



Leaving Certificate Examination, 2019

Design & Communication Graphics

Higher Level

Sections B and C (180 marks)

Thursday, 20 June

Morning, 9:30 - 12:30

This examination is divided into three sections:

SECTION A (Core - Short Questions)

SECTION B (Core - Long Questions)

SECTION C (Applied Graphics - Long Questions)

SECTION A

- Four questions are presented.
- Answer **any three** on the accompanying A3 examination paper.
- All questions in Section A carry **20 marks** each.

SECTION B

- Three questions are presented.
- Answer **any two** on drawing paper.
- All questions in Section B carry **45 marks** each.

SECTION C

- Five questions are presented.
- Answer **any two** (i.e. the options you have studied) on drawing paper.
- All questions in Section C carry **45 marks** each.

General Instructions:

- *Construction lines must be shown on all solutions.*
- *The graphics presented are not necessarily drawn to scale and must not be used for scaling purposes.*
- *Write the question number distinctly on the answer paper in Sections B and C.*
- *Work on one side of the drawing paper only.*
- *All dimensions are given in metres or millimetres.*
- *Write your Examination number in the box provided on section A and on all other sheets used.*

SECTION B - Core

Answer **any two** questions from this section on drawing paper.

B-1. The image on the right shows a package for *Doritos* tortilla chips. It is based on a regular hexagonal prism which has been shaped as shown.

Fig. B-1 shows the incomplete dimetric projection (using the axonometric axes method) of the package. The plan and elevation are shown in their required positions.

- Draw the axonometric axes **X**, **Y** and **Z** and the isosceles triangle **abc**.
- Draw the plan and elevation orientated as shown.
- Draw the axonometric projection of the portion of the package as given.
- Complete the remainder of the package in the axonometric projection.

