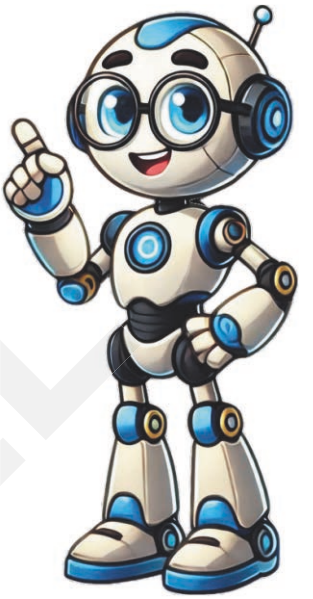
8
Chapter

# Playing With Constructions

**We'll cover the following key points:**

→ Construction in Mathematics
→ Circle
→ Squares and Rectangles
→ Exploring Diagonals of Rectangles and Squares
→ More on Constructions



Hi, I'm EeeBee

**Still curious?** Talk to me by scanning the QR code.

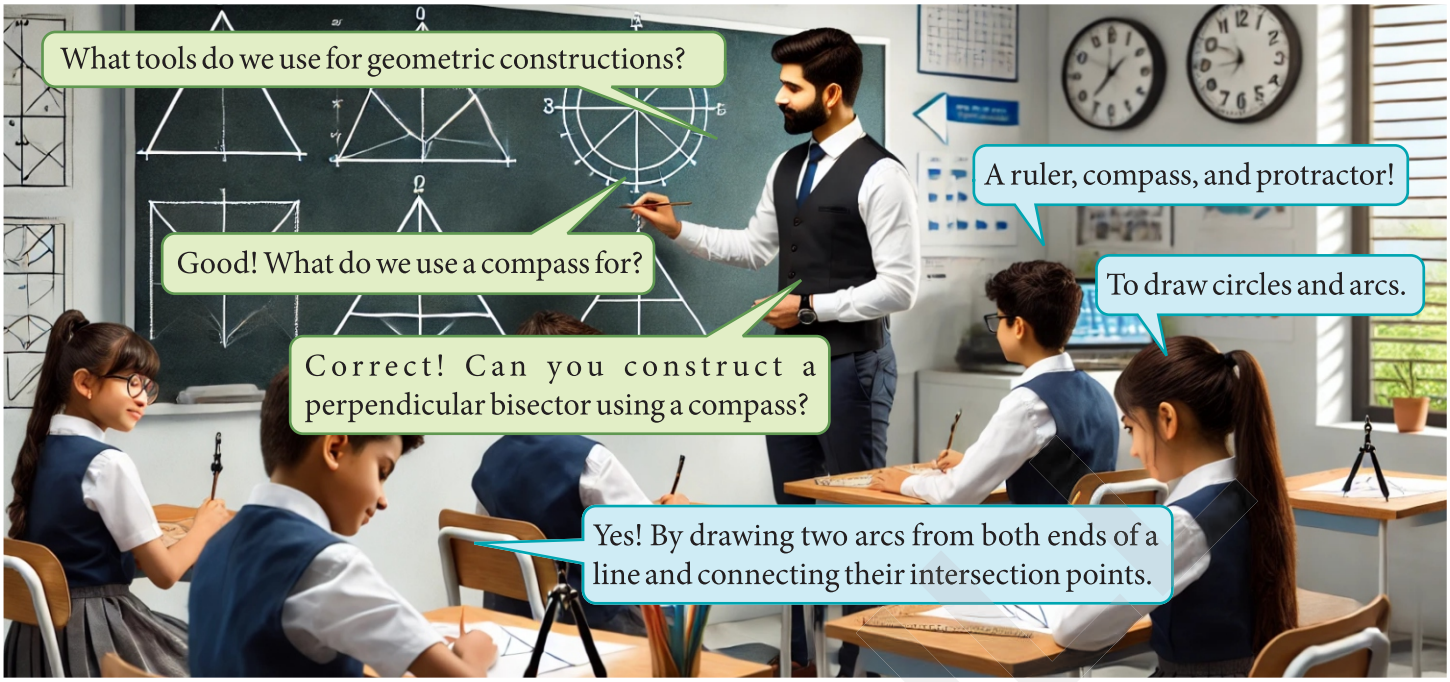
**Do you Remember fundamental concept in previous class.**
In class 5th we learnt
→ Circle
→ Perspective of Drawing Solid Objects

## Learning Outcomes

**By the end of this chapter, students will be able to:**

- Understand the concept of patterns in mathematics and their significance in problem-solving.
- Identify and extend number patterns in sequences using logical reasoning.
- Visualize and analyze number sequences to recognize their underlying rules.
- Explore and establish relations among different number sequences.
- Create new patterns by applying arithmetic operations like addition, subtraction, multiplication, and division.
- Recognize patterns in geometric shapes and describe them using mathematical terms.
- Predict the next elements in a pattern and justify their reasoning.
- Develop critical thinking skills through identifying similarities and differences in patterns.
- Solve real-life problems using patterns in numbers and shapes.
- Design and explore their own patterns in numbers and shapes creatively.

## Construction in Mathematics




Start by explaining that construction in mathematics refers to the process of drawing shapes, angles, and figures with the help of basic tools, following specific rules. Emphasize that construction does not involve measuring with numbers, but rather using tools to create exact shapes.

### Key Tools in Construction:

- **Ruler:** To draw straight lines.
- **Compass:** To create circles or arcs.
- **Protractor:** To measure and draw angles.


### Circle:

A circle is a two-dimensional geometric shape made up of all the points on a plane that are equidistant from a fixed point, known as the **center**. The constant distance from the center to any point on the circle is called the **radius**. Circles are among the most elegant and commonly encountered shapes in both nature and human-made designs. They play a vital role in the architecture of buildings, the layout of gardens, the construction of wheels, and everyday items such as clocks, plates, and coins.

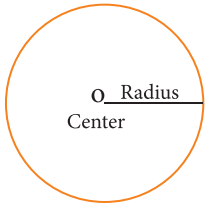



*Fig. 8.1*

### Constructing a Circle of Any Radius Using Ruler and Compasses

1. **Mark the Center Point:** Identify and mark a point OO on your paper. This will serve as the center of your circle.
2. **Set the Compass Radius:** Adjust the compass by measuring the given radius on your ruler.

Ensure the distance between the metal tip and the pencil tip matches the desired radius.

3. **Position the Compass:** Place the metal tip of the compass firmly on point O.
4. **Draw the Circle:** Rotate the compass pencil tip completely around point O, keeping the metal tip steady. Ensure a smooth and continuous motion to create a perfect circle.
5. **Complete the Circle:** Once the pencil completes a full round, you will have your circle of the specified radius.

