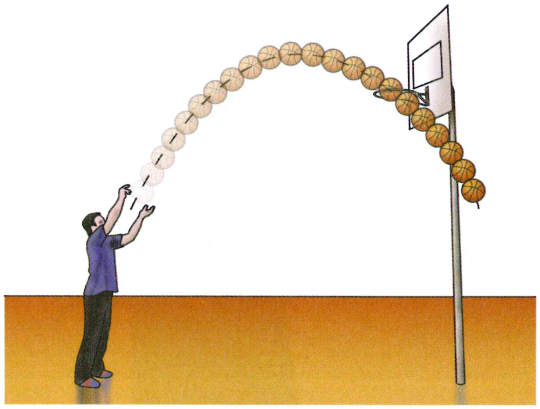
Chapter 17

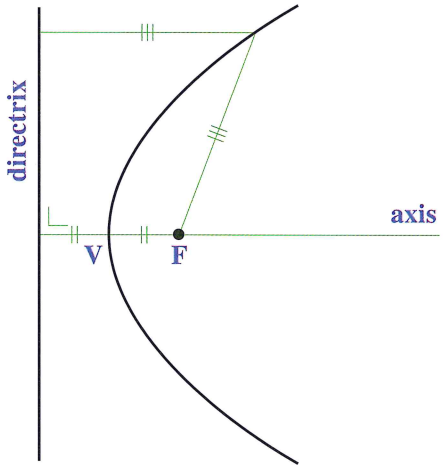
The Parabola

Whenever a ball is thrown into the air, it travels along a path in the shape of a curve called a **parabola**.



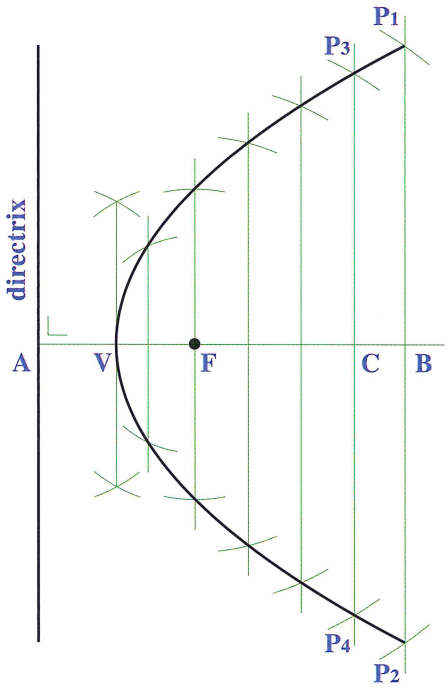
A **parabola** is the path traced out by a point which moves in a plane so that its distance from a fixed line is always equal to its distance from a fixed point.

Parts of a Parabola



1. The fixed line is called the **directrix**.
2. The fixed point **F** is called the **focal point**.
3. The **vertex V** lies midway between the directrix and the focal point.
4. The **axis** is a line drawn perpendicular to the directrix through the focal point.

