# Chapter - 11
# Constructions

**Q: 1**   Sirisha is posed with the following four construction problems.

Problem 1: Construct an equilateral ΔABC with AB = 3 cm.
Problem 2: Construct a parallelogram MNOP with MN = 2 cm, ∠M = 60° and MP = 4 cm.
Problem 3: Construct a right-angle triangle ΔXYZ with ∠Y = 90° and XY = 3 cm.
Problem 4: Construct a square PQRS with diagonal PR = 4 cm.

Which of these have sufficient information for Sirisha to construct a UNIQUE geometrical figure?

**1** only 1 and 4             **2** only 2 and 3
**3** only 1, 2 and 4         **4** all - 1, 2, 3 and 4

**Q: 2**   Construct a ΔABC, right-angled at C and AC = 3.5 cm, that can be inscribed in a circle   **[3]** of radius 4 cm. Show your steps and give valid reasons.

*(Note: The construction of a circle is not needed.)*

**Q: 3**   Usha was asked to construct a triangle, ΔDGF', similar to ΔDEF with sides equal to   **[1]** $\frac{4}{5}$ of the corresponding sides of ΔDEF.

Shown below are the first four steps she followed during construction.
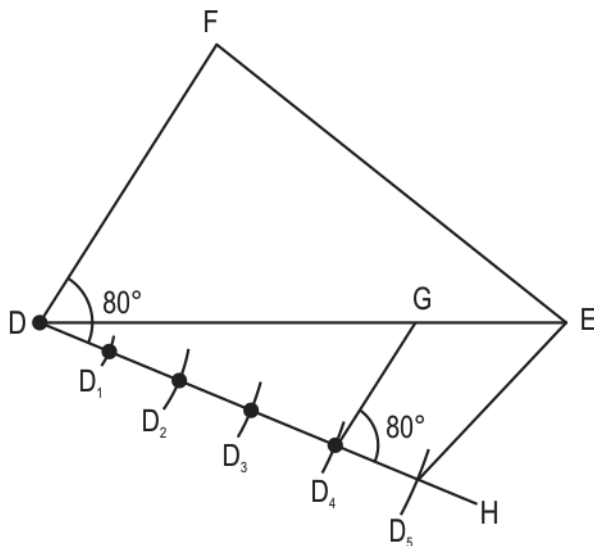


Step 1: Draws a line DH which makes an acute angle with the side DE.

Step 2: Locates 5 points $D_1, D_2, D_3, D_4,$ and $D_5$ on DH such that $DD_1 = D_1D_2 = D_2D_3 = D_3D_4 = D_4D_5.$
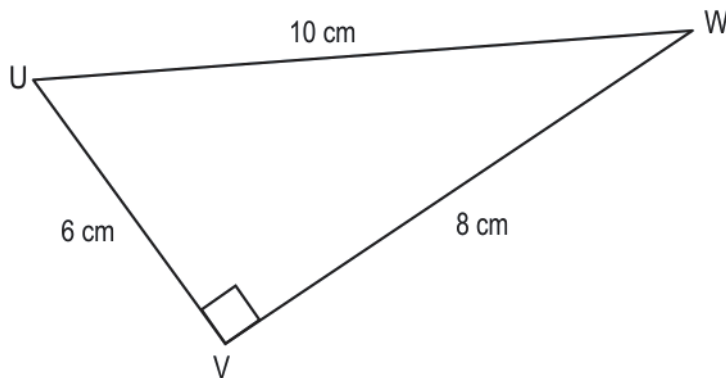
Step 3: Joins $ED_5$.

Step 4: Draws $GD_4$ parallel to FD.

*( Note: The figure is not to scale.)*

Is Usha's approach correct? If yes, what should be her next step? If no, what is her mistake?

