Chapter 29

Developments 2

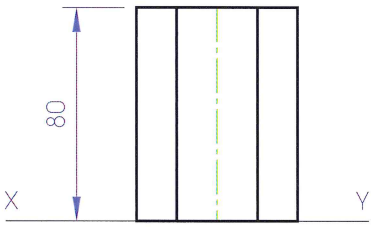
Parallel-line Developments

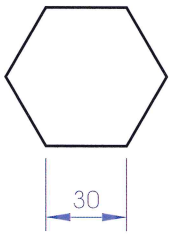
In chapter 10 we considered developments of a range of objects. We saw that:

> Every face or surface in a development represents the true shape of that face or surface of the object.

Example 1

1. The elevation and plan of a **regular hexagonal prism** are shown over.
(a) Draw the given views.
(b) Draw a complete **development** of the prism.



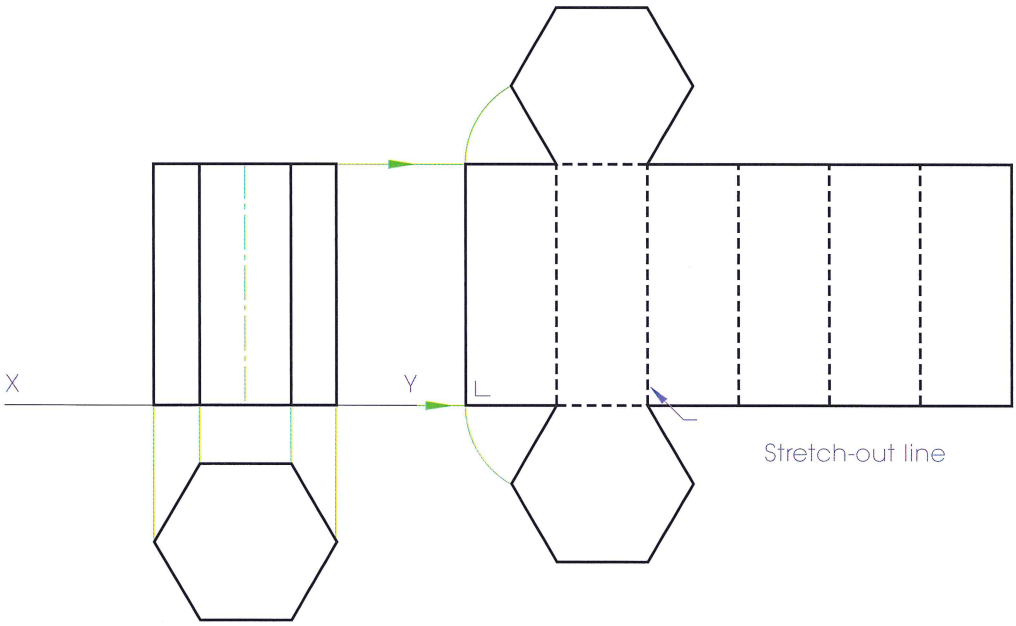


1. The plan and elevation are drawn in the normal manner.

2. The base edges of the prism develop as a straight line which is known as the **stretch-out line**. It will be 6 × 30 = 180 mm long.

3. The lateral edges develop as lines perpendicular to the stretch-out line. It can be seen from the plan that these edges will be 30 mm apart. Their true lengths can be transferred from the elevation, as shown below.

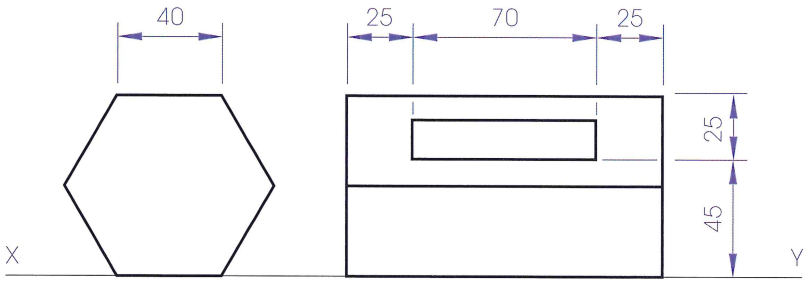
4. The end faces, which appear in true shape in plan, can be redrawn in the development.



> The base or end face edges of a prism develop as a straight line known as the **stretch-out line**.
> Its lateral edges develop as lines **perpendicular to the stretch-out line**.
> The result is known as a **parallel-line development**.

Example 2

1. The elevation and end view of a **box for tennis balls** are shown over.
- **(a)** Draw the given views.
- **(b)** Draw a complete **development** of the box.

