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Level 1
Professional
Courseware

Mastercam®



X⁴

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Mastercam® X4 Training Tutorials – Professional Courseware Mill Level 1

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Sincerely,

Mariana Lendel

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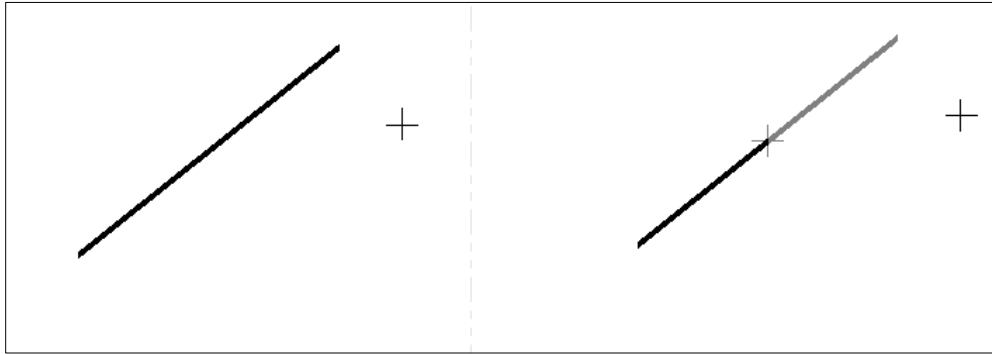
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☛ **Tips:** **Trim to Point** trims or extends a curve to a point or any defined position in the graphics window. If the point that you enter does not lie on the selected entity, Mastercam calculates the closest position on the entity and trims the entity to that point.

☛ Enable **Trim to Point** button .



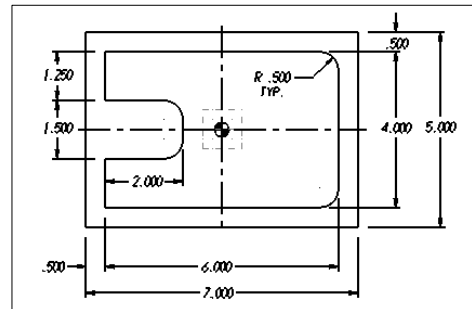
☛ Select the entity to trim/extend and then select the point. Select the **OK**  button to exit the command.

CREATE DRAWING # 1

Full Size Drawings can be found at the back of the Book

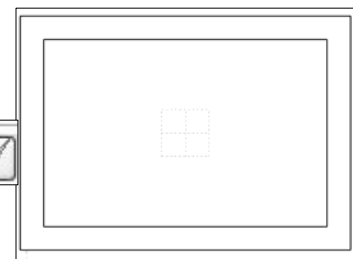
Use the following commands;

- Create Rectangle**
- Create Line Endpoint**
- Create Fillet**
- Trim-1 Entity**
- Trim-Divide**




☛ **Create Rectangle** 

☛ Enter the values as shown and enable Anchor to center icon



☛ Select the **Origin** (middle of the grid) as the rectangle anchor.

☛ **Screen Fit** 

☛ Apply button to finish the rectangle and continue with the same command. 

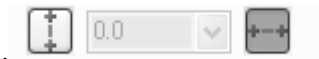
☛ Repeat the step for the 6 by 4 rectangle.

☛ Press **Esc** to exit the rectangle command.

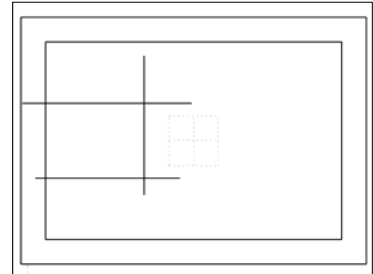
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➤ **Create Line Endpoint** 



- Enable the **Horizontal** icon and draw (sketch) the first horizontal line.
- Enter the **Y** value = 0.75
- Press **Enter** twice to finish the line.
- Draw the second line
- Enter the **Y** value = -0.75
- Press **Enter** twice to finish the line.
- Enable the **Vertical** icon and draw (sketch) the vertical line.