Drawing a Parabola by the Locus Method



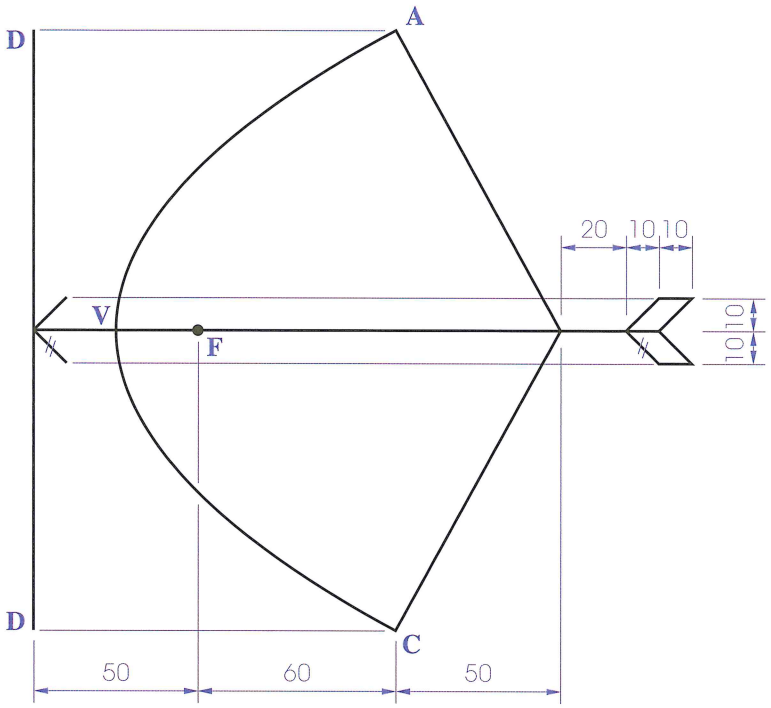
1. Position the directrix and the focal point F. Bisect AF to locate the vertex V.
2. Draw lines parallel to the directrix. With centre F and radius AB, swing arcs to intersect the line through B at P_1 and P_2. These are two points on the parabola.
3. With centre F and radius AC, swing arcs to intersect the line through C at P_3 and P_4. These are two more points on the parabola.
4. Other points on the curve can be located in the same way.
5. Draw a smooth curve through the points.

Answer Worksheet 17A

Exercises

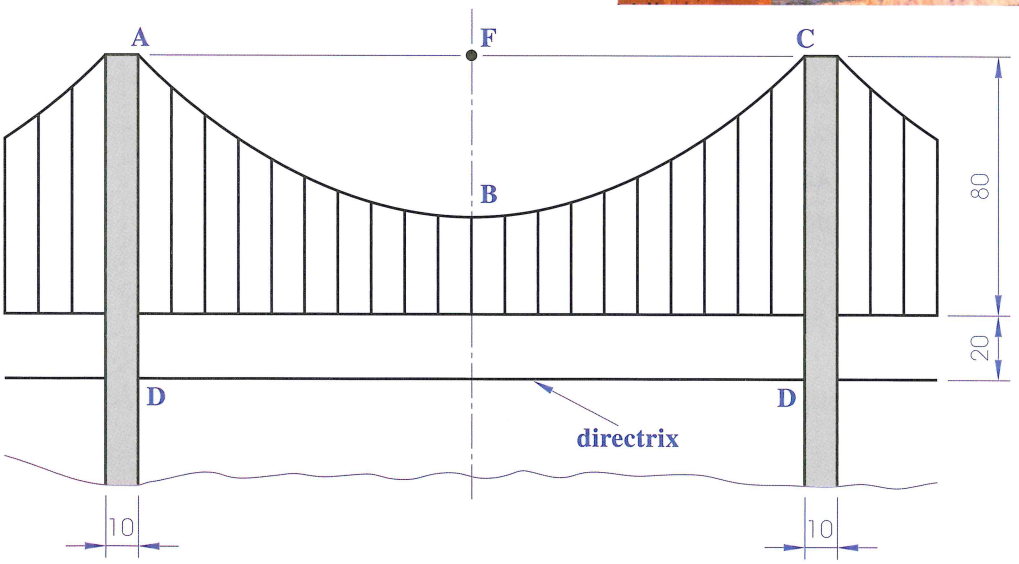
1. The figure represents a **bow and arrow**. The curve AVC is based on a **parabola** with the **vertex** at V and the **focal point** at F. The line DD is the **directrix** for the curve.

Draw the figure full-size.