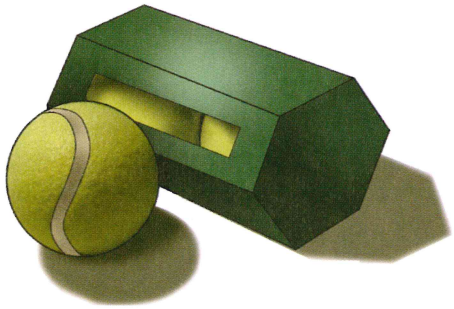


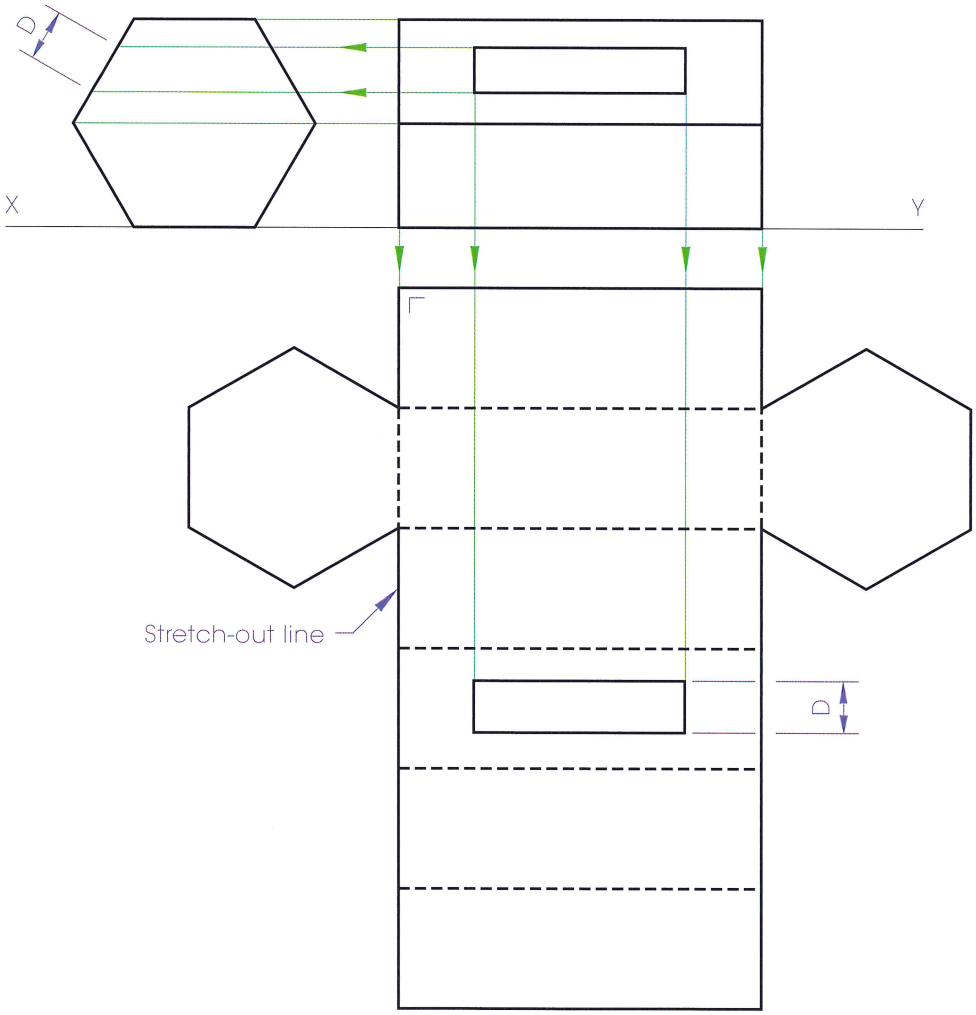
1. The end view and elevation are drawn in the normal manner.

2. In this case the stretch-out line will be $6 \times 40 = 240$ mm long and can be drawn as shown below.

3. The lateral edges will be perpendicular to the stretch-out line and 40 mm apart. Their true lengths can be transferred from the elevation.

4. The true length and width of the opening can be transferred from the elevation and end view respectively, allowing the development to be completed as shown.



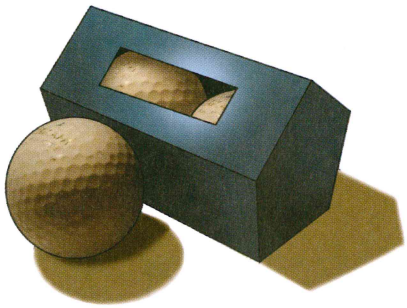


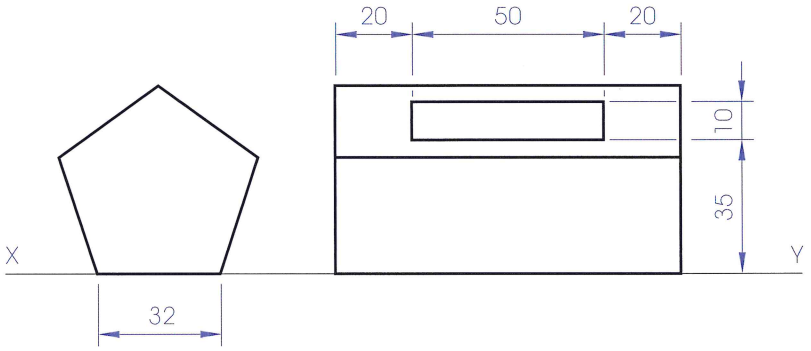
Exercise

The elevation and end view of a package for **two golf balls** are shown below. The box is based on a **regular pentagonal prism.**

(a) Draw the given views.

(b) Draw a complete **development** of the box.





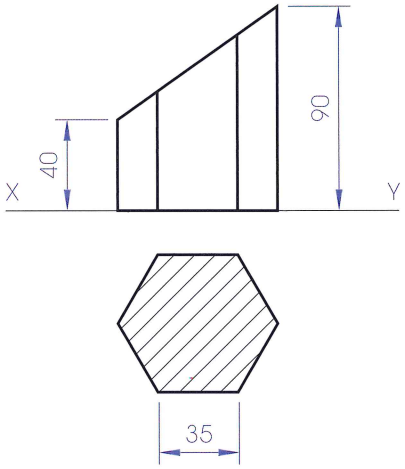
Example

The figure over shows the elevation and plan of a **truncated regular hexagonal prism**.

