

## Hexagonal Pattern

Although the drawing appears to be short of some dimensions - only the inscribed circle is shown as  $\varnothing 20.0$  - it contains all the information required for the program development. Keep in mind that a hexagon (or any polygon) has its own dimensional characteristics, that do not have to be repeated in the drawing. Also keep in mind, that all the holes are equally spaced along the edges (flat sides of the hexagon).

To calculate the edge length (side  $S$  or *flat*), use this formula:

$$S = \varnothing \times \tan 30 = 20 \times 0.57735 = 11.547$$

There are six holes on each flat, which means five equal spaces. The distance between holes can be calculated:

$$11.547 / 5 = 2.3094$$

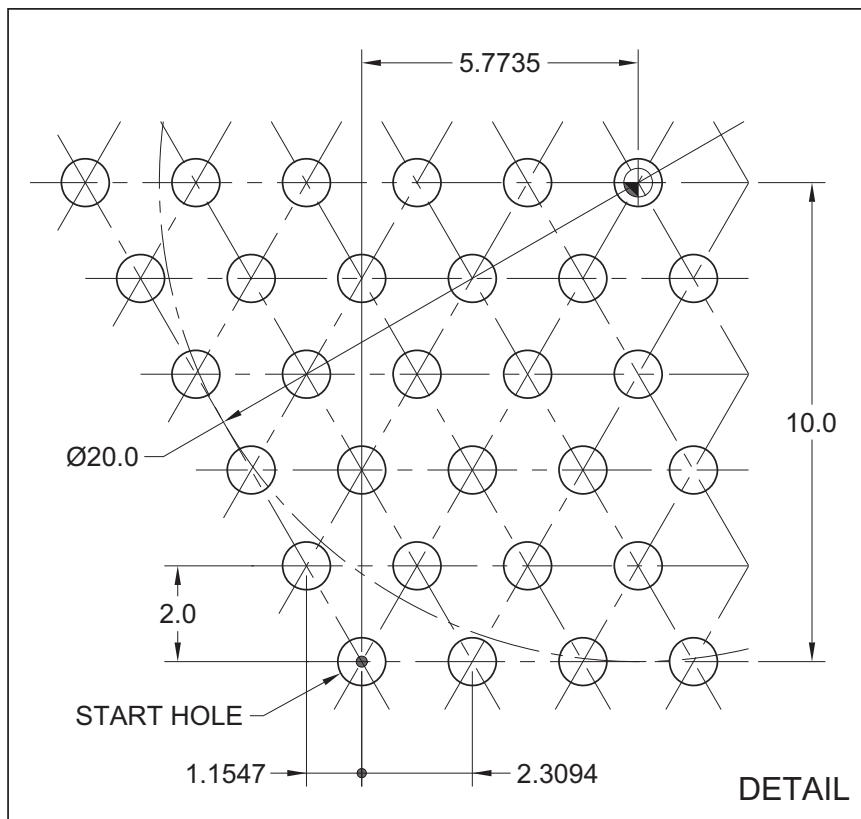
One half of this distance will be the X-axis motion from one row to the next, which is:

$$2.3094 / 2 = 1.1547$$

Horizontally, there are eleven rows, which is ten equal spaces measured vertically. Each space is 1/10th of the inscribed circle ( $\varnothing 20.0$ ):

$$20.0 / 10 = 2.0$$

These last two results are all that is needed to calculate the  $XY$  hole locations or the  $XY$  tool motions. The details are shown on the next page. Both projects can now be completed:



# NOTE:

The absolute XY location of the lower left corner of the pattern (START HOLE) is X-5.7735 Y-10.0 and must be used as the starting point for both projects.

## Project 27-05a:

(PROJECT 27-05A)	N28 X-4.6188	N58 X3.4641	N88 X-1.1547
(START AT THE LL CORNER)	N29 X-6.9282	N59 X5.7735	N89 X1.1547
(X0Y0 = CENTER OF HEX)	N30 X-9.2376	N60 X8.0829	N90 X3.4641
	N31 X-10.3923 Y-2.0	N61 X10.3923	N91 X5.7735
N1 G90 X-5.7735 Y-10.0	N32 X-8.0829	N62 X9.2376 Y4.0	(LAST HOLE)
N2 X-3.4641	N33 X-5.7735	N63 X6.9282	...
N3 X-1.1547	N34 X-3.4641	N64 X4.6188	
N4 X1.1547	N35 X-1.1547	N65 X2.3094	
N5 X3.4641	N36 X1.1547	N66 X0	
N6 X5.7735	N37 X3.4641	N67 X-2.3094	
N7 X6.9282 Y-8.0	N38 X5.7735	N68 X-4.6188	
N8 X4.6188	N39 X8.0829	N69 X-6.9282	
N9 X2.3094	N40 X10.3923	N70 X-9.2376	
N10 X0	N41 X11.547 Y0	N71 X-8.0829 Y6.0	
N11 X-2.3094	N42 X9.2376	N72 X-5.7735	
N12 X-4.6188	N43 X6.9282	N73 X-3.4641	
N13 X-6.9282	N44 X4.6188	N74 X-1.1547	
N14 X-8.0829 Y-6.0	N45 X2.3094	N75 X1.1547	
N15 X-5.7735	N46 X0	N76 X3.4641	
N16 X-3.4641	N47 X-2.3094	N77 X5.7735	
N17 X-1.1547	N48 X-4.6188	N78 X8.0829	
N18 X1.1547	N49 X-6.9282	N79 X6.9282 Y8.0	
N19 X3.4641	N50 X-9.2376	N80 X4.6188	
N20 X5.7735	N51 X-11.547	N81 X2.3094	
N21 X8.0829	N52 X-10.3923 Y2.0	N82 X0	
N22 X9.2376 Y-4.0	N53 X-8.0829	N83 X-2.3094	
N23 X6.9282	N54 X-5.7735	N84 X-4.6188	
N24 X4.6188	N55 X-3.4641	N85 X-6.9282	
N25 X2.3094	N56 X-1.1547	N86 X-5.7735 Y10.0	
N26 X0	N57 X1.1547	N87 X-3.4641	
N27 X-2.3094			

➡ Project 27-05b:

Using the *L* or *K* address allows repetition of identical tool motions and can significantly shorten the length of the CNC program.

```
(PROJECT 27-05B)
(START AT THE LL CORNER)
(X0Y0 = CENTER OF HEX)

N1 G90 X-5.7735 Y-10.0
N2 G91 X2.3094 L5
N3 X1.1547 Y2.0
N4 X-2.3094 L6
N5 X-1.1547 Y2.0
N6 X2.3094 L7
N7 X1.1547 Y2.0
N8 X-2.3094 L8
N9 X-1.1547 Y2.0
N10 X2.3094 L9
N11 X1.1547 Y2.0
N12 X-2.3094 L10
N13 X1.1547 Y2.0
N14 X2.3094 L9
N15 X-1.1547 Y2.0
N16 X-2.3094 L8
N17 X1.1547 Y2.0
N18 X2.3094 L7
N19 X-1.1547 Y2.0
N20 X-2.3094 L6
N21 X1.1547 Y2.0
N22 X2.3094 L5 (LAST HOLE)
...
```

**Note that the tool motion to the first hole is - and must be - in the absolute mode G90.**