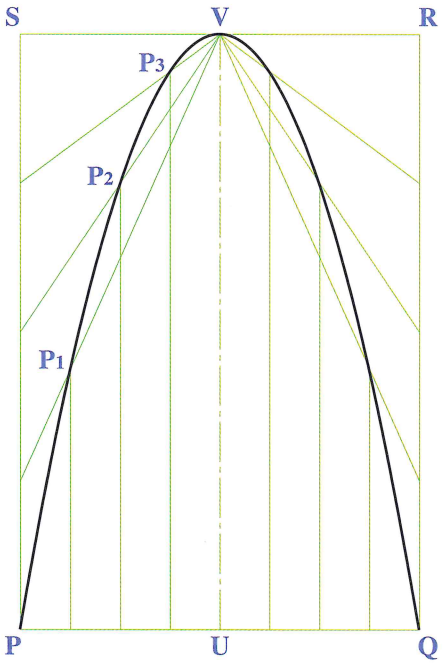
2. The figure below shows a drawing of a portion of the **Golden Gate Bridge** in San Francisco. The curve ABC is based on a parabola with the **vertex** B and the **focal point** at F. The line DD is the **directrix** of the curve. *The vertical cables are equally spaced.*

Reproduce the figure to the given measurements, showing clearly how to obtain the vertex B and the points A and C.



Inscribing a Parabola in a Given Rectangle PQRS

1. Bisect SR to get V, the vertex of the parabola.
2. Draw the axis VU of the parabola.
3. Divide PS and PU into the same number of equal parts, say four.
4. Draw lines from each of the points on PS to V.
5. Draw lines through the points on PU parallel to the axis to intersect the lines through V at P_1, P_2 and P_3. These points of intersection lie on the parabola.
6. Repeat steps 3, 4 and 5 for the other half of the curve. Draw a smooth curve through the intersections as shown.

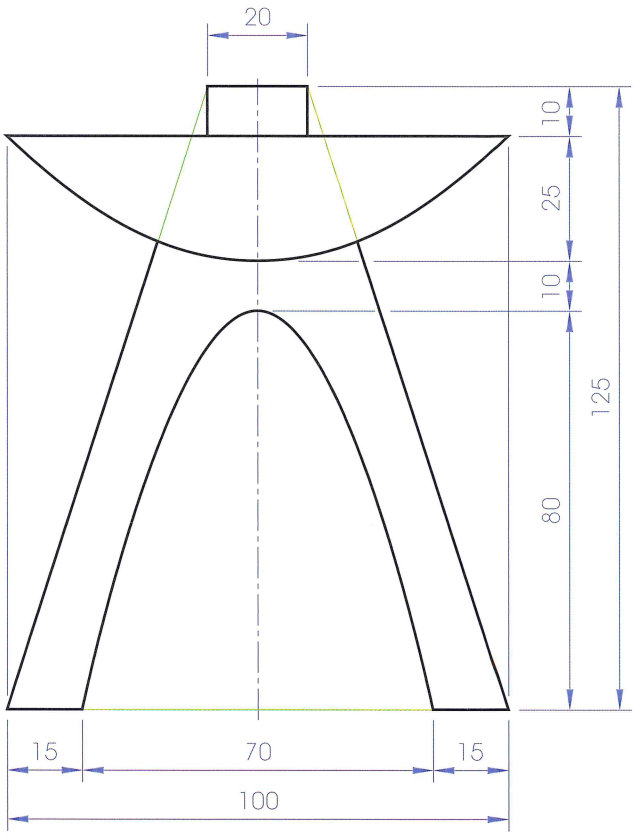


Answer Worksheet 17B

Exercises

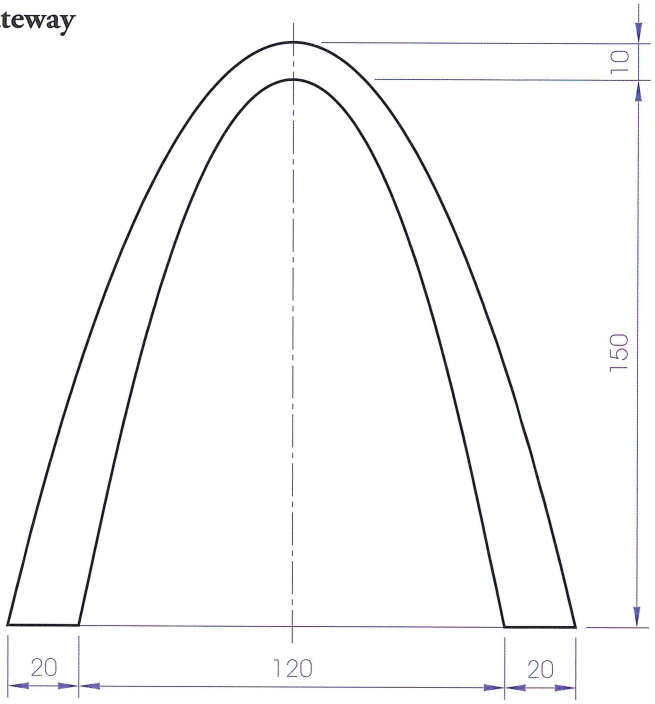
1. The figure across shows a **candle holder**. Also shown is a drawing of the holder. Both curves are **parabolas**.