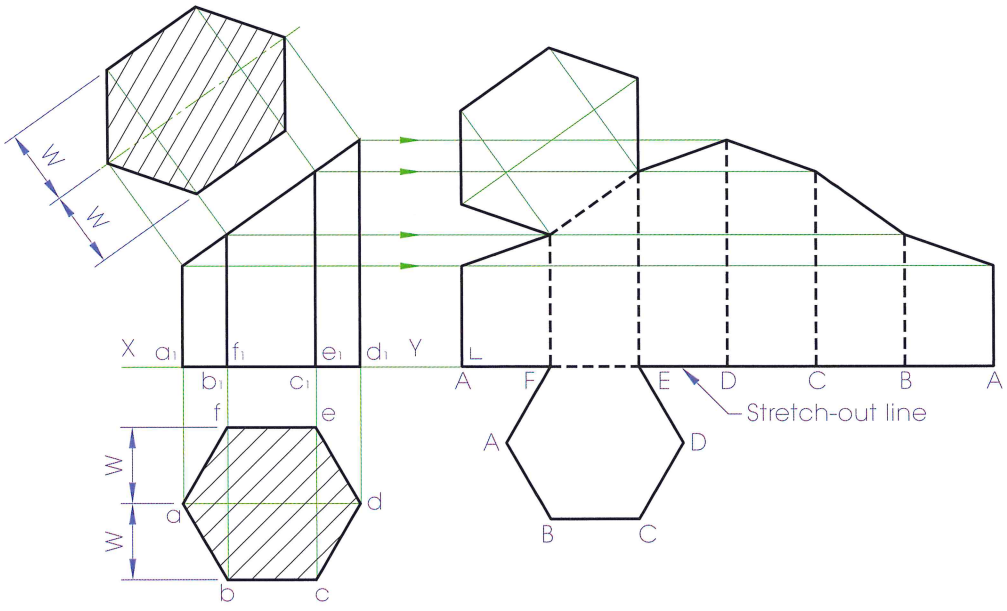
(a) Draw the given views.

(b) Determine the **true shape** of the cut section of the solid.

(c) Draw a complete **development** of the truncated prism.



1. The given views and the true shape of the cut section are drawn as shown below (refer to page 222).
2. The stretch-out line will be 210 mm long.
3. The lateral edges will be perpendicular to the stretch-out line and 35 mm apart. Their true lengths can be transferred from the elevation as shown over.
4. The development can be completed by redrawing the base (which appears in true shape in plan) and the true shape of the cut section of the solid.



The seam is normally at the shortest lateral edge.

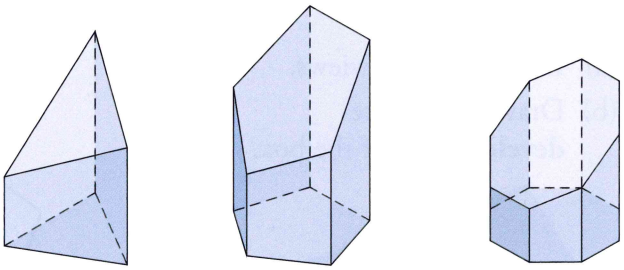
Exercises

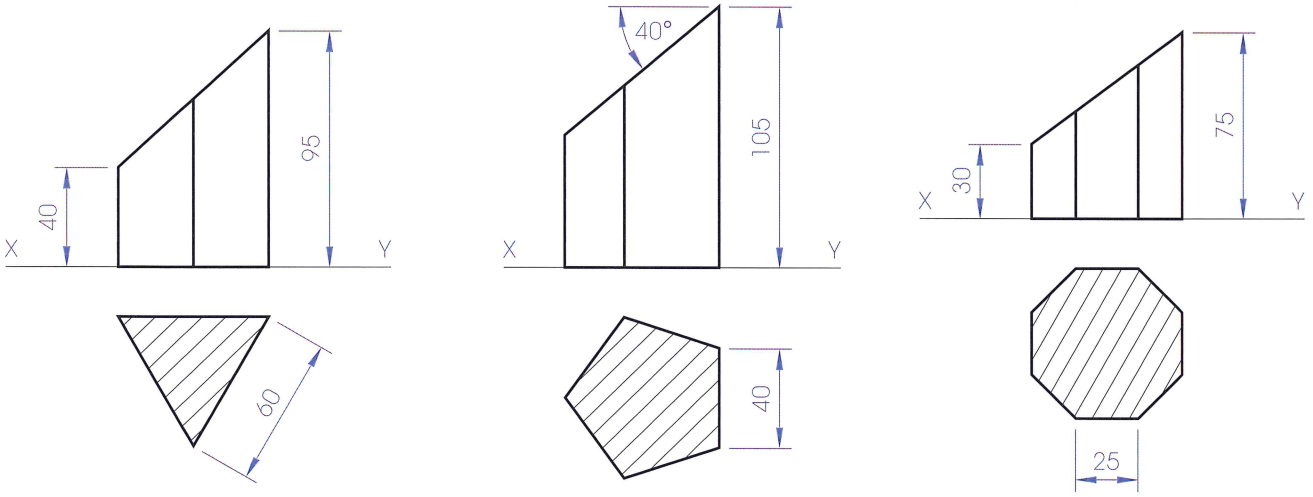
1. The figure below shows the elevation and plan of a truncated **equilateral triangular prism**, a truncated **regular pentagonal prism** and a truncated **regular octagonal prism**. In each case:

(a) Draw the given views.