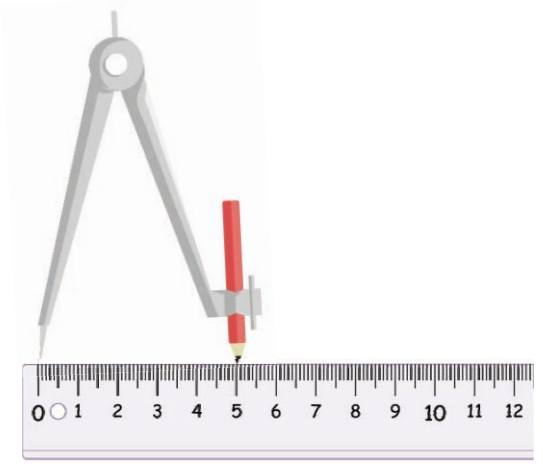



*Fig. 8.2*

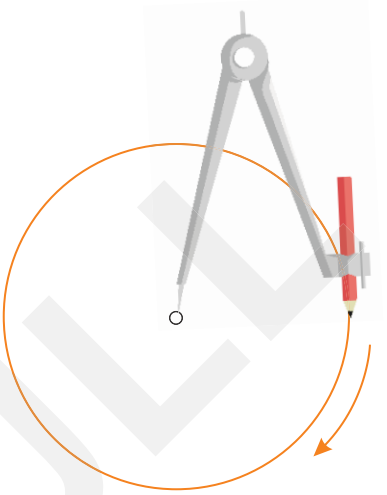


*Fig. 8.3*

**Example :** Let A and B be the centers of two circles, each with a radius of 4 cm. Draw the two circles such that the center of one circle lies on the circumference of the other. Let the two circles intersect at points X and Y. Verify whether the line segments AB and XY are perpendicular to each other.

**Solution :**

**Steps for Construction:**

**Draw the First Circle:** Draw a point A on your paper. Using a compass, draw a circle with center A and radius 4 cm.

1. **Mark a Point on the Circumference:** Select a point B on the circumference of the first circle.
2. **Draw the Second Circle:** With B as the center and a radius of 4 cm, draw another circle such that it passes through point A.
3. **Label the Points of Intersection:** Mark the intersection points of the two circles as X and Y.
4. **Join the Line Segments:** Draw the line segments AB and XY.
5. **Measure the Angles:** Use a protractor to measure $\angle XAY$ and $\angle XBY$.

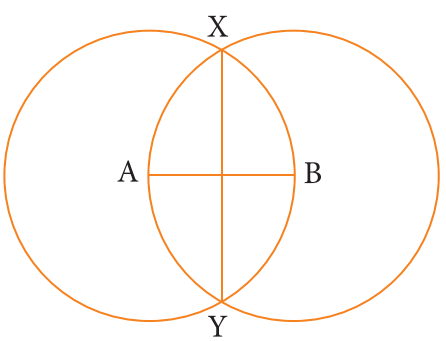



*Fig. 8.4*

**Upon measurement: $\angle XAY = 90°$ and $\angle XBY = 90°$.**

This confirms that the line segments AB and XY are perpendicular to each other, as they intersect at a right angle.

1. **Draw a circle with a radius of 4 cm.**
2. **With the same center O, draw three additional circles of radii 6 cm, 4.5 cm, and 2.8 cm.**
3. **Let C and D be the centers of two circles with equal radii of 5 cm.Draw them so that each circle passes through the center of the other. Let the circles intersect at points X and Y. Examine whether CD and XY are perpendicular.**
4. **Along the circumference of this circle, draw two waves on a line segment whose total length is 18 cm.**
5. **Draw two circles of radius 6 cm centered at points E and F such that each circle passes through the center of the other. Find the points of intersection of the circles, and examine if EF and the line through the points of intersection are perpendicular.**
6. **Draw a circle of radius 7 cm.**
7. **With the same center, draw three circles of radii 7.5 cm, 6.2 cm, and 4.5 cm.**

## Squares and Rectangles

In mathematics, squares and rectangles are two common types of quadrilaterals. They are part of the broader category of polygons and have special properties that make them interesting to study.

Top of Table

Black Board

Door

*Fig. 8.5*

### Square

A square is a special type of rectangle where all four sides are equal in length. In a square, all angles are right angles (90°), and opposite sides are parallel.

**Properties of a Square:**

1. All four sides are of equal length.

Take a Task

Watch Remedial

2. All four angles are 90 degrees.
3. Opposite sides are parallel.
4. Diagonals are equal in length and bisect each other at right angles.

In the given square ABCD, the lines AB, BC, CD, and DA are called the sides of the square, and the points A, B, C, and D are the corners of the square. The side AB is opposite to side CD, and side AD is opposite to side BC. All four sides of a square are equal in length. Therefore, AB = BC = CD = DA.

The four angles ∠A, ∠B, ∠C, and ∠D are each 90°, meaning the angles of a square are right angles. When naming a square, we list the vertices in the order in which they appear, starting from any corner. For example, the above square can be named as ABCD, BCDA, CDAB, DABC, etc. However, we cannot name it as ACDB or ABDC.

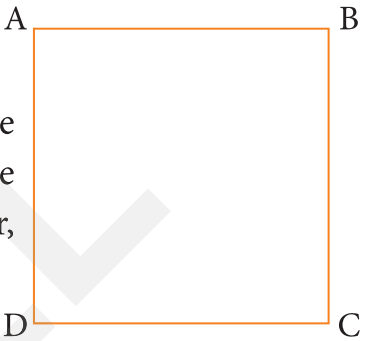


*Fig. 8.6*

## Rectangle

A rectangle is a quadrilateral where opposite sides are equal in length, and all four angles are 90 degrees. A rectangle is a more general shape compared to a square, where only the opposite sides need to be equal, not all four sides.

**Properties of a Rectangle:**

1. Opposite sides are equal in length.
2. All four angles are 90 degrees.
3. Opposite sides are parallel.
4. Diagonals are equal in length but not necessarily bisect each other at right angles.

In the given rectangle PQRS, the lines PQ, QR, RS, and SP are called the sides of the rectangle, and the points P, Q, R, and S are the corners of the rectangle. The side PQ is opposite to side RS, and side PS is opposite to side QR. Opposite sides of a rectangle are equal in length. Therefore, PQ = RS and PS = QR.

The four angles ∠P, ∠Q, ∠R, and ∠S are each 90°, meaning the angles of a rectangle are right angles. When naming a rectangle, we list the vertices in the order in which they appear, starting from any corner. For example, the above rectangle can be named as PQRS, QRSP, RSPQ, SPQR, etc. However, we cannot name it as PRQS or QSPR.

