KNOWLEDGESMART TRAINING

USER NOTES

<table>
<thead>
<tr>
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<th>DATE</th>
<th>DESCRIPTION</th>
<th>APPROVED</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>
SCOPE

These notes are intended to be used as handouts from the Evolve Consultancy KnowledgeSmart productivity training courses. They reinforce the topics covered during the training and provide a guide to the exercises undertaken.

They can also be used as stand-alone training materials or as trainer’s notes for your own internal training.

They are delivered as a combined PDF package so you can use the document as a complete unit or split each chapter out as necessary.

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DRAWING ELEMENTS

ACCUDRAW EXAMPLE

USE ACCUDRAW TO DIVIDE AN EMPTY SPACE BY 2

Draw two lines with a gap between them

AccuSnap to the end of the first line, type O (or Ctrl + Tentative)

AccuSnap to the end of the second line, type /2

Hit [Enter]

Click to place the line.
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DRAWING ELEMENTS

ACCUSNAP

The Keypoint Snap setting lets you snap to equally spaced points along an element. The default value of 2 gives you the endpoint and midpoint. Use the AccuDraw keyin K to change the default setting of 2 to another number.

E.g. Changing the keypoint to 5 will allow you to snap to 5 portions (6 points) of a line.

“Lock” the snap type by using Shift Tentative (brings the snaps list up at your cursor) or double-click the tool in the toolbox – the tool goes hatched to show the lock (keypoint). All other snaps (e.g. centre point) will always return back to the locked snap after use.

Right click on the Multi-snap tool to set the Properties. Drag Keypoint to the top of the list to ensure keypoints are always a priority over snapping to intersections.

Holding Ctrl+Shift down will enable/disable AccuSnap. Enable for Fence Create in AccuSnap Settings (click on the snap icon in the status bar and go to AccuSnap, or go to Settings>Snaps>AccuSnap) will enable snaps when you place a fence.
When using AccuSnap in “messy” areas move towards the junction point from the direction of the line you wish to snap to.
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DRAWING ELEMENTS

ARRAY A SINGLE LINE

Choose the Array tool (3, 6) from the Main toolbox.

To array this line around in a curve to make a 180 degree stair rotation (polar) we need the following settings:

Method = Polar
Items = 7 (includes the original)
Delta angle = -30 (for a clockwise rotation)
Rotate items = On

Click on the line. As you drag the cursor away from the line you shall see points representing the rotated items. Check that you have the correct number and adjust your settings if needed.
Click on your centre of rotation – in this case the bottom of the red line.

COPY & ARRAY

Use the copy tool to create multiple copies by entering the number of copies in the Pop dialog box. This will place the number of objects in one go.

The Move/Copy Parallel (3,9) tool will allow you to place the distance in the dialog box, rather than using AccuDraw. Check Keep Original to Copy Parallel.
The Array tool (3, 6) will allow you to place rows and columns and will show a preview of dots.

A Polar Array will allow you to rotate the elements as they are copied. The number of items includes the original.
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DRAWING ELEMENTS

CIRCLES AND ARCS

PLACING CIRCLES (E, 1)

Place a circle by Centre and choose the centre point to start:

Place a circle by Edge and select the first point on the edge, and two more points on the edge:

Placing a circle by Diameter allows you to define the diameter by the second point placement:
Ticking the box for setting the Diameter or Radius will allow you to define the Diameter or Radius without having to use AccuDraw or points on the screen.

PLACING ARCS (E, 3) (Note: the third point has not been placed in the images below but the cursor is shown heading towards it.)

Method: Start Center:
Start 1, Center 2, End 3

Method: Center, Start
Center 1, Start 2, End 3

Method: Start, Mid, End
Start 1, Mid 2, End 3
Method: Start, End, Mid
Start 1, End 2, Mid 3
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DRAWING ELEMENTS

CIRCLES EXAMPLES

DRAWING A CIRCLE TANGENTIAL TO TWO OR THREE LINES

Using the Tangential Snap, snap to each line in turn to place the circle tangential.