(b) Determine the **true shape** of the cut section of the solid.

(c) Draw a complete **development** of the truncated prism.



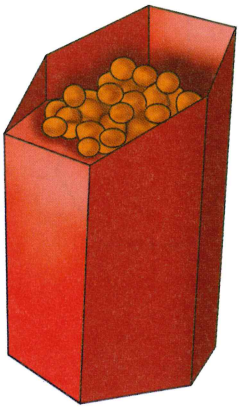


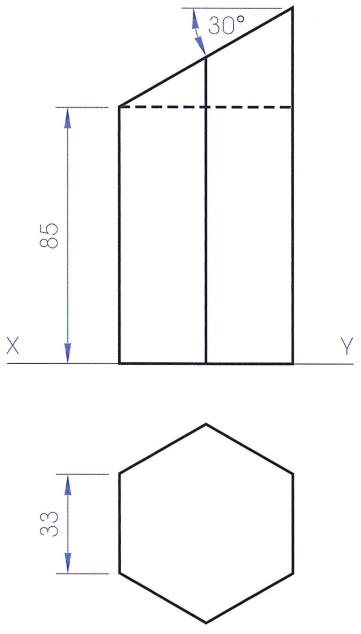
2. The elevation and plan of a **display box** are shown below. The box is based on a **truncated regular hexagonal prism**.

(a) Draw the given views.

(b) Draw a complete **development** of the display box.

(c) A cover is to be used to close the box. Determine the **true shape** of the cover.



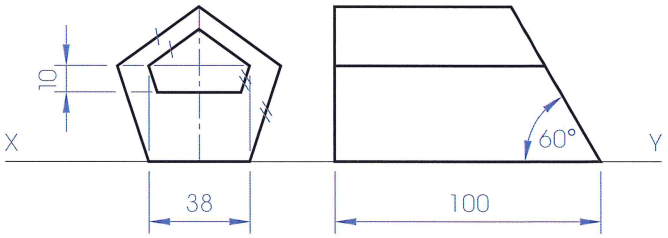


Example

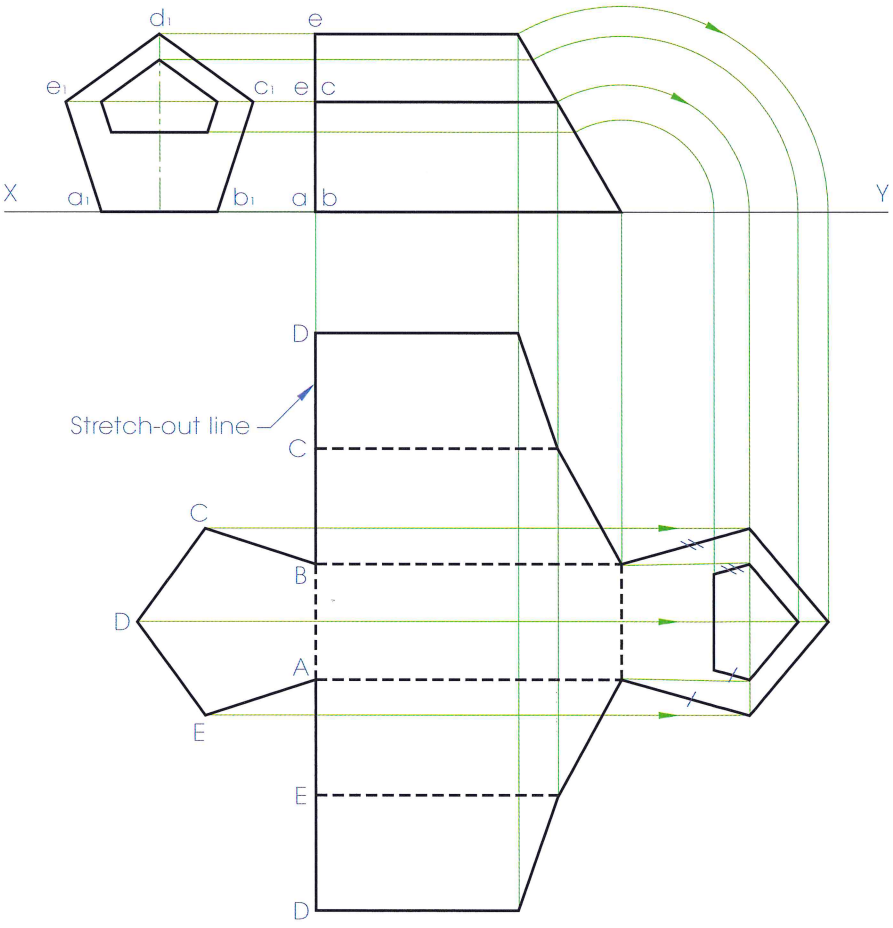
The figure over shows the elevation and end view of a **box**, which is based on a **truncated regular pentagonal prism**.

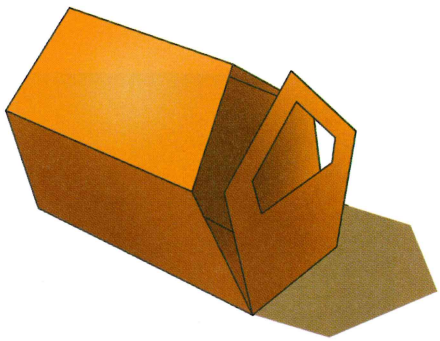
(a) Draw the given views.

