

Exercise 12: Idler Arm

Create this part using the dimensions provided. Use relations where applicable to maintain the design intent. Give careful thought to the best location for the origin.

The only reference planes required for this part are Top, Front and Right.

This lab uses the following skills:

- *Symmetry in the Sketch* on page 117.
- *Mid Plane Extrusion* on page 119.
- *Extruding Up To Next* on page 124.

Units: **millimeters**



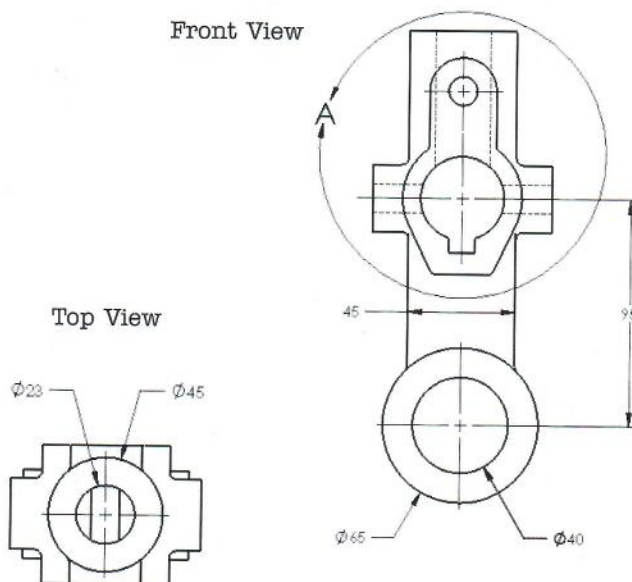
Design Intent

The design intent for this part is as follows:

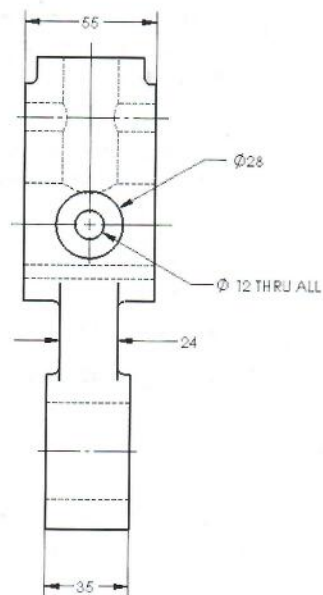
1. The part is symmetrical.
2. Front holes are on the centerline.
3. All fillets and rounds (highlighted red above) are **R3mm**.
4. Center holes in Front and Right are in line.

Dimensioned Views

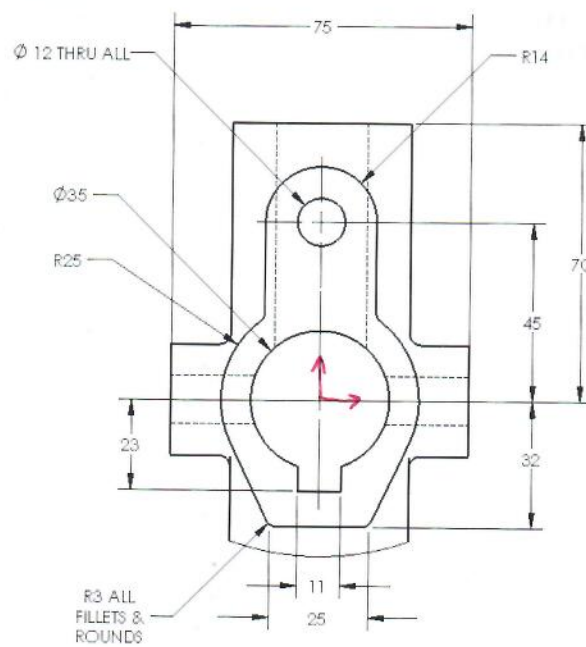
Use the following graphics with the design intent to create the part.



Right View



Detail View A

DETAIL A
SCALE 1 : 1

Exercise 13: Tool Holder

This lab reinforces the following skills:

- *Symmetry in the Sketch* on page 117.
- *Mid Plane Extrusion* on page 119.
- *Introducing: Circles* on page 122.
- *Trim and Extend* on page 135.