*Fig. 8.7*

**Key Differences between a Square and a Rectangle:**

1. **Sides:**
   - In a square, all four sides are equal.
   - In a rectangle, only the opposite sides are equal.
2. **Shape:**
   - A square is a special type of rectangle.
   - A rectangle is not always a square, unless all sides are equal.

**Points of Rules**

- Always use a sharp pencil for accuracy.
- Hold the compass firmly to avoid slipping.
- Use light strokes initially and darken the final lines.
- Label all points clearly.
- Practice regularly to improve construction skills.

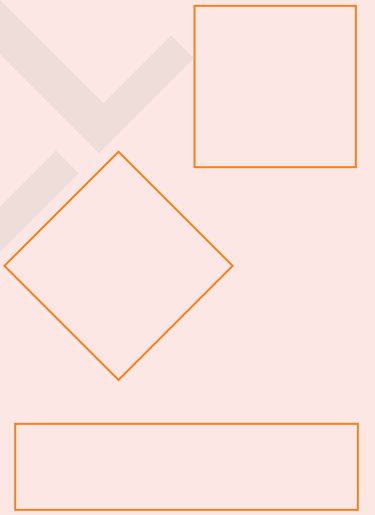
## Activity Time

Take a square piece of paper. Clearly, it has all sides of equal length, and each angle is 90°.

Now, fold the square along any of its diagonals. After folding, check whether the lengths of the sides remain equal. (Yes/No). Also, measure the angles formed at the corners and see if they are still 90° (Yes/No).

Repeat the same activity with a different square, folding it along the other diagonal.

You will find that folding a square along its diagonals does not change the equality of its sides or the measure of its angles.



## Constructing Rectangles

Constructing a rectangle involves creating a quadrilateral with specific properties: opposite sides are equal in length, and all four angles are 90° (right angles). Here's how you can construct a rectangle using basic geometric tools like a ruler and a protractor.

### Steps to Construct a Rectangle:

1. **Draw the First Side (AB):**
   - Using a ruler, draw a straight line segment of the desired length. This will be one of the sides of the rectangle, say AB.

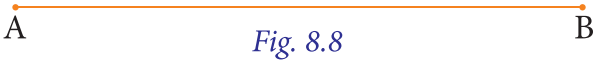



*Fig. 8.8*

2. **Draw the Adjacent Side (AD):**
   - Place the protractor at point A. Measure a 90° angle and mark a point D such that AD is the desired length.
   - Use the ruler to connect points A and D.

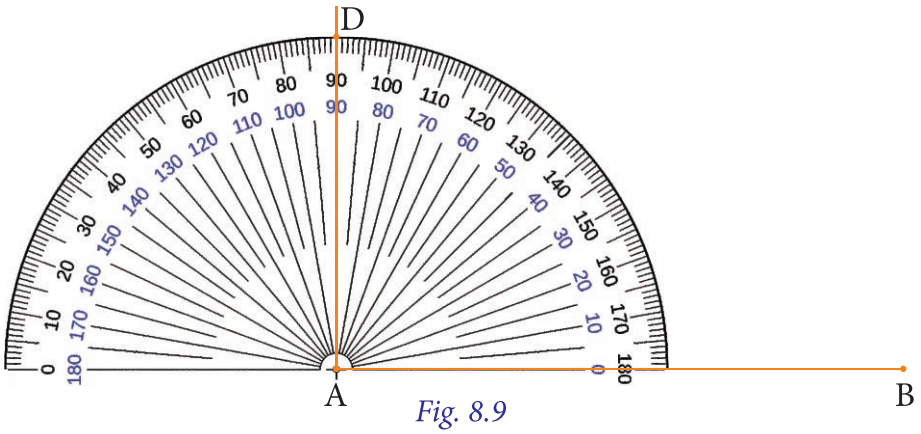



*Fig. 8.9*

3. **Draw the Opposite Side (BC):**
   - Now, using a ruler, draw a line segment BC equal in length to side AB. Make sure this line is parallel to side AD (you can use a set square or ruler to ensure the parallelism).
   - This will be the second pair of opposite sides of the rectangle.


*Fig. 8.10*

4. **Draw the Final Side (CD):**
   - Finally, connect point C to point D. This side should be equal in length to side AD and parallel to side AB.

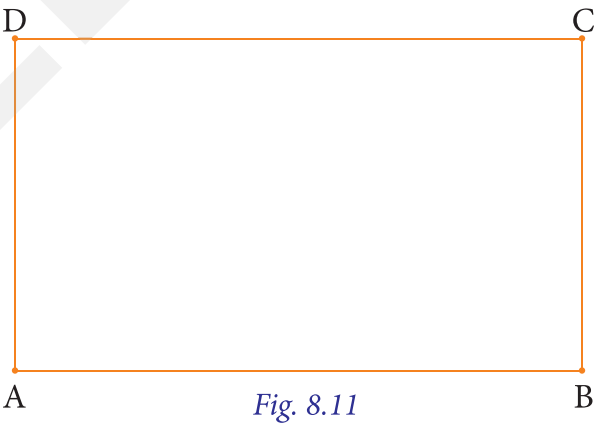



*Fig. 8.11*

5. **Check the Angles:**
   - Use a protractor to check if all four angles of the rectangle are 90°.

### Example:

Let's say you want to construct a rectangle with a length of 6 cm and a width of 4 cm.