**Q: 4** **In one of the geometry classes, the teacher drew the following triangle on the board.** **[1]**



*(Note: The figure is not to scale.)*

**She then asked the students to draw the LARGEST circle such that:**
**i) the centre of the circle coincides with one of the vertices of ΔUVW and**
**ii) one of the sides of ΔUVW is a tangent to the circle.**

**What should be the centre and radius of the circle?**

**Q: 5** **A circle has a diameter XY.** **[2]**

**Construct a tangent at point Y. Use a ruler and compass.**

**Q: 6** **Prasoon wanted to construct a square that is circumscribing a circle with centre O. He** **[1]**
**draws two tangents at the end of diameter, XY using perpendicular bisectors as shown**
**below.**
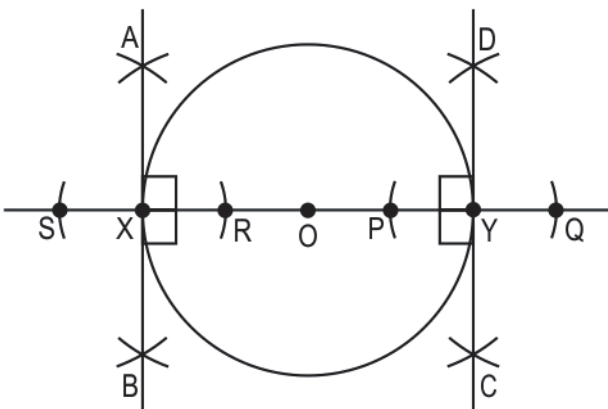


**What are the next steps Prasoon needs to take to complete the square?**

**Q: 7** Two circles are such that the centre of each lies on the circumference of the other circle. **[2]**

Construct two tangents to these circles such that the perpendicular distance between the two tangents is equal to the distance between the two centres. Use only a ruler and compass.

**Q: 8** Shown below is a rectangle PQRS with *a* units as the breadth and *b* units as the length. **[3]**
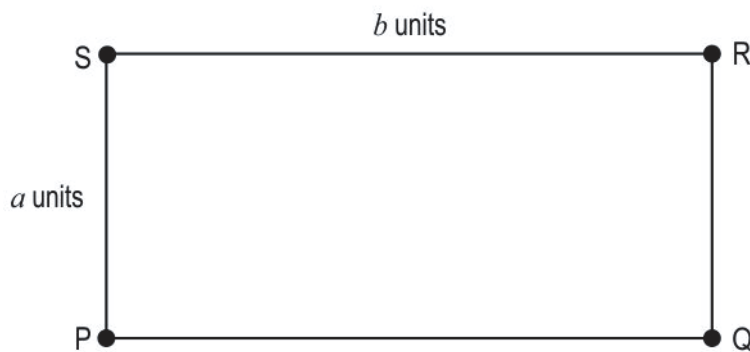


*b* units

Construct a rectangle PXYZ such that PZ = $\frac{a}{2}$ units and PX = $\frac{3b}{5}$ units where X is on PQ and Z is on PS. Use a ruler and compass only.

**Q: 9** Two friends, Ketaki and Priyam, were discussing about the common tangents to circles. **[3]**

Ketaki said, "Only 2 circles can have a common tangent."
Priyam said, "Any number of circles can have a common tangent."
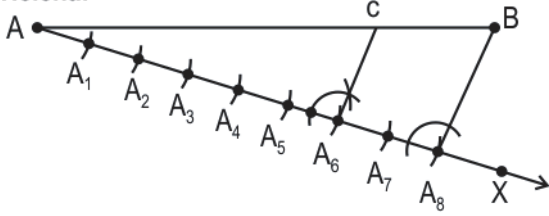
Who is right? Justify your answer with a construction.

**Q: 10** Two tangents drawn from an external point to a circle are 5 cm in length and at an angle of 105°. **[3]**
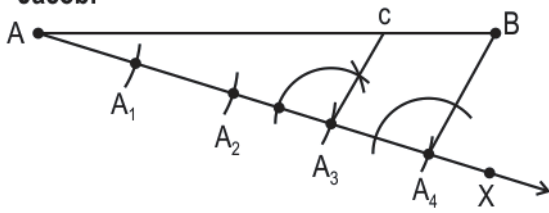
Find the radius of the circle. Use a ruler and compass only.

**Q: 11** A teacher asked her students to divide a straight line, AB, in the ratio 6:2 using a     **[1]**
compass and ruler. Two students' solutions are shown below.