DRAWING A CIRCLE TANGENTIAL TO TWO LINES

Choose Start, End, Mid

Tangent Snap on two of the lines for Start and End, then choose the placement of the arc.
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DRAWING ELEMENTS

CREATING A COMPLEX SHAPE (6,3) OR CHAIN (6,2):

Using the Manual method pick each element in the shape.

Using the Automatic method pick the first element then left click to select the next element or right click to reset if cycling through incorrect elements to get the right one.

The element in Element Information is a Complex Chain.

Recreating the chain with Simplify Geometry ticked will show the information as a Shape.
To modify the vertices of a shape, select the element and use the grab handles. Use the Alt key to change the constraint mode.

Delete an internal vertex from your shape using the Delete Vertex tool (7,0).

Add vertex’s back in using the Insert Vertex tool (7,9).
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DRAWING ELEMENTS

ABSOLUTE CO-ORDINATES

AccuDraw can also enter absolute co-ordinates. The absolute co-ordinate values are distances from the design file’s global origin (0,0). Ordinate surveys use absolute coordinates.

When AccuDraw is active, type P to bring up the Data Point Keyin window once only.

Type M to bring up the Data Point Keyin for multiple entries.

Choose “Absolute (xy=)” from the menu on the left and type in your co-ordinate in the text box. Enter the co-ordinate in the format: X,Y,Z (The Z value is only necessary in a 3D file).

If one or more values are 0 you may either enter 0 or leave it blank.
100,0,0 is the same as 100
100,0,100 is the same as 100,,100

Check co-ordinates of a point using AccuSnap (Snaps > AccuSnap > Update Statusbar Coordinates - shown below) or by using Running Coordinates (right click on the status bar and turn on Running Coordinates).

AccuDraw can be set to show a readout of Northing and Eastings instead of X and Y. Use the keyin: accudraw settings northeast
The keyin window can be opened from the Primary tools:

or by hitting [Enter] over a View while no tool is active.

Use the keyin: `accudraw settings xy` to return back to normal.

MODIFYING CO-ORDINATES USING ELEMENT INFORMATION

You can modify co-ordinates using the Geometry section of Element Information. Open Element Information by selecting the element, then clicking on the "i" icon in the Primary tools:

Type in values for the x and y coordinates of your start and end points of the line.
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DRAWING ELEMENTS

HATCHING AND PATTERNING

Hatching is found in the Drawing task > Patterns toolbox (shortcut R 1).

1. Enter a value in Spacing.
2. Enter the Angle for the hatching. Remember, angles read anti-clockwise from horizontal, so 90° is straight up, 270° straight down.
3. Enter Tolerance (if required). Tolerance defines how accurately hatching matches a curve.
4. Click on an element to select it for hatching.

5. The second click identifies the origin point of the hatch. Using this point carefully can ensure that hatching always lines up on multiple elements.

   e.g. Always select the same point for the origin of the hatch for all shapes.

   ![All the hatching on all three shapes lines up.](image)

**ASSOCIATIVE PATTERN**

With Associative Pattern off, hatching is placed on the Active level using the active symbology.

![If the shape is modified, the hatching remains as individual lines.](image)
If you try to delete the pattern, each line is an individual element. You need to either pick the “Delete Pattern” tool (shortcut R 8) or turn on Graphic Group Lock before deleting.

To associate the element with the hatching and have it update automatically if the element is modified, tick Associative Pattern ON.

You will notice now that once a hatch is associative it adopts the symbology of the element, ignoring the active symbology.

Now if you try to delete the pattern (using Delete Element or by selecting the hatch and hitting the Delete key), the element is also deleted.
To hatch an element associatively but maintain control of the symbology independently, you will need to also tick Associative Region Boundary.

The element will be modifiable along with the pattern, and the pattern will adopt the active symbology.

The hatching can now also be deleted independently of the element.