1. Draw AB = 6 cm.


*Fig. 8.12*

2. At point A, measure a 90° angle, and mark AD = 4 cm.

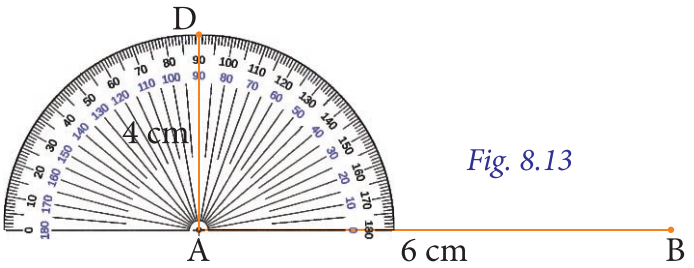



*Fig. 8.13*

3. Draw BC = 4 cm parallel to AD.

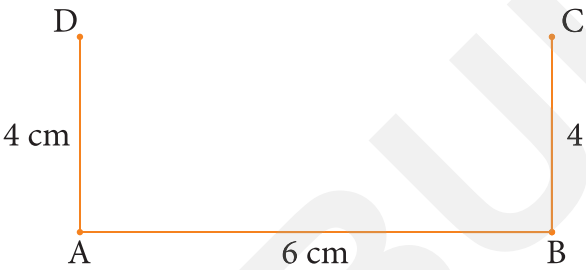



*Fig. 8.14*

4. Finally, connect C to D to complete the rectangle.

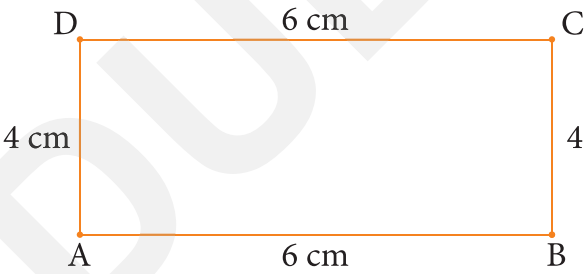



*Fig. 8.15*

## Constructing a Square

A square is a special type of rectangle where all four sides are of equal length, and all four angles are 90°. Here's how you can construct a square using basic geometric tools like a ruler and a protractor.

### Steps to Construct a Square:

**1. Draw the First Side (AB):**

- Using a ruler, draw a straight line segment of the desired length. This will be one side of the square, say AB.


*Fig. 8.16*

**2. Draw the Adjacent Side (AD):**

- Place the protractor at point A. Measure a 90° angle and mark point D such that the length

of AD is the same as AB (this is the side length of the square).

- Use the ruler to connect points A and D.

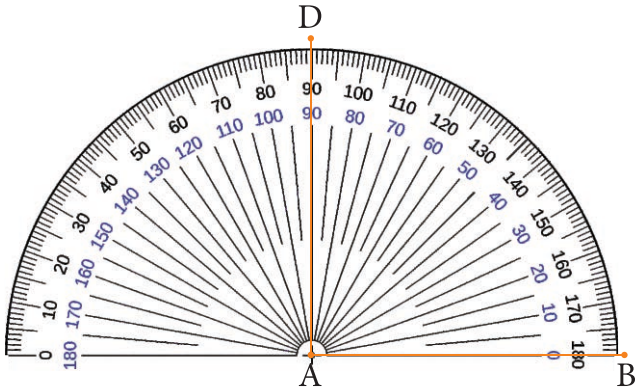



*Fig. 8.17*

3. **Draw the Opposite Side (BC):**
   - Now, using a ruler, draw a line segment BC equal in length to AB. Make sure this line is parallel to side AD (you can use a set square or ruler to ensure the parallelism).
   - Mark point C.

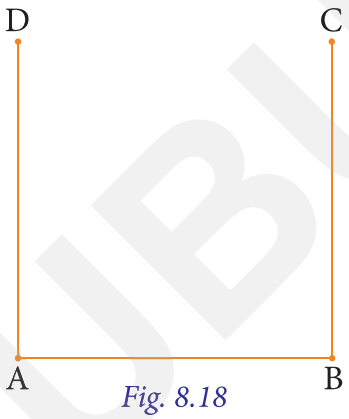



*Fig. 8.18*

4. **Draw the Final Side (CD):**
   - Connect point C to point D. This side should be equal in length to AD and AB.
   - The side CD will complete the square.

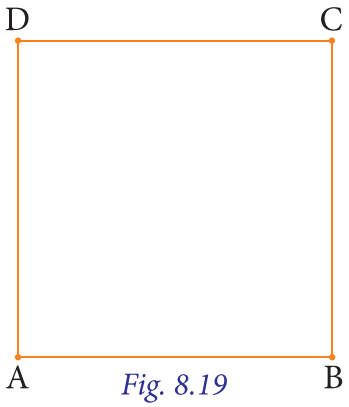



*Fig. 8.19*

5. **Check the Angles:**
   - Use a protractor to check if all four angles are 90° to ensure it's a perfect square.

**Example:**

Let's say you want to construct a square with a side length of 5 cm.

1. Draw AB = 5 cm.


*Fig. 8.20*

2. At point A, measure a 90° angle, and mark AD = 5 cm.

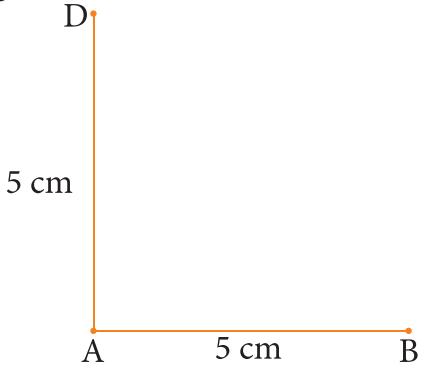



*Fig. 8.21*

3. Draw BC = 5 cm parallel to AD.

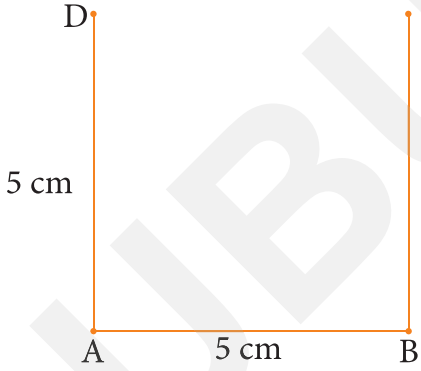



*Fig. 8.22*

4. Finally, connect C to D to complete the square.

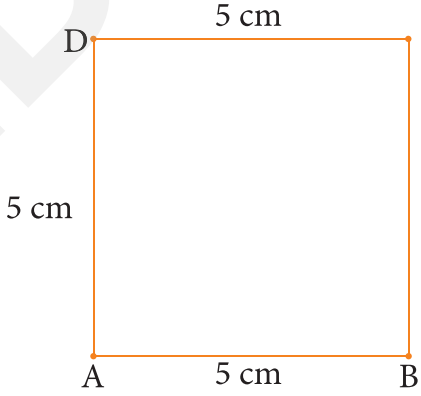


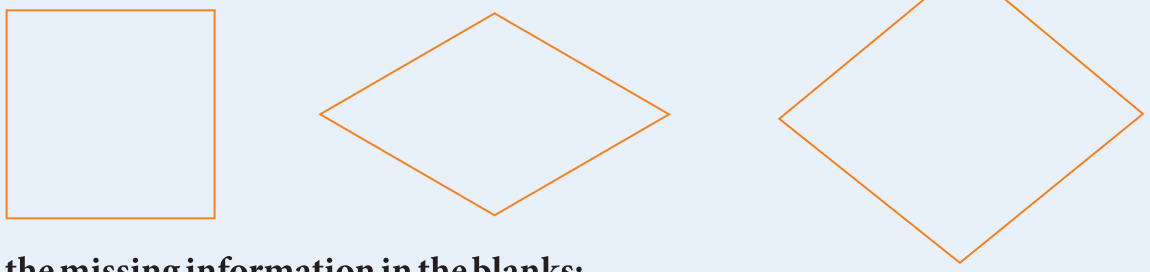

*Fig. 8.23*

## Exercise 8.2

Knowledge Application

1. **Construct a square with the following dimensions:**
   (a) Each side measuring 7 cm
   (b) Each side measuring 10 cm

2. **Identify any squares in the following collection:**



3. **Provide the missing information in the blanks:**

   (a) A square has all four sides of _____ length.

