LEARNING OBJECTIVES

After completing this lesson, you will be able to:

1. Understand the Polar Degree Clock
2. Draw Lines to a specific length and angle
3. Draw objects using Polar Coordinate Input
4. Use Dynamic Input
5. Use Polar Tracking and Polar Snap

LESSON 11

POLAR COORDINATE INPUT

In Lesson 9 you learned to control the length and direction of horizontal and vertical lines using Relative Input and Direct Distance Entry. Now you will learn how to control the length and **ANGLE** of a line using **POLAR** Coordinate Input..

UNDERSTANDING THE *"POLAR DEGREE CLOCK"*

Previously when drawing Horizontal and Vertical lines you controlled the direction using a <u>Positive</u> or <u>Negative</u> input. *Polar Input is different*. The Angle of the line will determine the direction.

For example: If I want to draw a line at a 45 degree angle towards the upper right corner, you would use the angle 45. But if I want to draw a line at a 45 degree angle towards the lower left corner, you would use the angle 225.

You may also use Polar Input for Horizontal and Vertical lines using the angles 0, 90, 180 and 270. No negative input is required.
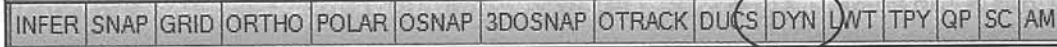
POLAR DEGREE CLOCK
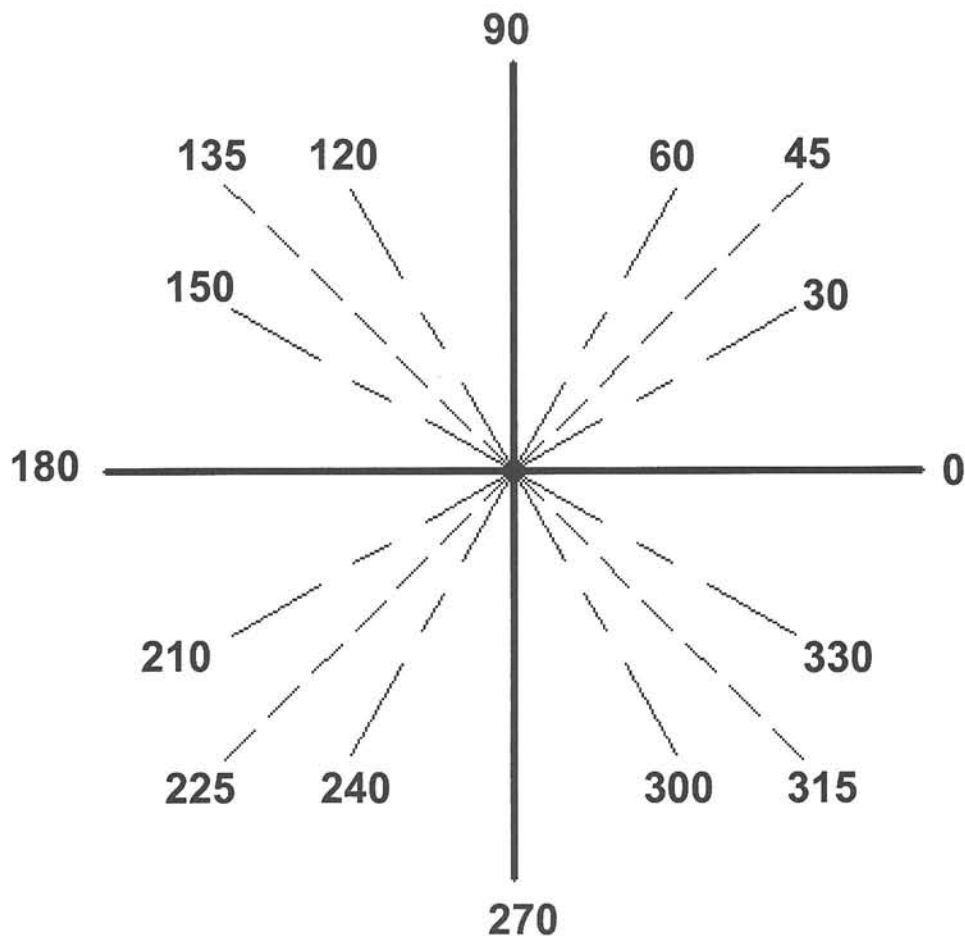
POLAR COORDINATE INPUT....continued