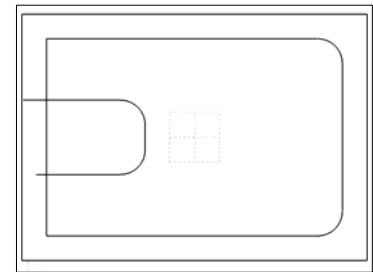


- Enter the **X** value = -1.0
- Press **Enter** twice to finish the line.
- Press **Esc** to exit the command.








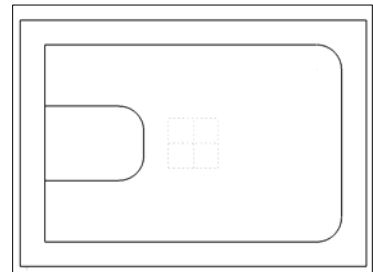
➤ **Create Fillet** 

- Enter the **Radius** = 0.5
- Select the two lines between which you need to create fillet.
Repeat the step 3 times.
- Note that the lines are automatically trimmed with the arc. This is because the trim button was by default enabled.  
- Press **Esc** to exit the command.








➤ **Trim/Break/Extend** 

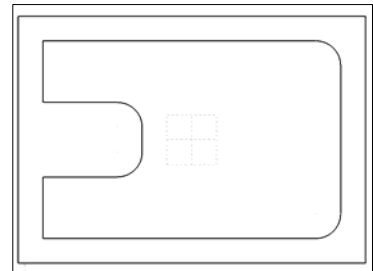
- Enable the **Trim 1** entity icon     
- First select one of the horizontal lines as the entity to trim/extend.
- Second select the vertical line up to which you are trimming /extending the first line.



➤ Note to select always the line to trim on the side that you are keeping after the trimming.

- Repeat the step to trim the second horizontal line.

- Enable **Divide** icon.     
- Select the vertical line somewhere between the two horizontal lines.
- **Save** the file in your Student folder.

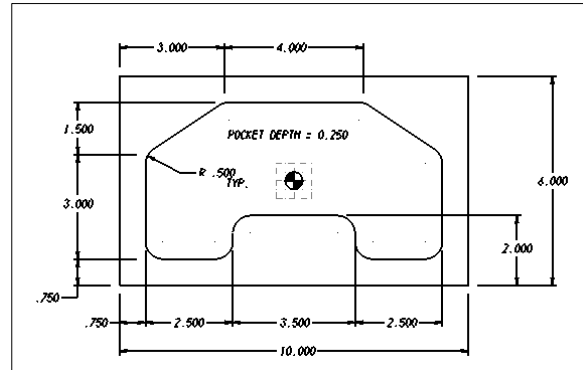


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CREATE DRAWING # 2

Use the following commands;

- Create Rectangle**
- Create Line Parallel**
- Trim - Divide**
- Create Fillet**



Tips: After creating the two rectangles, create the parallel lines for the bottom half only. Trim-divide the bottom line and then insert the fillets.

Create the parallel lines for the upper half, and then fillet the corners.

EXERCISE CREATING ARCS

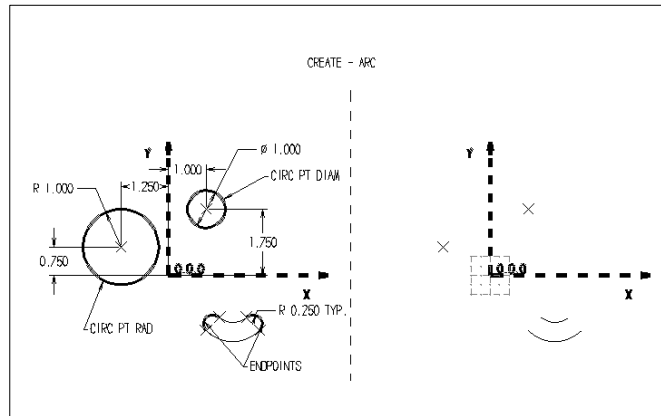
Resources – Download the file from www.emastercam.com/files/x4_ptg-milllevel1.html

File

- **Open**
 - Select **Create_Arc.mcx**

- **Create**
- **Arc**

- **Circle Center Point**





- Enter the **Radius = 1.0** and select the point as the center location. Select the **Apply** button to continue in the same command.
- Enter the **Diameter = 1.0** and select the point as the center location. Select the **OK** button to exit.

