

2.3 Drawing Lines with Polar Tracking

You can draw lines at specific lengths and angles by typing the numbers, as shown in Figure 2-7. The **Polar Tracking** command is helpful in reducing the amount of typing.

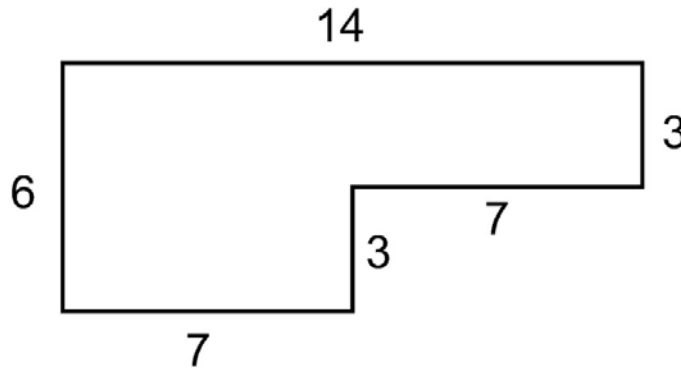

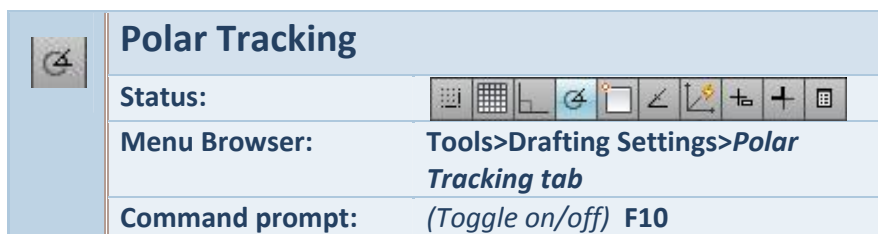



Figure 2-7

- Polar Tracking makes it easy to work with pre-set angles as you draw. Rather than typing the angle, you simply move the pointer to find the tracking line and then type only the distance.
- You can set the polar angles as needed, but in this section you will work with standard 90-degree increments to create, straight horizontal and vertical lines.
- To toggle Polar Tracking on and off, click  (Polar Tracking) on the Status Bar, or press <F10>.



To use Polar Tracking:

1. Turn on  (Polar Tracking) in the Status Bar (or press <F10>).
2. Start the **Line** command.
3. At the "Specify first point:" prompt, pick a starting point for the line.
4. At the "Specify next point:" prompt, move the crosshairs in the direction you want the line to extend until you see the Polar Tracking line.
5. When the correct Polar Tracking line appears, type in the desired length of line.
6. Press <Enter>. The line will be drawn that length in the direction you choose.
7. Repeat for another line segment, or press <Enter> to end the **Line** command.

- When the cursor approaches one of the polar angles, the dotted Polar Tracking line shows with a tool tip. The tool tip will read "Polar:", followed by the distance and angle from the last point (*distance<angle*), as shown in Figure 2-8.

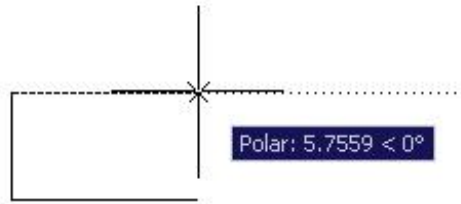



Figure 2-8




- POLAR settings for different angles are covered in Chapter 4 (4.3).
- You can use POLAR with or without Dynamic Input  (DYN).

Using Ortho for Vertical and Horizontal Lines

Another way to draw straight lines is to use ORTHO Mode, as shown in Figure 2-9. It always forces lines to 90° angle increments. Polar Tracking is usually the preferred method because it permits other angles as well as displaying the tracking lines



Figure 2-9

- To toggle **ORTHO** mode on or off, click  (Ortho Mode) in the Status Bar, or press <F8>.
-  (Ortho Mode) and  (Polar Tracking) cannot be turned on at the same time.

Practice Exercise 2-3: Polar Tracking

In this practice you use the **Line** command in conjunction with Polar Tracking to draw a precise object, as shown in Figure 2-10. Estimated time for completion: 5 minutes.