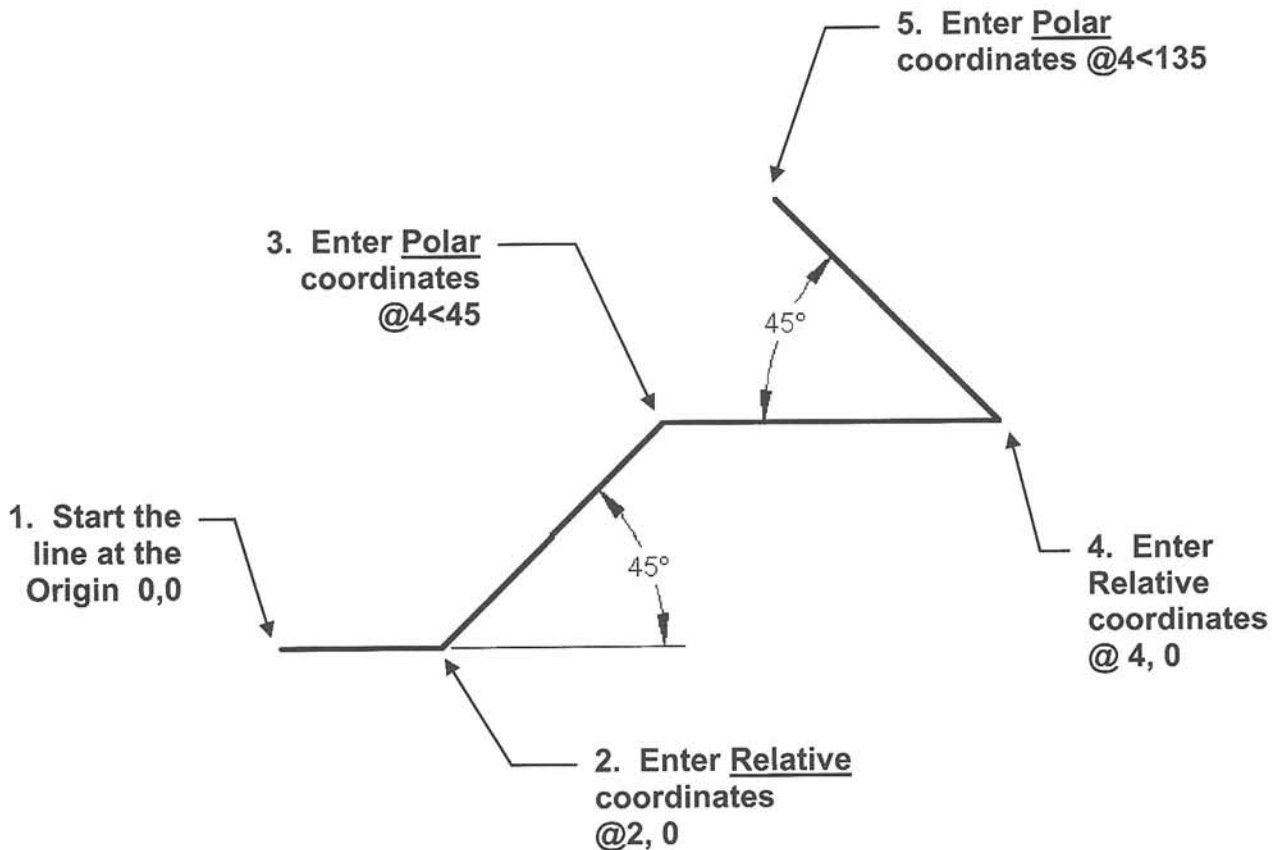## DRAWING WITH *POLAR COORDINATE INPUT*

When entering polar coordinates the first number represents the **Distance** and the second number represents the **Angle**. The two numbers are separated by the **less than (<)** symbol. The input format is: **distance < angle**

> **Note: If you are using Dynamic Input (DYN button), refer to the next page.**
>
> | INFER | SNAP | GRID | ORTHO | POLAR | OSNAP | 3DOSNAP | OTRACK | DUCS | DYN | LWT | TPY | QP | SC | AM |

A Polar coordinate of **@6<45** will be a distance of <u>6 units </u>and an angle of <u>45 degrees</u> *from the last point entered.*

Here is an example of Polar input for 4 line segments.

5. Enter Polar coordinates @4<135

3. Enter Polar coordinates @4<45

45°

1. Start the line at the Origin 0,0

45°

4. Enter Relative coordinates @ 4, 0

2. Enter Relative coordinates @2, 0

DYNAMIC INPUT

To help you keep your focus in the "drawing area", AutoCAD has provided a command interface called **Dynamic Input**. You may input information within the Dynamic Input tool tip box instead of on the command line.

When AutoCAD prompts you for the **First point** the Dynamic Input tool tip displays the **Absolute: X, Y** distance from the Origin.
Enter the **X** dimension, press the **Tab key**, enter the **Y** dimension then **<enter>**.

Specify first point: 2.227 5.357

First point
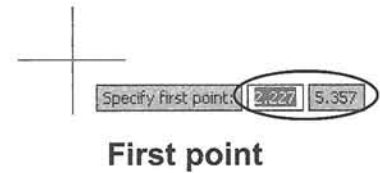
When AutoCAD prompts you for the **Second** and all **Next points** the Dynamic Input tool tip displays the **Relative: Distance and Angle** from the last point entered.
Enter the **distance**, press the **tab key**, move the cursor in the approximate desired angle and enter the **angle** then **<enter>**. (Note: The @ is not necessary)
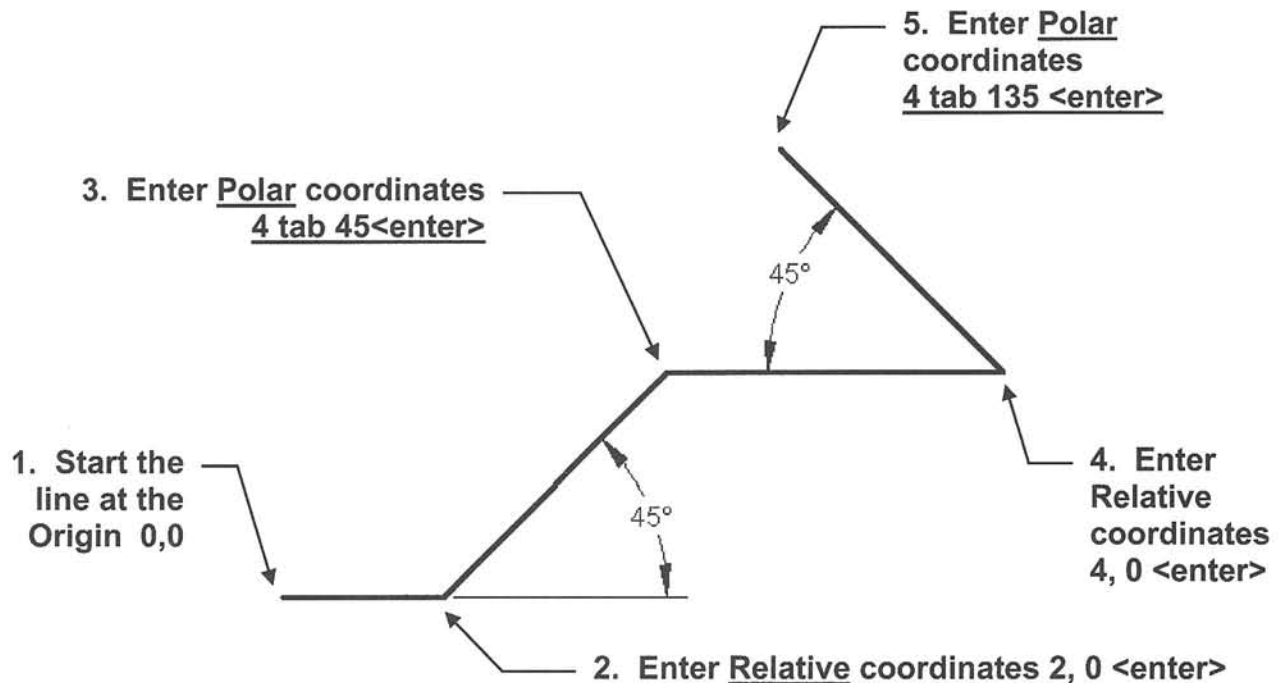
2.213   Specify next point or   38°