- **Create**
- **Arc**

- **Create Arc Endpoints**

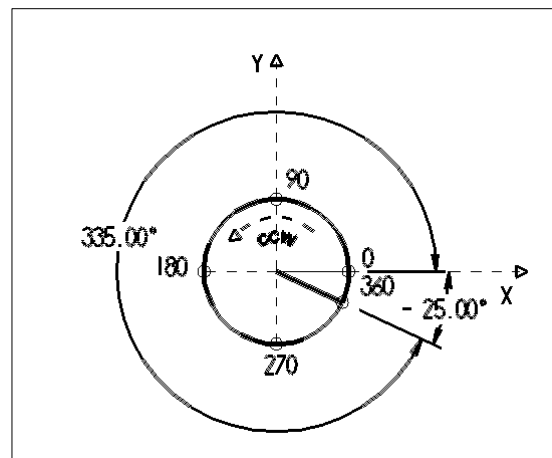
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- Enter the **Radius** = 0.25. Select the first point, select the second point. The system gives all possible results. Select the arc that you want to keep. Select the **Apply** button to continue in the same command. . Following the same steps create the other arc. Select the
- **OK** button to exit. 

ANGLE MEASUREMENT

Mastercam measures positive angles in **Counter Clockwise** direction as shown in the following picture. It also generates arcs in **CCW** direction.


- The same angle can be given as a positive angle 335 deg. or as a negative value -25 deg.

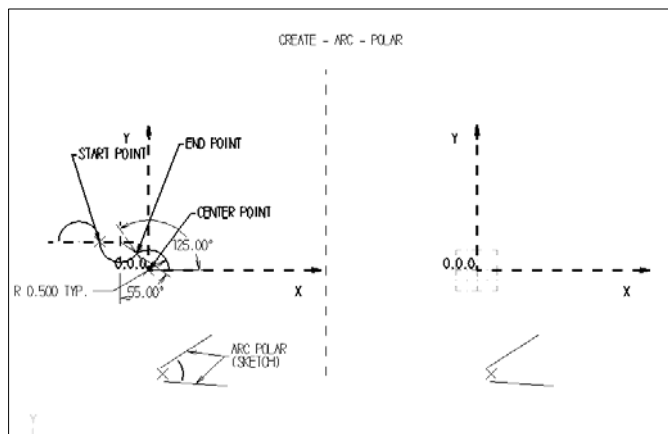



EXERCISE CREATING ARCS POLAR

Resources – Download the file from www.emastercam.com/files/x4_ptg-milllevel1.html

File

- **Open**
- Select **Create_Arc_polar.mcx**
- **Create**
- **Arc**
- **Arc Polar** 



- Enter the **Radius** = 0.5; enter the **Start Angle** = 0 and the **End Angle** = 125. Select the **Origin** as the center point. Select the **OK** button to exit. 



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☛ To set the other parameters of the arc use **Tab** key. Note that the diameter value is automatically changed by the system based on the radius.

☛ **Create**

☛ **Arc**

☛ **Arc Polar Endpoints** 


☛ **Tips:** Enable **End point** icon . Select the **End Point** as shown, Enter the **Radius= 0.5**; Enter the **Start Angle =180** and the **End Angle = 270 +55**. Select the **Apply** button to continue in the same command. 

☛ **Tips:** Enable **Start point** icon . Select the **Start Point** as shown, Enter the **Radius= 0.5**; Enter the **Start Angle =0** and the **End Angle = 180**. Select the **OK** button to exit. 

☛ **Create**

☛ **Arc**

☛ **Arc Polar** 

☛ **Tips:** Select the point as the center point, Enter the **Radius= 0.5** sketch the initial angle by selecting the midpoint of the lower line and sketch the final by selecting the midpoint of the upper line. Select the **OK** button to exit. 

EXERCISE USING XFORM MIRROR

Resources – Download the file from www.emastercam.com/files/x4_ptg-milllevel1.html

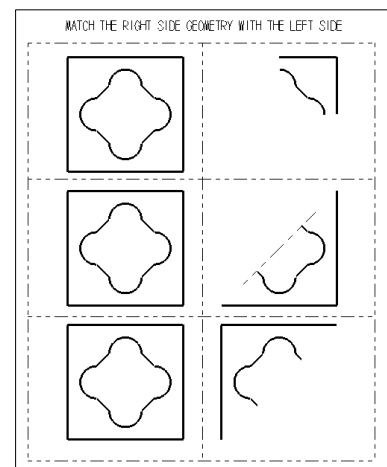
File

☛ **Open**

☛ Select **Mirror.mcx**

☛ **Xform**

☛ **Xform Mirror** 





☛ Mirroring is the process of creating reverse images of entities by reflecting them symmetrically with respect to a defined axis. You have the option to move or copy the original entities within the drawing.

