**

Area of kite = $\frac{1}{2} d_1 d_2$

The textbook asks for both an algebraic and geometric demonstration.

15. Similar Shapes

(i) Rectangles

If ABCD has sides a , b and PQRS has sides $2a$, $2b$:

Area of PQRS:

= $2a \times 2b$

= **$4ab$**

Therefore:

$$\text{Area(PQRS)} = 4 \times \text{Area(ABCD)}$$

(ii) Triangles with sides 2a, 2b, 2c

When all corresponding sides are doubled:

Area becomes $2^2 = 4$ times

(iii) Triangles with sides 3a, 3b, 3c

When all corresponding sides are tripled:

Area becomes $3^2 = 9$ times

The textbook explicitly asks these three scaling problems.

16. Shaded Triangle

Question: Find the fraction of the triangle that is shaded.

 **Answer:**

Figure-dependent.

This question uses Fig. 6.43, so the exact fraction must be read from the diagram.

17. Shaded Square

Question: Find the fraction of the square that is shaded.

 **Answer:**

Figure-dependent.

The answer depends on the regions shown in Fig. 6.44.

18. Circles in a Rectangle

Question: Use the previous questions to make a conjecture about the area occupied by circles fitted into a rectangle, test it for 10, 20 and 50 circles, and prove it.

 **Key Idea:**

The fraction occupied by the circles remains constant when the same fitting pattern is repeated.

This is a **conjecture-and-proof** question based on the preceding figures.

19. Nine Identical Rectangles

The nine identical rectangles form a larger rectangle of area **72 cm²**.

 **Answer:**

This is **figure-dependent** because the arrangement in Fig. 6.47 is required to determine the dimensions of each small rectangle.

20. Trisection of a Side

Question: Show that the blue and red shaded triangles in Fig. 6.48 have equal areas.

 **Key Idea:**

Both triangles have bases related to the **equal trisection parts** of the same side and share the appropriate altitude.

Therefore:

Area of blue triangle = Area of red triangle

The textbook also asks for a rearrangement proof by cutting and moving pieces.

21. 🌙 Quarter Circle and Semicircles

Question: Show that shaded regions A and B have equal areas.

✅ **Answer:**

The two shaded regions can be expressed as combinations of:

- the area of the quarter circle,
- the areas of the two semicircles,
- and the remaining parts of the square.

After subtracting the common regions, the remaining areas are equal.

Therefore:

Area A = Area B

The textbook gives this as a challenge problem in Fig. 6.49.

22. 🌸 Four-Petalled Flower

Question: Four semicircles are drawn inside a square of side **2 units**. Find the perimeter and area of the flower.

Each semicircle:

Diameter = 2

So:

Radius = 1

Perimeter

Four semicircular arcs:

$$= 4 \times \pi r$$

$$= 4\pi \text{ units}$$

Area

Four semicircles:

$$= 4 \times \frac{1}{2} \pi r^2$$

$$= 2\pi \text{ square units}$$

✓ **Answer:**

$$\text{Perimeter} = 4\pi \text{ units}$$

$$\text{Area} = 2\pi \text{ square units}$$

The figure and dimensions are specified in the textbook.

23. ★ Two Concentric Circles

Question: A chord of the larger circle has length l and touches the smaller circle. Show that the green annular region has area:

$$\pi l^2/4$$

 **Solution:**

Let:

- Larger radius = R
- Smaller radius = r

Since the chord touches the smaller circle, the perpendicular distance from O to the chord is r .

Half the chord:

$$l/2$$

Using Pythagoras:

$$R^2 = r^2 + (l/2)^2$$

Therefore:

$$R^2 - r^2 = l^2/4$$

Area of annular region:

$$= \pi(R^2 - r^2)$$

$$= \pi l^2/4$$

✓ **Answer:**

$$\text{Area} = \pi l^2/4$$

The textbook gives exactly this result to prove in Question 23.