   (b) In a rectangle, the opposite sides are _____ in length.

   (c) A square has four right angles, each measuring _____ degrees.

   (d) The opposite sides of a rectangle are _____ to each other.

   (e) A rectangle has two pairs of opposite sides that are _____ in length.

   (f) The diagonals of a square are _____ in length and bisect each other at right angles.

4. **Construct a rectangle with the following dimensions:**

   (a) 6 cm by 9 cm (b) 4 cm by 11 cm

   After constructing, check if the shapes satisfy the rectangle properties of having opposite sides equal and four right angles.

5. **Does the following statement stand True (T) or False (F):**

   (a) A square has four sides of equal length.

   (b) In a rectangle, all four angles are acute angles.

   (c) Opposite sides of a square are parallel and equal in length.

   (d) A rectangle can have two pairs of sides with unequal lengths.

   (e) The diagonals of a square are not equal in length.

   (f) All squares are rectangles, but not all rectangles are squares.



## Exploring Diagonals of Rectangles and Squares

### Diagonals of a Rectangle:

- A rectangle has two diagonals, which are line segments that connect opposite corners of the rectangle.
- The key properties of the diagonals of a rectangle are:

1. **Equal Length:** The diagonals of a rectangle are always equal in length.

2. **Bisect Each Other:** The diagonals of a rectangle bisect each other, meaning they cut each other into two equal parts at their point of intersection.
3. **Not Perpendicular:** Unlike a square, the diagonals of a rectangle are not perpendicular (they do not meet at right angles).

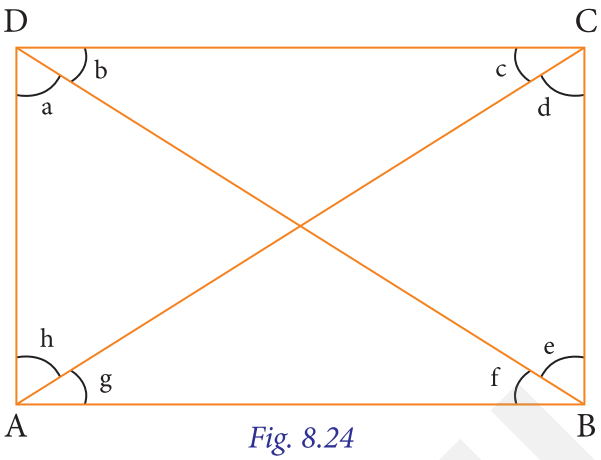



*Fig. 8.24*

## Steps to Construct the Diagonals of a Rectangle:

1. **Draw the Rectangle:**
   - Start by drawing a rectangle using a ruler. For example, let the rectangle have a length of 6 cm and a width of 4 cm.

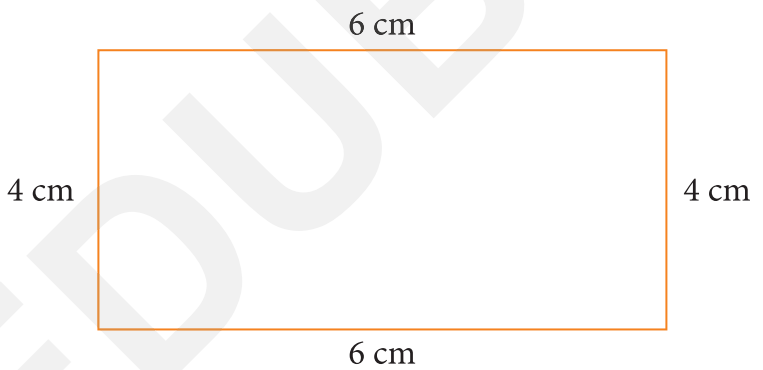



*Fig. 8.25*

2. **Label the Corners:**
   - Label the four corners of the rectangle as A, B, C, and D in clockwise or counterclockwise order.

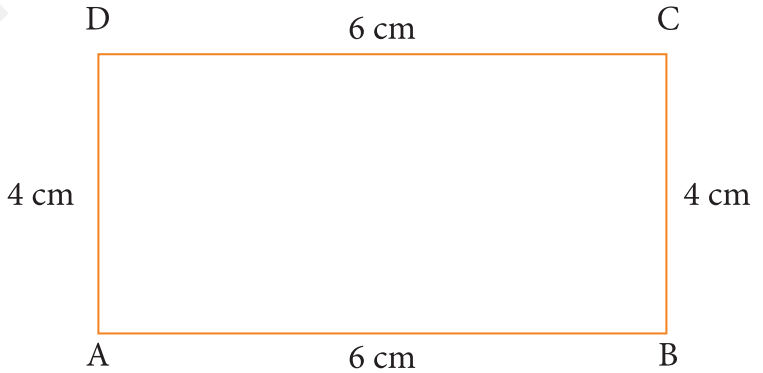



*Fig. 8.26*

3. **Draw the First Diagonal (AC):**
   - Using a ruler, draw a straight line segment connecting the opposite corners A and C. This is the first diagonal of the rectangle.

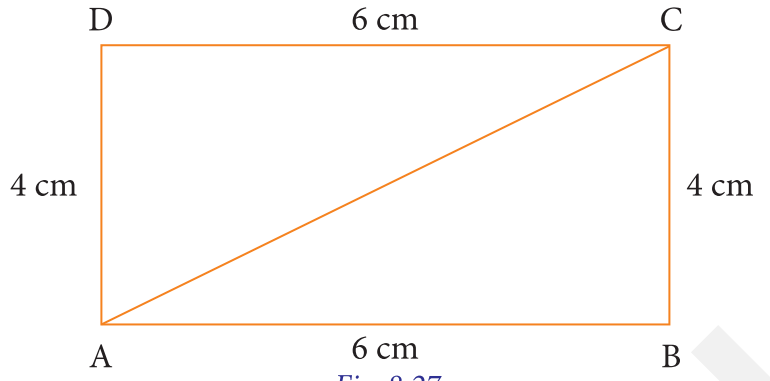


*Fig. 8.27*

4. **Draw the Second Diagonal (BD):**
   - Now, using a ruler, draw the second diagonal by connecting the opposite corners B and D.