Units: **millimeters**



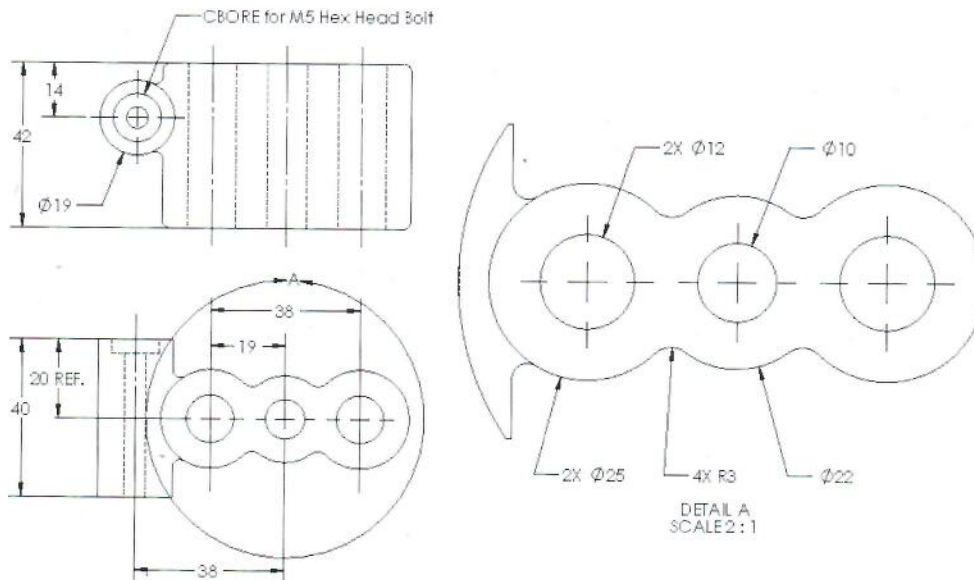
Design Intent

Some aspects of the design intent for this part are:

1. All fillets and rounds are **R2mm** unless otherwise noted.
2. Circular edges of equal radii/diameter should remain equal.

Dimensioned Views

Use the following graphics with the design intent to create the part.
Tangent edges are hidden in all views.



**Exercise 14:
Symmetry and
Offsets 1**

Use offsets and symmetry to complete the part.

This lab reinforces the following skills:

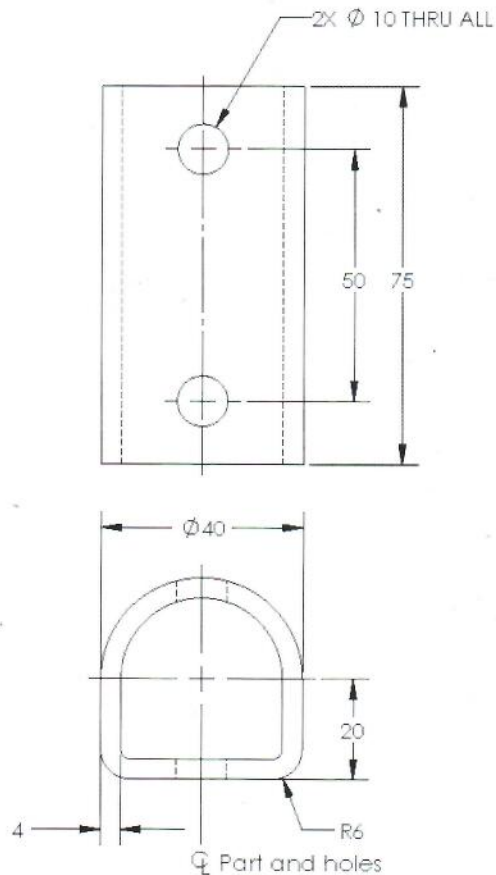
- *Introducing: Centerline* on page 117.
- *Symmetry after Sketching* on page 118.
- *Mid Plane Extrusion* on page 119.
- *Sketching an Offset* on page 133.



Units: **millimeters**

**Dimensioned
Views**

Use the following graphics to create the part.