Second and all next points
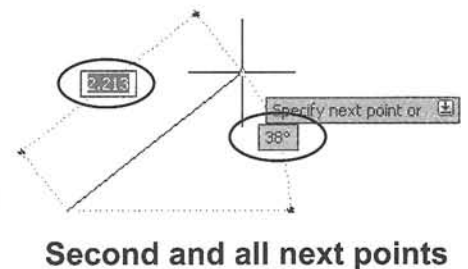
How to turn Dynamic Input ON or OFF

Select the **DYN** button on the status bar or use the F12 key.   CS DYN DWT

Here is an example of Dynamic input for 4 line segments.

5. Enter <u>Polar</u> coordinates
4 tab 135 <enter>

3. Enter <u>Polar</u> coordinates
4 tab 45<enter>

45°

1. Start the line at the Origin 0,0

45°

4. Enter Relative coordinates 4, 0 <enter>

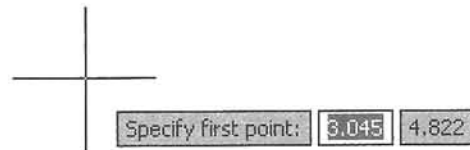2. Enter <u>Relative</u> coordinates 2, 0 <enter>

Note: Refer to Appendix C for more ways to control the Dynamic Input Tool tip box display.

DYNAMIC INPUT....continued

To enter Cartesian coordinates (X and Y)

1. Enter an "**X**" coordinate value <u>and a</u> **comma**.

2. Enter an "**Y**" coordinate value <enter>.

```
Specify first point:  3.045  4.822
```

To enter Polar coordinates (from the last point entered)

1. Enter the **distance** value from the last
   point entered.

2. Press the **Tab** key.

3. Move the cursor in the approximate
   direction and enter the **angle** value <enter>
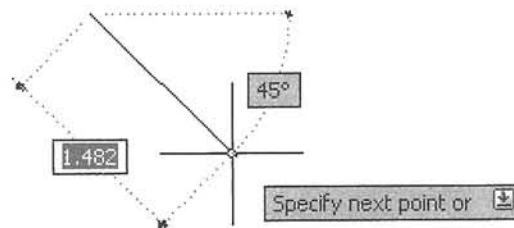
Note: Move the cursor in the approximate
direction and enter an angle value of <u>0-180</u> **only**
Dynamic Input does not required 360 degrees.
(Refer to example on the next page)
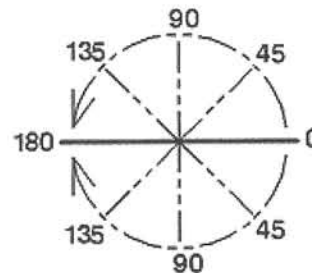
How to specify Absolute or Relative coordinates while using Dynamic Input.

To enter **absolute** coordinates when relative coordinate format is displayed in the
tooltip. Enter **#** to temporarily override the setting.

To enter **relative** coordinates when absolute coordinate format is displayed in the
tooltip. Enter**@** to temporarily override the setting.

Note about Ortho
You may toggle Ortho **On** and **OFF** by holding down the **shift** key.
This is an easy method to use Direct Distance Entry while using Dynamic Input.

USING DYNAMIC INPUT and POLAR COORDINATES

The following is a simple drawing to practice Dynamic Input and Polar coordinates. Think about how this differs from the basic polar input on page 11-2 and 11-3.

Example on the next page.

1 Set the Status Bar as follows:
DYN = ON   All others = OFF

| SNAP | GRID | ORTHO | POLAR | OSNAP | OTRACK | DUCS | DYN | LWT | QP |

2. Select the **Line** command:

3. Start the Line near the lower left corner of the drawing area.
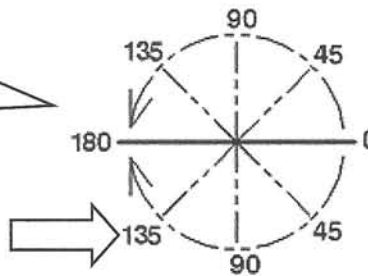
Line A 4. Move the cursor to the right.
5. Type 2 <tab> 0 <enter>