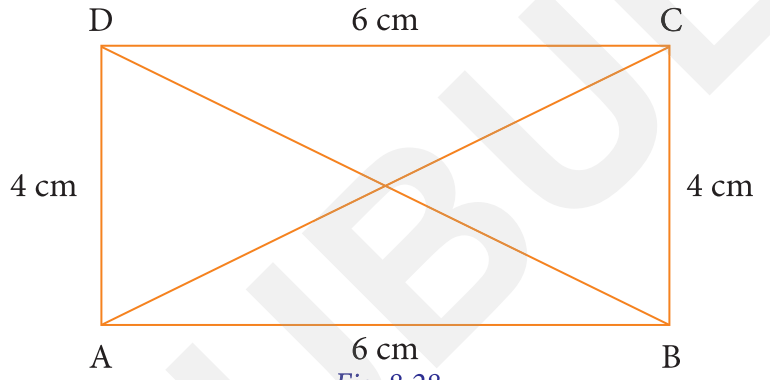


*Fig. 8.28*

5. **Check the Lengths:**
   - Measure both diagonals with a ruler to confirm they are of equal length.

6. **Check the Bisecting Point:**
   - The point where the diagonals intersect is the midpoint of both diagonals. Measure and confirm that the diagonals bisect each other (the segments of each diagonal are equal).

## Diagonals of a Square:

- A square is a special type of rectangle where all sides are of equal length.
- The diagonals of a square have the following properties:

1. **Equal Length:** The diagonals of a square are equal in length (just like in a rectangle).
2. **Perpendicular:** The diagonals of a square meet at a 90° angle, meaning they are perpendicular to each other.
3. **Bisect Each Other:** The diagonals bisect each other at right angles, dividing the square into four smaller right-angled triangles.

## Steps to Construct the Diagonals of a Square:

1. **Draw the Square:**
   - Start by drawing a square using a ruler. For example, let each side of the square be 5 cm.

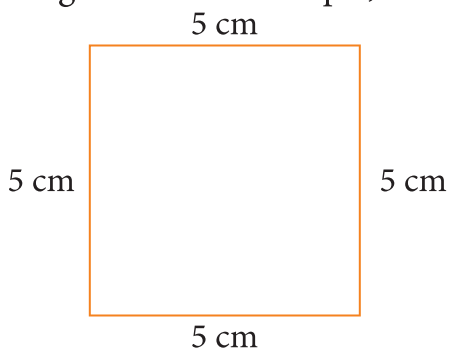



*Fig. 8.29*

2. **Label the Corners:**
   - Label the four corners of the square as A, B, C, and D in clockwise or counterclockwise order.

3. **Draw the First Diagonal (AC):**
   - Using a ruler, draw a straight line segment connecting opposite corners A and C. This is the first diagonal of the square.

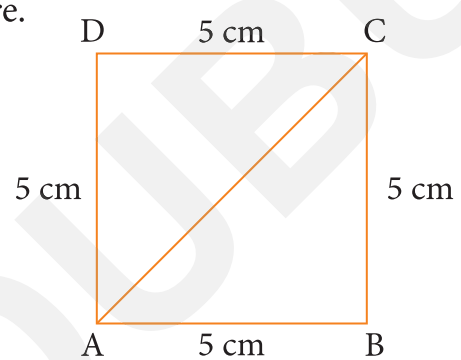



*Fig. 8.30*

4. **Draw the Second Diagonal (BD):**
   - Now, using a ruler, draw the second diagonal by connecting the opposite corners B and D.

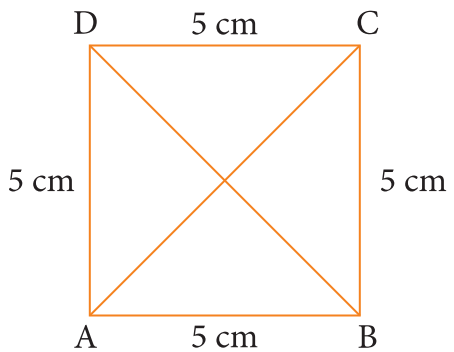



*Fig. 8.31*

5. **Check the Lengths:**
   - Measure both diagonals with a ruler. Since it's a square, both diagonals should be of equal length.

6. **Check the Perpendicular Intersection:**
   - Use a protractor to measure the angle where the diagonals intersect. The diagonals of a square meet at 90°, confirming that they are perpendicular.

7. **Check the Bisecting Point:**
   - The diagonals of the square bisect each other, so measure and confirm that the point where they intersect divides each diagonal into two equal segments.

**Key Differences between the Diagonals of Rectangles and Squares:**

1. **Length:**
   - In a rectangle, diagonals are equal but not necessarily equal to the side lengths.
   - In a square, diagonals are equal and are calculated using the side length.
2. **Angle:**
   - In a rectangle, the diagonals do not meet at right angles.
   - In a square, the diagonals meet at a 90° angle (perpendicular).
3. **Symmetry:**
   - Both the rectangle and the square have diagonals that bisect each other, but the symmetry is more noticeable in a square due to the perpendicular diagonals.

## Exercise 8.3

Knowledge Application

1. **Does the following statement stand True (T) or False (F):**
   (a) The diagonals of a rectangle are always equal in length.
   (b) The diagonals of a rectangle bisect each other at right angles (90°).
   (c) In a square, the diagonals do not bisect each other.
   (d) The diagonals of a rectangle and a square are always of different lengths.
   (e) The diagonals of a square form two right-angled triangles at their intersection.

2. **Construct a square in which:**
   (a) The length of the diagonal is 10 cm. (b) The length of the diagonal is 12 cm.

3. **Construct a rectangle in which:**
   (a) One side measures 6 cm and the diagonal is of length 10 cm.
   (b) One side measures 3 cm and the diagonal is of length 5 cm.

4. **Construct a square where:**
   (a) One side measures 7 cm and calculate the diagonal length.
   (b) One side measures 4 cm and calculate the diagonal length.

5. **Construct a rectangle in which:**
   (a) One side measures 7 cm and the diagonal divides the opposite angles into 50° and 40°.
   (b) One side measures 5 cm and the diagonal divides the opposite angles into 60° and 30°.

6. **Construct a square in which:**
   (a) One side measures 5 cm.
   (b) One side measures 8 cm.

## More on Constructions


Using ruler and compasses, we may construct different types of figures. Let us try to construct a square within a rectangle.