☛ **Tips for the upper shape** Select the entities to mirror using window selection. To enable **Window Selection** hold down the **Ctrl** key when you select the first corner.

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Mirror the geometry twice; once about **X**-axis, then about **Y**-axis.

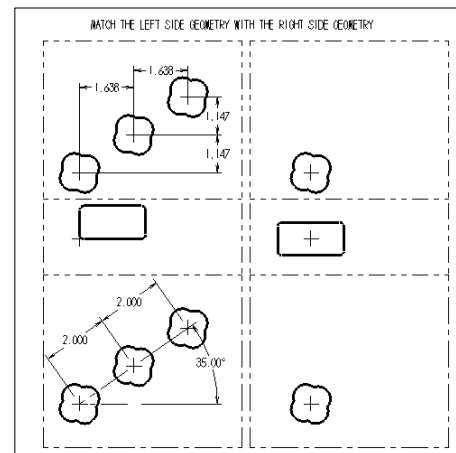
- ☛ **Tips for the middle shape** Select both contours to mirror using chain selection. To enable **Chain Selection** hold down the **Shift** key and select one entity of the contour at a time. Enable the **Select Line** button in the **Mirror** dialog box.  and select the red color line in the graphic area.
- ☛ **Tips for the lower shape** Select both contours to mirror using **Chain Selection** and enable **Select 2 points** button  in the **Mirror** dialog box. Select two of the open ends of the contours.





EXERCISE USING XFORM TRANSLATE

Resources - Download the file from www.emastercam.com/files/x4_ptg-milllevel1.html

File

- ☛ **Open**
 - ☛ Select **Translate.mcx**
- ☛ **Xform**
- ☛ **Translate** 



- ☛ Translate moves selected entities or one or more copies of the entities to new positions without altering the orientation, size, or shape of the entities.
- ☛ **Tips:** for the upper shapes:
 - ☛ Select the entities to translate, then hit **Enter** button. In the **Translate** dialog box enable **Copy**; enter the number # 2; enter the values for **Delta X** and **Y**. Select the **Apply** button to continue. 
- ☛ **Tips:** for the middle shape:
 - ☛ Select the entities to translate, then hit **Enter** button to end the selection. In the **Translate** dialog box enable **Move**; enter the number # 1. Click on **Select From point** button  and select the point to translate from the lower left corner of the rectangle. Select the point in the center as the point to translate to. Select the **Apply** button to continue. 
- ☛ **Tips:** for the lower shapes.
 - ☛ Select the entities to translate, then hit **Enter** button to end the selection. In the **Translate** dialog box enable **Copy**; enter the number # 2; enter the **Angle** = 35 and the **Length** = 2.0 in the **Polar** settings. Select the **OK** button to exit. 

EXERCISE USING BREAK

Resources – Download the file from www.emastercam.com/files/x4_ptg-milllevel1.html

File

➤ **Open**

- Select **Break.mcx**

- Break commands gives you option for breaking curves into multiple segments. Join command joins collinear lines, arcs that have the same center and radius, or splines that were originally created as the same entity.

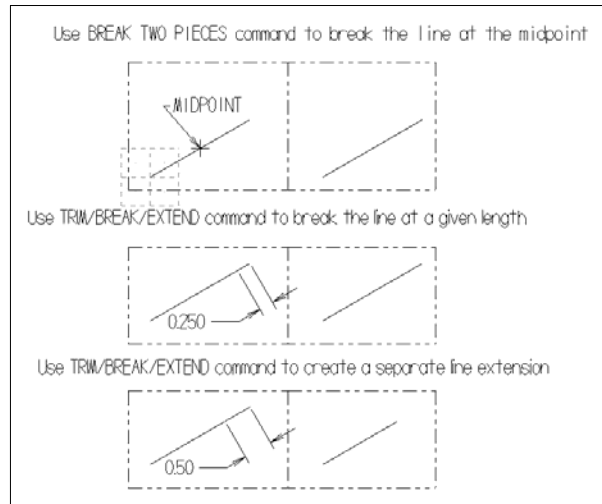
➤ **Edit**

➤ **Trim/Break**

- **Break Two Pieces** 

- **Tips:** Select the entity to break, select the **Midpoint** where you want to break the selected entity.