MODIFYING HATCHES

If a hatch has been created using Associative Region Boundary, the symbology (level, colour, style, weight, etc) can be changed as any other element. If, however, the hatching was created using only Associative Pattern, changing the hatch attributes will also change the element.
TO CHANGE HATCH ATTRIBUTES:

1. Set the attributes drop-downs first.
   Note: you cannot use ByLevel as this will maintain the same settings as the element. You must choose a specific value.

2. Then use Change Pattern (shortcut R 7) with Attributes ticked.

3. The hatch will be updated leaving the element in its original symbology.

TO CHANGE HATCH PARAMETERS:

To change the line spacing and angle:

1. Set the values in the Hatch Area tool settings.
2. Use Change Pattern (shortcut R 7) with Pattern Parameters ticked.

TO LINE-UP EXISTING HATCHES:

1. Use Change Pattern (shortcut R 7) with Intersection Point ticked.

2. Click on the first hatch. Note: you must click on the hatch, not the element.

3. Click on the origin point to re-hatch the element.
4. Continue selecting the hatches that you want to line up. Always use the same origin point as on the first hatch.
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DRAWING ELEMENTS

UNDERSTANDING THE DIFFERENCE BETWEEN LINES AND SMARTLINES

When the Line tool is used the lines are individual elements.

When a SmartLine is drawn all the lines are joined to make a single element. (HINT: Make sure Join is ticked on in the Place SmartLine toolbox).

USING INDEXING

Indexing is when AccuDraw (the compass on your cursor when you start a line) jumps to an axis. When you get close to horizontal or vertical, the line goes bold and sticks to your direction without having to enable SmartLock (pressing Enter enables/disables SmartLock). Indexing is also when AccuDraw jumps to the last distance you entered:
e.g. Draw a line 500 in the X direction. Move the cursor in the Y direction and you will see the grey line indexing at 500. You have no need to type in the distance again.

Notice the dialog change when you complete your shape – giving you the options to change the Fill type from None to Opaque or Outline.

SEGMENT & VERTEX TYPE

The SmartLine segment type can be changed from Line to Arc. The Arc is placed centre-edge only. E.g. draw a line 500 long, without right clicking (i.e. do not cancel), change the segment type to Arc, left click the centre of the circle then edge of the circle. Change the segment type back to Line and continue drawing.

Change back to Line and set the Rounding Radius (use rounding radius of 100), draw some lines.
Change vertex to chamfered and continue. When changing the vertex back to sharp you do not need to change the offset back to 0.

**POLAR MODE**

Use the spacebar to change from X and Y to Distance and Angle. Draw a line, then use TAB or the down arrow key to move the cursor to Angle, type in 45 (image below).
ORIGIN SHORTCUT

Using the “O” shortcut allows you to reposition AccuDraw’s Origin during any command. Use the spacebar to activate AccuDraw and type in O, or use Ctrl + tentative to set your origin.

E.g. To draw a line 100,100 off the endpoint of another line:

Start the line tool but without clicking the first point for the line, snap to the end point, then Ctrl+Tentative to set the origin.

Using AccuDraw move 100 in the Y direction away from the point, if you now move in the X direction you will see a dashed line. Move 100 in the X direction, now click to start your line.

DIRECTION LOCKS

When AccuDraw is active, [Enter] will lock AccuDraw to the direction you are moving. You can use this “Smart Lock” to guarantee you are drawing exactly along an axis.

In practical use, this allows you to make sure end points of elements line up:

Notice that when the line travels in the X direction and [Enter] is pressed, the Y axis is locked to 0. i.e. you can no longer draw a line in the Y Axis and can only travel along the X axis.
Using the lock X will lock the X distance, allowing you to draw only in the Y direction.

Using the lock Y will lock the Y distance, allowing you to draw only in the X direction.

A locks the Angle, leaving you to set your distance.

D locks the Distance, leaving you to choose your angle.
DRAWING ELEMENTS
MEASURING

The measuring tools are found in the Main Tasks (shortcut 9)

**MEASURE DISTANCE BETWEEN POINTS**

To measure a distance, set the Method to “Between Points” and click two points on the screen.