Scale 1:1

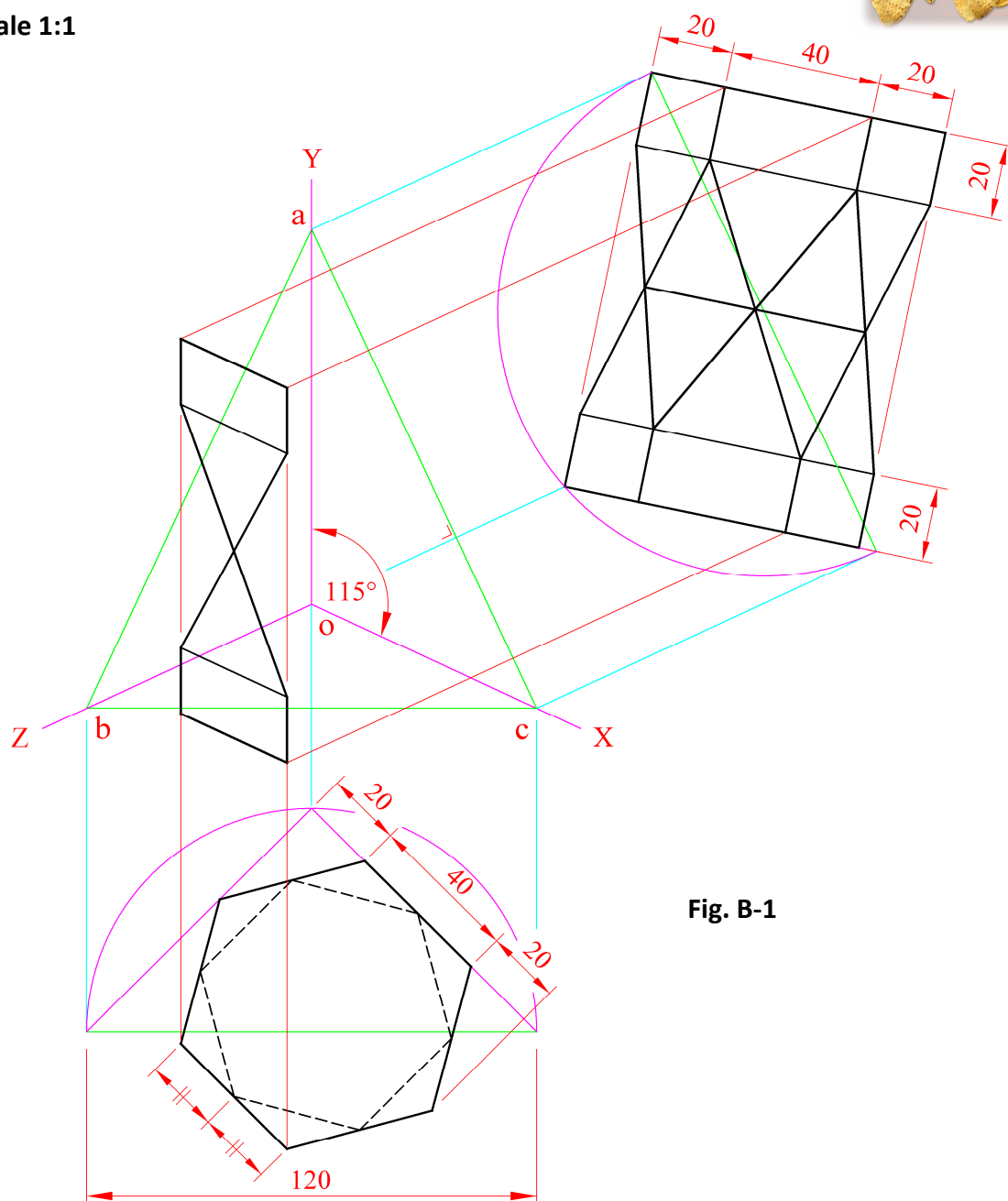


Fig. B-1

B-2. The image on the right shows the *de Lacy Bridge* in Drogheda, Co. Louth.

The projections of the bridge are shown in Fig. B-2 below.



- (a) The curve **ABC** is a parabola in elevation with vertex at **B**. Draw the given elevation.
- (b) The curves **DEF** and **PQS** in plan are branches of a double hyperbola. The vertices are at **E** and **Q**. The construction for the portion **DE** of one branch is shown. **HLG** is a straight line. Draw the given plan.
- (c) In elevation, the focus of the parabola **ABC** is located 4.9m from the vertex **B**. Locate the focus and draw a line which is tangential to the parabola at the point **C**.