Line B 6. Move the cursor up and to the right
7. Type 3 <tab> 45 <enter>

Line C 8. Move the cursor up.
9. Type 2 <tab> 90<enter>

Line D 10. Move the cursor down and to the left.
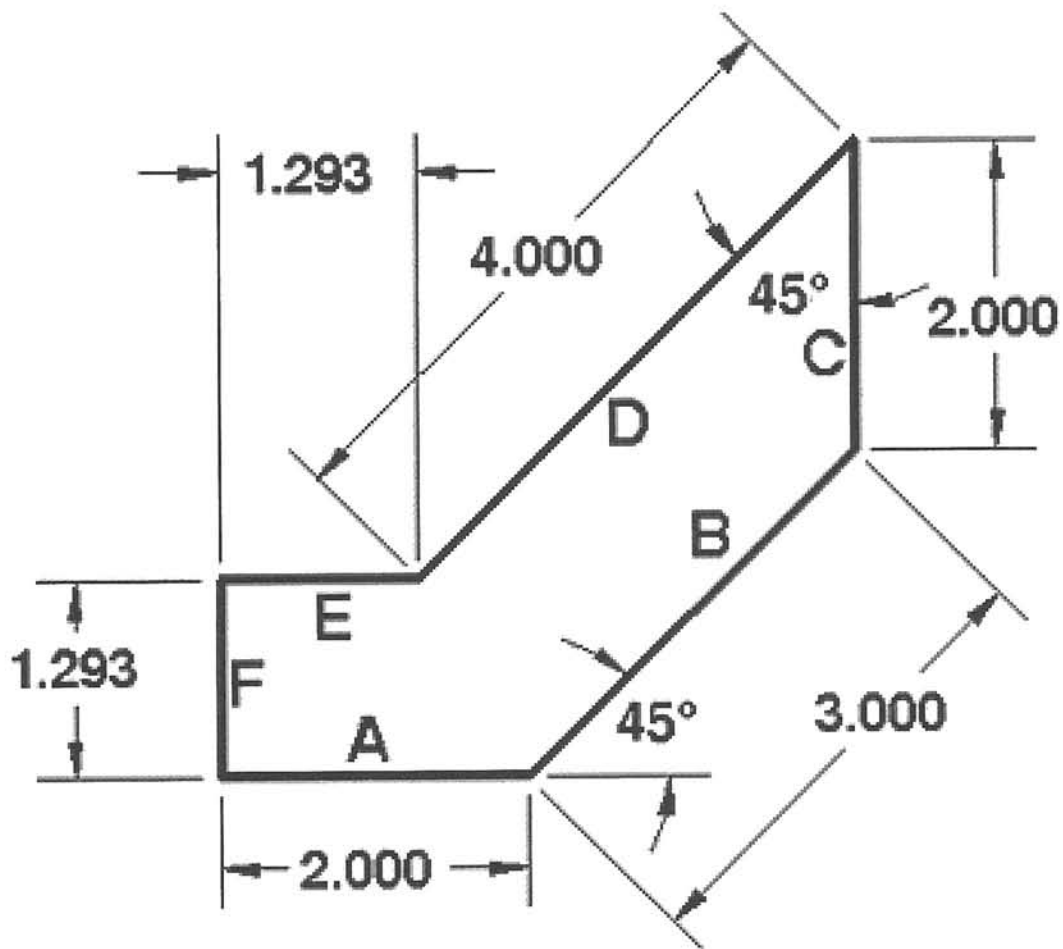11. Type 4 <tab>   135<enter>   (Note: 180 – 45 = **135**)

If you move the cursor around you will notice that the angle value display never exceeds 180

Line E 12. Move the cursor to the left.
13. Type 1.293 <tab> 180 <enter>

Line F 14. Move the cursor down.
15. Type 1.293 <tab> 90 <enter>
16. <enter> to stop

POLAR TRACKING

Polar Tracking can be used <u>instead</u> of **Dynamic Input**. When *Polar Tracking* is "**ON**", a dotted *"tracking"* line and a *"tool tip"* box appear. The tracking line.... "snaps" to a **preset angle increment** when the cursor approaches one of the preset angles.   The word *"Polar"*, followed by the *"distance"* and *"angle"* from the last point appears in the box.   (A step by step example is described on the next page.)
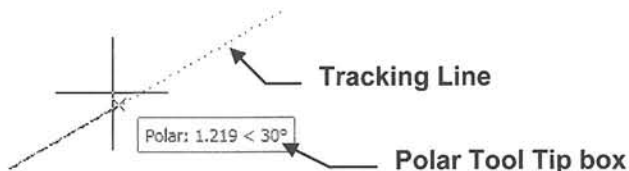

HOW TO SET THE INCREMENT ANGLE

1. Right Click on the **POLAR** button on the Status Bar and select "**SETTINGS**", or select an angle from the list.

POLAR ANGLE SETTINGS

Increment Angle   Choose from the Increment Angle list including 90, 45, 30, 22.5, 18, 15,10 and 5.
It will also snap to the selected angles multiples. For example: if you choose 30 it will snap to 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330 and 0.
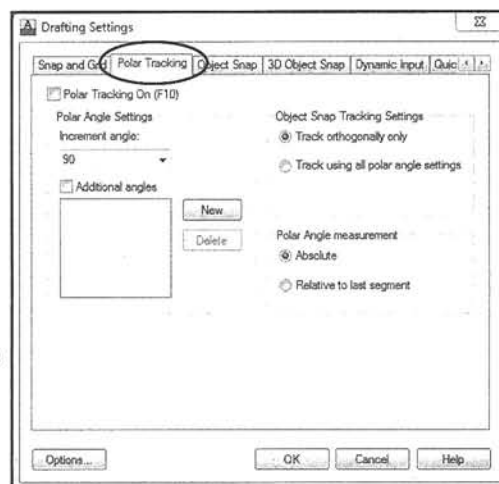
Additional Angles   Check this box if you would like to use an angle other than one in the Incremental Angle list.
For example: 12.5.

New   You may add an angle by selecting the "New" button. You will be able to snap to this new angle in addition to the incremental Angle selected. <u>But you will not be able to snap to it's multiple</u>. For example, if you selected 7, you would not be able to snap to 14.

Delete   Deletes an Additional Angle. Select the Additional angle to be deleted and then the Delete button.