As additional points are selected, the distance between each set of points displayed in Distance (think of this like “last distance measured”). The overall total is added together and displayed in Total.
1. Select the element to measure along.

2. As you move the cursor, the distance along the element is highlighted. You can use snap points to define an exact location.
PERPENDICULAR

The Perpendicular method gives a distance at exactly 90º to the element selected. This can be very useful for measuring from complex chains.

You can fix Perpendicular to measure only from a specific segment by using the “Segment Only” tick box. Turn this on before you select the element and you will only be able to measure from the segment of the element you select:
MINIMUM BETWEEN
Measures the minimum distance between two elements.

MEASURE MAXIMUM
Checks the maximum distance between the two most distant points on two elements.

In the example below, it will not report the distance between the two left-hand ends of the line, which you might expect, but measures the absolute maximum between the end points.

ABOUT
The About setting is only used when measuring 3D information. It adjusts the Projected distance based to report true distances or orthogonal distances. In the example below the Projected distance is based on the View Z:
MEASURE RADIUS

Reports the radius and diameter of an arc or circle. If the arc is elliptical, the primary and secondary axes' values will be shown; for a normal arc these will remain blank.
MEASURE ANGLE

Measures the minimum angle between two lines or segments. Depending on where along the element you select, will make a difference, as highlighted in the two examples below:
MEASURING

MEASURE AREA

Reports the area of an element.

You can change the unit of measurement for area or perimeter by changing the tool settings:

If multiple elements are selected before picking Measure Area, the total of all shapes is added to the Area, but Perimeter is reported as “Not Available”.

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NOTE: Measuring multiple elements requires you to click on the screen to accept the selection. When you do this, Measure Area will close, so to review the values, you will need to select the Measure Area tool again.

Changing the Method allows you to measure specific areas of elements without having to draw additional elements.

**INTERSECTION:** Selects the area that “overlaps” two or more shapes.
To select more than two, hold the Ctrl key down as you click on the elements.

**UNION:** Joins two or more shapes.

**DIFFERENCE:** Measures the area of the first shape you select, then subtracts any additional shapes that you pick.
MEASURING

FLOOD: Measures an area enclosed by any elements. You can adjust the tolerance value to allow for gaps.

POINTS: Allows you to draw a polygon to measure the area.
KNOWLEDGE

SMART TRAINING

DRAWING ELEMENTS

LINES OR ARCS EXAMPLE:

USE SMARTLINE, ACCUDRAW AND NEAREST SNAP TO DRAW LINES TO ARCS OR ROTATED LINES WITHOUT THE NEED FOR TRIMMING

Start a line towards the arc. Press Enter to lock the axis.

Set the Nearest Snap. The line will snap to only 1 point on the arc.
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DRAWING ELEMENTS

MOVE PARALLEL

Move Parallel (3, 9) will move or copy entities such as line strings, circles or arcs parallel to the original entity.

There are 3 Modes in the Move Parallel dialog box. All of them affect a line strings and arcs differently:

Mode: Mitre
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DRAWING ELEMENTS

PARTIAL DELETE

Use the Partial Delete (7,2) tool to trim a portion of the Shape without dropping it to individual elements.

E.g. To make a partial delete (in the red brick rectangle) at the apparent intersection of the line:

1. Click the Partial delete tool
2. Set the AccuDraw Origin on the corner of the yellow edge
3. [Enter] to lock AccuDraw to move only in the X axis
4. Use shortcut N (Nearest) to snap on to the red rectangle
5. Left-click to begin the partial delete. AccuDraw resets its origin.

6. Move around to the other side of the rectangle. AccuDraw’s indexing will show you when you have reached a point level with the start.

7. Left-click to complete the partial delete.

TRIMMING CIRCLES - USING PARTIAL DELETE

Partial delete (7, 3) can be used to trim your circle

To Trim between the intersection of two of the lines:
Intersection snap onto the first intersection. If the line starts partially deleting use right click to cycle [through the elements] to the circle.

Intersection snap to the second intersection to finish.