### Construction: Points Equidistant from Two Given Points

In geometry, a point that is **equidistant** from two given points lies on the **perpendicular bisector** of the line segment joining those two points. This concept is very useful in constructions where you need to find locations that are equally distant from two specific points.

### Steps to Construct Points Equidistant from Two Given Points:

Let's say you are given two points **A** and **B**, and you need to construct a point **P** that is equidistant from both **A** and **B**.

### Step-by-Step Construction:

1. **Draw the Line Segment AB:**
   - Start by drawing a line segment AB using a ruler. Label the points A and B.

*Fig. 8.32*

2. **Find the Midpoint of AB:**
   - To find the midpoint of line segment AB, measure the length of AB with a ruler and divide it by 2. Mark this point as M.
   - Alternatively, use a compass to measure equal lengths from A and B along the segment and mark where the compass arcs intersect.

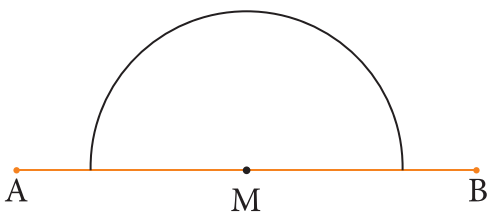


*Fig. 8.33*

**3. Draw the Perpendicular Bisector of AB:**

- Place the compass pointer at A and adjust the compass width to be more than half the length of AB.
- With the compass, draw arcs above and below the line AB. Without changing the compass width, repeat this step from point B.

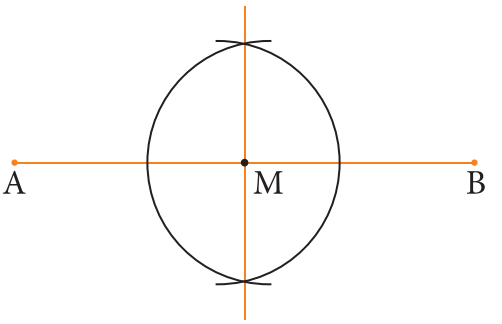


*Fig. 8.34*

- Mark the points where the arcs intersect above and below the line.
- Using a ruler, draw a straight line through these intersection points. This is the perpendicular bisector of AB, and it intersects AB at point M, the midpoint of AB.

**4. Choose Any Point on the Perpendicular Bisector:**

- Any point on the perpendicular bisector (other than the midpoint M) will be equidistant from A and B.
- You can choose any point P along this perpendicular bisector, and the distance from P to A will be the same as the distance from P to B.

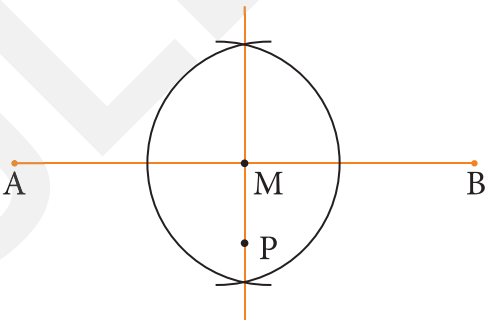


*Fig. 8.35*

**5. Verification:**

- Use a compass to check that the distance from P to A is equal to the distance from P to B.

**Example :** Construct a rectangle of sides 14 cm and 8 cm, and a square inside it, such that the center of the square is the same as the center of the rectangle.

**Solution Steps:**

**Step 1: Draw the Rectangle**

Draw a line segment AB of 14 cm to represent one side of the rectangle.

*Fig. 8.36*

**Step 2: Draw a 90° Angle**

At point A, draw an angle of 90° using a protractor to set the direction for the perpendicular sides of the rectangle.

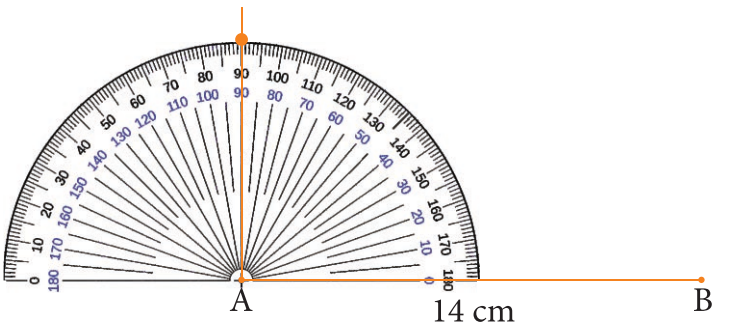


*Fig. 8.37*

**Step 3: Mark Point C**

From point A, draw an arc with a radius of 8 cm (the shorter side of the rectangle). The arc should intersect the 90° angle at a new point, labeled C.

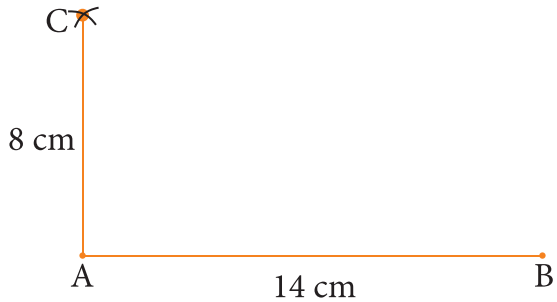


*Fig. 8.38*

**Step 4: Draw Side BD**

Now, use the same 8 cm radius and center at point B, to draw another arc, and mark the intersection as D. This step ensures the shorter side of the rectangle is properly positioned.

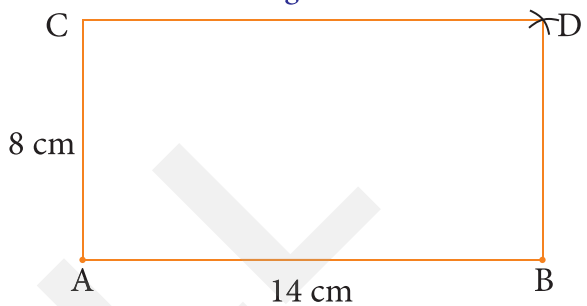


*Fig. 8.39*

**Step 5: Construct the Square inside the Rectangle**

The center of the square must coincide with the center of the rectangle. To do this:

- Measure the midpoints of the sides of the rectangle.
- Draw diagonals inside the rectangle to find the center of the rectangle.
- Use this center to draw the square, ensuring the square fits inside the rectangle with its center aligned.