   Reproduce the drawing to the given dimensions showing all construction lines.



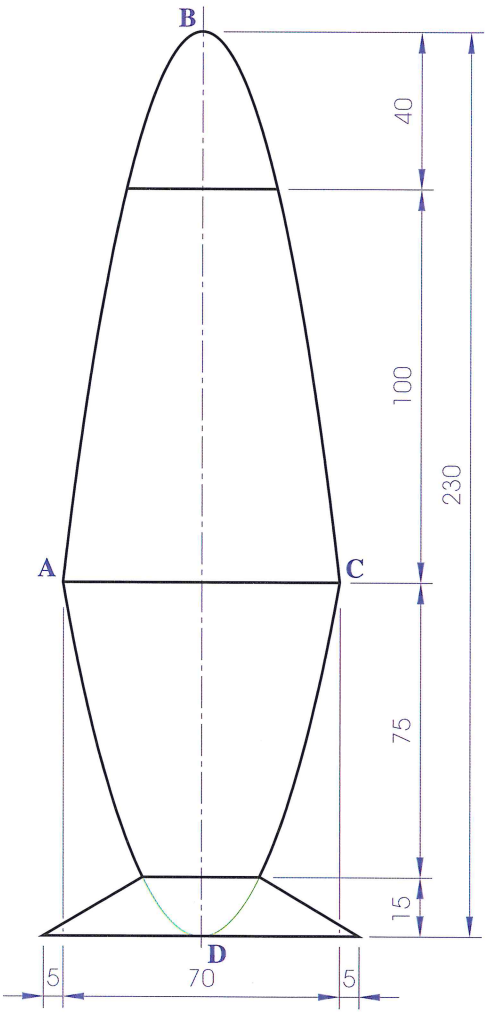
2. The figure across shows a drawing of the famous **Gateway Arch** at St Louis, Missouri, in the United States of America. The arch contains two **parabolic** curves.

Reproduce the drawing of the arch showing all constructions.



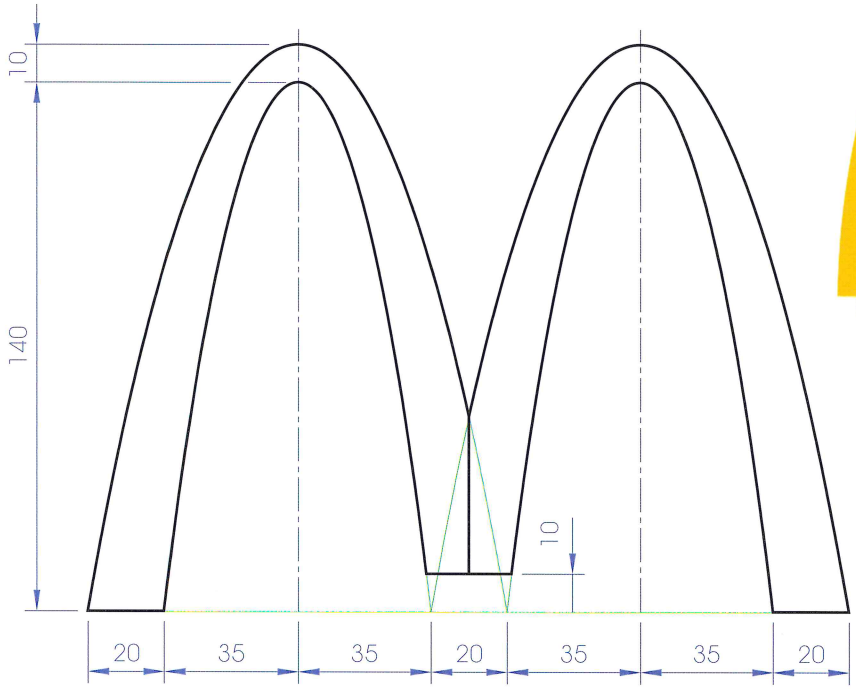
3. The figure across shows a drawing of a **lava lamp**, which is composed of two **parabolic** curves ABC and ADC, with vertices at B and D, respectively.

