

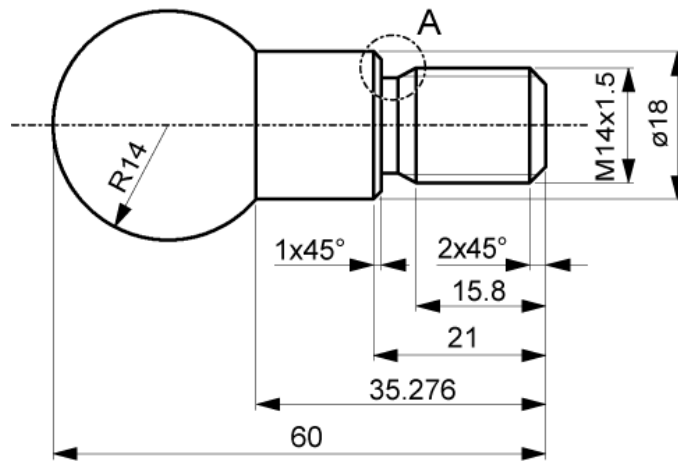


Classwork-5[Solution]

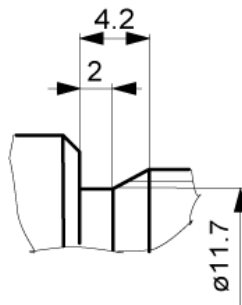
Student Name: _____

Grade: $\frac{-}{5}$

Write a word address program in **absolute mode** to execute the operations shown in the figure below. Use CNC tool and operations sheet given.



Detail A



CNC TOOL AND OPERATIONS SHEET

Tool	Operation	Tooling	Constant cutting speed	Speed(rpm)	Feed (mm/rev)
2	Facing	Right hand tool	180	-	0.1
2	Rough Turning	Right hand tool	180	-	0.15
2	Finishing	Right hand tool	240	-	0.1
4	External Threading	External thread tool right	-	500	1.5



Sequence Number	Word Address Command	Meaning
N5	T0202	1st Side
N10	G96 S180	
N15	G95 F0.1	
N20	M3	
N25	G0 X32 Z0	
N30	G1 X-1	
N35	G0 X30 Z1	
N40	G73 U1 R1	G73: Turning Cycle
N45	G73 P50 Q95 U.5 W.1 F.15	
N50	G1 X10 Z0 G42	
N55	X14 Z-2	
N60	Z-15.8	
N65	X11.7 Z-18	
N70	Z-20	
N75	X18 C1	
N80	Z-35.276	
N85	G3 X28 Z-46 R14	
N90	G1 Z-47	
N95	X30 G40	
N100	G72 P50 Q95 F0.1 S240	G72: Finishing Cycle
N105	G28 U1 W1	
N110	T0404	External Threading
N115	G97 S500 M3	
N120	G0 X19 Z4.5	Thread start Position [Clearance Position] [1] X-axis Clearance $\cong 2.5 \text{ mm}$ per side = 14 + 5 = 19 Z-axis Clearance $\cong 3 \times \text{Length of Thread Lead} = 3 \times P = 3 \times 1.5 = \mathbf{4.5}$ (Most screws are single-start thread forms, so their lead and pitch are the same).
N125	G78 P020060 Q80 R0.05	1mm=1000μm G78: Threading Cycle 02: Number of Finishing Cuts 00: Chamfer Value 60: Flank Angle Of Thread In[°] (allowed: 0°,29°,30°,56°,60°,80°) Q80: Min. Cutting Depth in μm [incremental] R0.05: Finishing offset in mm [incremental]
N130	G78 X12.16 Z-19 R0 P920 Q120 F1.5	X12.16: Minor Diameter $\text{Minor}\varnothing = \text{Major}\varnothing - 2D_{EXT}$ $\text{Minor}\varnothing = 14 - 2(0.92) = 12.16\text{mm}$ R0: Incremental Taper Value in mm With Sign (R=0 Cylindrical Thread) P920: Thread Depth in μm [always positive] $D_{EXT} = 0.61343 \times P$ $D_{EXT} = 0.61343 \times 1.5 = 0.920\text{mm}$ Q120: Cutting Depth Of First Cut in μm Without Sign [Radius Value] F1.5: Thread Pitch in mm
N135	G28 U1 W1	
N140	M30	Program End



SEQUENCE NUMBER	Word address command	Meaning
N5	T0202	2nd Side Facing
N10	G95 G96 S180 F0.1 M3	
N15	G0 X32 Z6	
N20	G74 W0.5 R.5	G74: Facing Cycle W0.5: Depth Of Cut In Z In <i>mm</i> Without Sign [Incremental] R0.5: Retract Height in <i>mm</i>
N25	G74 P30 Q40	P30: Block Number Of First Block For Programmed Shape Q40: Block Number Of Last Block
N30	G1 X30 Z0.2	
N35	X-1	
N40	Z6	
N45	G0 X32 Z0	
N50	G1 X-1	
N55	G0 X30 Z1	
N60	G73 U0.5 R1	G73: Turning Cycle
N65	G73 P70 Q90 U0.5 W.1 F.15	
N70	G42 G1 X-1 Z0	
N75	X0	
N80	G3 X28 Z-14 R14	
N85	G1 Z-15	
N90	G40 X30	
N95	G72 P70 Q90 S240 F.1	G72: Finishing Cycle
N100	G28 U1 W1	
N105	M30	Program End

Bibliography

- [1] P. Smid, CNC programming handbook: a comprehensive guide to practical CNC programming., Industrial Press Inc., 2003.