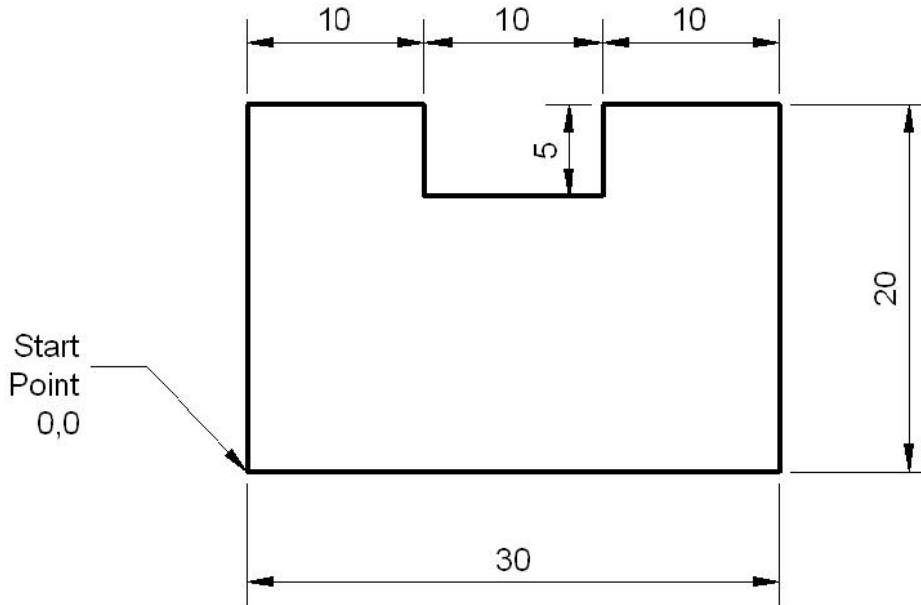




Figure 2-10

1. Open **Exercise 2-3.dwg**, from your class files folder.
2. Turn on  (Polar Tracking) in the Status Bar.
3. Toggle  (Dynamic Input) off in the Status Bar, (this is not necessary but makes the Polar Tracking function clearer).
4. Start the **Line** command. At the "Specify first point:" prompt, type **0,0** and press <Enter>.
5. Move the crosshairs straight to the right hand side from the start point. When you see the Polar Tracking line, type **30**, and press <Enter>.
6. Move the crosshairs straight up from the new point. When you see the Polar Tracking line, type **20**, and press <Enter>.
7. Continue to draw the shape shown above, moving the crosshairs and typing in the distance for each segment.
8. For the last segment, type **C** <Enter> to close the figure and finish the **Line** command.
9. Save the drawing for use in the next practice.

4.1 Using Object Snap

When AutoCAD saves information in a drawing file, it does not save images of the objects you created, but rather geometrical descriptions of the objects. For example, a line is stored as two endpoints, a circle by its centre point and radius. AutoCAD therefore knows the exact endpoints of each line in the drawing, the exact centre of each circle, and so on. **Object Snaps** allow you to take advantage of this geometrical precision by snapping to exact points on objects while you are in a command, as shown in Figure 4-1. You need some object snaps to be on most of the time. These can be setup as **running** object snaps, sometimes also known as Automatic Object Snaps.

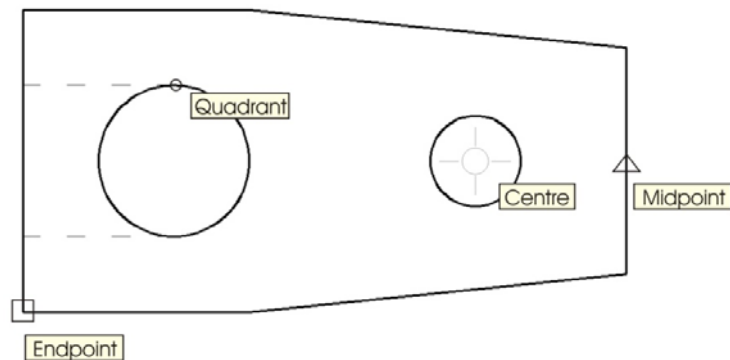





Figure 4-1


	Object Snap
Status Bar:	
Menu Browser:	<i>Tools>Drafting Settings>Object Snap tab</i>
Command prompt:	F3 (Toggles On/Off)

To use Running (Automatic) Object Snaps:

1. Turn on  (Object Snap) at the Status Bar.
2. Start a command such as **LINE** or **CIRCLE**.
3. Move your cursor over an object in the drawing. A small icon will display at the snap location when the pointer is near it.
4. Pick the point when the small icon is showing.
5. Continue picking other points as needed.

- When using an Object Snap where the object you are selecting could have more than one such point (e.g. **Endpoint, Quadrant**), pick a point on the object *near* your intended point.

Object Snap Settings

You can select which Object Snap modes are turned on at any time in the Drafting Settings dialog box in the *Object Snap* tab, as shown in Figure 4-2. To access the dialog box, right click on  (Object Snap) in the Status Bar and select **Settings...**. Select each option you want to turn on.