24. ★ Pythagorean Theorem Through Semicircles

Question: Semicircles are drawn on all sides of a right-angled triangle. Show:

$$\text{Area(A)} + \text{Area(B)} = \text{Area(C)}$$

✓ **Proof:**

Area of a semicircle is:

$$1/2 \pi r^2$$

Since diameter is proportional to the sides of the right triangle, the areas of the semicircles are proportional to the **squares of the three sides**.

By the Pythagorean theorem:

$$a^2 + b^2 = c^2$$

Multiplying by $\pi/8$ gives:

$$\text{Area(A)} + \text{Area(B)} = \text{Area(C)}$$

✓ **Answer:**

Proved.

25. Two Intersecting Circles

Question: Two congruent circles of radius r pass through each other's centres. Find the area of the region enclosed by the two circles.

The common region consists of two 60° sectors minus two equilateral triangles.

Area:

$$= 2[(\pi r^2/6) - (\sqrt{3}/4)r^2]$$

 **Answer:**

$$\text{Area} = (\pi/3 - \sqrt{3}/2)r^2$$

This is the lens-shaped common region shown in Fig. 6.53.

26. Three Triangles in a Rectangle

Question: Use Fig. 6.54 to express the area of the rectangle in terms of the areas **A**, **B** and **C**.

 **Answer:**

This is a **figure-based area-relationship problem**. The exact expression depends on the labelled dimensions in Fig. 6.54; the text extraction of the formula is not reliable enough to reproduce it accurately.

The textbook asks this as a proof using the three triangle areas.

27. Equal Shaded Areas

Question: Show that the two shaded regions in Fig. 6.55 have equal areas.

 **Key Idea:**

Express each shaded region as the difference between:

- the relevant semicircle/quarter-circle area, and

- the relevant triangle area.

The common terms cancel, giving:

Area of first shaded region = Area of second shaded region

 **Answer:**

The two shaded regions have equal areas.

The textbook specifically asks for this equality using the quarter circle, semicircle and triangle shown in Fig. 6.55.

COMPLETE ANSWER KEY

Q.	Answer
1	Area models for the two identities
2	$50\sqrt{2} \text{ cm}^2 \approx 70.71 \text{ cm}^2$
3	13 cm each
4	36 cm
5	$75\sqrt{15/4} \text{ cm}^2 \approx 72.62 \text{ cm}^2$
6	84 cm^2
7	188.57 m approx.
8	86.625 cm^2
9(i)	176 cm
9(ii)	≈ 568 revolutions
10	Yes, for rectangles
11	$\frac{1}{2}(a+b)h$
12	$\frac{1}{2}(a+b)h$
13	$\frac{1}{2}(a+b)h$

- 14 $\frac{1}{2} d_1 d_2$
- 15(i) 4 times
- 15(ii) 4 times
- 15(iii) 9 times
- 16 Figure-dependent
- 17 Figure-dependent
- 18 Conjecture/proof based on repeated circle arrangement
- 19 Figure-dependent
- 20 Blue area = Red area
- 21 **Area A = Area B**
- 22 Perimeter 4π , Area 2π
- 23 $\pi l^2/4$
- 24 **Area A + Area B = Area C**
- 25 $(\pi/3 - \sqrt{3}/2)r^2$
- 26 Figure-dependent expression
- 27 Two shaded areas are **equal**

★ Chapter 6 Final Revision

 **Triangle:** Area = $\frac{1}{2} \times \text{base} \times \text{height}$

▲ **Heron's Formula:** Area = $\sqrt{[s(s-a)(s-b)(s-c)]}$

◆ **Trapezium:** Area = $\frac{1}{2}(a+b)h$

 **Kite:** Area = $\frac{1}{2} d_1 d_2$

○ **Circle:** Area = πr^2

 **Sector:** Area = $(\theta/360^\circ)\pi r^2$

☾ **Arc:** Length = $(\theta/360^\circ)2\pi r$

 Circumference: $2\pi r$

The Chapter 6 summary confirms the circle, arc, triangle, Heron's formula and sector formulas used throughout these exercises.