1

## **Tests comprehension of motion types**

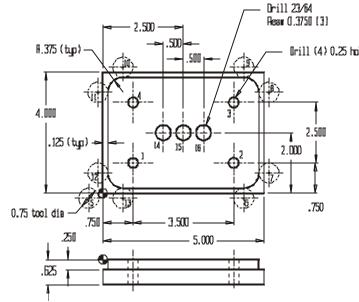
Name: Date: Score (126 possible):

**Instructions:** This is the first complete program you will be working on. Though it will not require that you actually write the entire program on your own, it will show you much of what is involved in doing so.

First use the print to come up with the coordinates going into the program by filling in the coordinate sheet. For the Z coordinate of the hole machining operations, you may wish to give two values, one for the approach position and the other for the hole bottom position, so you'll have these values available when you work on the program. For the 0.25 holes, for example, you could specify Z as 0.100/-0.730. For the 0.75 end mill, position it 0.100 away from the workpiece in X in point number 5.

*Second*, study the process to confirm that you understand what the program will be doing. *Third*, fill in the blanks in the program with the appropriate G codes, feedrates, spindle speeds, and axis positions.

Print:



Coordinate sheet:

#	Х	Y	Z
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
l <b>≅</b> 14			
15			
16			

Warning about the drawing: The drawing is not to scale. The end mill is drawn smaller than its actual size. While it appears that the end mill is tangent to the center of hole number one (and 2, and 3, and 4), in reality it is not. Notice the 0.125 step around the workpiece. This must be used to calculate the positions for the end mill's path. For the X position of point 13, for example, you must add the 0.125 step to the 0.375 workpiece radius, the result for point 13's X is 0.5, not 0.375 as it would be if you (incorrectly) subtract 0.375 (tool radius) from the 0.75 X position of point one.

## Process:

Seq.	Operation description	Tool	Station	Speed	<b>Feedrate</b>
1	Center drill all holes	#3 center drill	1	2000 rpm	5.0 ipm
2	Drill (4) 0.25 holes	1/4 drill	2	1200 rpm	4.8 ipm
3	Drill (3) 23/64 holes	23/64 drill	3	800 rpm	.0 ipm
4	Ream (3) 0.3750 holes	0.375 reamer	4	600 rpm	7.0 ipm
5	Mill contour	0.750 end mill	5	400 rpm	4.5 ipm

Program: (One point for each correctly filled in blank)	N205 (pt 4)			
O0001 (Program number)	N210 M09			
(Center Drill) N005 T01 M06	N220 G91 G28 Z0 M19 N225 M01			
N010 G54 G90 S M03 T02				
N015 G X Y (pt 1)	(23/64 drill)			
N020 G43 H01 Z M08	N230 T03 M06			
N025 G01 Z-0.200 F5.0	N235 G54 G90 S M03 T04			
N030 G00 Z	N240 G X Y (pt 14)			
N035 (pt 2)	N245 G43 H03 Z M08			
N040 (pt 2)	N250 G01 ZF			
N045	N255			
N050 (pt 3)	N260 (pt 15)			
N055 (pt 3)	N265			
N060	N270			
N060 (pt 4)	N275 (pt 16)			
N080	N280			
N085	N285 M09			
N090 (pt 14)	N290 G91 G28 Z0 M19			
N095 (pt 14)	N295 M01			
N100				
N105 (pt 15)	(0.3750 reamer)			
N110 (pt 13)	N300 T04 M06			
N115 N115	N305 G54 G90 S M03 T05			
N120 (pt 16)	N310 G X Y (pt 14)			
N125 (pt 10)	N315 G43 H04 Z M08			
N125 M09	N320 G01 Z			
N135 G91 G28 Z0 M19	N325			
N140 M01	N330 (pt 15)			
141 +O IVIO I	N335			
(1/4 drill)	N340			
N145 T02 M06	N345 (pt 16)			
N150 G54 G90 S M03 T03	N350 M09			
N155 G X Y (pt 1)	N355 M09			
N160 G43 H02 Z M08	N360 G91 G28 Z0 M19			
N165 G01 Z-0.730 F	N365 M01			
N170 (pt 2)	(0.750 end mill)			
N180 (pt 2)	N370 T05 M06			
N185	N375 G54 G90 S M03 T01			
N190 (pt 3)	N380 G X Y (pt 5)			
	N385 G43 H05 Z0.1 M08			
N195 N200	N390 G01 Z-0.25 F50.			
14400				