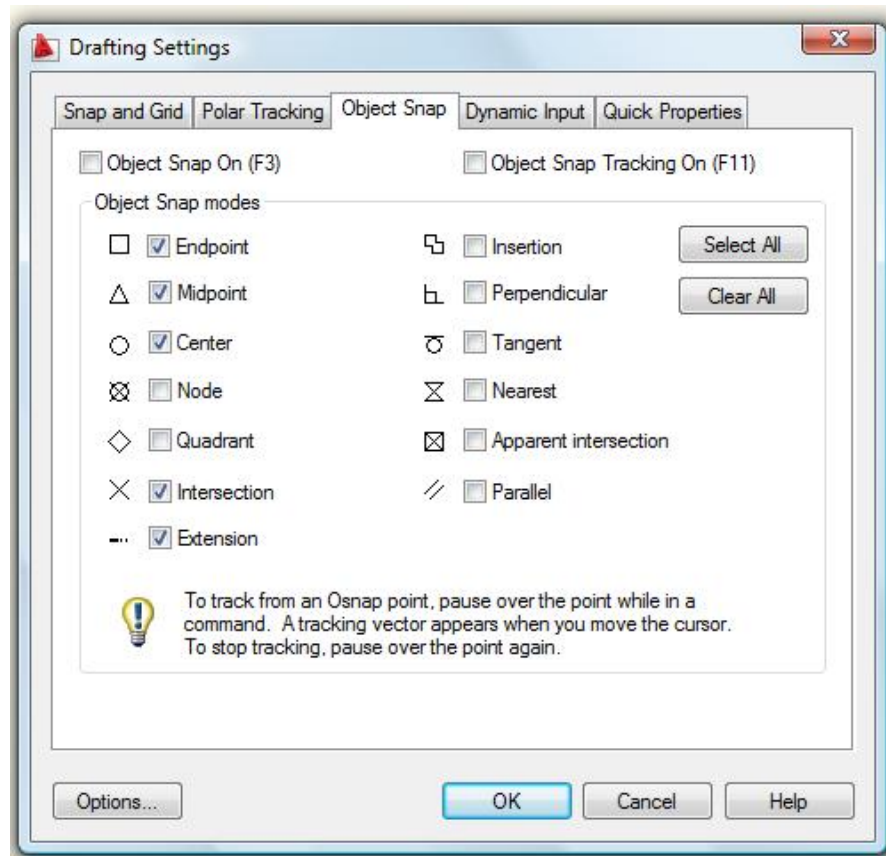



Figure 4-2

- You can also modify the settings when you are in the middle of a command.

New In 2009!

- The easiest way to select one additional running Object Snap is to right-click on  (Object Snap) in the Status Bar and select the option in the shortcut menu. Running object snaps are noted in the menu with a blue box around the symbol., as shown in Figure 4-2a.

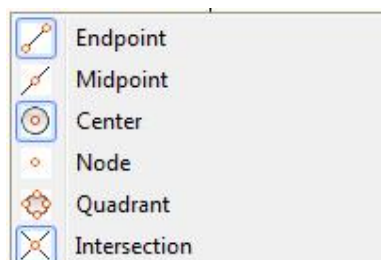


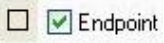


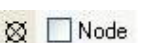
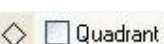

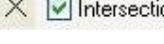
Figure 4-2a



- The symbol adjacent to each Object Snap mode displays in the drawing window when you move the cursor over the snap location. A small tag also displays the name of the snap.

The Primary Object Snaps

As a general rule the most frequently used Object Snaps are **Endpoint**, **Midpoint**, **Centre**, **Intersection**, **Extension** and **Perpendicular**. These will normally be turned on as running (automatic) Object Snaps. **Quadrant** and **Node** are helpful in certain situations. However, you should turn on those which are specific to your industry i.e. those which you use on a regular basis, which may or may not be the same as those above.

- It is NOT good practice to turn on more snaps than you use on a regular basis as some snaps will interfere with each other. A good rule of thumb is to turn on those on the left hand side only and use only those on the right hand side in specific circumstances.
- The snaps that you use occasionally can be selected manually from either the *Object Snap* toolbar or by holding down the “**Shift**” and right-clicking at the same time, which will display the object snap shortcut menu.
- You can also type the first three letters of an Object snap to snap to that point.

	Snaps to the end point of a line or arc.
	Snaps to the midpoint of a line or arc.
	Snaps to the centre point of a circle or arc. You can move your cursor over the edge of the circle to get the centre point of Quadrant snap is not on as well.
	Snaps to a permanent reference point.
	Snaps to the quadrant point of a circle or arc (often described as clock positions, i.e. 12, 3, 6, and 9 o'clock.)
	Snaps to the intersection of two objects. Intersection can be used in two ways: pick directly on the intersection, or pick on the first object for the intersection and the second object. Intersections that do not actually exist, but would if the two lines were extended, can be picked in this manner. (Shown as an Extended Intersection)
	Snaps to a point on the continuation of an object.