POLAR ANGLE MEASUREMENT

<u>ABSOLUTE</u> Polar tracking <u>angles</u> are relative to the UCS.

<u>RELATIVE TO LAST SEGMENT</u> Polar tracking <u>angles</u> are relative to the last segment.

USING POLAR TRACKING and DDE

1. Set the Polar Tracking Increment Angle to 15.

2. Turn all the Status Bar buttons to Off except POLAR.
   (Note: DYN should be OFF but you may wish to leave it ON)

SNAP	GRID	ORTHO	POLAR	OSNAP	OTRACK	DUCS	DYN	LWT	QP

3. Select the Line command.

P1 4. Start the Line in the lower left area of the drawing area.

P2 5. Move the cursor in the direction of P2 until the Tool Tip box displays 30 degrees.
   6. Type 2 <enter> (for the length).

P3 7. Move the cursor in the direction of P3 until the Tool Tip box displays 90 degrees.
   8. Type 2 <enter> (for the length).

P4 9. Move the cursor in the direction of P4 until the Tool Tip box displays 0 degrees.
   10 Type 2 <enter> (for the length).

P5 11 Move the cursor in the direction of P5 until the Tool Tip box displays 150 degrees
   12 Type 2 <enter> (for the length).

P6 13 Move the cursor in the direction of P6 until the Tool Tip box displays 180 degrees.
   14 Type 2 <enter> (for the length).

   15 Then type C for close.
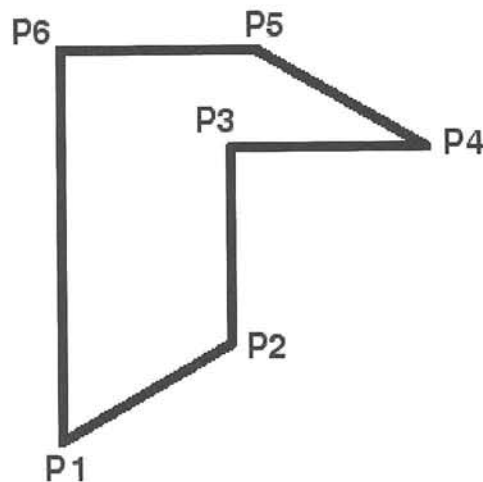
POLAR TRACKING ON or OFF

You may toggle Polar Tracking On or Off using one of the following:
Left click on the POLAR button on the Status Bar or Press F10

POLAR SNAP

Polar Snap is used with Polar Tracking to make the cursor snap to specific *distances* and *angles*. If you set <u>Polar Snap distance to 1</u> and <u>Polar Tracking to angle 30</u> you can draw lines 1, 2, 3 or 4 units long at an angle of 30, 60, 90 etc. without typing anything. You just move the cursor and watch the tool tips.

(A step-by-step example is described on the next page)

<u>SETTING THE POLAR SNAP</u>

1. Set the **Polar Tracking Increment Angle** as shown on page 11-8

2. Right Click on the **SNAP** button on the Status Bar and select "**SETTINGS**"

3. Select <u>**Snap ON**</u>

4. Select **PolarSnap**

5. Set the **Polar Distance**

6. Select **OK** button.

USING POLAR TRACKING and POLAR SNAP

Now let's draw the objects below again, but this time with "Polar Snap" .

1. Set **Polar Tracking** Increment Angle to 30 and **Polar Snap** to 1.00.

2. Turn all the Status Bar buttons Off except **SNAP** and **POLAR**.

| INFER | SNAP | GRID | ORTHO | POLAR | OSNAP | 3DOSNAP | OTRACK | DUCS | DYN | LWT | TPY | QP | SC |

3. Select the Line command:

P1   4. Start the Line in the lower left area of the drawing area.

P2   5. Move the cursor in the direction of P2 until the Tool Tip box displays
        Polar 2.00 <30°

P3   6. Move the cursor in the direction of P3 until the Tool Tip box displays
        Polar 2.00 <90°

P4   7. Move the cursor in the direction of P4 until the Tool Tip box displays
        Polar 2.00 <0°

P5   8. Move the cursor in the direction of P5 until the Tool Tip box displays
        Polar 2.00 <150°

P6   9. Move the cursor in the direction of P6 until the Tool Tip box displays
        Polar 2.00 <180°