Exercise 15: Ratchet Handle Changes

Make changes to the part created in the previous lesson.

This exercise uses the following skills:

- *Trim and Extend* on page 135.



Design Intent

Some aspects of the design intent for this part are:

1. The part must remain symmetrical about the Right plane.
2. The Transition requires flats that are driven by the distance between them.

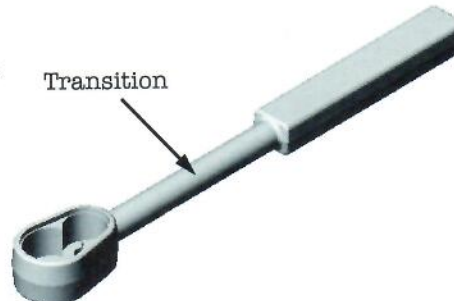


Procedure

Open an existing part.

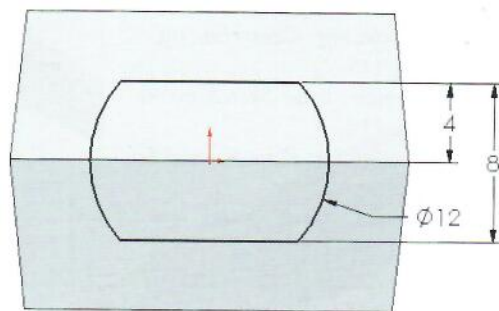
- 1 **Open the part *Ratchet Handle Changes*.**

The change will take place in the shape of the Transition feature.

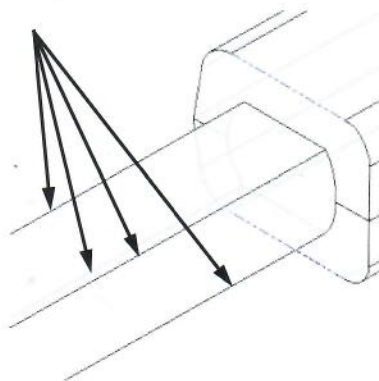


2 Edit the sketch.

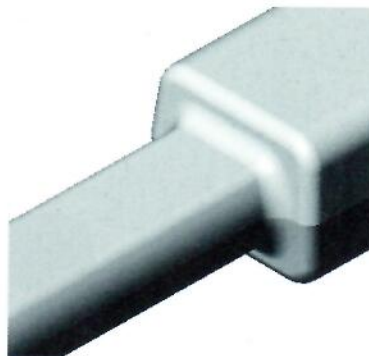
Right-click the Transition feature and click **Edit Sketch**. Modify the sketch to add the equally spaced horizontal flats **8mm** apart. Exit the sketch.

**3 Edit Feature.**

Edit the H End Fillets feature to add more edges. Select the four new edges created by the flats. Click **OK**.

**4 Resulting fillets.**

The new edges become part of the fillet feature, causing the shape of the next fillet feature to update.

5 Save and close the part.

Exercise 16: Symmetry and Offsets 2

Use offsets and symmetry to complete the part.

This lab reinforces the following skills:

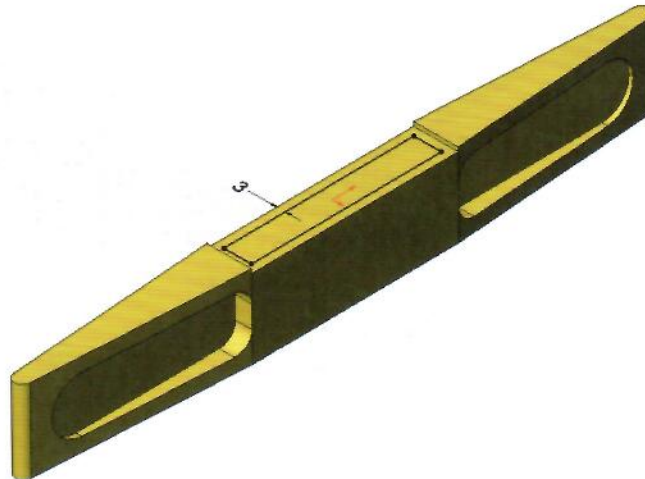
- *Introducing: Centerline* on page 117.
- *Symmetry after Sketching* on page 118.
- *Introducing: View Normal To* on page 122.
- *Sketching an Offset* on page 133.
- *Offset From Surface* on page 138.
- *Measuring* on page 140.