- Object Snap settings are saved in the system (not in individual drawings) and remain set until changed. When you toggle  (Object Snap) on or off in the Status Bar it does not change the settings.
- Clicking  in the Drafting Setting dialog box opens the Options dialog box in the *Drafting* tab. Here, you can change the colour of the Object Snap button, as well as other settings.

 **To use the Extension Object Snap (not LT prior to 2007)**

The **Extension** object snap works differently than the rest of the primary object snaps. Instead of selecting a point it enables you to specify a start point at a distance from another point. In the example shown in Figure 4-3, the **Extension** object snap is used to start a new line at a distance from another wall without having to create an extra line that would need to be erased. Many people work with the **Extension** Object Snap set all the time

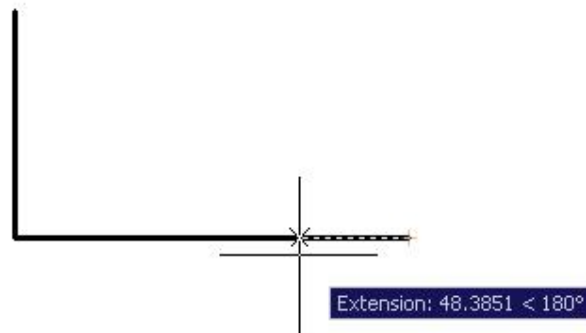



Figure 4-3

1. Toggle  (Object Snap) on in the Status Bar and make sure the appropriate object snaps are selected including **Extension**.
2. Start a command such as **Line** or **Circle**.
3. Move the cursor over an existing object in the drawing. One of the standard Object Snap icons appears. Instead of clicking a point move the cursor away. A small plus symbol appears at the snap location. Move the crosshairs away from the object.
4. When the cursor reaches a point along the line of the object, a dashed line appears from the end of the object to the crosshairs. In addition, a snap tip appears to tell you the distance from the object and its angle. Type in the distance you want to be from the original point.

Practice Exercise 4-1: Using Object Snaps

In this practice you will set Object Snaps and use them to draw a fence line and roofline, as shown in Figure 4-4. Estimated time for completion: 5 minutes.

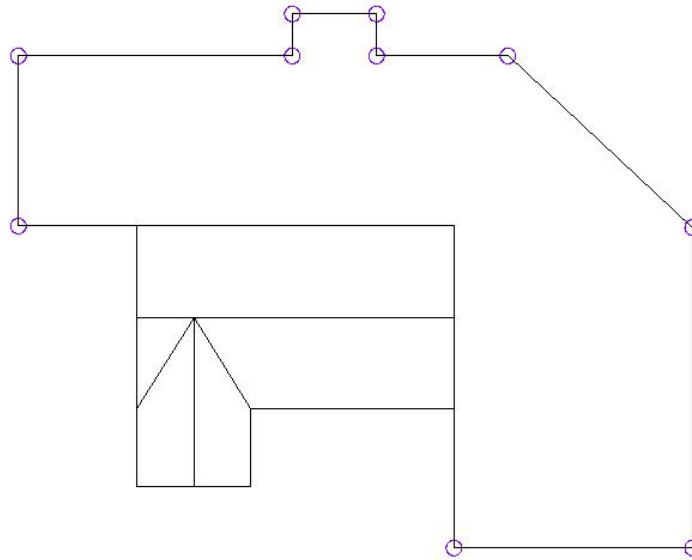

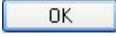




Figure 4-4

Task 1 – Draw the Fence

1. Open the drawing **Exercise 4-1.dwg** from your class files folder. This is an empty drawing file.
2. Right-click on  (Object Snap) in the Status Bar and select **Settings**. From the menu set the Object Snap modes to **Endpoint**, **Midpoint**, **Centre** and **Extension** only, and turn Object Snap on. Click  to close the dialog.
3. Start the **LINE** command and draw a "fence" from the corner of the house through each of the "fence posts" to the other corner of the house as shown above.

Task 2 – Draw the Roof Lines

1. Right-click on  (Object Snap) in the Status Bar and select **Settings**. From the menu, add the object snap **Intersection** from the list.
2. Ensure that  (Polar Tracking) is turned on. Start the **LINE** command again and draw a line from the midpoint on the right-hand side of the house (Point 1) to the point where it intersects the left-hand side, as shown in Figure 4-5. This shows the main roof ridge.