- **Tips:** Select the entity near the endpoint that you want to use to calculate length, and enter the **length** in the **Ribbon Bar**.



➤ **Edit**

➤ **Trim/Break**


- **Trim/Break/Extend** 

- **Tips:** Select the line in the graphics window. To break this line by the specified amount enter in the extension length dialog box -0.25  -0.25 . Then select the break icon . Select the line above the midpoint and the line will be broken.

➤ **Edit**

➤ **Trim**

- **Trim/Break/Extend** 

- **Tips:** Select the line in the graphics window. To break this line by the specified amount enter in the extension length dialog box 0.5,. Then select the break icon . Select the line above the midpoint and the line will be extended by 0.5 with a separate entity.

EXERCISE USING JOIN

Resources – Download the file from www.emastercam.com/files/x4_ptg-milllevel1.html

File

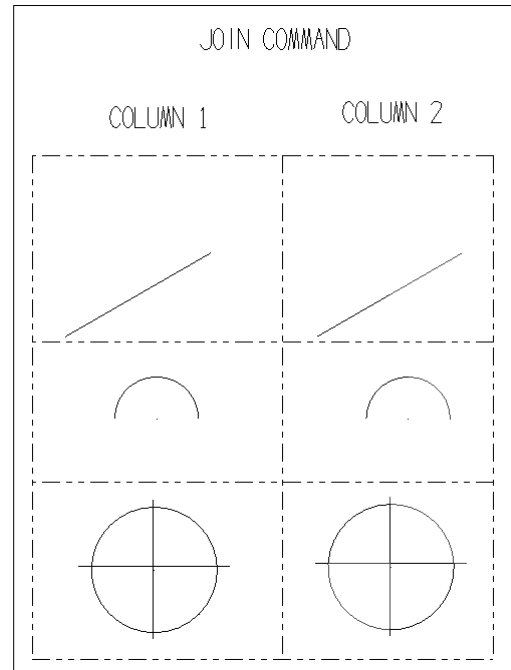
- **Open**
 - Select **Join.mcx**

➤ **Edit**

- **Join entities** 

➤ The Join command is used to join collinear lines, arcs that have the same center and radius, or splines that were originally created as the same entity.

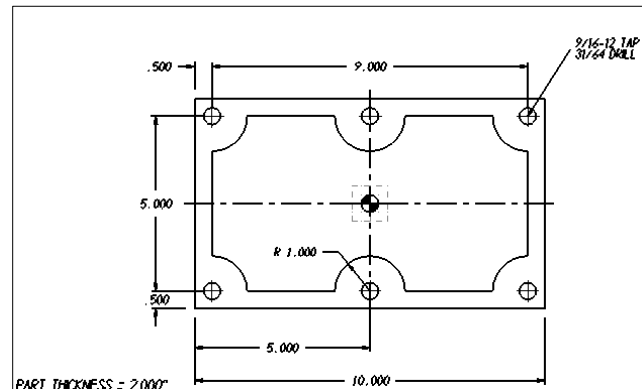
➤ **Tips:** Select the entities to join. Press **Enter** to end the selection.



CREATE DRAWING # 3

Use the following commands;

- Create Rectangle**
- Create Line Parallel**
- Create Arc Polar**
- Create Arc Circle Center Point**
- Trim-1 Entity**
- Delete the construction lines**
- Xform Mirror about X-axis**
- Xform Mirror about Y-axis**
- Xform Translate (to give the part depth)**



➤ **Tips:** Create just a 1/4 of the entire geometry and then, **Mirror** the geometry twice; once about **X-axis**, then about **Y-axis**.