Scale 1:100

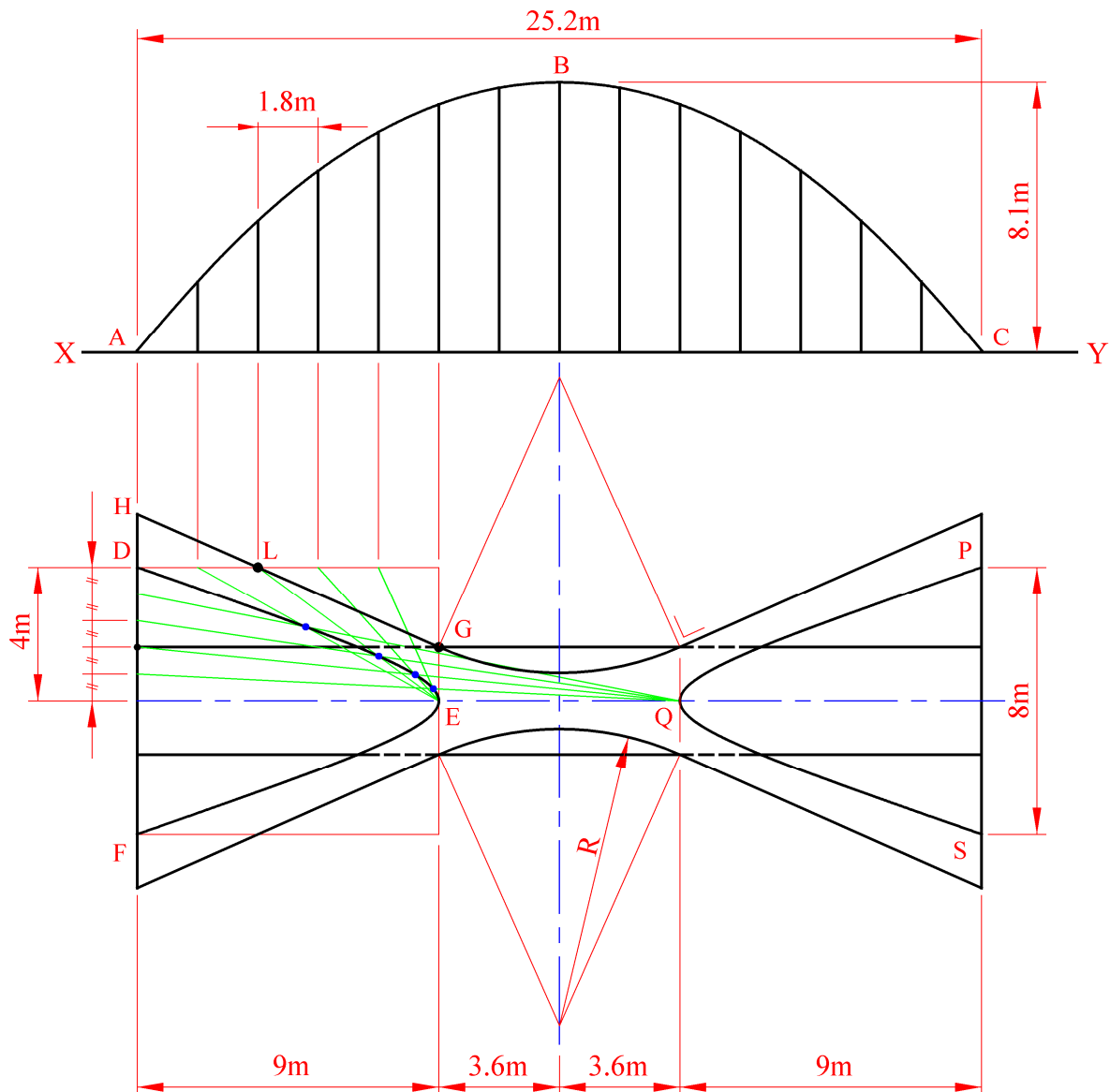


Fig. B-2

B-3. The image on the right shows the entrance structure to the *Pilo Hotel* in Co. Meath. It comprises a series of planar glass surfaces.

Fig. B-3 shows the plan and elevation of two of the surfaces **A** and **B**. The surfaces are identical and the plan is constructed on a square grid as shown.



- (a) Draw the plan and elevation of the intersecting planes **A** and **B**.
- (b) Determine the dihedral angle between the planes **A** and **B**.

- (c) Project an auxiliary elevation of plane **A** on the X_1Y_1 line.

Hence determine, and indicate in degrees, the inclination of plane **A** to the horizontal plane.

- (d) Laser lighting is used to enhance the entrance to the hotel at night. The inclined straight line **PQ** represents the path of a laser beam. Determine the points of intersection of the line **PQ** with the planes **A** and **B**.