10 Then type C for close.
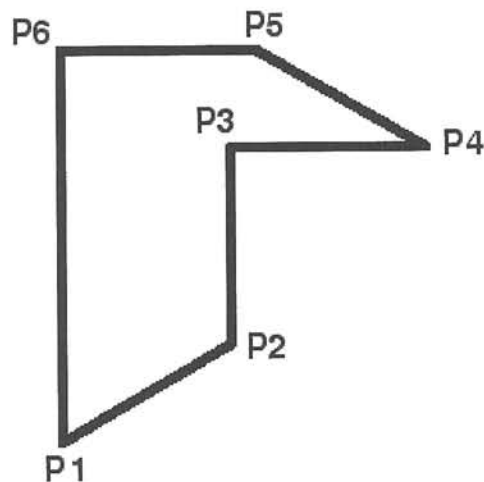
NOTE: You may OVERRIDE the Polar Settings at any time by typing:
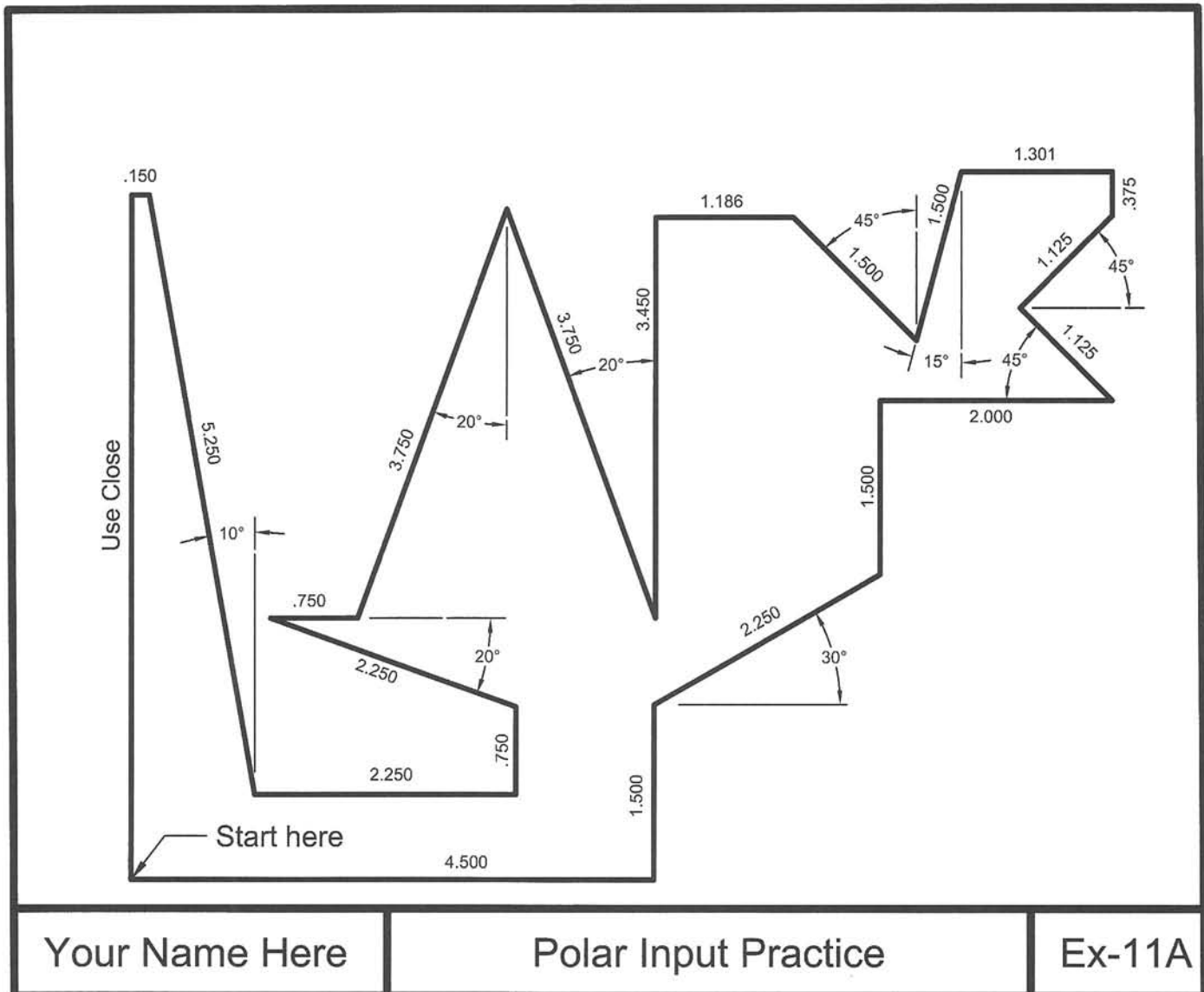*Polar coordinates (@ Length< Angle) on the Command line.*

EXERCISE 11A

INSTRUCTIONS:

1. Start a **New** file using **Border A-2013.dwt**
2. After reviewing the lengths and angles below set the
   Polar Tracking Increment Angle and Polar Snap distance.

   Note: You may have to "override" a few of the lengths. (See bottom of 11-11)

3. Use Layer = Object line.
4. Edit the Title and Ex-XX by double clicking on the text. Do not erase and replace.
5. Do not dimension
6. Save as **EX11A**
7. Plot using Page Setup **Class Model A**

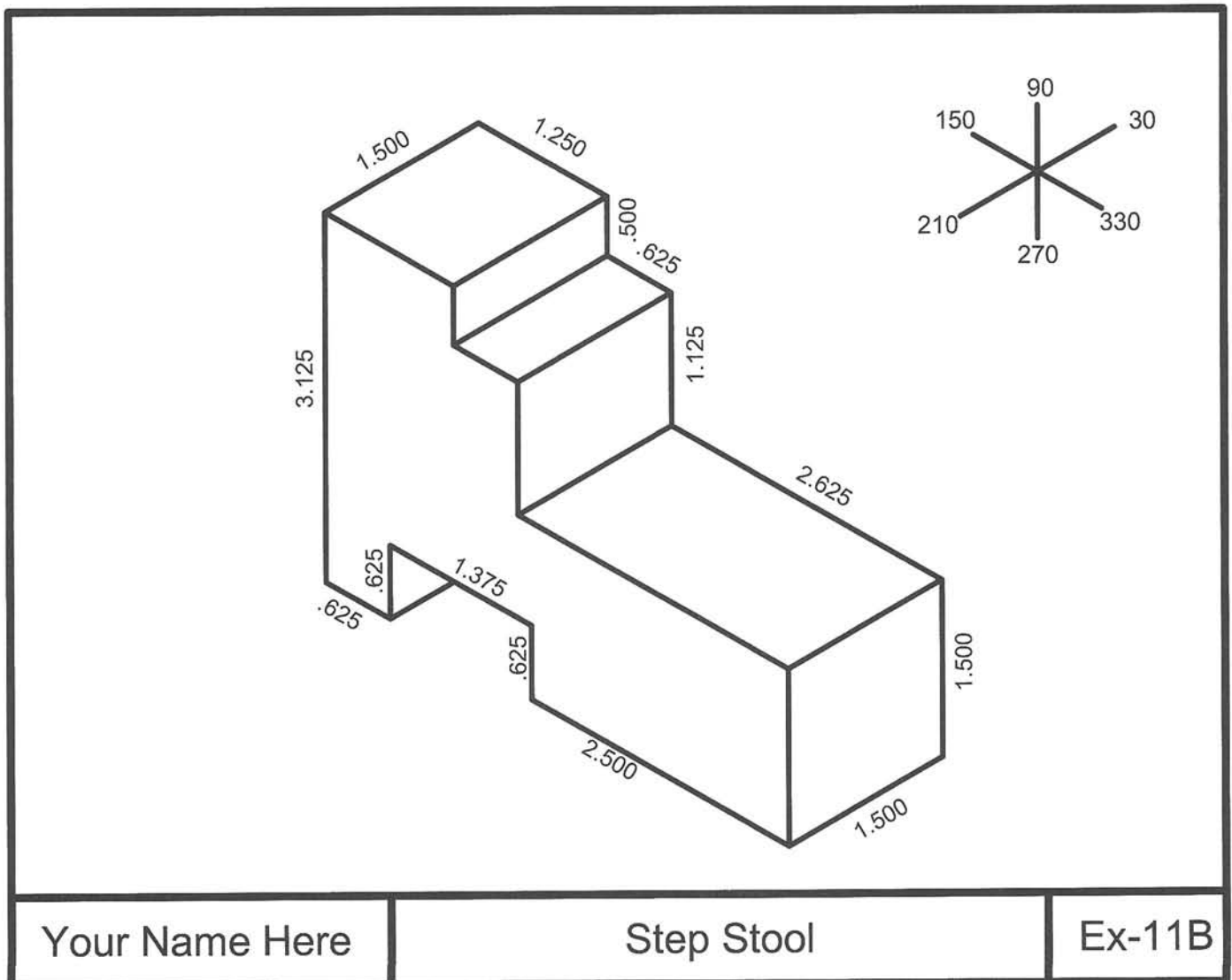| Your Name Here | Polar Input Practice | Ex-11A |