(b) Draw a complete **development** of the box.



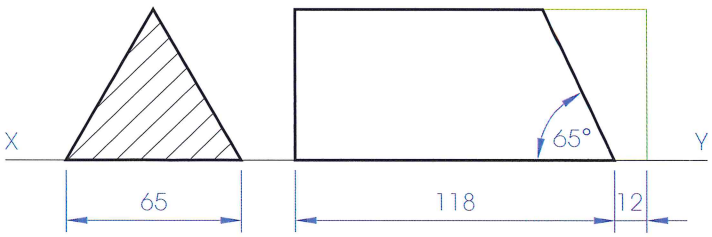
1. The given views are drawn in the normal manner.
2. The stretch-out line will be 5 × 38 = 190 mm long.
3. The lateral edges will be perpendicular to the stretch-out line and 38 mm apart. Their true lengths can be transferred from the elevation as shown over.
4. The left face, a regular pentagon of side 38 mm, can be drawn.
5. The true shape of the cut surface of the prism can be determined by rabatting it into the horizontal plane as shown across.





Exercises

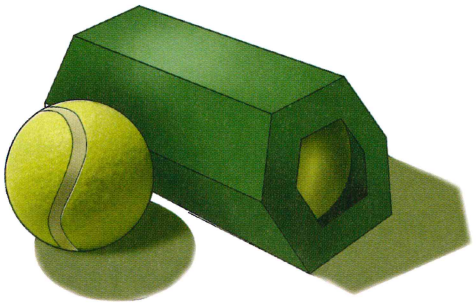
1. The elevation and end view of a truncated **equilateral triangular prism** are shown below.
   (a) Draw the given views.
   (b) Draw a complete **development** of the truncated prism.

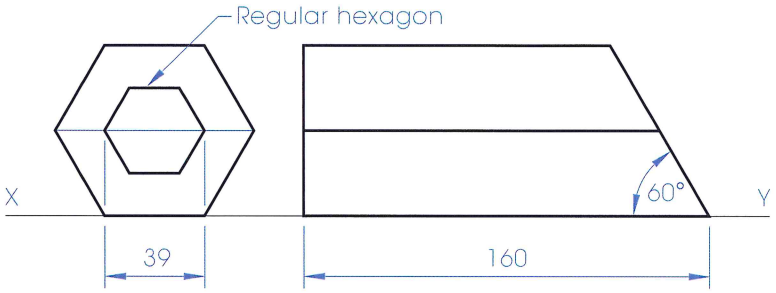


2. The figure below shows the elevation and end view of a package for **two tennis balls**. It is based on a **truncated regular hexagonal prism**.

(a) Draw the given views.

(b) Draw a complete **development** of the package.





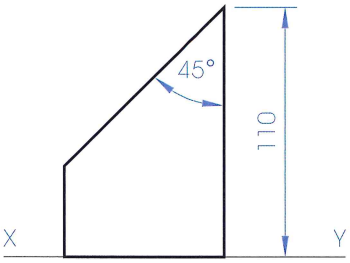
Example

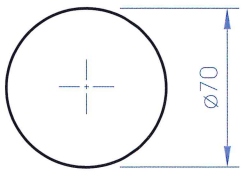
The elevation and plan of a **truncated cylinder** are shown over.

(a) Draw the given views.

(b) Determine the **true shape** of the cut section of the solid.

(c) Draw the complete **development** of the solid

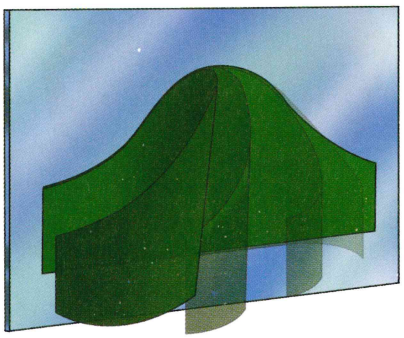




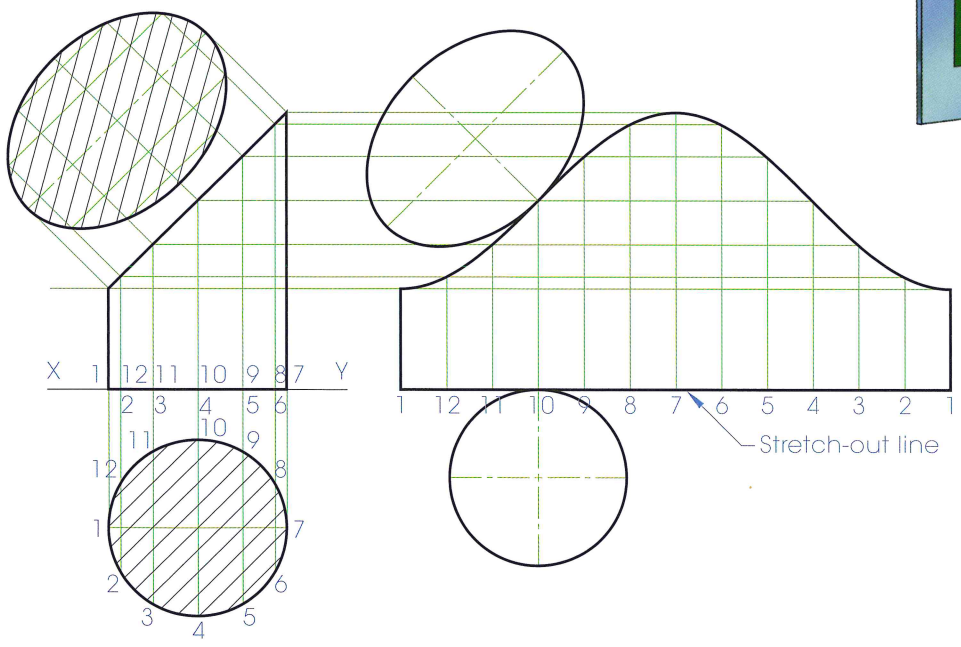
1. The required plan, elevation and true shape are drawn in the normal manner.