Helena:



Jacob:



**Whose solution is correct? Give a valid reason for your answer.**

**The table below gives the correct answer for each multiple-choice question in this test.**
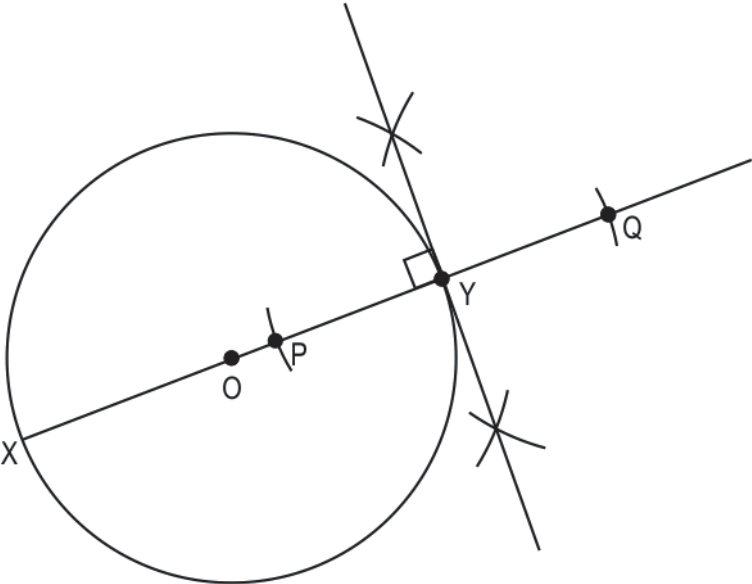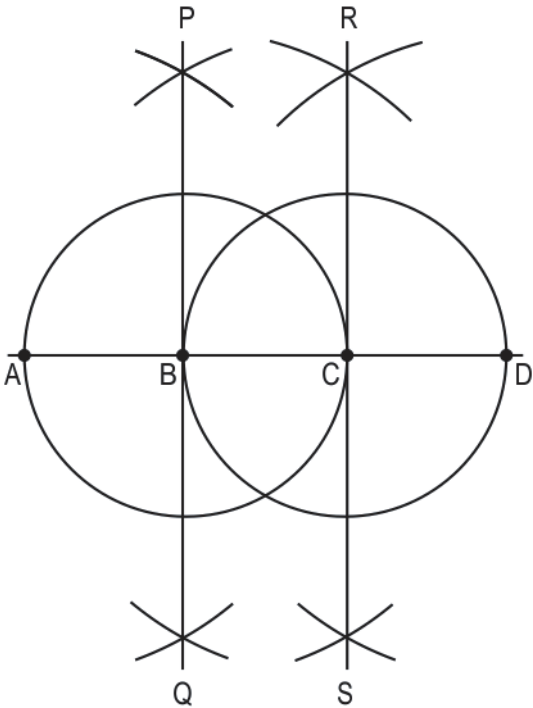
| Q.No | Correct Answers |
|------|-----------------|
| 1    | 3               |