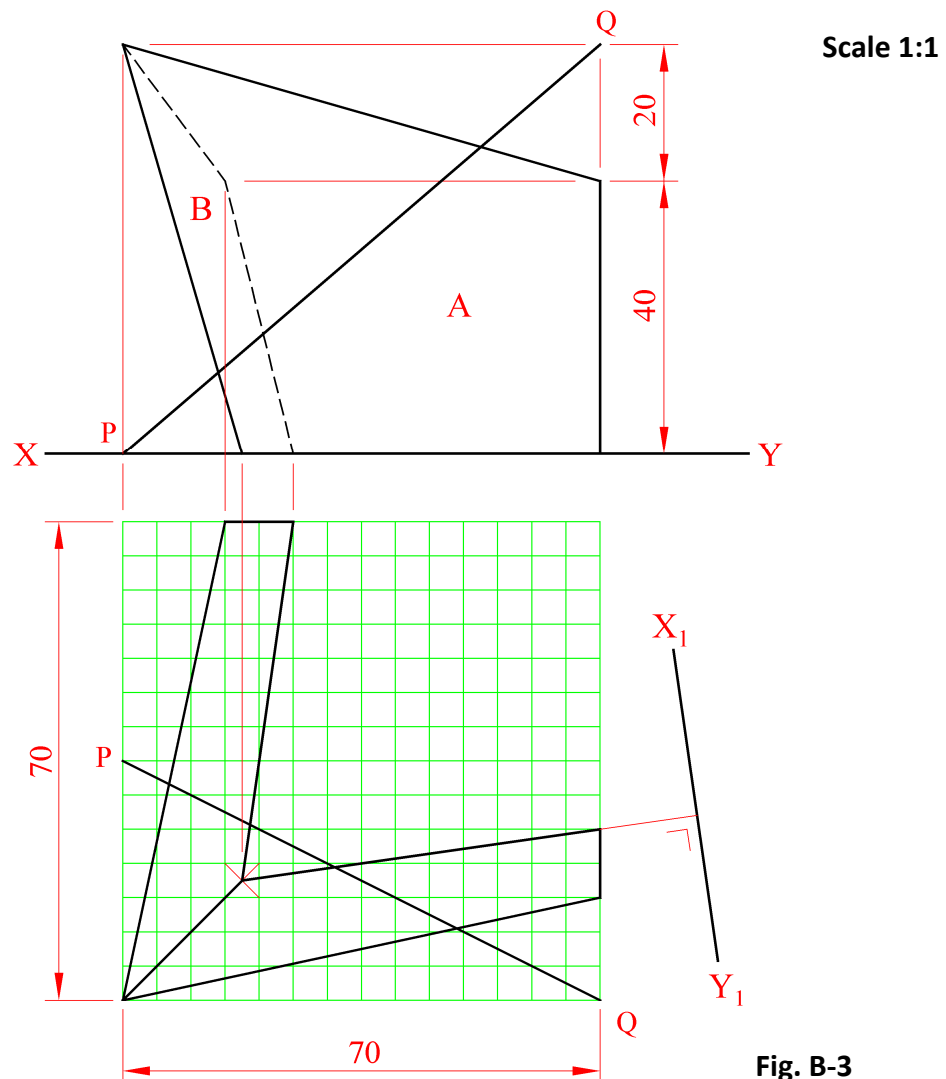


Fig. B-3

SECTION C - Applied Graphics

Answer **any two** questions (i.e. the options you have studied)
from this section on drawing paper.

Geologic Geometry

- C-1. (a)** The accompanying map, located on the back page of Section A, shows ground contours at five metre vertical intervals.

ABC is the centreline of a proposed track for motocross bikes. **DEFG** is a proposed pit stop area. **O** is the centre of the circular curve.

The track has the following specifications:

- the portion from **A** to **B** is level at an altitude of 55m
- the portion from **B** to **C** is rising uniformly to a level of 60m at the finish line **C**
- the formation level at **F**, in the pit stop area, is 55m and the gradient from **F** to **E** is the same as that of the track from **B** to **C**.



Using side slopes of 1 in 1 for the cuttings and 1 in 2 for the embankments, complete the earthworks necessary to accommodate the track and pit stop area between **A** and **C** on each side.

- (b)** On the map, **P**, **Q** and **R** are three points on the top surface of a stratum of ore. **Q** and **R** are at altitudes of 40m and 25m respectively. The stratum has a strike of north 54° west as indicated by the given strike line **S**.
- Using the given **X₁Y₁** line already drawn on the map, determine the dip of the stratum.
 - Find the altitude of point **P**. In the space provided at the top of the map, draw the elevation of the triangular portion of the top surface of the stratum. *(Point **R** is already located for you in the elevation).*
 - Determine the true angle between the line **PR** and the strike line **S**.