2. Consider the projections of twelve equally spaced elements on the surface of the cylinder as shown below. The stretch-out line can be determined by setting out the resulting chord distance twelve times as shown.

3. The elements will develop as lines perpendicular to the stretch-out line. Their true lengths can be transferred from the elevation. Then draw a smooth curve to pass through their endpoints as shown.



4. The base and the true shape of the cut section can now be redrawn in their required positions.

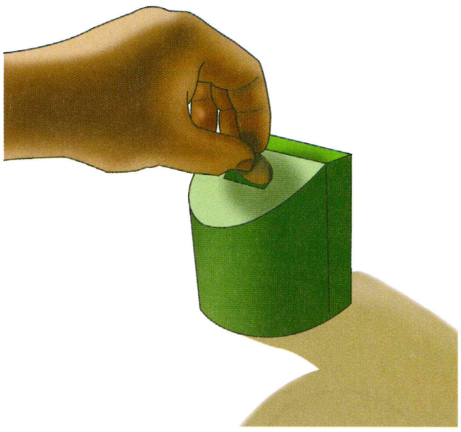


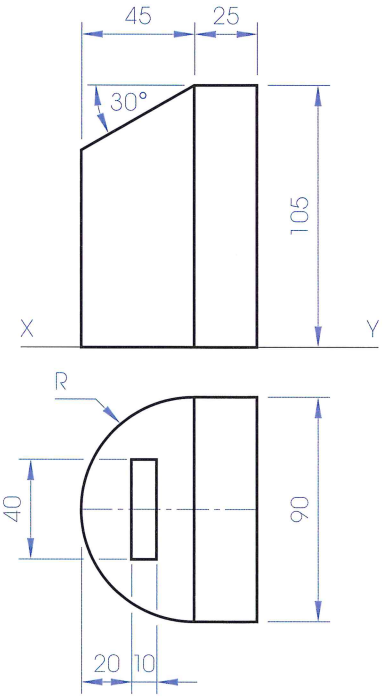
Exercises

1. The elevation and plan of a **collection box** are shown over.

(a) Draw the given views.

(b) Draw the complete **development** of the box.





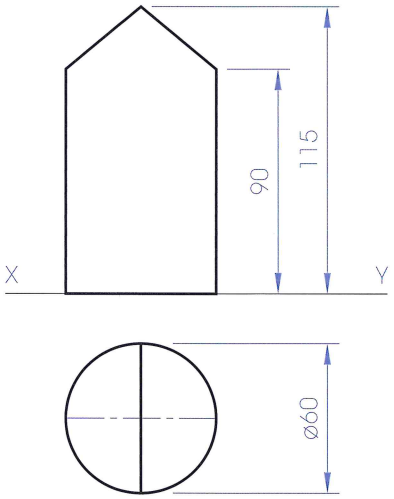
2. The figure over shows the elevation and plan of a **bin**.

(a) Draw the given views.

(b) Project an **end elevation** of the bin.

(c) Draw the **development** of the *curved surface* of the bin.

(d) Determine the **true shape** of *one* of the sloping surfaces of the bin.

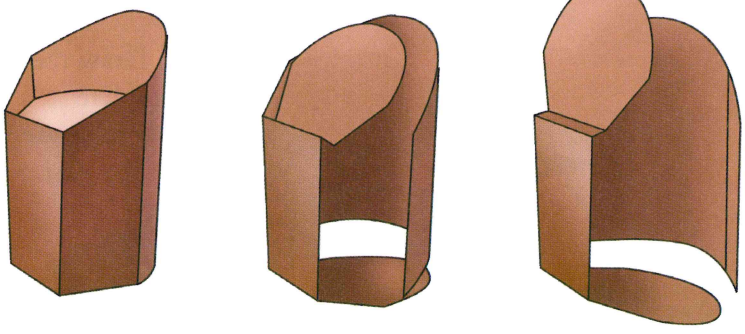


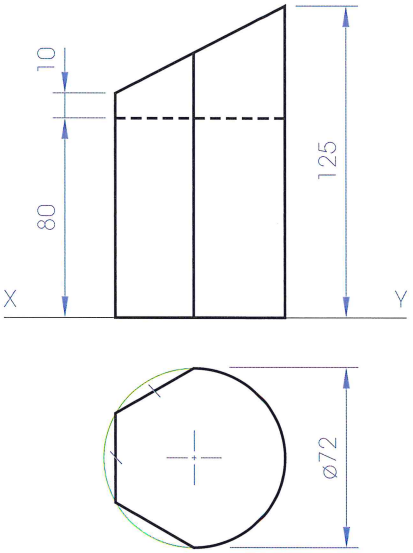
3. The elevation and plan of a **display box** are shown over.