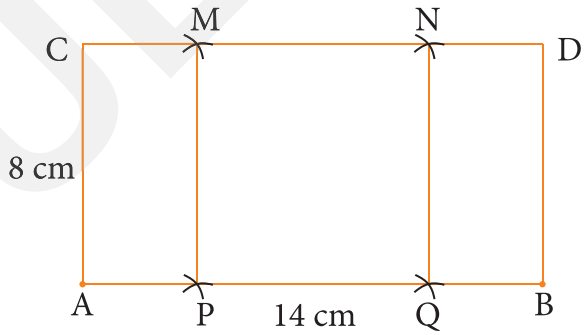


*Fig. 8.40*

**Step 6: Final Construction**

Complete the construction of the rectangle by connecting the points A, B, C, and D. Inside, construct the square with the center of the square coinciding with the center of the rectangle.

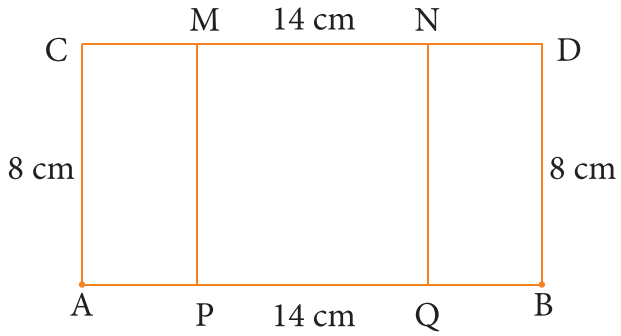


*Fig. 8.41*

## Exercise 8.4

Knowledge Application

**1. Provide the missing information in the blanks:**

(a) The diagonals of a rectangle are always _____ in length.

(b) A square is a special type of _____, where all four sides are equal.

(c) The diagonals of a square bisect each other at _____ angles.

(d) The opposite sides of a _____ are parallel and equal in length.

(e) The area of a _____ is calculated by squaring the length of one of its sides.

(f) The diagonals of a _____ are equal and bisect each other at right angles.

(g) A _____ has four sides of equal length and four right angles.

(h) A _____ has all angles as right angles but may have unequal adjacent sides.

**2. Does the following statement stand True (T) or False (F):**

(a) The diagonals of a rectangle are always of different lengths.

(b) A square is a rectangle with all sides of equal length.

(c) The diagonals of a square do not bisect each other at right angles.

(d) The area of a square is calculated by multiplying the length of two adjacent sides.

(e) A rectangle always has four sides of equal length.

(f) In a rectangle, opposite sides are equal and parallel.

(g) The diagonals of a square are always shorter than the sides of the square.

(h) A circle has a constant diameter.

**3. Match the Columns**

| Column A | Column B |
|---|---|
| i. Rectangle | a. All sides are equal |
| ii. Square | b. Opposite sides are equal and parallel |
| iii. Diagonals of a Rectangle | c. The diagonals are perpendicular |
| iv. Diagonals of a Square | d. The diagonals bisect each other at right angles |
| v. Area of a Square | e. Length × Width |
| vi. Area of a Rectangle | f. Side$^2$ |
| vii. Circle | g. $\pi r^2$ |
| viii. Perimeter of a Square | h. 4 × Side |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Take a Test

**1. Tick (✓) the correct answer:**

a. What tool is used to draw a perfect circle in geometry?

(i) Ruler ☐ (ii) Compass ☐ (iii) Divider ☐ (iv) Protractor ☐

b. The instrument used to measure angles is:

(i) Compass ☐ (ii) Divider ☐ (iii) Protractor ☐ (iv) Ruler ☐

c. To construct a perpendicular bisector of a line segment, we use:

(i) Ruler and Compass ☐ (ii) Protractor and Compass ☐

(iii) Divider only ☐ (iv) Ruler only ☐

d. The sum of the angles on a straight line is:

(i) 90° ☐ (ii) 180° ☐ (iii) 360° ☐ (iv) 270° ☐

e. A triangle with all sides of equal length is called a:

(i) Scalene Triangle ☐ (ii) Isosceles Triangle ☐

(iii) Equilateral Triangle ☐ (iv) Right-Angled Triangle ☐

## 2. Provide the missing information in the blanks:

a. The tool used to measure the length of a line segment is a _____.

b. A triangle with one right angle is called a _____ triangle.

c. The sum of all angles in a triangle is _____.

d. A perpendicular line makes an angle of _____ degrees with the given line.

e. The radius of a circle is the distance from the _____ to any point on the circle.

## 3. Construct a triangle with the following measurements:

- Side AB = 6 cm
- Side BC = 8 cm
- Side AC = 10 cm

**After construction, verify if it is a right-angled triangle.**


## 4. Match the Columns:

| Column A | Column B |
|---|---|
| a) Drawing a perpendicular bisector | i) Using a compass and ruler |
| b) Constructing an angle of 60° | ii) Using a compass to mark arcs |
| c) Bisecting a given angle | iii) Dividing the line segment into two equal parts |
| d) Drawing a circle of given radius | iv) Dividing the angle into two equal parts |

## Assertion and Reason

Experiential Learning

Each question has two statements, Assertion (A) and Reason (R). Choose the correct option:

A: Both A and R are true, and R is the correct explanation of A.

B: Both A and R are true, but R is not the correct explanation of A.

C: A is true, but R is false.

D: A is false, but R is true.

1. **Assertion (A):** A perpendicular bisector divides a line segment into two equal parts.

**Reason (R):** A perpendicular bisector always makes an angle of 90° with the line segment.

2. **Assertion (A):** The sum of the angles in a triangle is always 180°.
   **Reason (R):** A triangle is a closed figure formed by three straight lines.
3. **Assertion (A):** To construct a circle, we need its radius.
   **Reason (R):** The radius is the distance from the center to the boundary of the circle.
4. **Assertion (A):** A scalene triangle has all sides of different lengths.
   **Reason (R):** The angles in a scalene triangle are also different.
5. **Assertion (A):** The protractor is the best tool to construct circles.
   **Reason (R):** A protractor is used to measure angles.

## HOTS (Higher Order Thinking Skills)

Critical Thinking

1. A rectangle has a length of 8 cm and a width of 6 cm. Construct the rectangle and draw its diagonals. Prove that the diagonals bisect each other.
2. Construct an equilateral triangle with a side length of 7 cm. Measure each angle. Are the angles equal? Why?
3. A circle of radius 5 cm is drawn. Construct two perpendicular diameters. How many equal parts does the circle get divided into?

## Case Study

Critical Thinking

A playground is being constructed in the shape of a rectangle. It has a length of 20 m and a width of 15 m. Inside the playground, a circular fountain with a radius of 4 m is also being constructed.

**Questions:**

1. Calculate the area of the rectangular playground.
2. Calculate the area of the circular fountain.
3. Find the remaining area of the playground after the fountain is constructed.
4. Construct a diagram of the playground with the fountain in the center.
5. If the boundary of the playground is to be fenced, how much fencing is required?