CREATE DRAWING # 4

Use the following commands;

Create Rectangle

Create Line Parallel

Create Fillet

Create Arc Circle Center Point

- **Tips:** After you create the 9.5 by 6.5 rectangle, create the parallel lines necessary for the first pocket. By filleting the corners the geometry will be cleaned up. Create the parallel lines for the second pocket and fillet its corners. Fillet the outside rectangle and use the center location of the fillet arcs to create the 9/16 and the 3/8 circles.

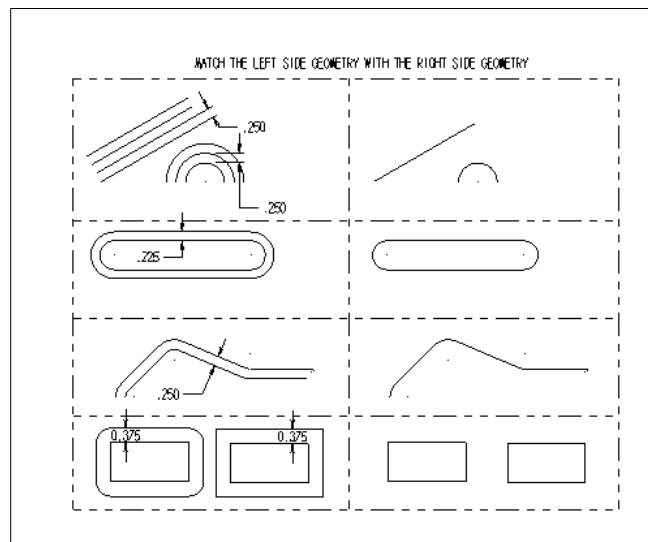
EXERCISE USING XFORM OFFSET

Resources – Download the file from www.emastercam.com/files/x4_ptg-milllevel1.html

File

➤ **Open**

- Select **Offset.mcx**



- Offsets a single entity - moves or copy the entity at a defined distance and direction. The direction is perpendicular to the curve at every point along the curve relative to the current construction plane.


➤ **Xform**

➤ **Offset**

- **Tips:** Select the type of operation to perform **Copy**; number of steps # 3; enter the value for **Offset distance** = 0.25; select the entity in the graphics window. Click on one side of the selected entity to indicate the offset

direction. Select the **Apply** button to continue.



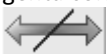

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➤ Change the **Offset** settings and select the arc and the side to indicate the offset direction. Select the **OK** to close the dialog box. 

➤ Offsets chains of curves - displaces them by a defined distance and direction and optionally a depth. The offset is perpendicular to the chains of curves at every position along the curves relative to the current construction plane.

➤ **Xform**

➤ **Offset Contour** 

➤ **Tips:** Select the contour and then the **OK** button to exit **Chaining**.  Enable **Copy**; enter the **Distance** = 0.225 and select the **OK** button . In the graphic window you should see the resulted contour will be displayed in magenta color. Make sure that it is outside the original contour (in red). Otherwise, select **Reverse** button . Select the **OK** button  to exit **Offset Contour** dialog box.

The last exercises demonstrates how Mastercam deals with sharp corners along a contour.

➤ Enable **Sharp** in the **Offset Contour** dialog box for the first rectangle.

➤ Enable **None** in the **Offset Contour** dialog box for the second rectangle.

CREATE DRAWING # 5

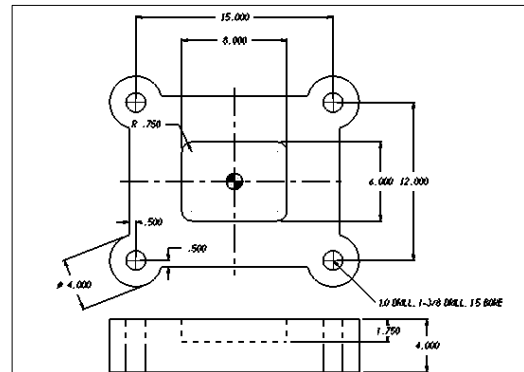
Use the following commands;

Create Rectangle

Create Arc Circle Center Point

Xform Offset Contour

Trim -3 Entities



➤ **Tips:** After you create the 15 by 12 rectangle, create the 4.0" and 1.5" diameter circles by selecting the rectangle corners as the centers of the circles. Use **Xform Offset Contour** with the **move** option enabled, and offset the exiting rectangle outside 0.5. Trim the outside geometry using **Trim 3 entities** command.