(a) Draw the given views.

(b) Draw the complete **development** of the box.

(c) A lid is to be used to cover the display. Determine the **true shape** of the lid.



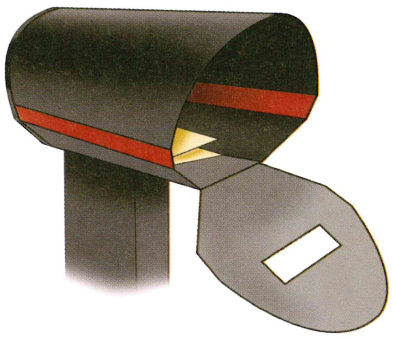


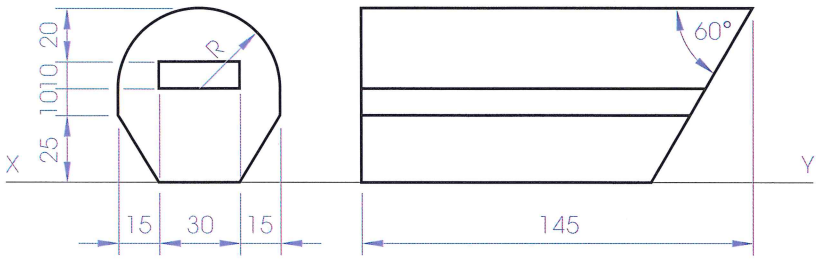
Example

The elevation and end view of a **mailbox** are shown below.

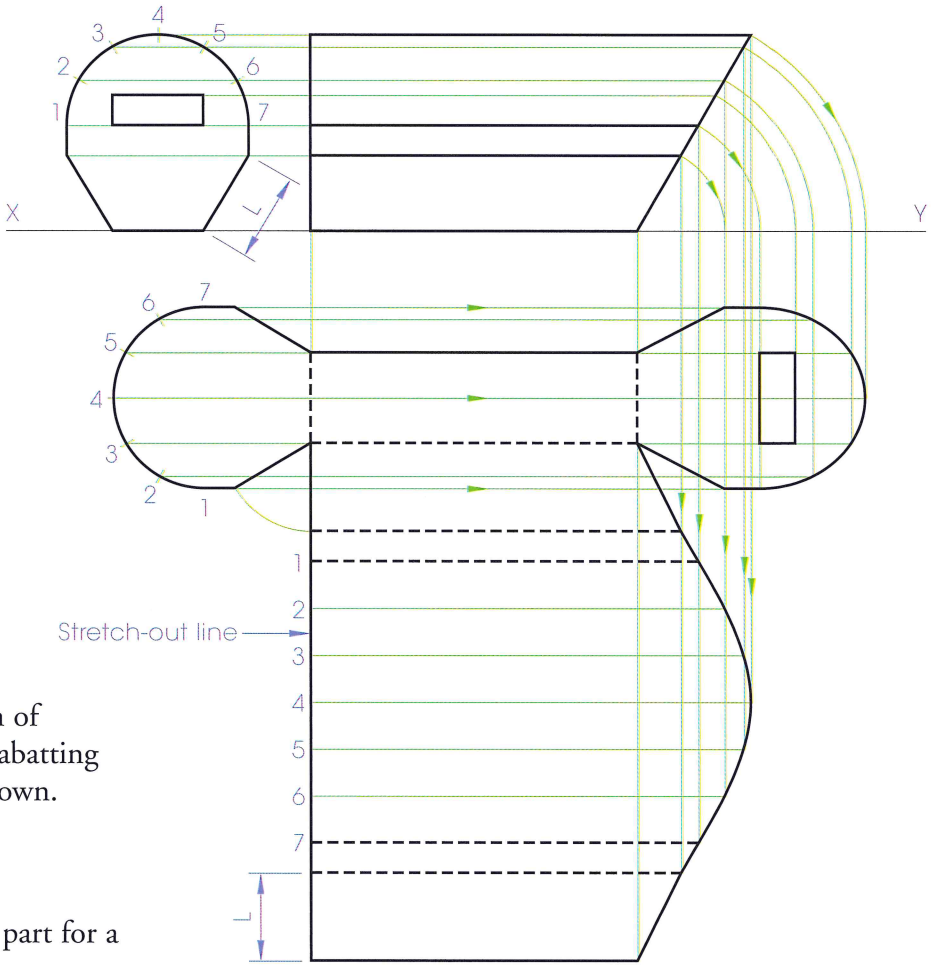
(a) Draw the given views.

(b) Draw the complete **development** of the mailbox.





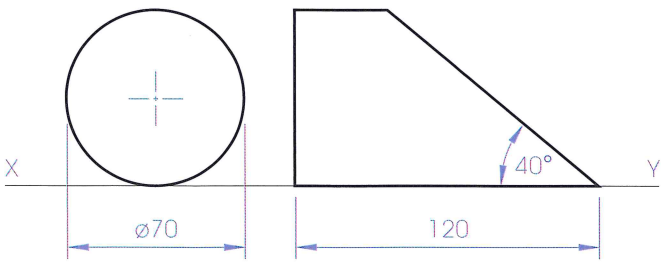
1. The elevation and end view are drawn in the normal manner.
2. The length of the stretch-out line and location of the lateral edges can be determined from the end view.
3. The true lengths of the lateral edges and the elements of the curved surface can be transferred from the elevation. These endpoints can be joined by a straight line/smooth curve as appropriate.
4. The left end face can be redrawn as it appears in true shape in the end view.
5. The true shape of the cut section of the solid can be determined by rabatting it into the horizontal plane as shown.