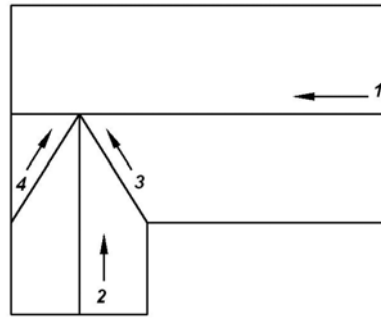



Figure 4-5

3. Draw another line from the midpoint of the front wing of the house (Point 2) straight up to the intersection of the ridge you just drew. This creates the ridge of the wing.
4. Draw another line from the top right-hand corner of the wing (Point 3) to the intersection of the two ridge lines.
5. Start the **Line** command again. Move (DON'T CLICK) the cursor over the lower left-hand endpoint of the wing and then pull it up without selecting the point. The **Extension** object snap is enabled. Type a distance of **3050**. The **Line** command starts at this point. End it at the intersection of the two ridge lines.
6. Save and close the drawing.

4.2 Using Object Snap Overrides

You use automatic  (Object Snap) for the points you normally snap to. Other snaps are required less often, such as **Tangent** or **Perpendicular**. Rather than constantly changing the Object Snap settings, you can apply the other snaps as one-time *object snap overrides*. Object snaps applied as overrides are active only for the next point you pick. You can access overrides through shortcut cursor menus when you are in a command, as shown in Figure 4-6.

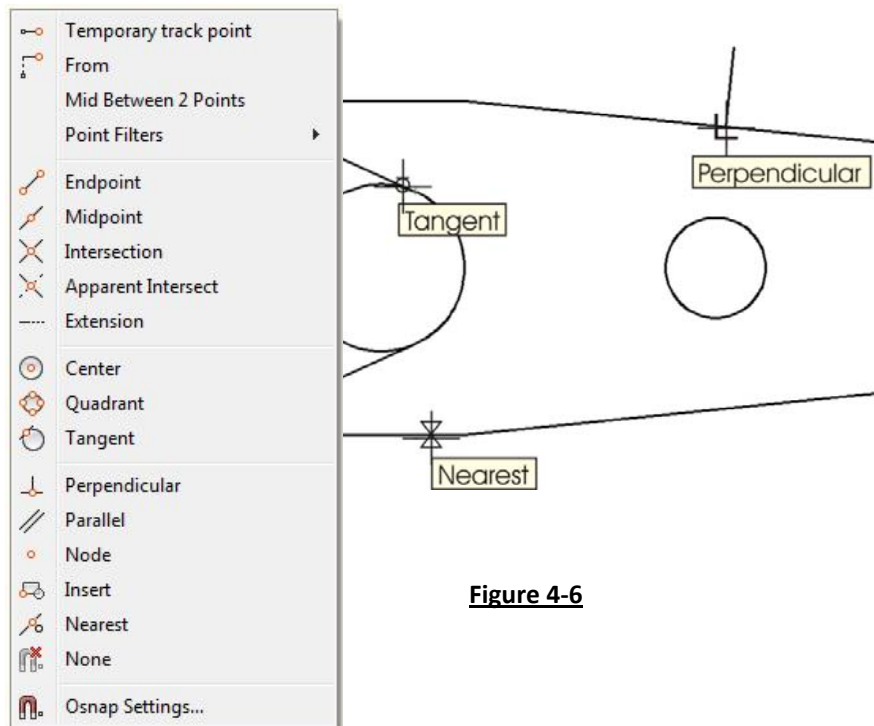


Figure 4-6

Object Snap Overrides







Shortcut Menu (right-click in a command) **Snap Overrides** or **<Shift> + right-click**

Command prompt: **<first three letters>**

To use an Object Snap override:

1. Start a command where point input is required (e.g. **Line**, **Circle**, etc.).
 2. Before picking the point, select an Object Snap override.
 3. Move the crosshairs near the location on the object you want to snap to. AutoCAD will display an icon on the snap location.
 4. When you see the icon, pick to select the point.
- You must start a command before using an Object Snap override.
 - You can apply any snap as an override, whether or not OSNAP is turned on. For example, you want to draw a circle at the centre of an arc but you are automatically snapping to the endpoints or midpoint instead. Start the CIRCLE command, choose the Centre override and move the cursor over the arc. The icon will show the Centre snap.
 - Object Snap overrides can be used whenever AutoCAD prompts for a point.
 - If you pick the wrong Object Snap from the toolbar, do not press <Esc> or click Undo (this would cancel the command). Instead, select the correct Object Snap twice. The first time will cancel the previous snap and the second will set the new snap.

Typical Object Snap Overrides

	TANgent	Snaps to the point on a circle or arc that forms a line tangent to that object.
	PERpendicular	Snaps to a point which creates a perpendicular line from one object to another.
	PARallel	Snaps to a point that creates a line parallel to the object selected.
	INSert	Snaps to the insertion point of text, a block, or an external reference.
	NEArest	Snaps to the point on an object that is visually closest to the crosshairs.
	NONE	Turns off OSNAP for the next point picked.
No Icon	Mid Between 2 Points	Snaps to a point midway between two other points that you select. Typically, the other two points are selected by preset object snaps such as Endpoint or Midpoint . A quick way to get the centre of a rectangle is to select the midpoint between the two points of the opposite corners.