Procedure

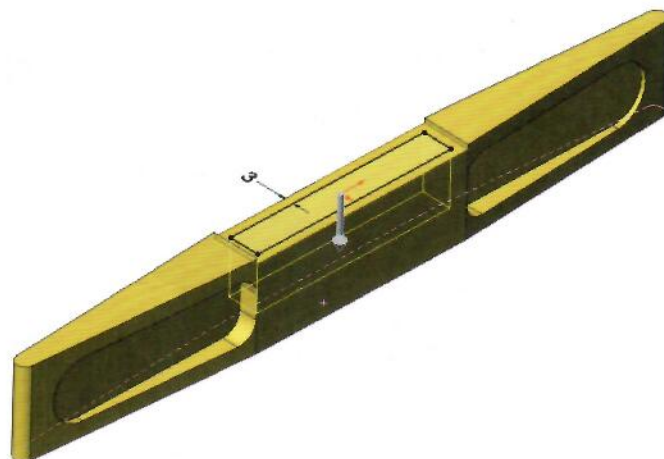
Open the existing part `Offset_Entities` and create the geometry as shown in the following steps:

- 1 **Offset entities.**
Use **Offset Entities** to create the sketch geometry shown.

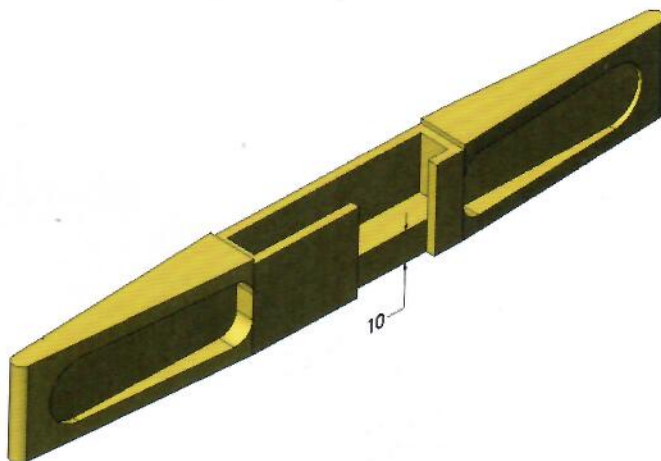


2 Offset from surface.

Use a **Cut Extrude** with an **Offset From Surface** of 10mm. Select the hidden face using **Select Other**.

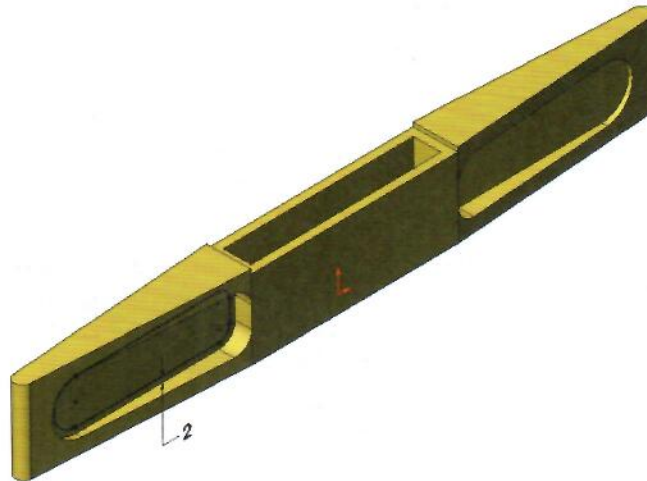


This cutaway shows the results of the offset from surface option. The **Measure** tool can be used to check this value.



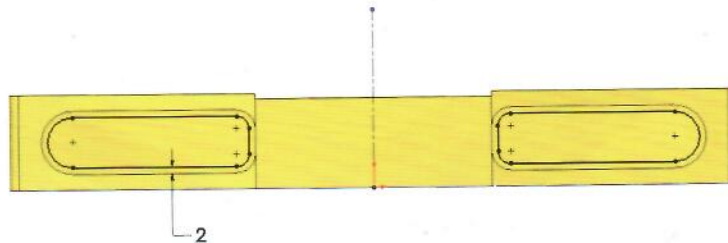
3 Offset.