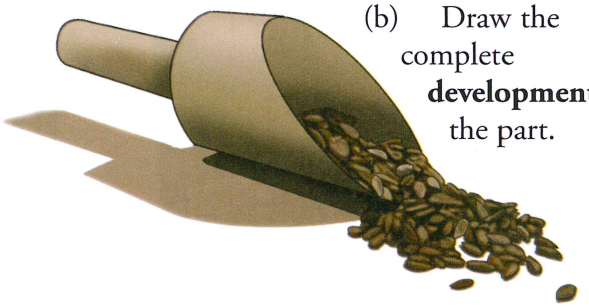
Exercises

1. The elevation and end view of a part for a **scoop** are shown below.

   (a) Draw the given views.



(b) Draw the complete **development** of the part.

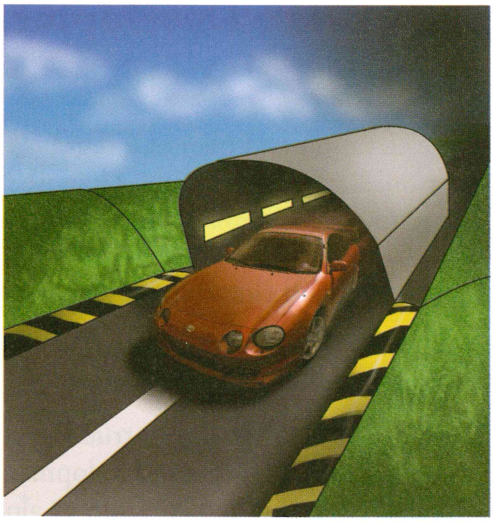


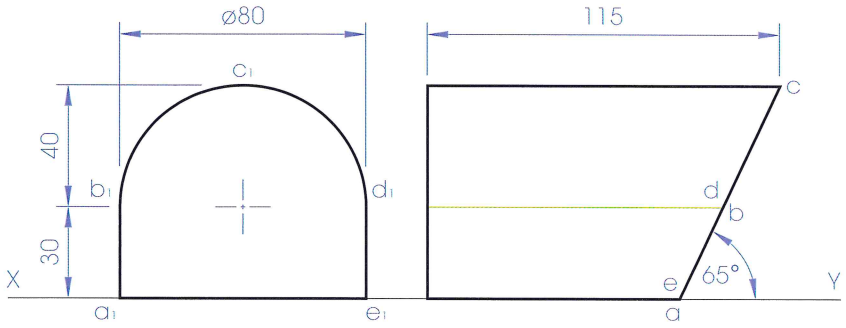
2. The elevation and end view of a **tunnel** are shown below.

(a) Draw the given views.

(b) Draw the complete **development** of the tunnel.

(c) Determine the **true shape** of the surface ABCDE.

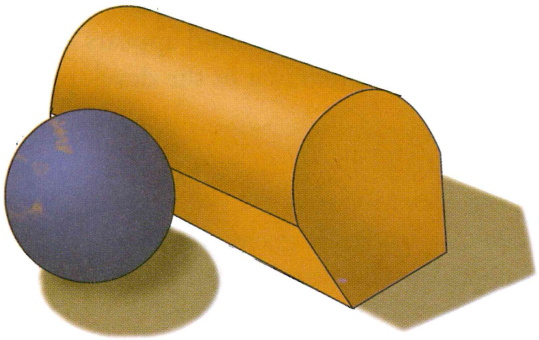


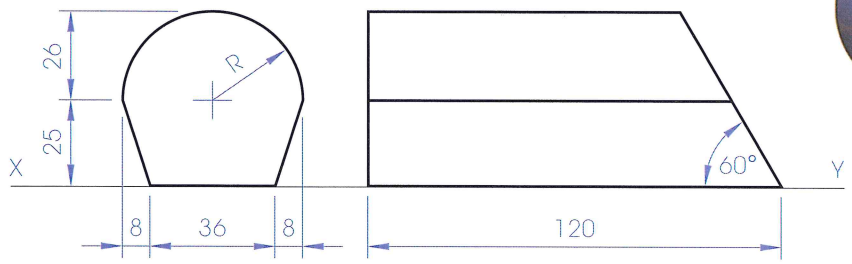


3. The elevation and end view of a package for **two handballs** are shown below.

(a) Draw the given views.

(b) Draw the complete **development** of the package.



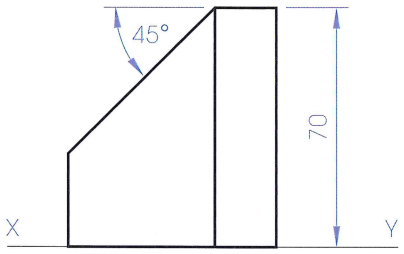


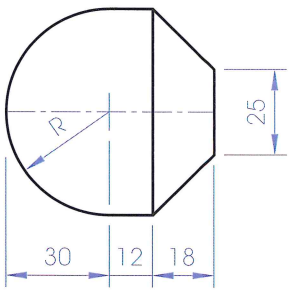
4. The elevation and plan of a **bunker** are shown below.

(a) Draw the given views.

(b) Determine the **true shape** of the door of the bunker.

(c) Draw the complete **development** of the bunker.





Answer Worksheets 29A, 29B and 29C