EXERCISE 11B

INSTRUCTIONS:

1. Start a **New** file using **Border A-2013.dwt**
2. After reviewing the lengths and angles below set the
   Polar Tracking Increment Angle to **30**
   Polar Snap distance to **.125**

   Note: the isometric lines are 30, 90, 150, 210, 270 and 330. (Refer to page 11-2)

3. Use Layer = Object line.
4. Edit the Title and Ex-XX by double clicking on the text. Do not erase and replace.
5. Do not dimension
6. Save as **EX11B**
7. Plot using Page Setup **Class Model A**

| Your Name Here | Step Stool | Ex-11B |

EXERCISE 11C

INSTRUCTIONS:
1. Start a **New** file using **Border A-2013.dwt**
2. After reviewing the lengths and angles below set the
   Polar Tracking Increment Angle and Polar Snap distance

   Note: the isometric lines are 30, 90, 150, 210, 270 and 330. (Refer to page 11-2)

3. Use Layer = Object line.
4. Edit the Title and Ex-XX by double clicking on the text. Do not erase and replace.
5. Do not dimension
6. Save as **EX11C**
7. Plot using Page Setup **Class Model A**

| Your Name Here | Support Bracket | Ex-11C |
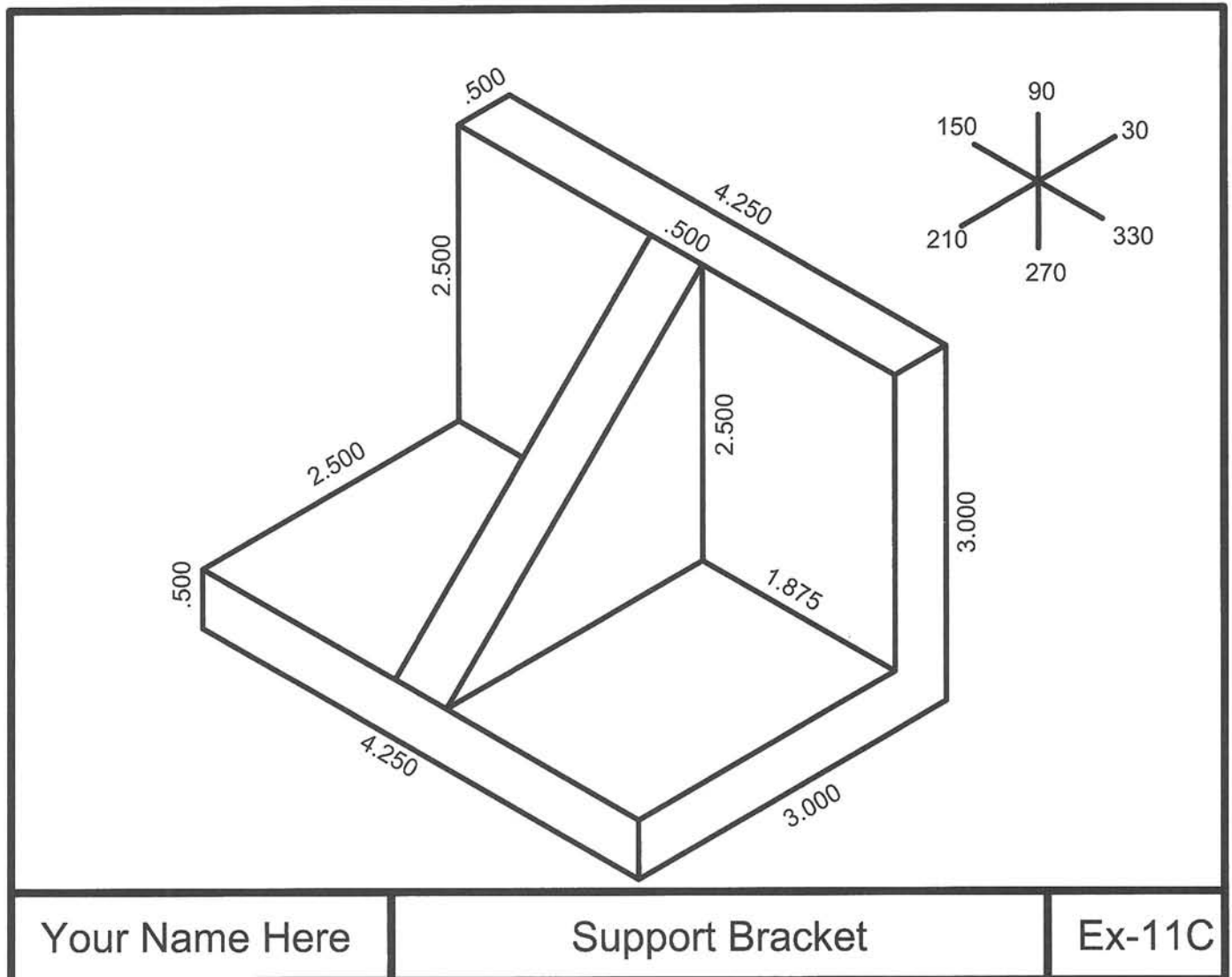
EXERCISE 11D