Scale 1:1000

Structural Forms

C-2. The image on the right shows a structure designed to provide shade for a seating area in a garden.

The projections of a similar structure are shown in Fig. C-2 below.

The curved surface is produced by translating the generating parabola **ABC**, in a vertical position, along the parabolic curve **DEF**, which is shown in elevation.

In the outline end view, the dotted line shows the generating parabola **ABC**.



B is the vertex of the parabola **ABC** and **E** is the vertex of the parabolic curve **DEF**.

- Draw the given elevation of the structure.
- Draw the end view of the generating parabola **ABC**.
- Project the plan of the structure.
- The projections of an overhead telephone line **PQ** are also shown. Draw the elevation and plan of the line **PQ** and determine the vertical distance from the point **R** on the surface of the structure to the line **PQ**.

Scale 1:100

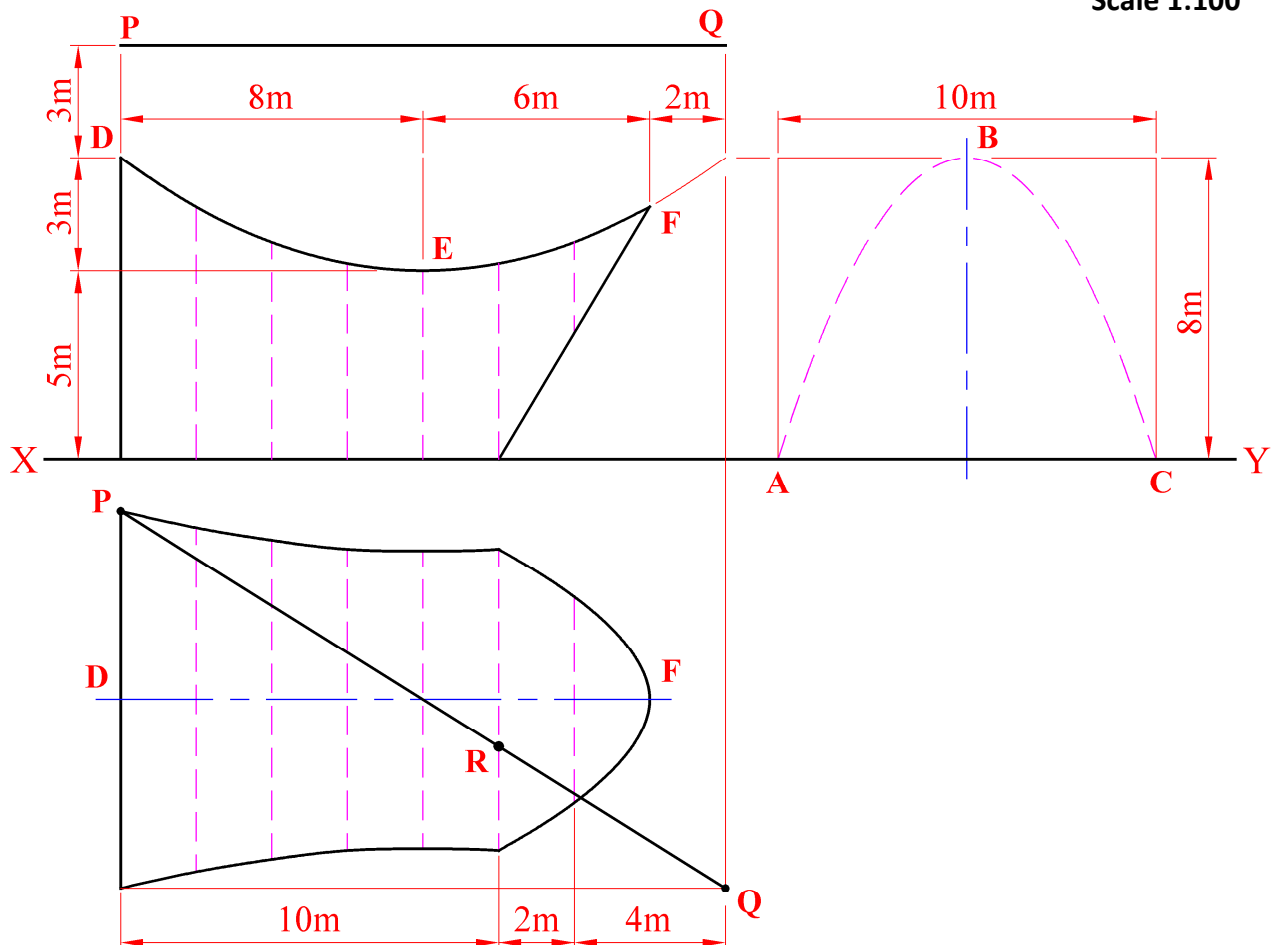


Fig. C-2

Surface Geometry

C-3. The image on the right shows the *Louis Vuitton* retail store in Singapore. The design comprises a steel-framed glass building with irregularly shaped faces.

Fig. C-3 shows the elevation, plan and end view of a model of part of the building.

- Draw the given elevation, plan and end view.
- Determine the dihedral angle between surfaces **A** and **B**.
- Determine the true shape of the vertical surface **C** and the true shape of the inclined surface **B**.
- Determine the horizontal and vertical traces of surface **B**.



Scale 1:100

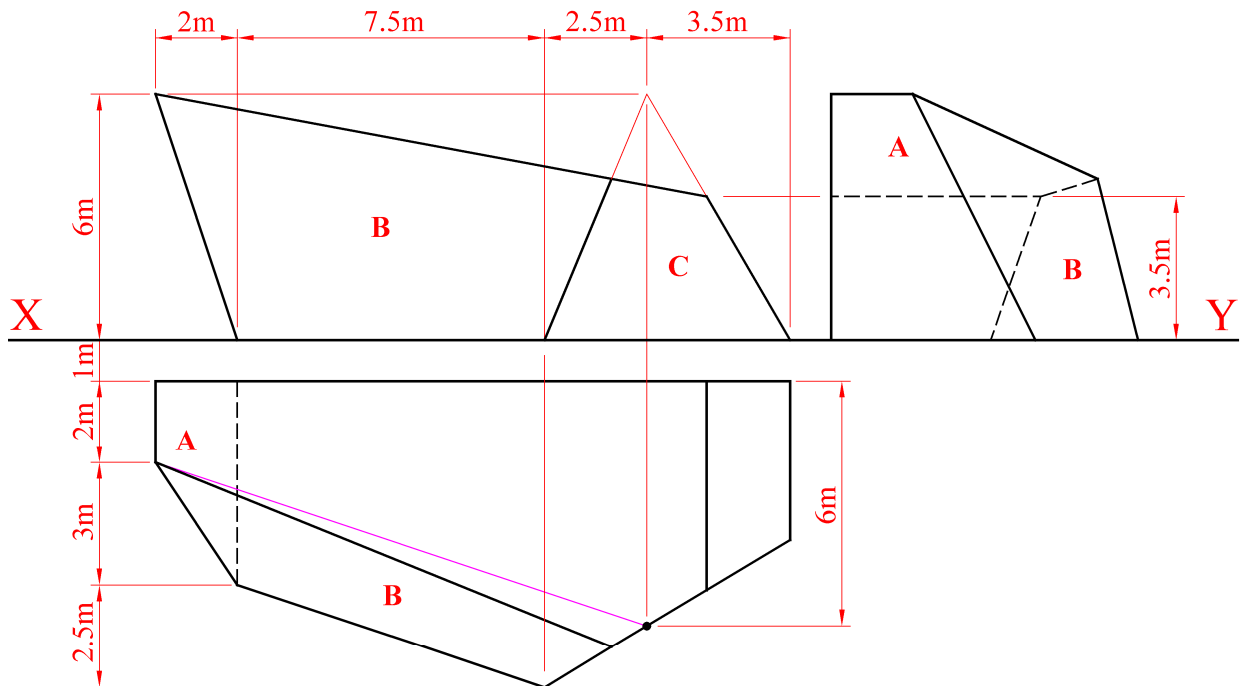


Fig. C-3

Dynamic Mechanisms

- C-4. (a)** The image on the right shows a toy which uses a series of cams and inline flat followers to create linear vertical movement.