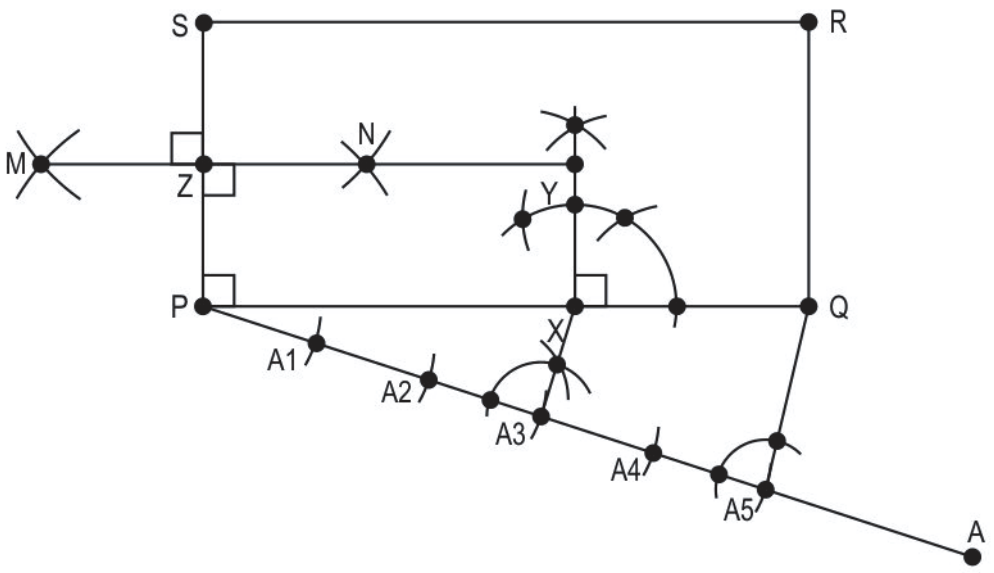| Q.No | Teacher should award marks if students have done the following: | Marks |
|------|------------------------------------------------------------------|-------|
| 2 | Constructs AC = 3.5 cm. | 0.5 |
| | Constructs a perpendicular at point C. | 0.5 |
| | Writes that hypotenuse AB = 8 cm because, for every right-angled triangle in a circle, the hypotenuse is equal to the diameter. | 1 |
| | With A as the centre, construct an arc with a length of 8 cm intersecting the perpendicular from step 3 at B. | 0.5 |
| | Connects AB to complete the triangle. | 0.5 |
| | The construction may look as follows:<br><br><br><br>(Award full marks for the question if the method is correct but measurements are off by +/- 0.1 cm.) | 0 |
| 3 | Writes that Usha's approach is not correct. | 0.5 |

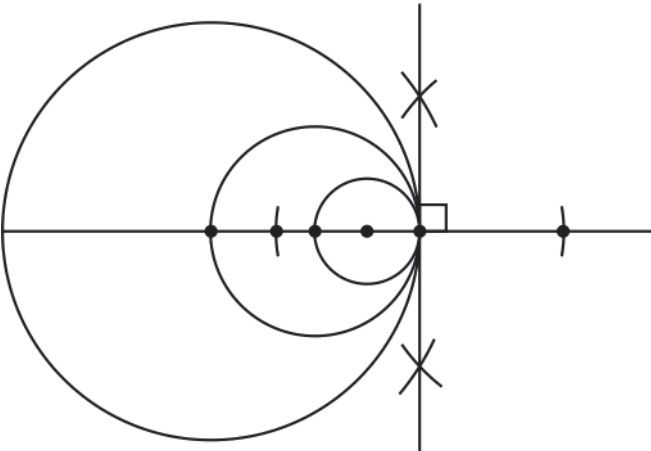| Q.No | Teacher should award marks if students have done the following: | Marks |
|------|------------------------------------------------------------------|-------|
|  | Writes that Usha has drawn $D_4$ G parallel to DF instead of drawing it parallel to $D_5$ E. This has resulted in DG not being $\frac{4}{5}$ of DE.<br><br>(Award full marks for any equivalent explanation.) | 0.5 |
| 4 | Writes that the centre of the circle should be the vertex W. | 0.5 |
|  | Writes that the radius of the circle should be 8 cm. | 0.5 |
| 5 | Draws a circle with centre O, diameter XY and cuts two equal arcs, say P and Q, from point Y. | 1 |
|  | Constructs the perpendicular bisector of PQ that passes through point Y. | 1 |
|  | The construction may look as follows:<br><br> | 0 |
| 6 | Writes that Prasoon needs to draw another diameter that is perpendicular to XY, say EF. | 0.5 |
|  | Writes that the next step to be followed by Prasoon is to construct tangents at E and F respectively using perpendicular bisectors. | 0.5 |