Create a new sketch and offset the face **2mm**.



4 Offsets with symmetry.

Use **View Normal To** to orient the part. Use **Center lines** and **Mirror Entities** to create and mirror sketch geometry as shown. Use a **Cut Extrude Through All**.



5 Save and close the part.

Exercise 17:
Pulley

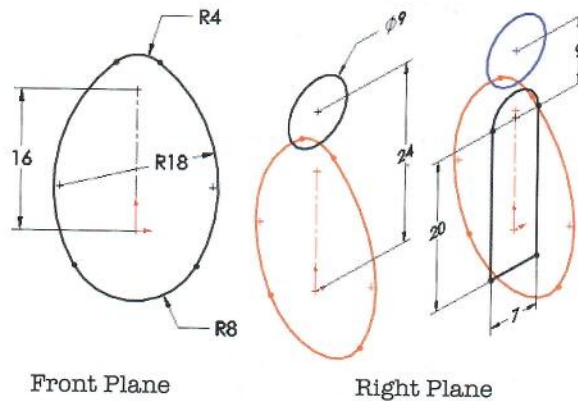
Complete this part using the dimensions provided. Use relations where applicable to maintain the design intent.

This lab uses the following skills:

- *Symmetry in the Sketch* on page 117.
- *Mid Plane Extrusion* on page 119.
- *Draft Toggle* on page 119.
- *Introducing: Circles* on page 122.

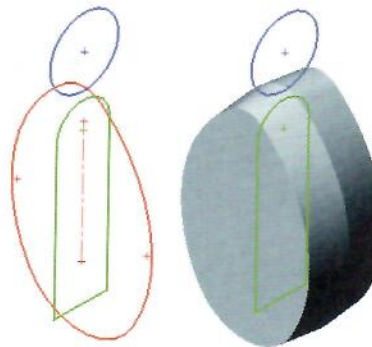
**Optional
Sketching**

If you would like to use the existing geometry, skip to **Procedure**. If you would like to create the sketches, open a new **mm** part and use the dimensions below. There are three sketches required, the first created on the **Front Plane**, the remaining two on the **Right Plane**.

**Procedure**

Open an existing part named Pulley.

- 1 **Extrusion with draft.**
Extrude the Base sketch (red) **10mm** using the **Mid-plane** end condition and **6°** of draft.



2 Hanger.

Use the Hanger (blue) sketch and another **Mid-plane** extrusion of **4mm** with the same amount of draft.



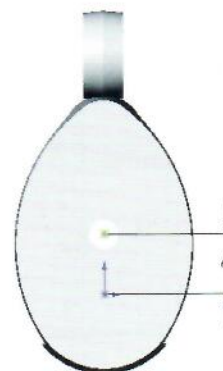
3 Cut and hole.

Create a cut using the Center Cut sketch (green). The cut is **Through All- Both**.

Add a **5mm** diameter hole.



Create another hole, **3mm**, centered above the origin.

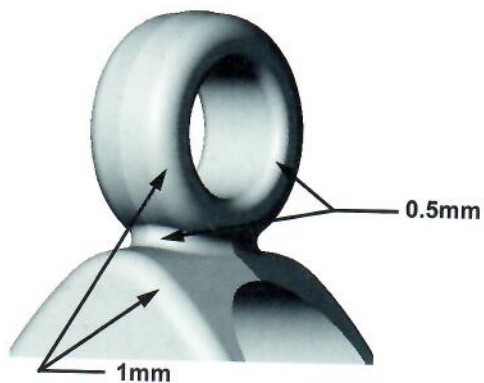


4 Fillets.

Add a fillet of **1mm** to the bottom edges of the cut.



Add fillets of **1mm** and **0.5mm** as shown.

**Note**

These fillets are very order dependent; the **1mm** fillets must precede the **0.5mm** ones.

5 Save and close the part.