Draw the displacement diagram for a similar cam mechanism which will impart the following motion to an inline follower given the following data:

- 0° to 60° Rise 90mm with uniform velocity;
- 60° to 90° Dwell;
- 90° to 270° Fall 60mm with Uniform Acceleration and Retardation (UAR);
- 270° to 360° Return to initial position with uniform velocity.

Note: It is not necessary to draw the cam profile.

(In the displacement diagram, use a distance of 15mm to represent each 30° interval.)



- (b)** The image on the right shows a modern Penny Farthing bicycle.

The front wheel has a radius of 350mm.

The wheel is shown in line diagram format in Fig. C-4(b) below.

The spokes are at 30° intervals.

A reflector, as shown, is located on one of the spokes at a height of 220mm above the ground.

The wheel rolls along the horizontal line **AB**.

Plot the locus of the reflector for one full clockwise revolution of the wheel.

Scale 1:10

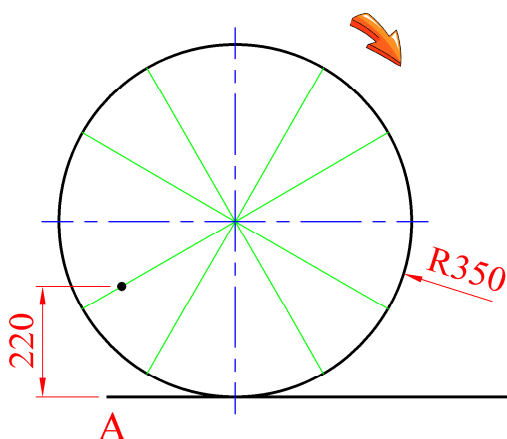


Fig. C-4(b)

Assemblies

C-5. The 3D graphic on the right shows a Manual Coffee Grinder, for grinding coffee beans. The details of the grinder are given in Fig. C-5 below. The parts list is also given in two tables.

Power is transmitted from the horizontal top spindle to the vertical spindle by means of two friction cones in contact. There is a 2mm space between the hopper and the grinding disc.

Draw a sectional elevation on A-A, with the parts fully assembled.

(Unless otherwise stated, fillets are 6mm and chamfers 1×1mm. Some dimensions and inner parts have been removed for clarity. Any omitted dimensions may be estimated.)