/// To use the Parallel Object Snap (not LT prior to 2007)

Parallel can only be used to draw linear objects. At least one point must be chosen before **Parallel** is invoked. The new line will be parallel to the object selected, as shown in Figure 4-7.

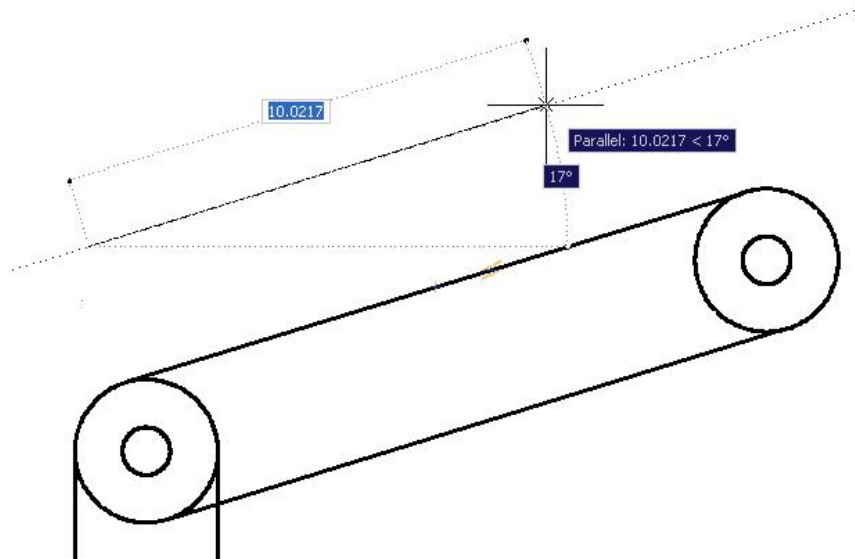


Figure 4-7

1. Start the **Line** command.
2. Click a start point of your line (anywhere will do for this example).
3. Select the **Parallel** object snap override.
4. Move your cursor over the object to which the new line should be parallel (DO NOT PRESS ENTER OR CLICK). Firstly you will see the Parallel icon appear, then as you move away a small cross will appear on the object.
5. Move the cursor away from the object. When you reach a point that makes the new line parallel to the object selected, a dashed line will appear to show the parallel direction. In addition, a parallel marker and a snap tip appear. Type the distance of the new line or pick the point you wish to use.

Practice Exercise 4-2: Object Snap Overrides

In this practice you will use a variety of running Object Snaps in conjunction with the **LINE** and **CIRCLE** commands to complete the drawing as shown in Figure 4-8. Estimated time for completion: 5 minutes.

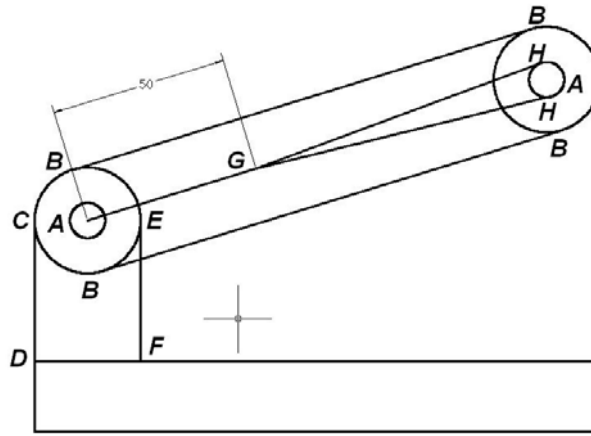




Figure 4-8

- Remember: for points that are not set as running (Automatic) **object snaps**, you must pick an Object Snap override **each** time you pick a point
1. Open the drawing **Exercise 2-2.dwg**, from your class files folder.
 2. Set the  (Object Snap) settings to **Endpoint, Midpoint, Centre, and Quadrant**,
 3. Draw circles of *radius 5* at the **centre** of the two existing circles.
 4. Draw lines (B to B) connecting the large circles **tangent** to each circle. Hold down <Shift>, right-click and use the shortcut menu to select the **Tangent** object snap override for each point you click.
 5. Draw a line from the 9 o'clock **quadrant** (C) of the lower circle to the upper left **endpoint** (D) of the rectangle.
 6. Draw a line from the 3 o'clock **quadrant** (E) of the lower circle **perpendicular** to the top of the rectangle (F).
 7. Draw a line from the **Centre** (A) of the left-hand circle, **parallel** to one of the angled lines and **50 units** long (G). From that point continue to the line **tangent** to the small circle on the right hand side (H).
 8. Draw one more line from the **endpoint** of the parallel line (G) **tangent** to the other side of the small circle on the right hand side (H).
 9. Save and close the drawing

4.3 Polar Tracking at Angles

You can use **Polar Tracking** to help draw horizontal and vertical lines, as well as lines at other angles, for instance 15, 30 or 45 degrees. Right-click on  (Polar Tracking) in the Status Bar and select from the list of standard angles, as shown in Figure 4-9. This can be done in the middle of a command.