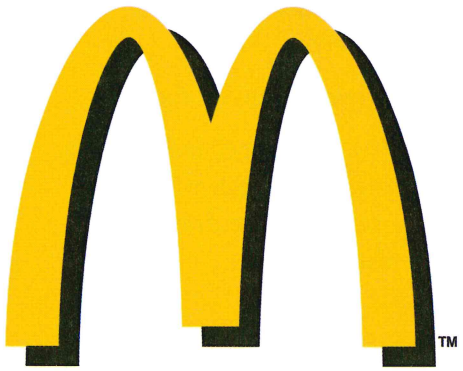
Make a copy of the drawing showing all construction lines clearly.



4. The figure below shows the **McDonald's** logo. A drawing of the logo, consisting of two **parabolas**, is also shown in the figure.

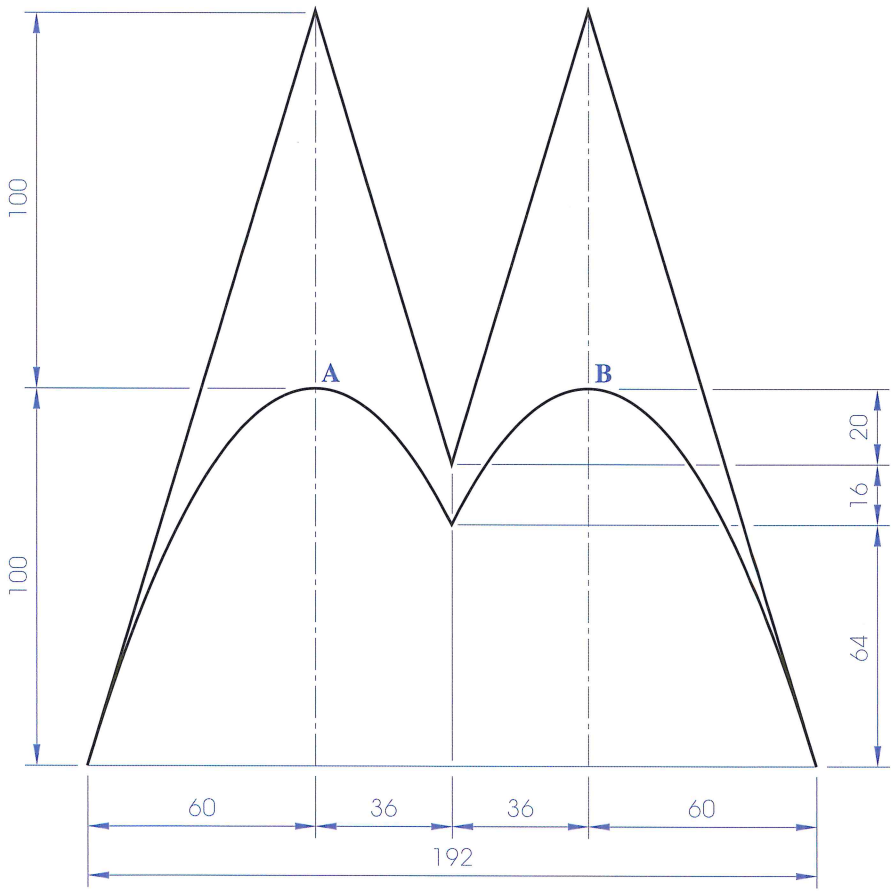
Draw the logo to the dimensions given.