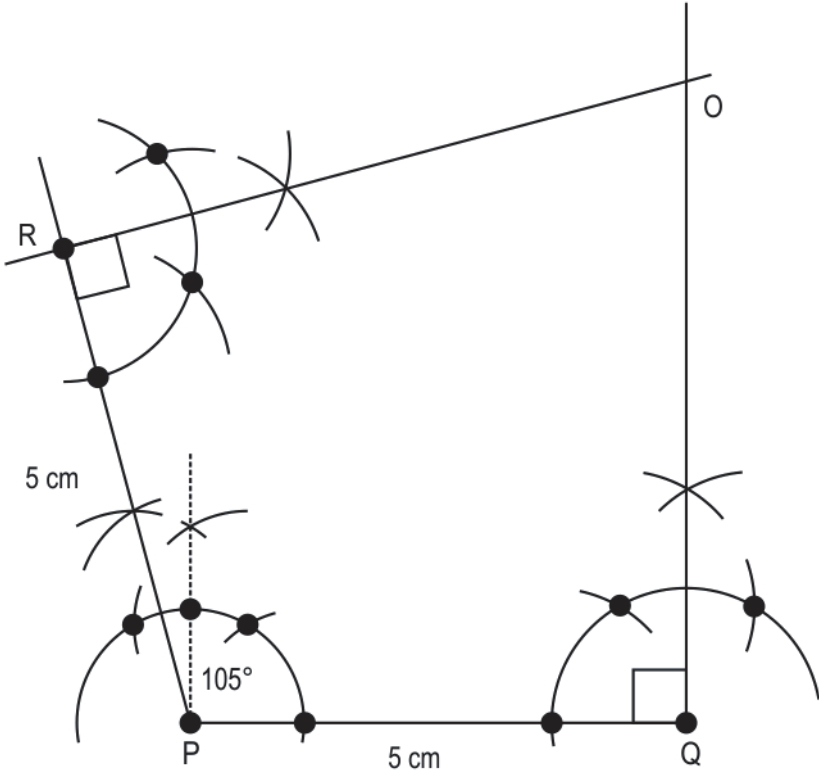| Q.No | Teacher should award marks if students have done the following: | Marks |
|------|----------------------------------------------------------------|-------|
| 7 | Constructs two circles with centres, say B and C, such that the centre of each lies on the circumference of the other circle, where both circles have the same radii. | 0.5 |
| | Uses perpendicular bisectors to:<br><br>♦ construct a tangent at B for the circle with centre C.<br><br>♦ constructs a tangent at C for the circle with centre B. | 1.5 |
| | The construction may look as follows:<br><br> | 0 |
| 8 | Draws the given rectangle PQRS. Draws a line PA making an acute angle with PQ. Marks 5 arcs having an equal radius on PA. Joins $A_5$ to Q and draws a line parallel to $A_5$Q from $A_3$. Marks the point dividing PQ as X to get PX:PQ = 3:5. | 1.5 |
| | Constructs the perpendicular bisector of PS, say MN, and marks the mid-point as Z. | 0.5 |

| Q.No | Teacher should award marks if students have done the following: | Marks |
|------|-----------------------------------------------------------------|-------|
|  | Draws a 90° angle at X and extends MN to mark the point of intersection as Y. | 1 |
|  | The final construction may look as follows: | 0 |



| Q.No | Teacher should award marks if students have done the following: | Marks |
|------|-----------------------------------------------------------------|-------|
| 9 | Writes that Priyam is right. | 0.5 |
|  | Draws 3 circles such that they have one common point of contact. | 1 |
|  | Draws a tangent at the common point of contact. | 1 |

| Q.No | Teacher should award marks if students have done the following: | Marks |
|------|------------------------------------------------------------------|-------|
|      | **The construction may look as follows:** | **0** |
|      |  | |
|      | **Writes that, similarly, any number of such circles can be drawn with a common tangent.** | **0.5** |
| **10** | **Draws a tangent PQ of length 5 cm.** | **0.5** |
|      | **Draws an angle of 105° at P and draws the other tangent PR of length 5 cm.** | **1** |
|      | **Draws an angle of 90° at Q and R and extends the lines to meet at O.** | **1** |
|      | **Measures OQ and OR to find the radius of the circle as 5.9 cm.**<br><br>**(Award full marks if radius is 5.9 ± 0.1 cm.)** | **0.5** |

| Q.No | Teacher should award marks if students have done the following: | Marks |
|------|------------------------------------------------------------------|-------|
| | **The construction may look as follows:** | **0** |
| |  | |
| **11** | **Writes that both students' solution is correct and gives a valid reason. For example, 6:2 is equivalent to 3:1 and hence, the line can either be divided into 8 equal parts or 4 equal parts.** | **1** |