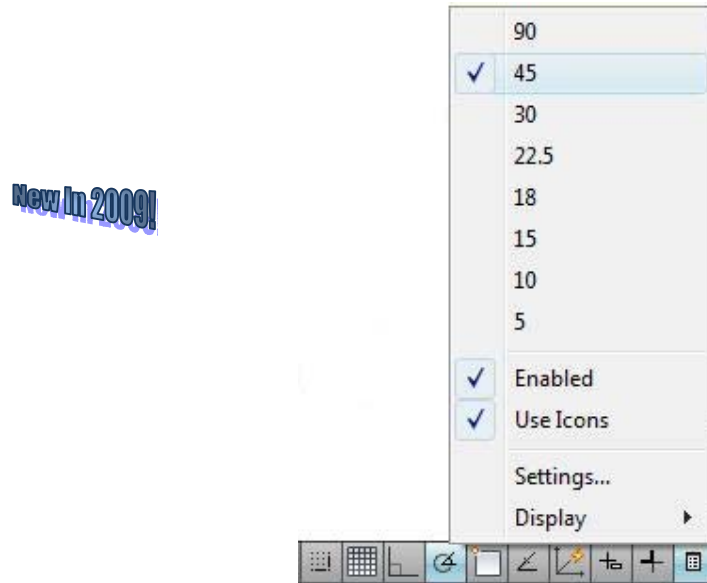


Figure 4-9

Polar Tracking Settings

For more Polar Tracking options, select **Settings** to open the Drafting Settings dialog box, as shown in Figure 4-10. In this dialog box you can specify additional angles and other settings.

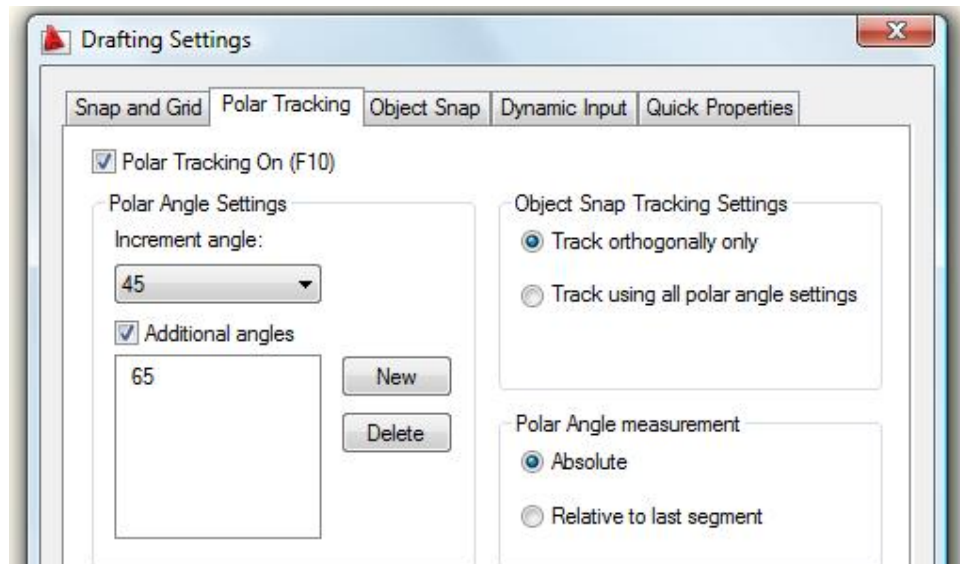


Figure 4-10

Polar Tracking Options

Increment angle: <input type="text" value="45"/>	Select an angle from the list of Increments angles or type in another angle to use. Whatever angle you choose, AutoCAD will allow you to track to that angle and multiples of it. For example, if you choose 30, you can track to 0, 30, 60, 90, 120, etc. These are the same options as the shortcut menu.
<input checked="" type="checkbox"/> Additional angles <input type="text" value="65"/>	Select to use angles other than the one specified by the increment angle list.
<input type="button" value="New"/>	Click to add an additional angle. You will be able to snap to this angle only, not its multiples, and to multiples of the Increment Angle list. You can add up to ten Additional Angles.
<input type="button" value="Delete"/>	Deletes the selected Additional Angles from the list.