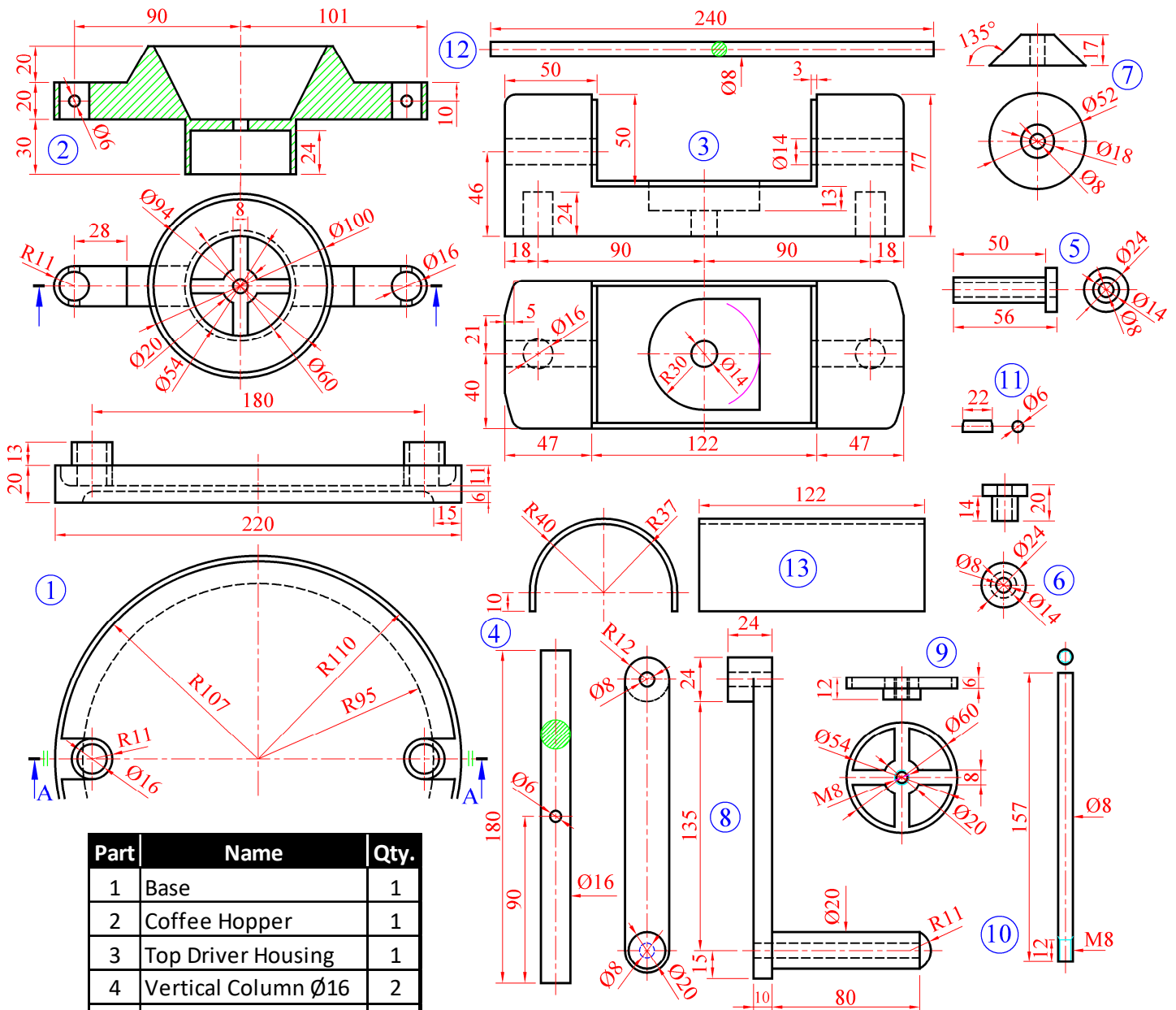
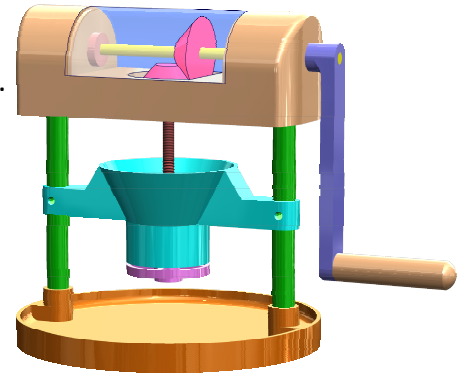


Fig. C-5
Scale 1:1

Part	Name	Qty.
1	Base	1
2	Coffee Hopper	1
3	Top Driver Housing	1
4	Vertical Column Ø16	2
5	Bush for Top Spindle	2
6	Vertical Spindle Bush	1
7	Driver Friction Cone	2
8	Handle Assembly	1
9	Bottom Grinding Disc	1

Part	Name	Qty.
10	Vertical Spindle Ø8	1
11	Hopper Anchor Pin Ø6	2
12	Top Spindle Ø8	1
13	Transparent Top Cover	1

There is no examination material on this page

There is no examination material on this page

There is no examination material on this page