5. The figure across shows a drawing of the **Motorola** sign. It contains two **parabolas** with vertices at A and B respectively.

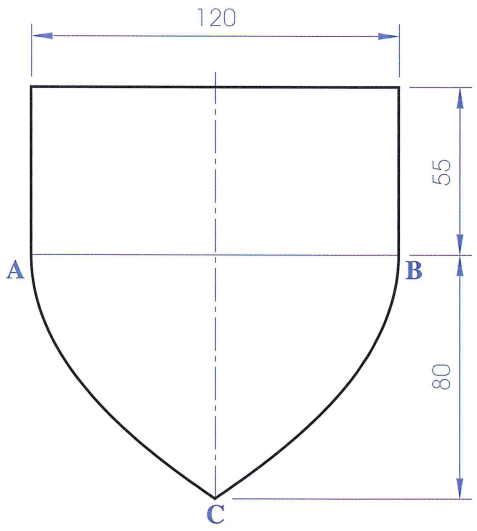
Reproduce the given drawing of the sign showing all construction lines clearly.



6. The figure across represents the outline of a **crest** for a county jersey. The curves AC and BC are **semi-parabolas** with vertices at A and B respectively.

(a) Draw the given figure.

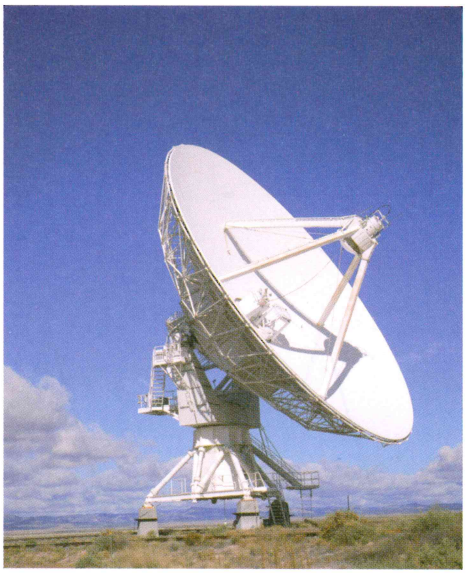
(b) Use your freehand drawing skills to sketch the design shown in the drawing of the crest.

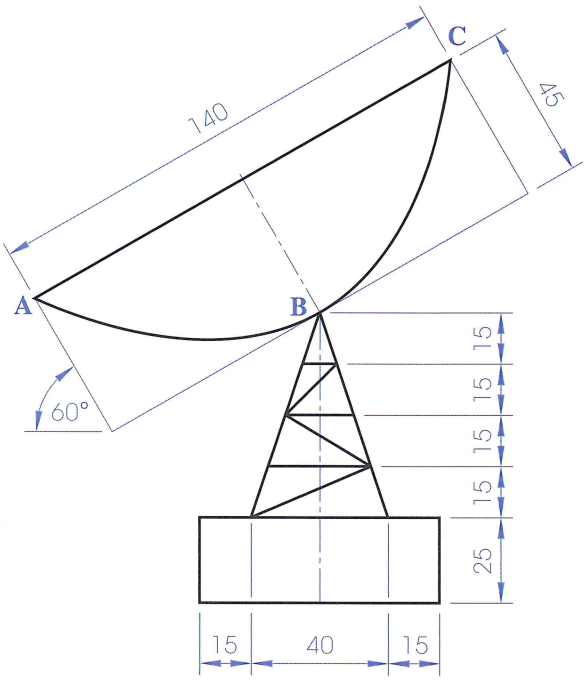


7. The figure over shows a drawing of a **radio telescope**. The curve ABC is a **parabola**.

(a) Draw the given view.

(b) The dish is tilted so that the axis of the **parabola** is at an angle of 45° to the ground. On a separate diagram, draw a view of the telescope in this position.





8. A drawing of the **Vodafone** symbol is shown over. The curves AD and ABC are based on **parabolas** with vertices at A and B respectively.

Reproduce the given drawing full-size showing all construction lines.