Polar Angle Measurement

- When the *Absolute* option is selected, the polar tracking is relative to the X and Y axes.
- When the *Relative to last segment* option is selected, **polar tracking** is relative to the last segment drawn or to a segment you snap to with OSNAP.

For example, the *Increment Angle* is set to **90**. You start the **LINE** command, and draw a diagonal line at about 40 degrees for the first segment. Continuing with the **LINE** command, you draw another segment using Polar Tracking, as shown in Figure 4-11. If the *Absolute* option is selected, you can draw the line in increments of 90 degrees relative to the X and Y axes (to the right, left, up, or down). If *Relative to last segment* is selected, you can draw the line along the last line, or in 90-degree increments from it.

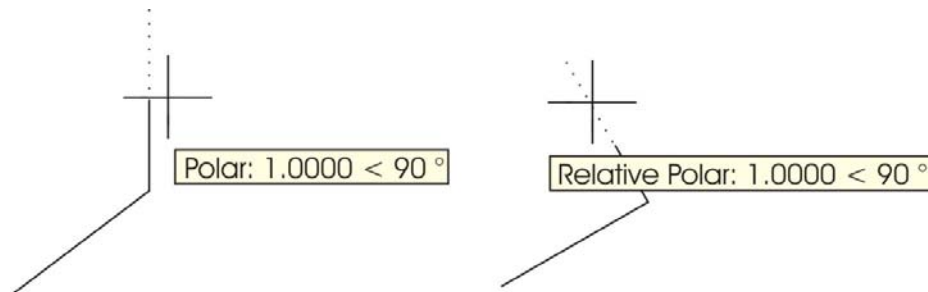


Figure 4-11

Note

- You can override Polar Tracking at any time by typing in "*angle*" at the command prompt. (Example: Specify next point or [Undo]: <36) This works even if POLAR is turned off.

Practice Exercise 4-3: Object Snap Overrides

In this practice you will adjust the Polar Tracking settings and then use **Polar Tracking** to draw the outline of the part, as shown in Figure 4-12. Estimated time for completion: 5 minutes.

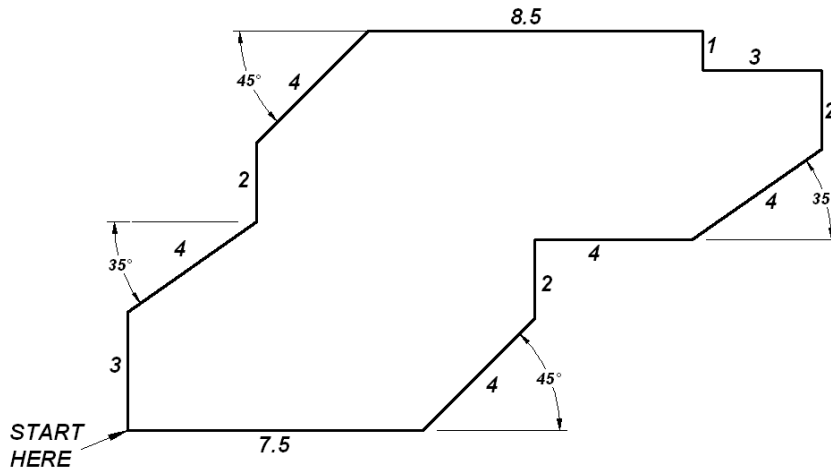


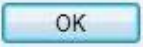



Figure 4-12

1. Open the drawing **Exercise 4-3.dwg**, from your class files directory. This is an empty drawing file, use this file only not another empty file.
2. Right-click on  (Polar Tracking) in the Status Bar and select **Settings** from the menu.
3. Set the *Increment angle* to **45** degrees. Select the *Additional Angles* option and click on the  button to add an additional angle of **35** degrees. Make sure that Polar Tracking is ON and click  to close the dialog box.
4. Draw in an anti-clockwise direction. Start the **LINE** command and pick a point in the lower left corner of the screen. Move the pointer straight to the right so that the tracking line at 0 degrees shows. Type in **7.5** and press <Enter>.
5. Pull the pointer up and to the right until you see 45 degree tracking line. Type in **4** and press <Enter>.
6. Continue to draw the outline as shown above, finding the appropriate tracking angle and typing in the distance for each segment.
7. For the last angled segment, the 35 degree tracking **will not work** (because this is the opposite or complementary angle, Dynamic Input flips the angle convention around to $180-35 = 145$ degrees). When you get to that point on the drawing, ensure Dynamic Input  is turned on in the Status Bar and type both the distance **4** and the angle **145** in the Dynamic Input boxes. Then finish the shape.
8. Save and close the drawing.