INSTRUCTIONS:

1. Open **Border A-2013.dwt**
   Note: You will have to do some adding and subtracting on this one.
2. Draw the 5.000 Diameter Circle using Layer Object line.
3. Draw the 4.000 Diameter Circle using Layer Center line.
4. Draw each polar line on layer Centerline using the following example:
   For example: the line marked "X" is drawn as follows:
   a. Place 1st endpoint in the center of the circle.
   b. Enter Polar coordinates for 2nd endpoint (distance 2.750 angle 138)
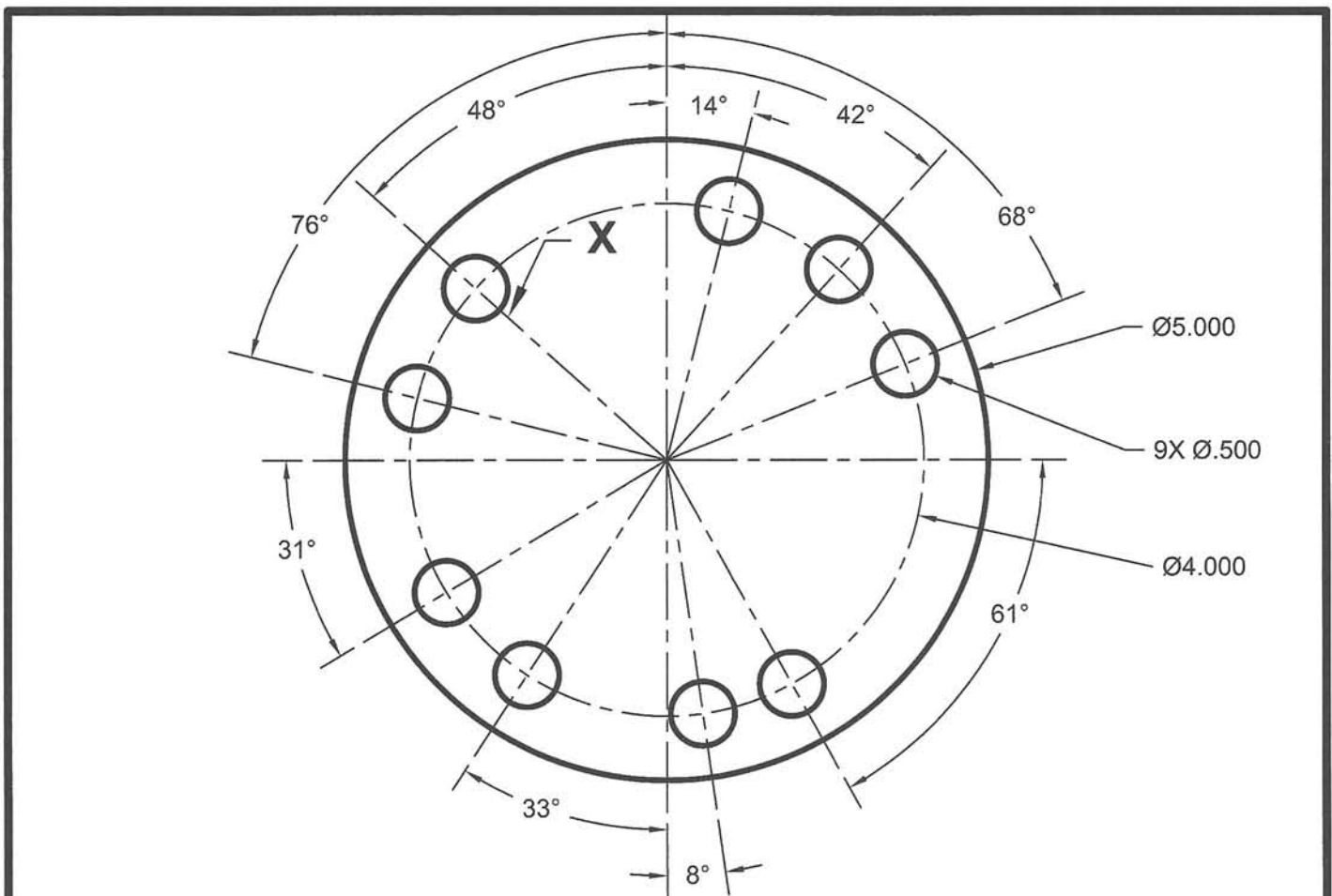   (Refer to Polar Clock on page 11-2)
5. Draw the .500 Diameter Circles. Locate their center using object snap Intersection.
6. Edit the Title and Ex-XX by double clicking on the text. Do not erase and replace.
7. Do not dimension
8. Save as **EX11D**
9. Plot using Page Setup **Class Model A**

| Your Name Here | Polar Puzzle | Ex-11D |

Notes: