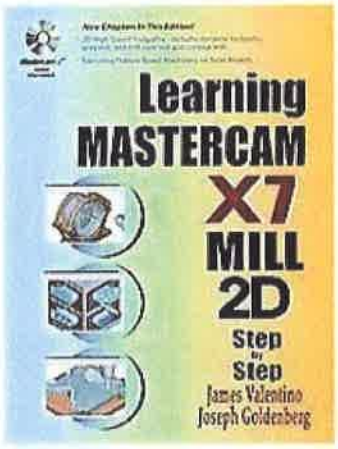
QUEENSBOROUGH
COMMUNITY COLLEGE

Department of Engineering Technology

Computer Applications In Engineering Technology



MT-369

Laboratory Supplement
To The
"Learning Mastercam X7" Text Book

STUDENTS NAME: .....

Prepared by Prof. J Goldenberg

DEPARTMENT OF ENGINEERING TECHNOLOGY

Computer Applications in Engineering Technology
MT-369

3 Credits, 2 Class Hours, 3 Lab Hours

TEXT: *Learning Mastercam Mill 7 Step by Step in 2D* by J.V. Valentino and J. Goldenberg, Industrial Press, 2014; Laboratory Manual by J. Goldenberg.

INSTRUCTOR: Prof. J. Goldenberg

Course Outline

WEEK	TOPICS
1	**INTRODUCTION TO CAD/CAM/CIM** ♦ Mastercam X5 CNC software ♦ System requirements ♦ Software installation ♦ The process of generating a Word Address program
2	**MASTERCAM X SETUP PROCEDURES** ♦ Types of files created by Mastercam X5 ♦ Starting the Mastercam X5 Design package ♦ Description of the Mastercam X5 Mill Main interface Window ♦ Explanation of Gview, View, WCS, Cplane and Tplane terms ♦ Short-cut keys for entering commands
3	**CREATING 2D GEOMETRY** ♦ Generating the CAD model ♦ Point construction ♦ Line construction ♦ Arc construction ♦ Rectangle construction

4 **CREATING 2D GEOMETRY** (continued)

- Polygon construction
- Ellipse construction
- Geometric letter construction
- Filet construction in
- Chamfer construction
- Screen Display Management: zoom, pan, fit, repaint, regenerate

5 **EDITING 2D GEOMETRY**

- Deleting/Undeleting Entities
- Modifying existing geometry
- Using Xform functions
- Quiz

6 **PRODUCTIVITY TOOLS FOR CREATING CAD FILES**

- Using Levels to organize information
- Checking the CAD Model for dimensional correctness
- Using analyze feature to check and edit the CAD model
- File conversion with other CAD/CAM programs
- Sending Mastercam X files over the internet as an e-mail attachment

7 **GENERATING HOLE OPERATIONS IN 2D SPACE**

- Specifying Drilling on the CAD model
- Selecting Drill Cycle parameters
- Back plotting and Verifying Hole operations
- Panning, Dynamic Rotation and Sectioning within the Verifier
- Editing drill toolpath. Postprocessing

8 **PROFILING AND POCKETING IN 2D SPACE**

- Creating a 2D Contour for profiling
- Common problems encountered in 2D Chaining
- Specifying 2D Contouring Parameters
- Specifying Pocket Parameters

9 **EDITING MACHINING OPERATIONS**

- The Operations Manager
- Creating, moving, copying, deleting existing operations
- Editing existing toolpath
- Changing the Chaining order
- Expanding and collapsing the Operations Display listing
- Quiz

10 **USING TRANSFORM TO CONTROL EXISTING TOOLPATHS**

- The Transform Toolpath function
- Translating existing toolpaths
- Rotating existing toolpaths
- Mirroring existing toolpaths
- Converting a "transform" into new geometry and operations

11 **USING A LIBRARY FOR MACHINING OPERATIONS**

- Advantages of using Mastercam's Operations Library
- Saving Operations to the Operations Library
- Importing Operations from the Operations Library
- Editing data in the Operations Library
- Quiz

12 **USING TABS AND WORK OFFSETS**

- Applications of Mastercam's Tab function
- Specifying tab parameters
- Editing tabs
- Work Offsets
- Applying Mastercam to Work Offsets

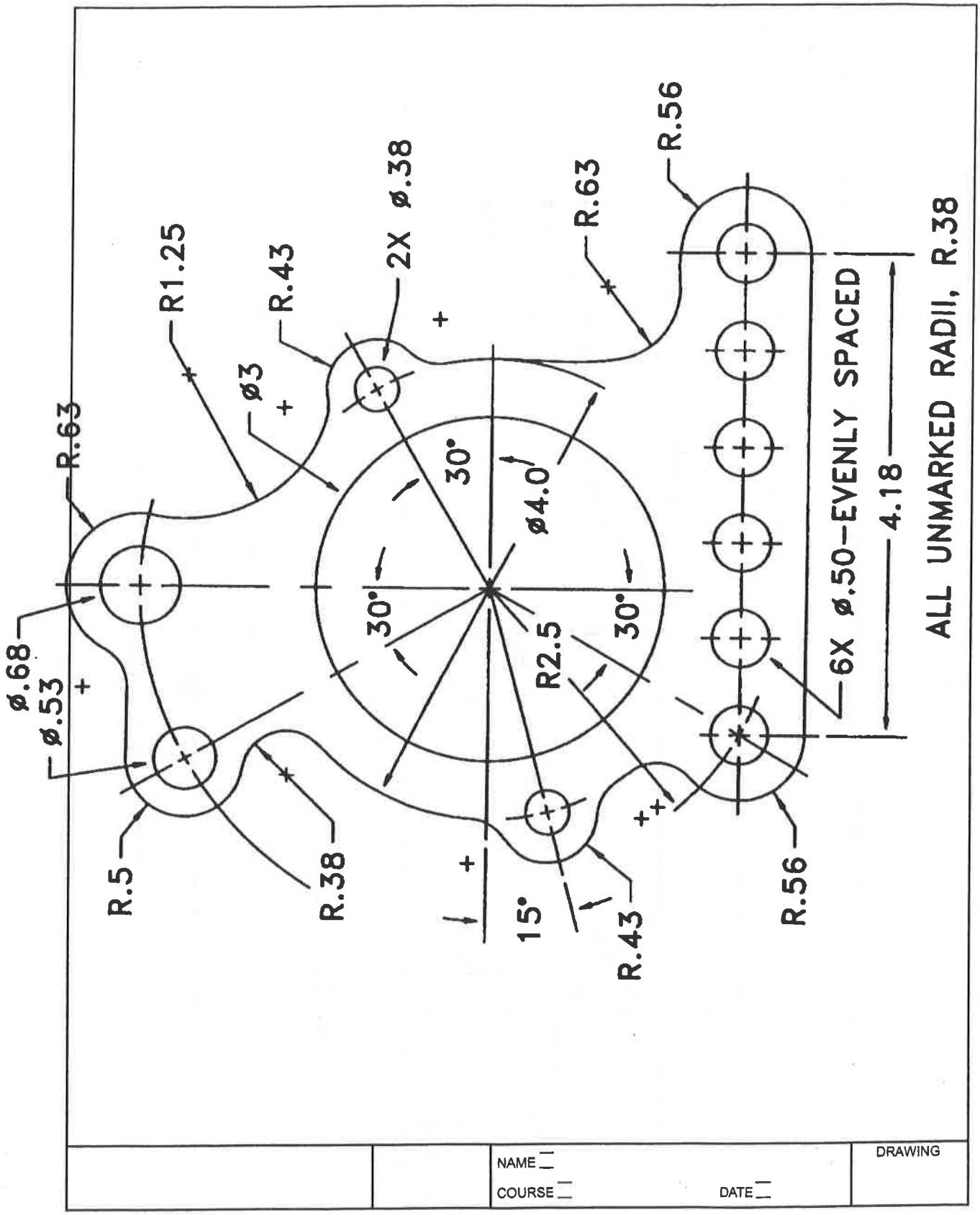
13 **CUSTOMIZING MASTERCAM X**

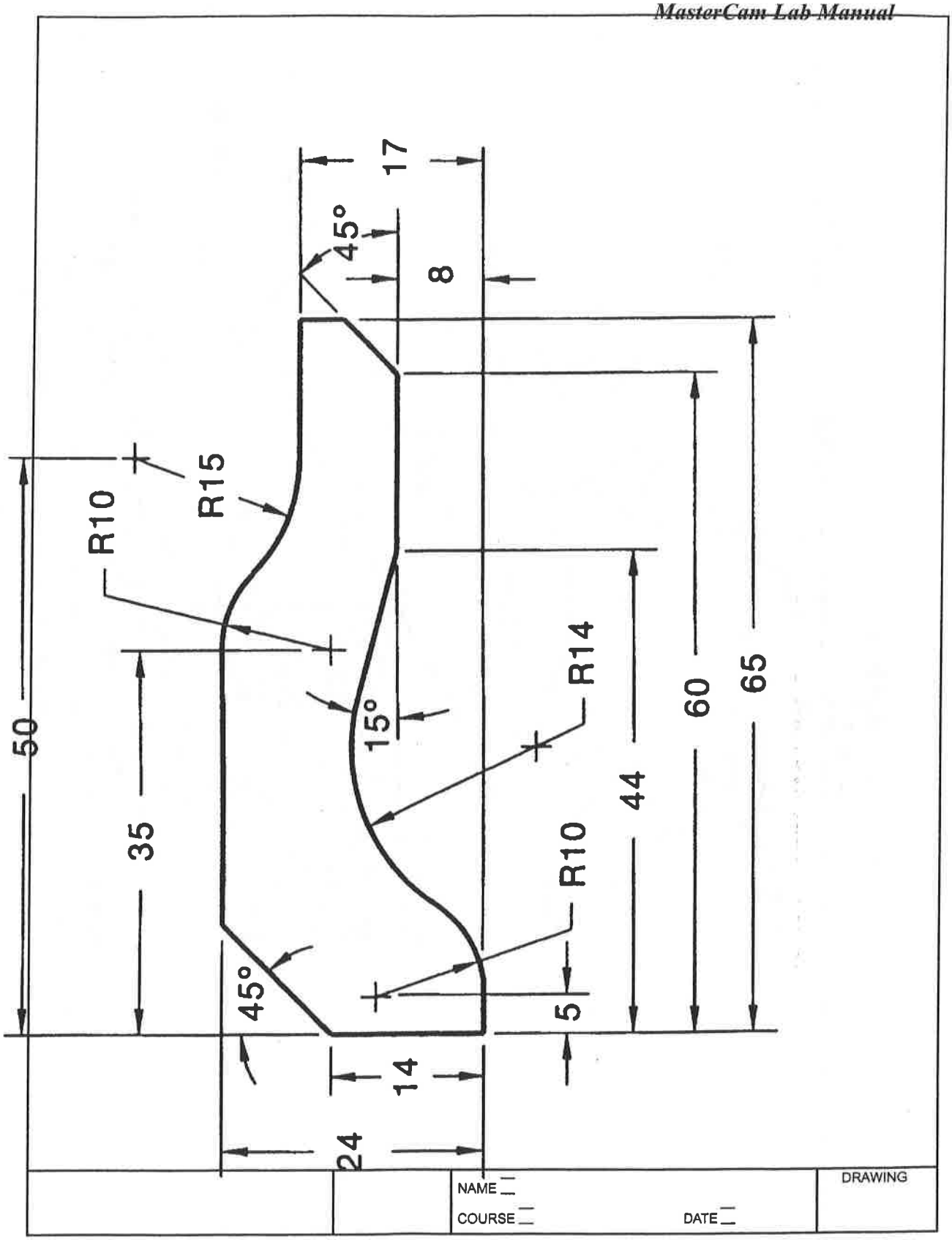
- The Customize Dialog box
- Customizing Toolbar menus
- The Toolbar States dialog box
- Creating customized Drop Down menus
- The Key Mapping dialog box
- Quiz

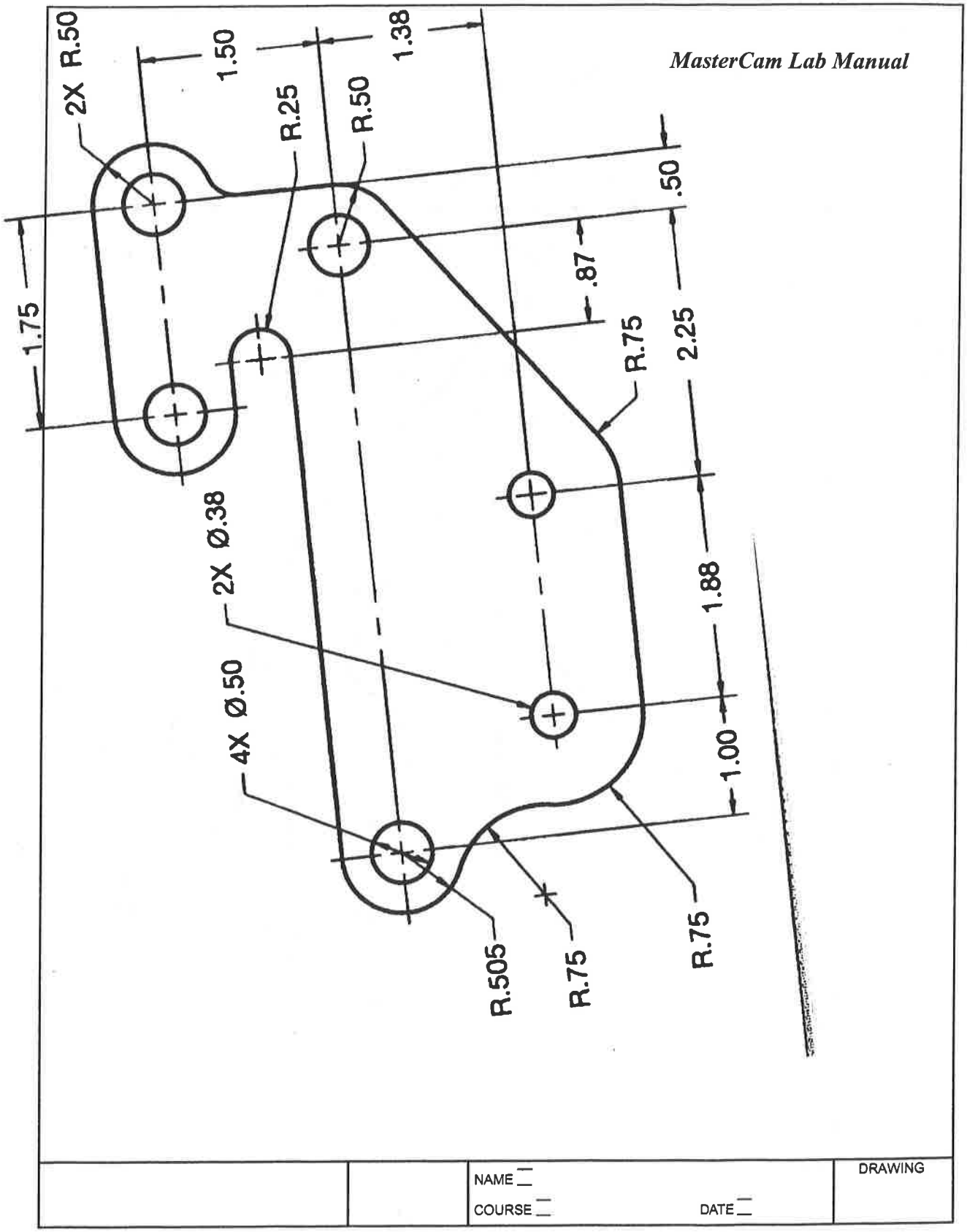
14 **SUMMARY. CLASS REVIEW**

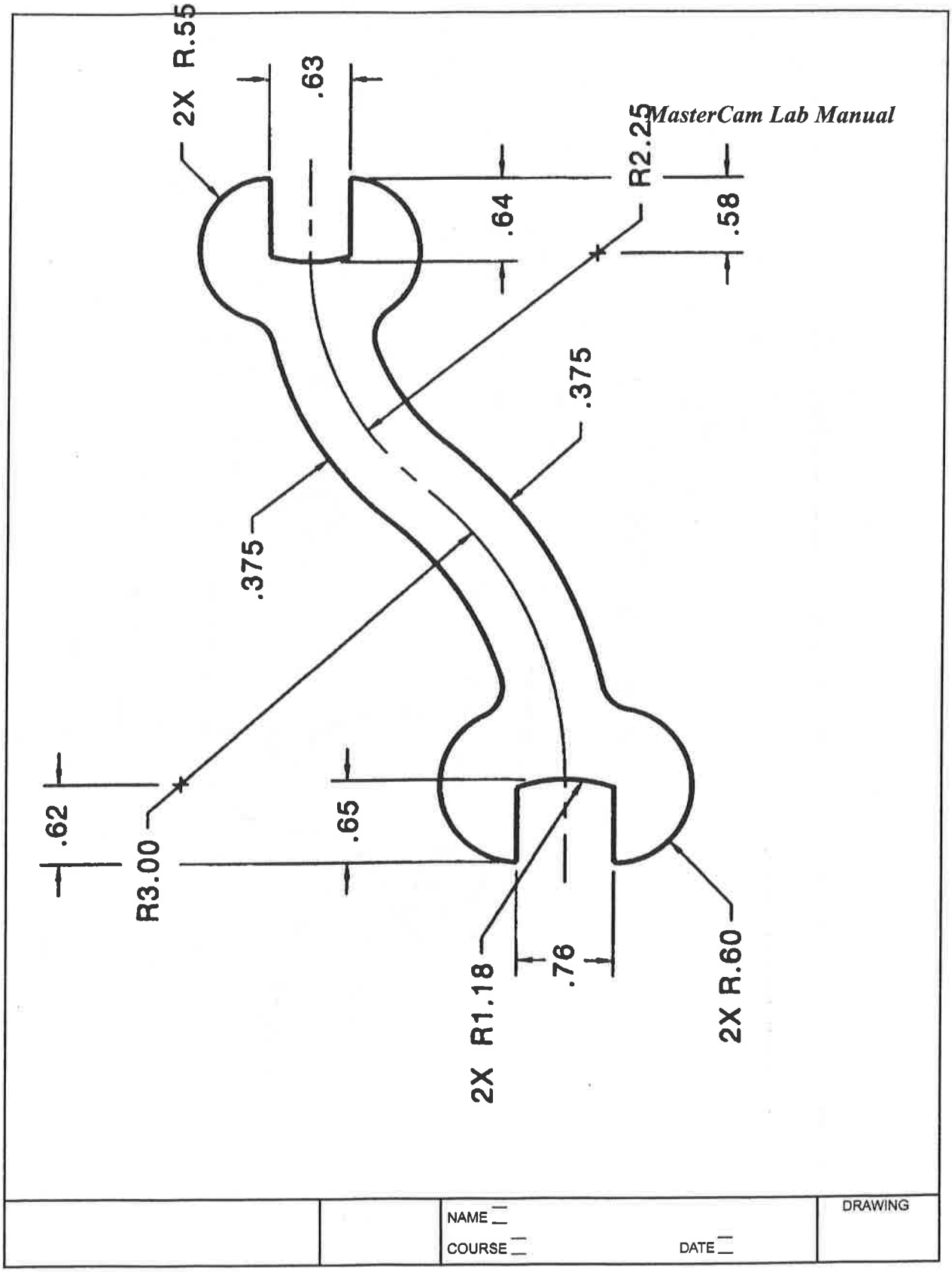
15 **FINAL**

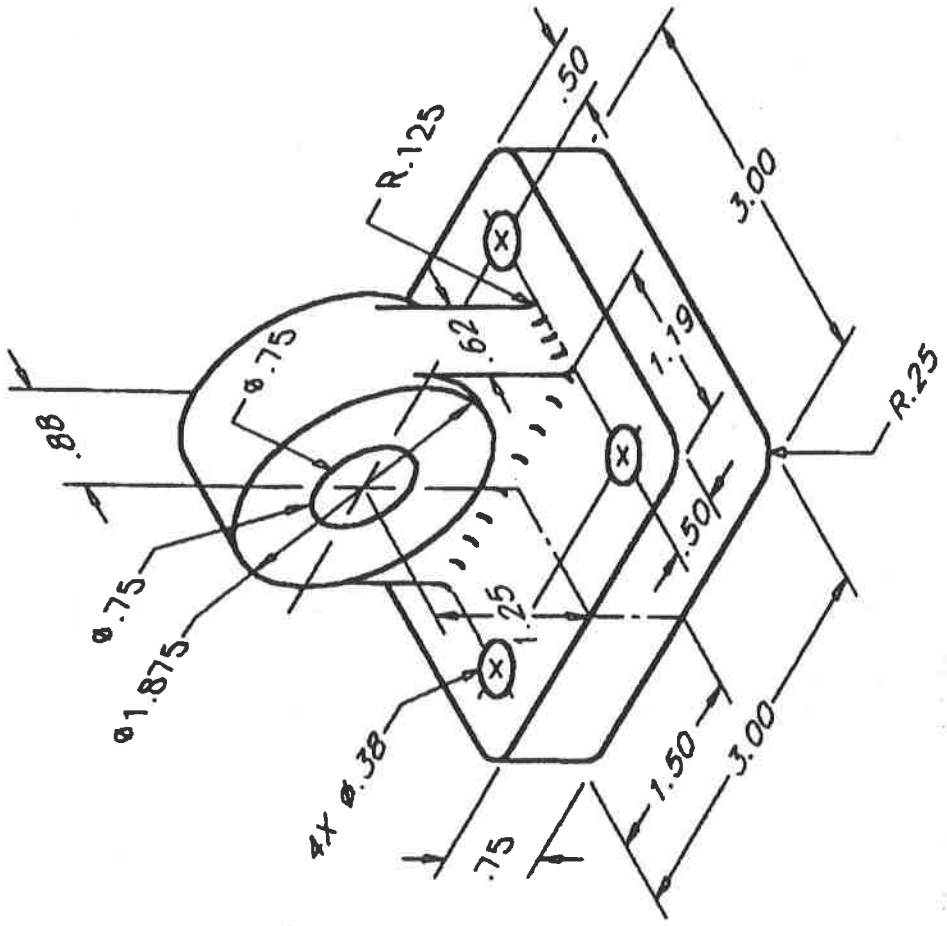
6/20/16


R.63
R1.25
ø3
R.43
2X ø.38
R.63
R.56
ø.68
ø.53
30°
ø4.0
30°
30°
30°
R2.5
6X ø.50–EVENLY SPACED
4.18
ALL UNMARKED RADII, R.38
R.5
R.38
15°
R.43
R.56
NAME
COURSE
DATE
DRAWING

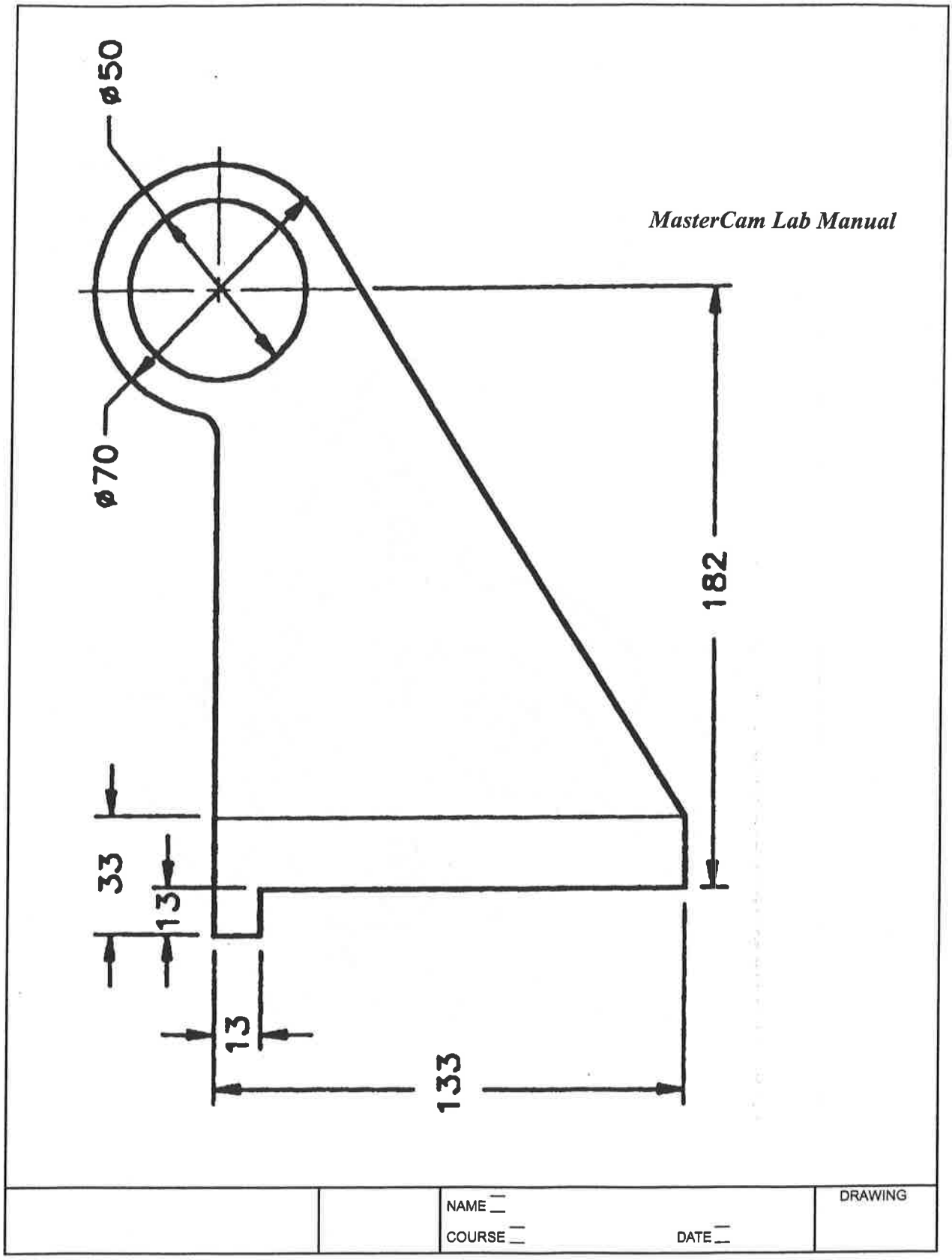

17
45°
8
R15
R10
50
35
15°
R14
60
65
44
R10
45°
5
14
24
NAME
COURSE
DATE
DRAWING

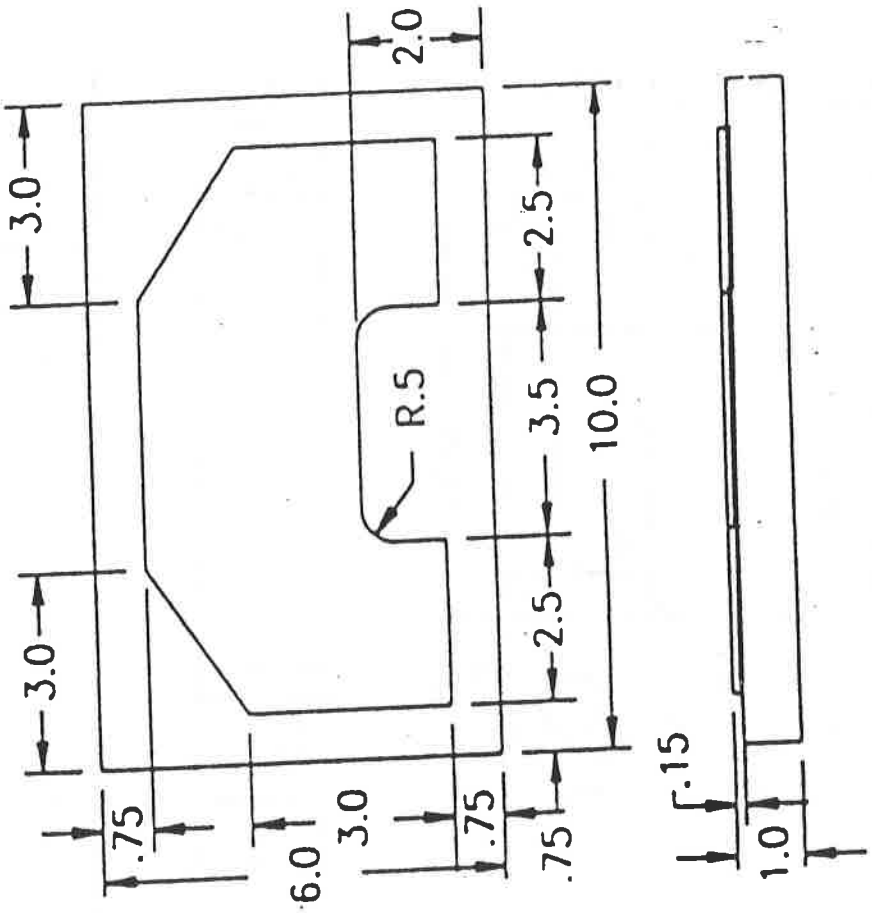

2X R.50
1.50
1.38
R.25
R.50
.50
.87
1.75
R.75
2.25
2X Ø.38
1.88
4X Ø.50
1.00
R.505
R.75
R.75
NAME
COURSE
DATE
DRAWING

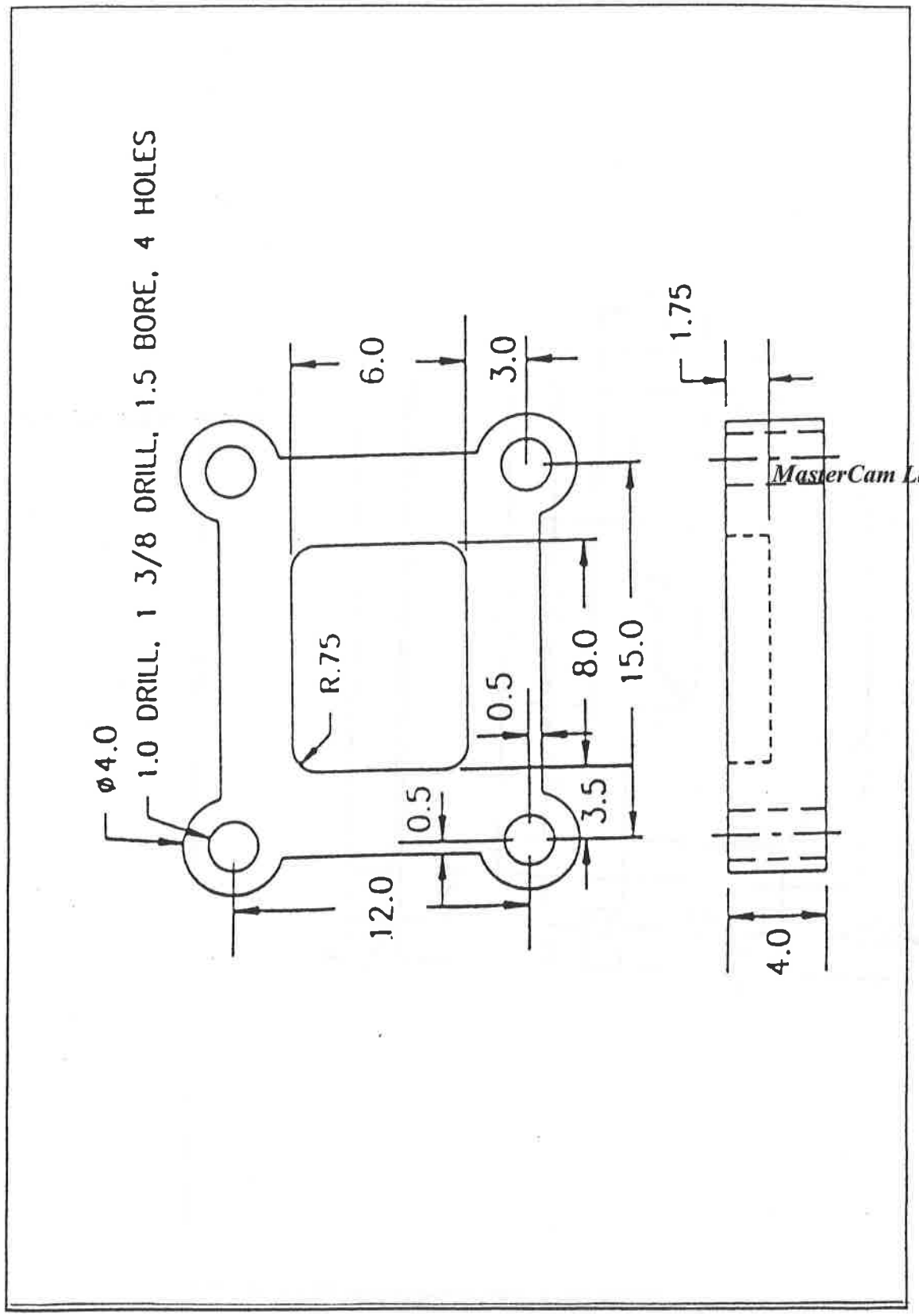

2X R.55
.63
R2.25
.64
.58
.375
.375
.62
R3.00
.65
2X R1.18
.76
2X R.60
NAME
COURSE
DATE
DRAWING

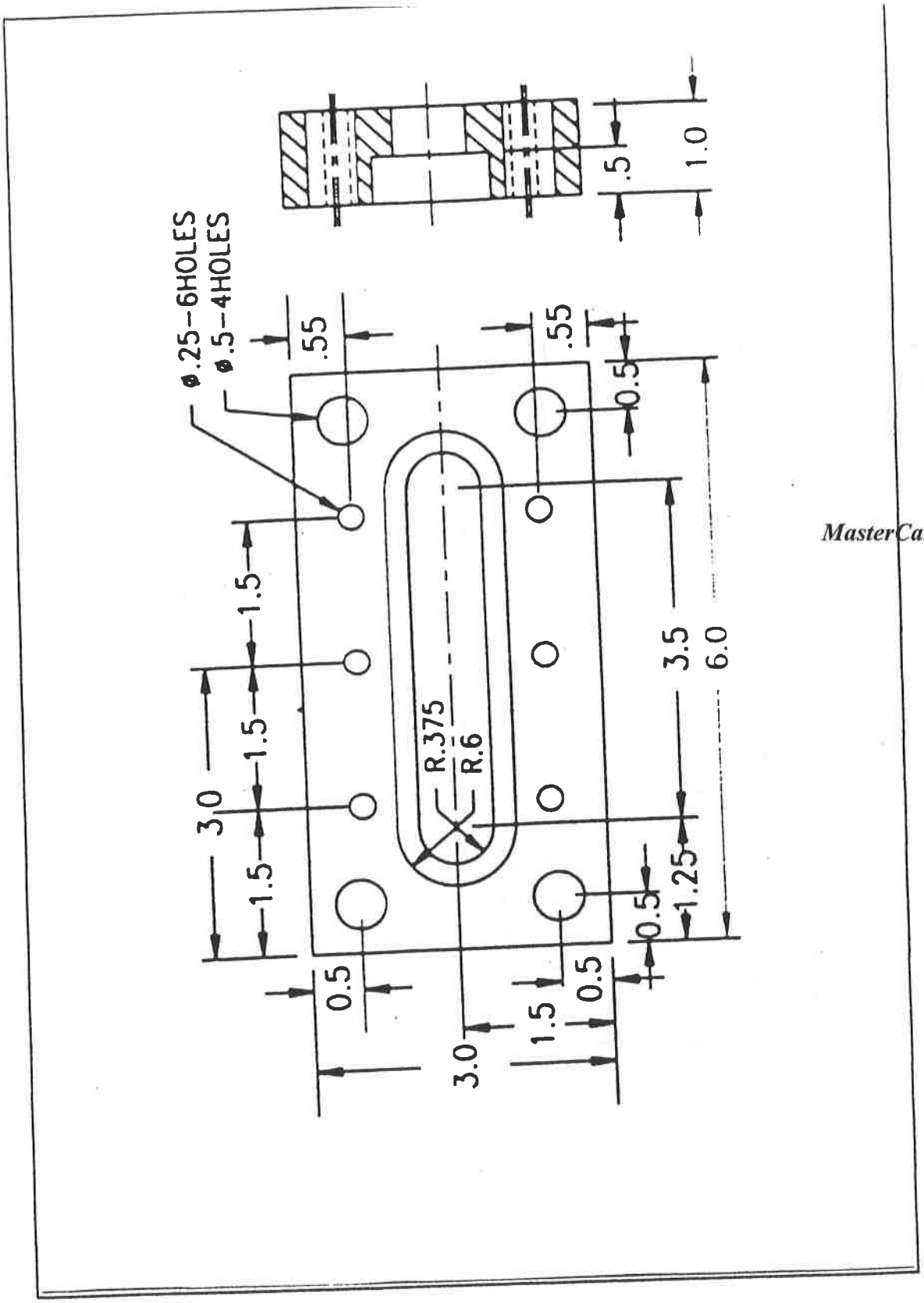


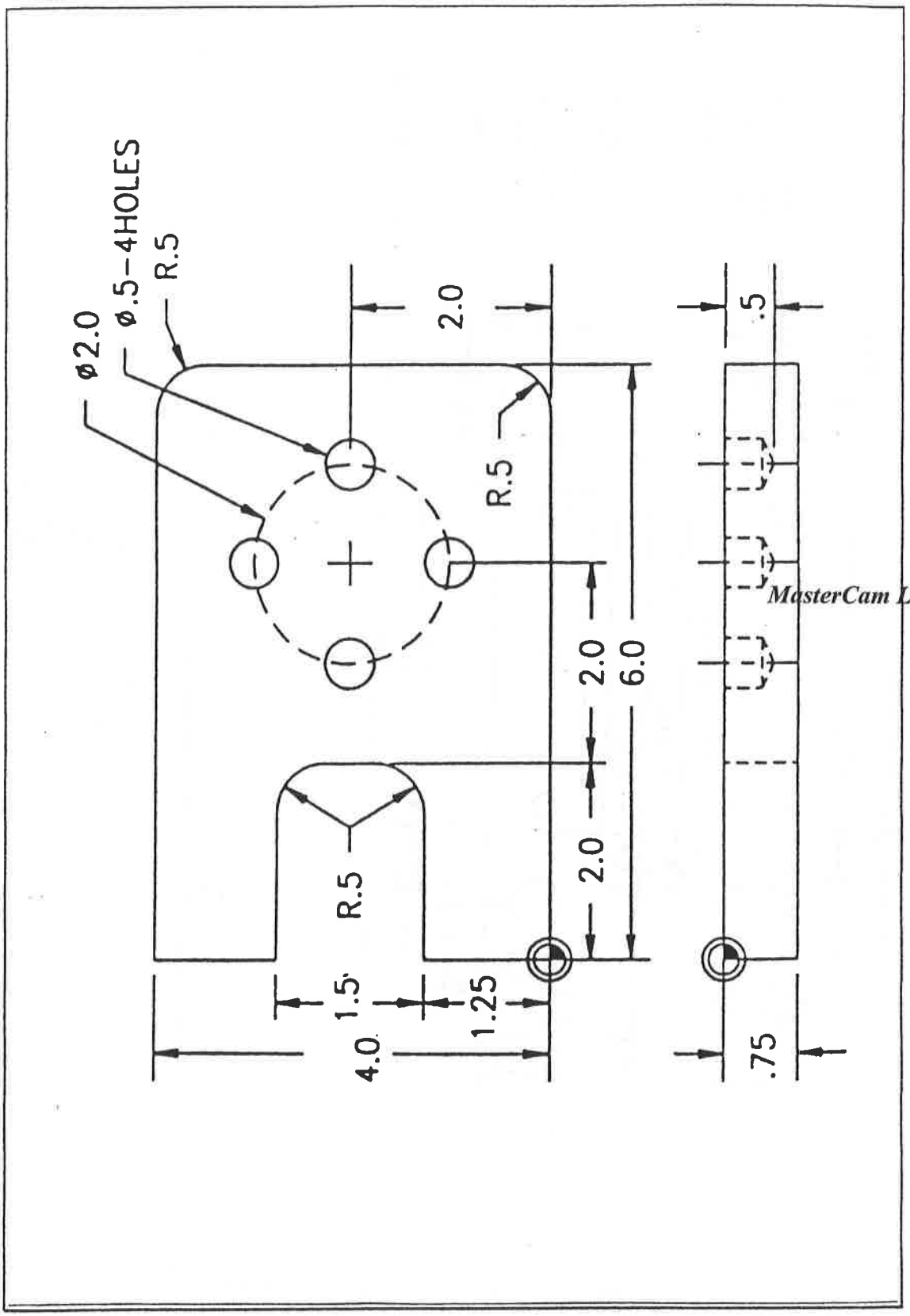
		NAME _ COURSE _ DATE _	DRAWING

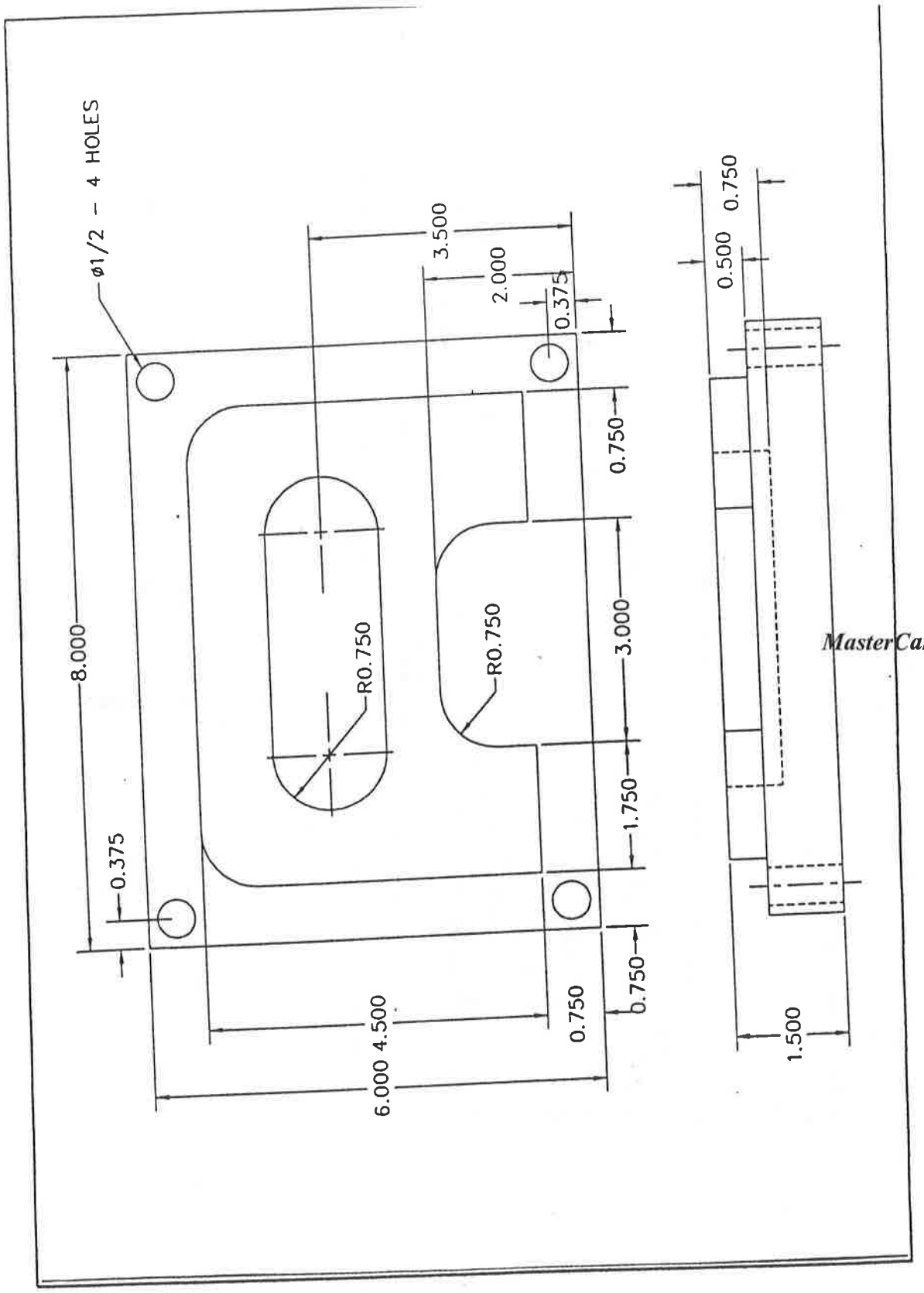

ø50
ø70
182
33
13
13
133
NAME
COURSE
DATE
DRAWING

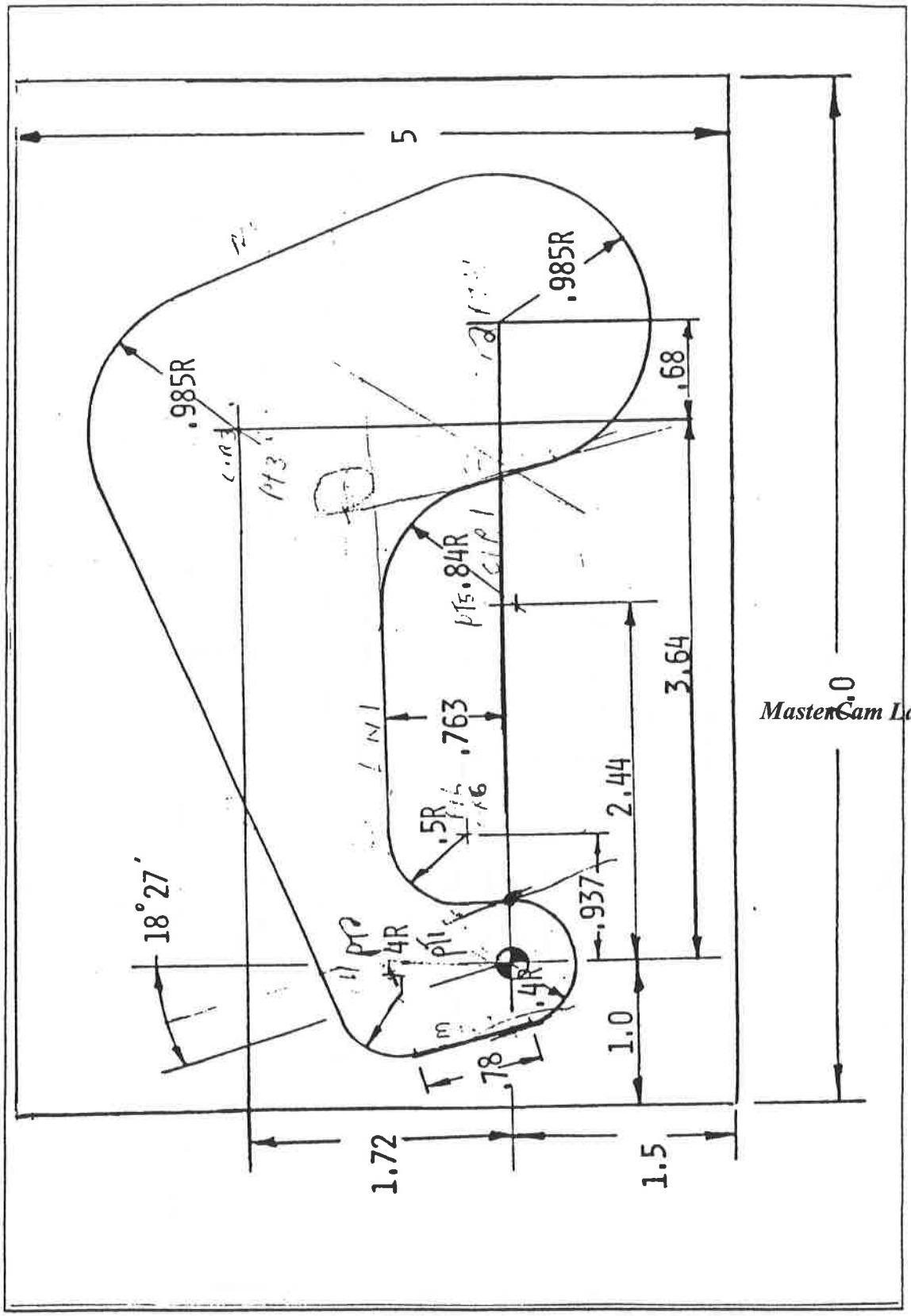

2.0
3.0
2.5
R.5
3.5
10.0
3.0
2.5
.75
6.0
3.0
.75
.75
.15
1.0

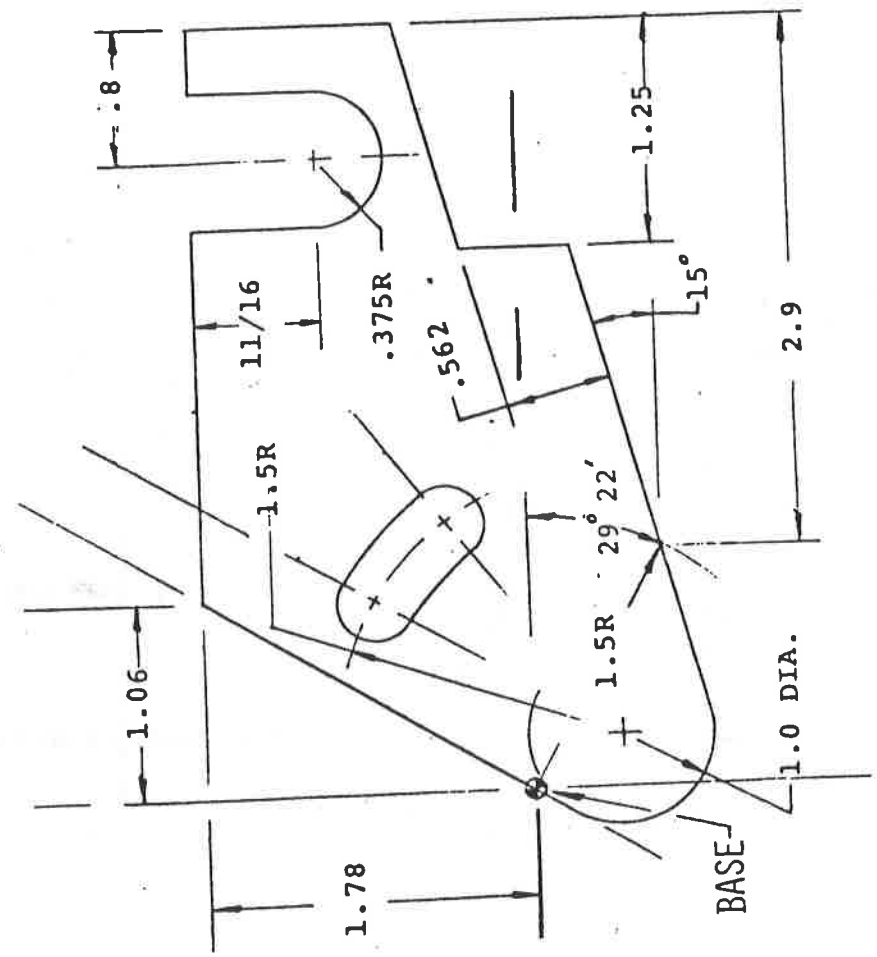

ø4.0
1.0 DRILL, 1 3/8 DRILL, 1.5 BORE, 4 HOLES
6.0
3.0
1.75
R.75
0.5
8.0
15.0
0.5
3.5
12.0
4.0

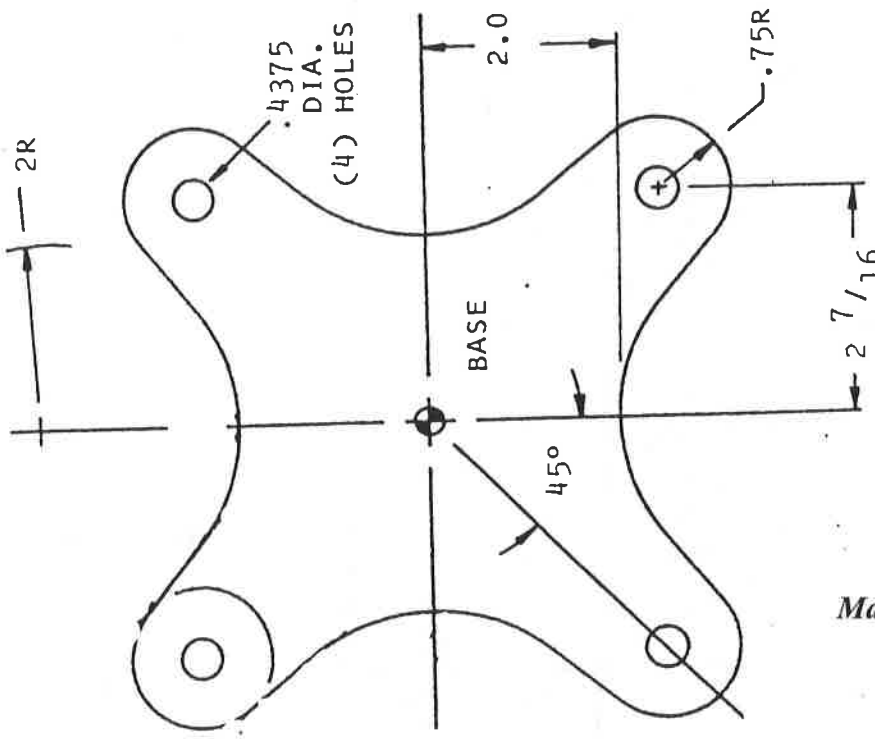

ø.25–6HOLES
ø.5–4HOLES
.55
.55
.5
1.0
0.5
1.5
1.5
1.5
3.0
1.5
R.375
R.6
3.5
6.0
1.25
0.5
0.5
0.5
1.5
3.0

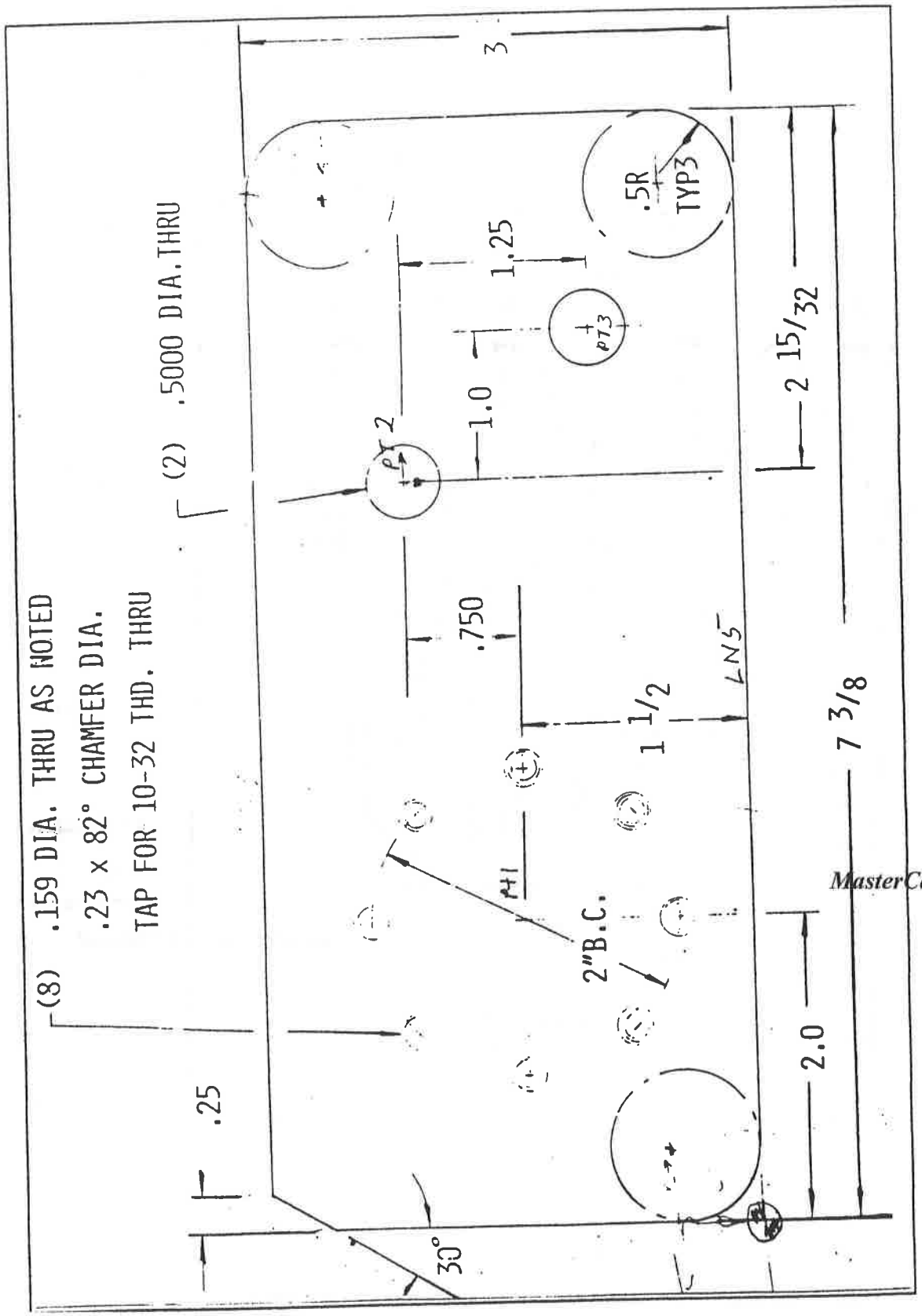

ø2.0
ø.5-4HOLES
R.5
2.0
R.5
2.0
6.0
2.0
R.5
1.5
1.25
4.0
.5
.75

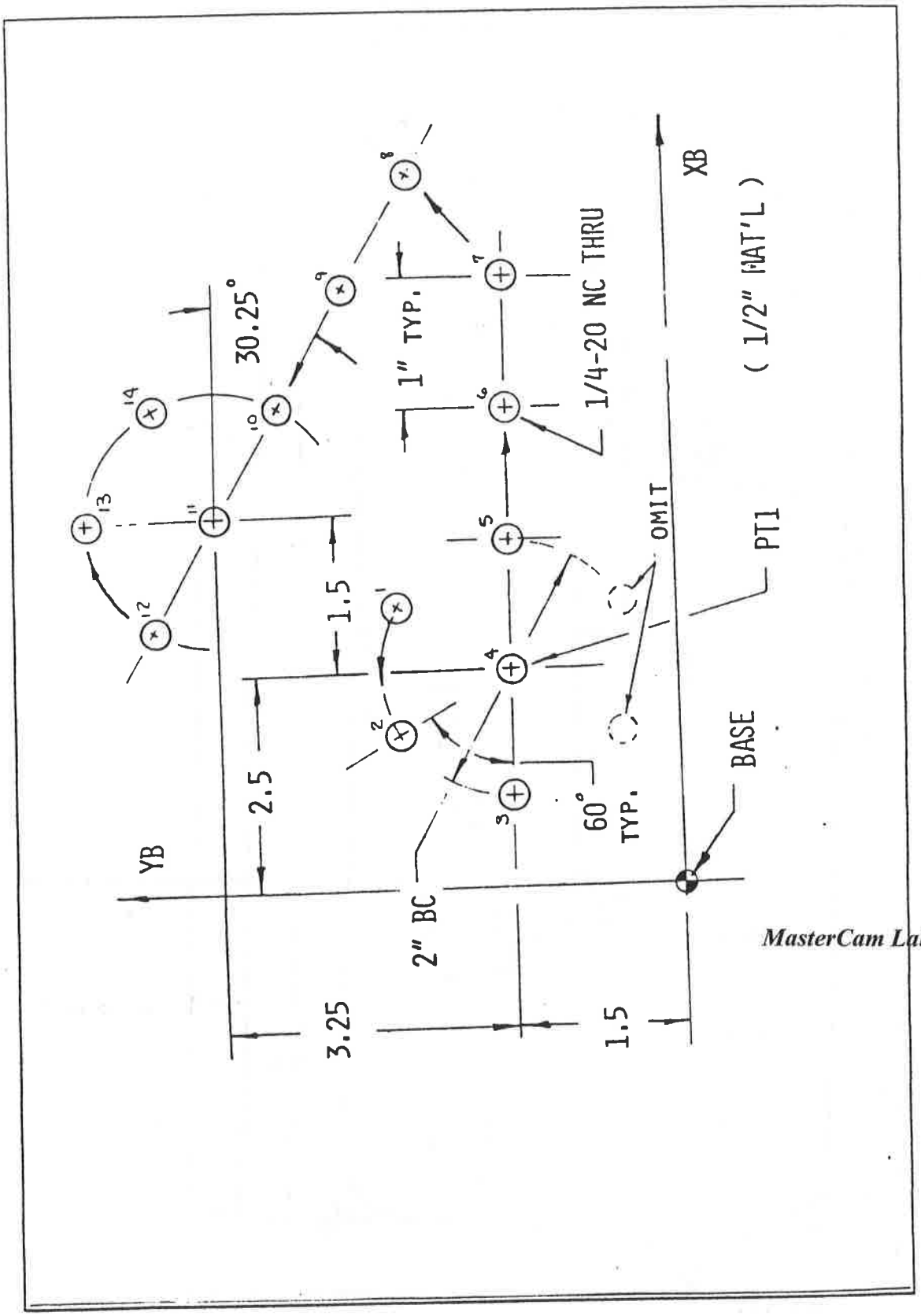

ø1/2 - 4 HOLES
3.500
2.000
0.375
0.750
3.000
1.750
0.750
R0.750
R0.750
8.000
0.375
4.500
6.000
0.750
0.750
0.500
0.750
1.500

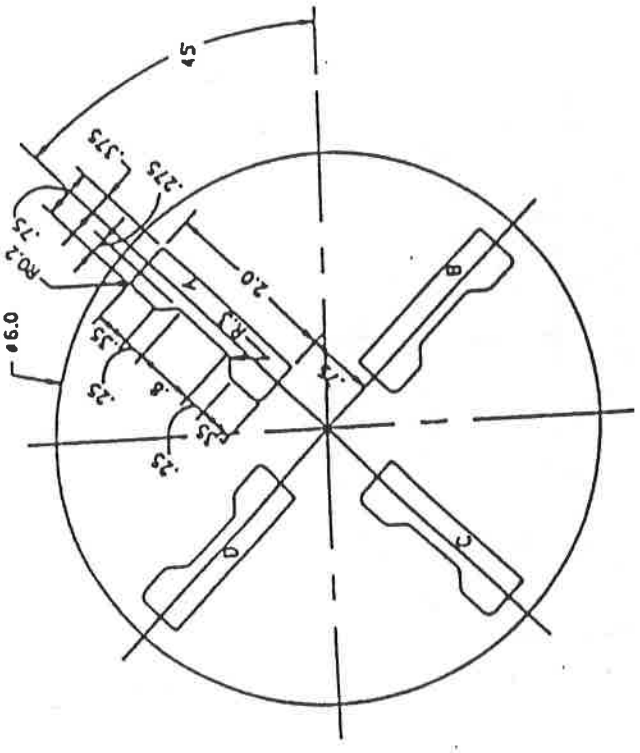

5
.985R
.985R
.68
.84R
3.64
.763
.5R
2.44
.937
18°27'
.4R
.4R
.78
1.0
1.72
1.5
1.0

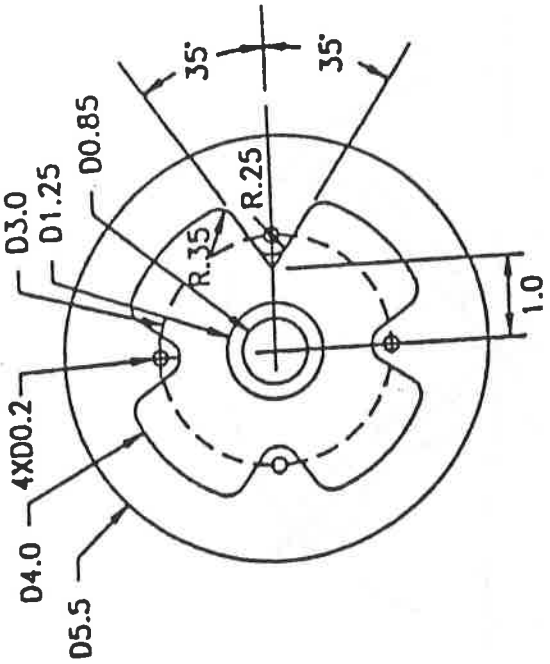

.8
11/16
.375R
.562
1.25
15°
2.9
1.5R
29° 22'
1.5R
1.06
1.0 DIA.
1.78
BASE

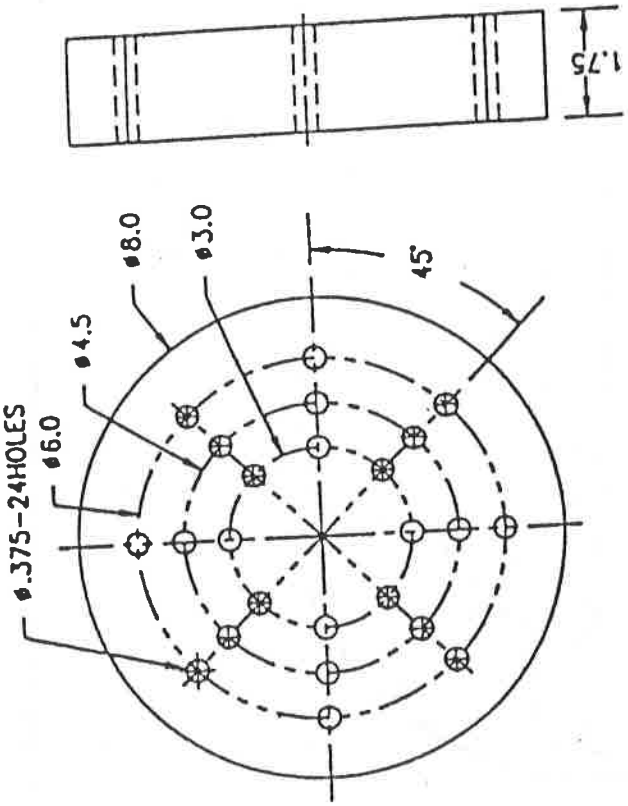

.4375
DIA.
(4) HOLES
2.0
.75R
2R
BASE
2 7/16
45°

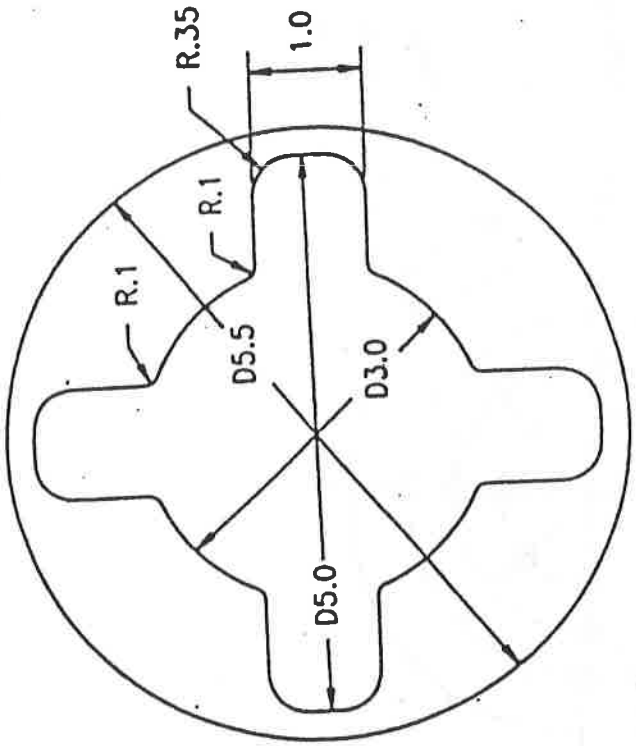

(8) .159 DIA. THRU AS NOTED
.23 x 82° CHAMFER DIA.
TAP FOR 10-32 THD. THRU
(2) .5000 DIA. THRU
3
.5R
TYP3
1.25
1.0
2 15/32
.750
1 1/2
7 3/8
2"B.C.
2.0
.25
30°

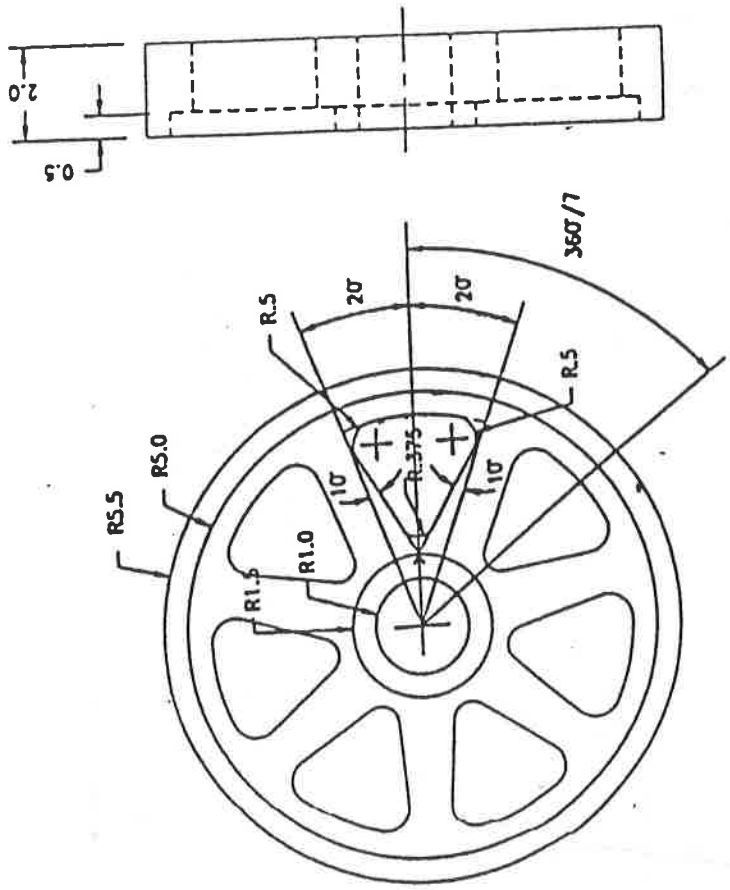

30.25°
1" TYP.
1/4-20 NC THRU
XB
(1/2" MAT'L)
OMIT
PT1
1.5
2.5
YB
BASE
60° TYP.
2" BC
3.25
1.5

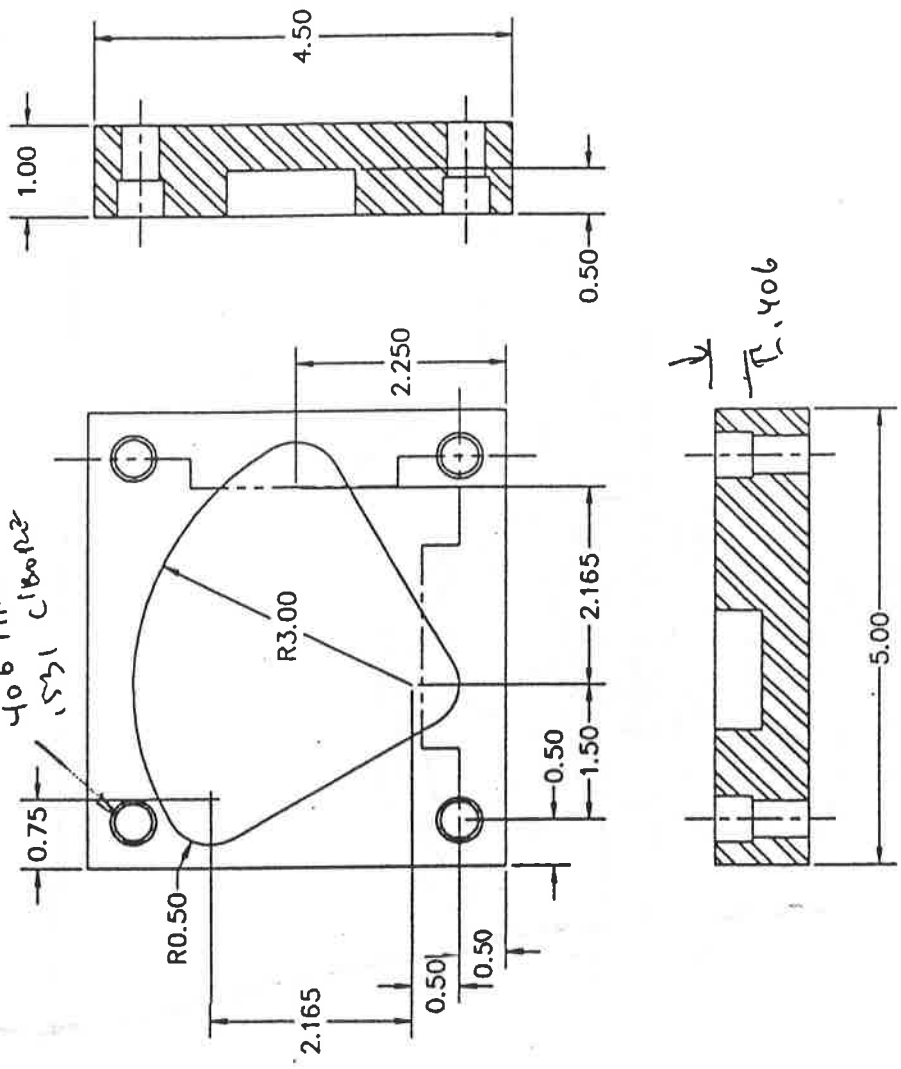

45
.375
.275
.75
R0.2
.35
.25
.8
.35
.25
2.0
7
R.5
.75
Ø.9
B
C
D

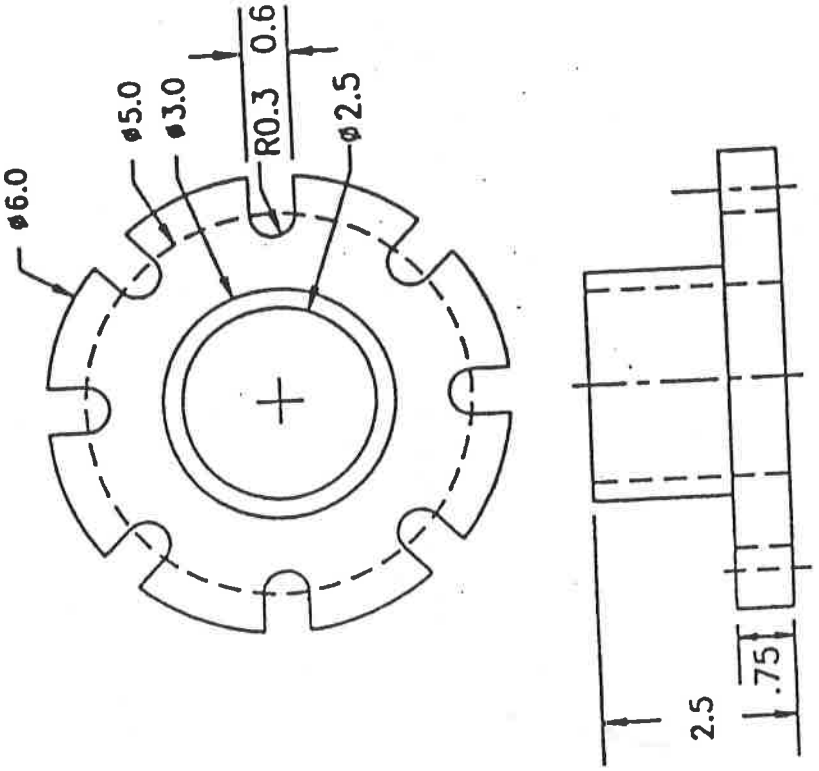

35°
35°
D0.85
D1.25
D3.0
R.25
R.35
1.0
4XD0.2
D4.0
D5.5

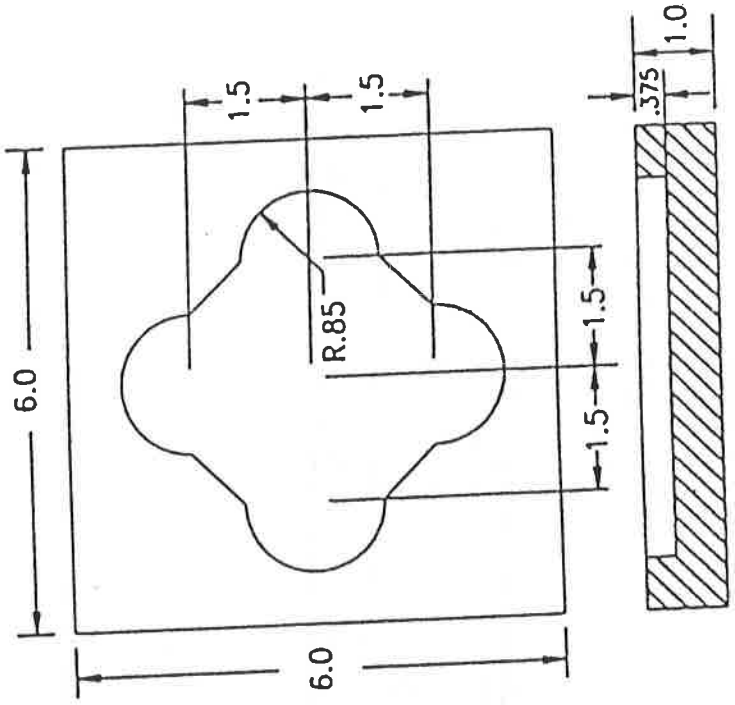

1.75
ø8.0
ø3.0
45°
ø4.5
ø6.0
ø.375-24HOLES

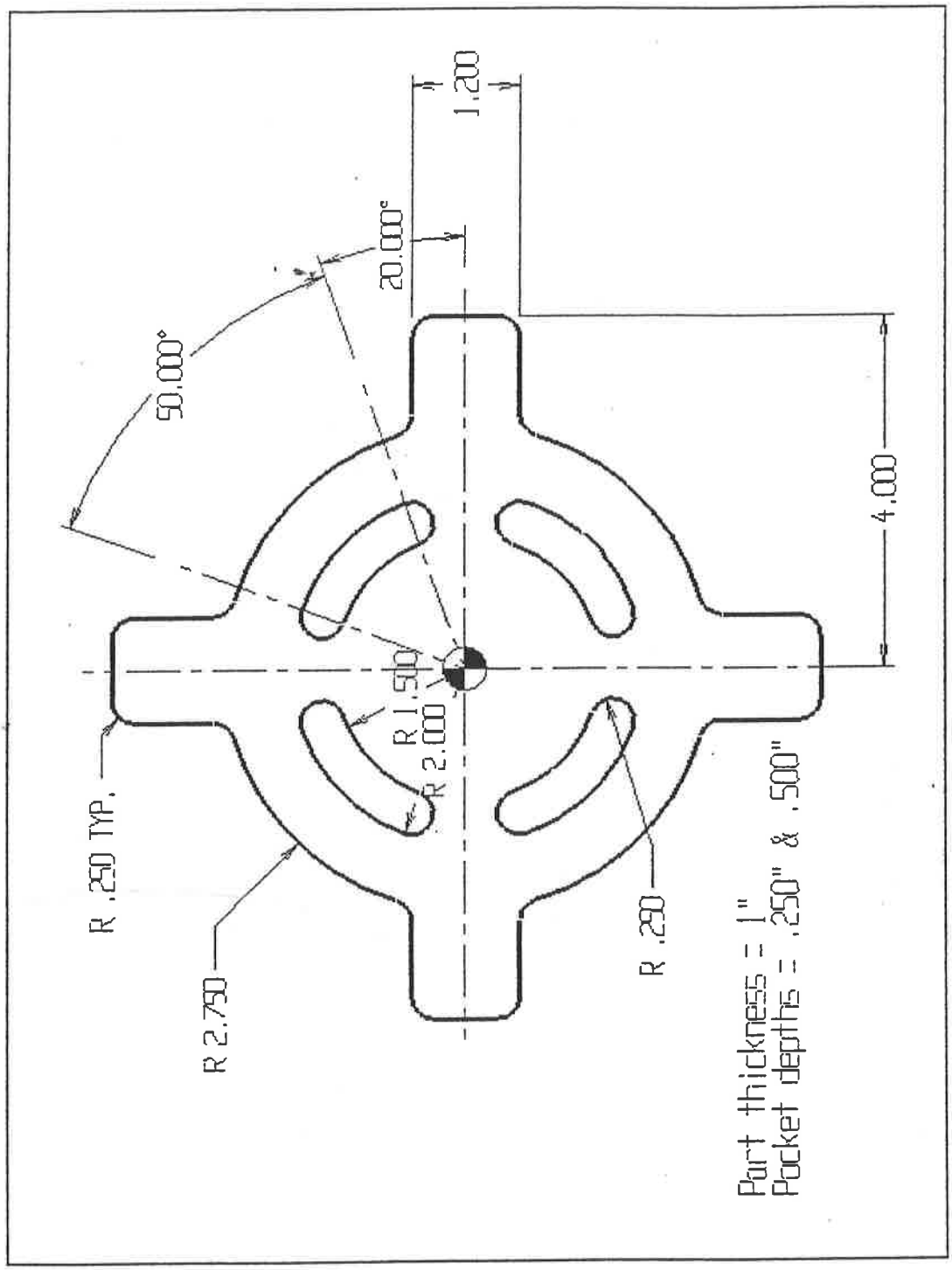

R.35
1.0
R.1
R.1
D5.5
D3.0
D5.0

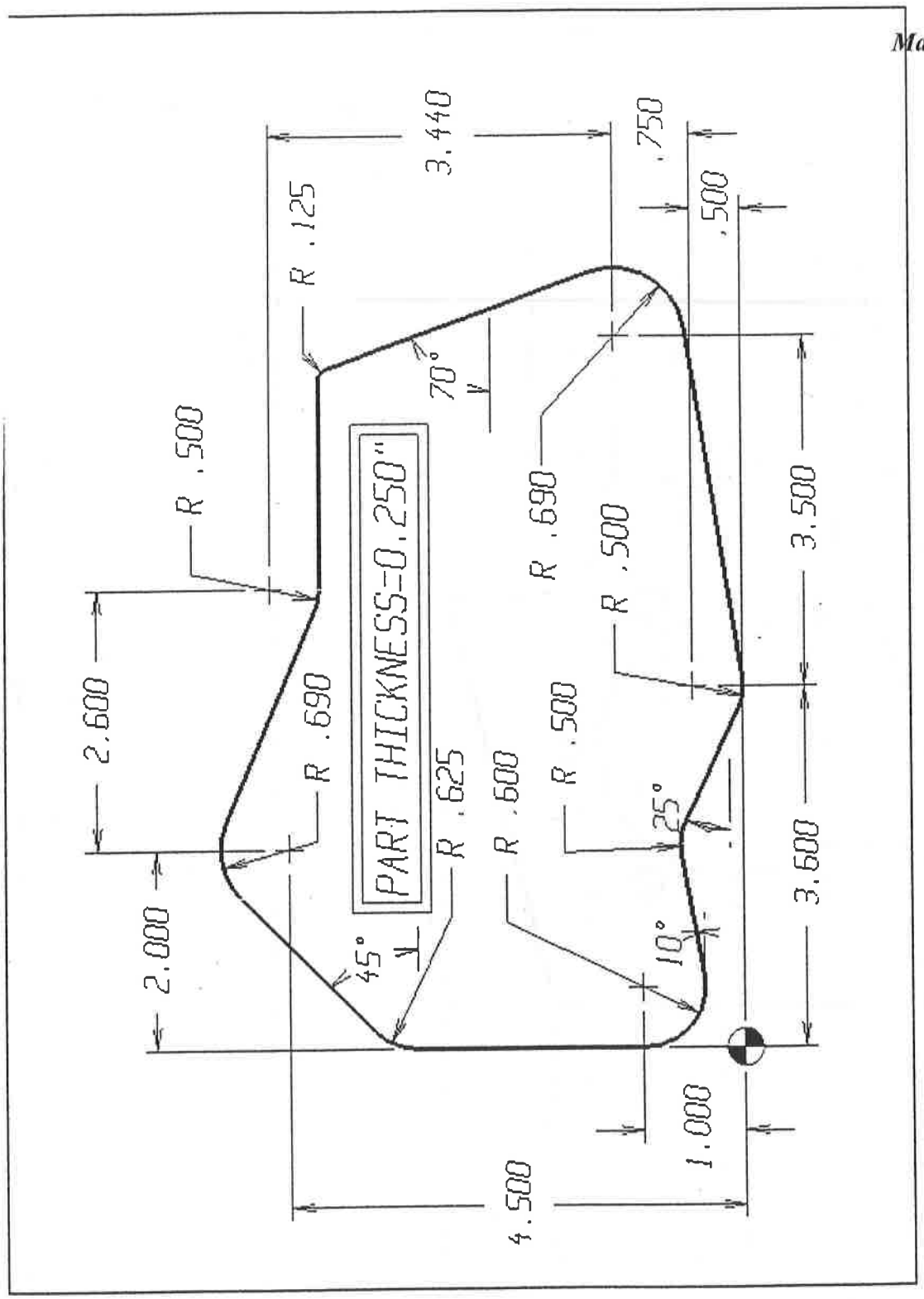

2.0
0.5
360/7
20
20
R.5
R.5
R5.0
R5.5
10
10
R.375
R1.0
R1.5

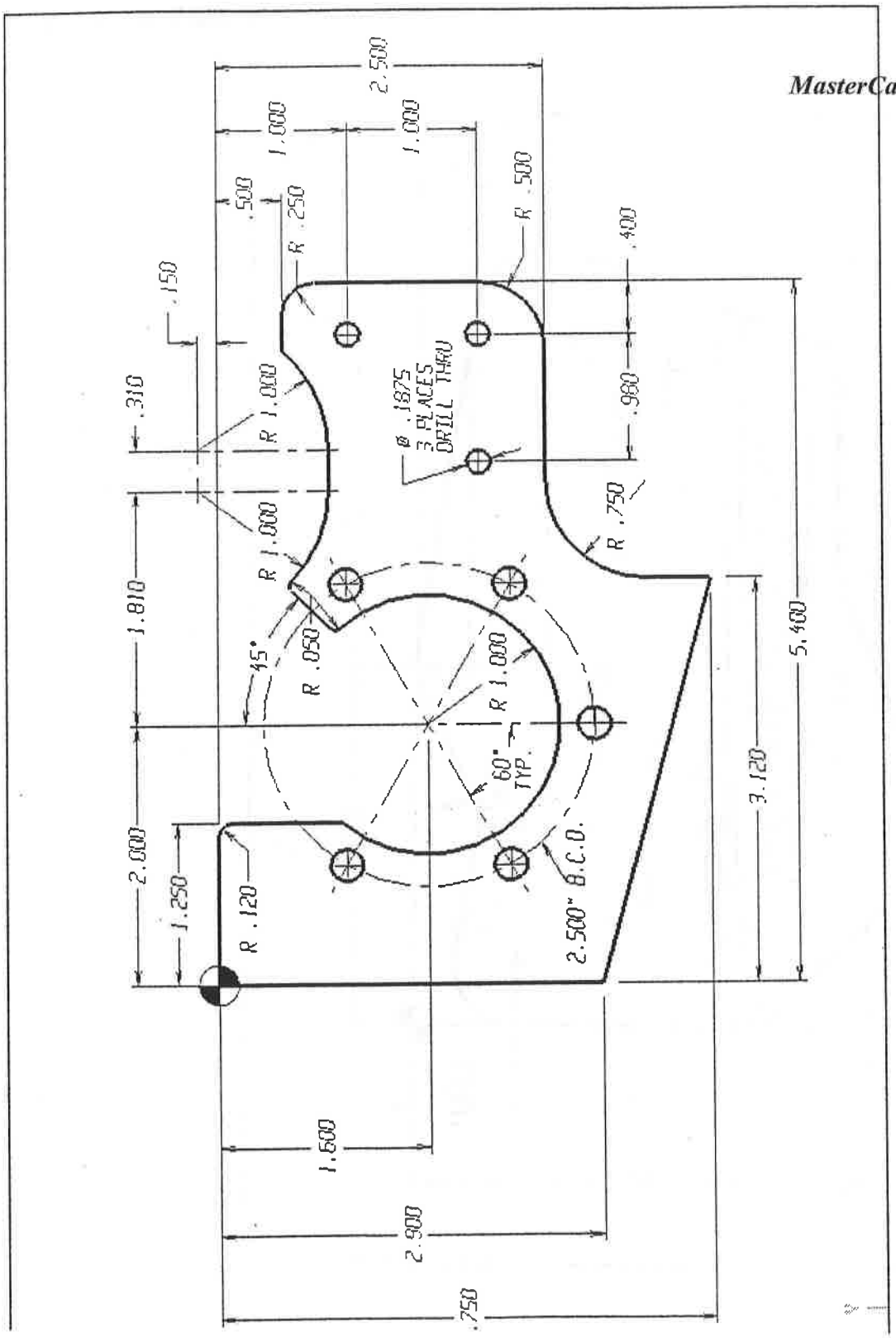

4.50
1.00
0.50
2.250
R3.00
2.165
0.50
1.50
0.75
R0.50
0.50
0.50
2.165
5.00


ø6.0
ø5.0
ø3.0
R0.3
0.6
ø2.5
2.5
.75

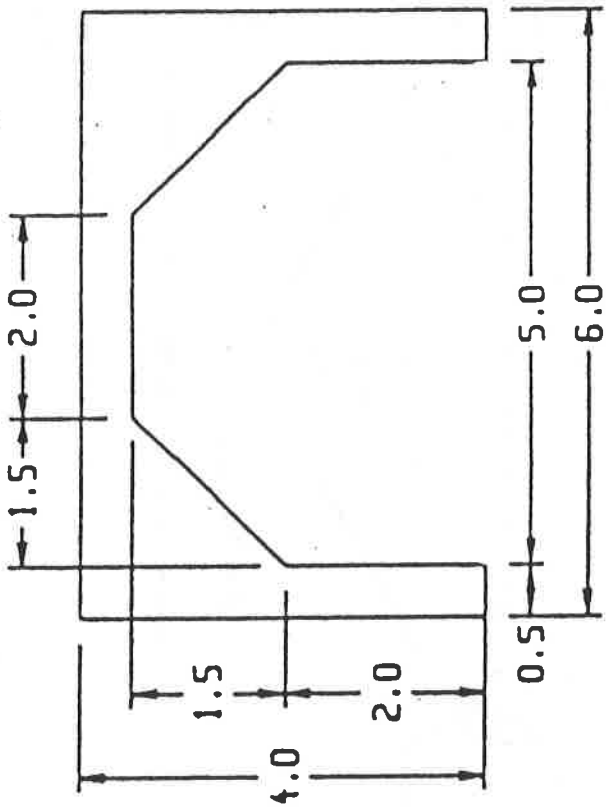

1.5
1.5
.375
1.0
R.85
1.5
1.5
6.0
6.0

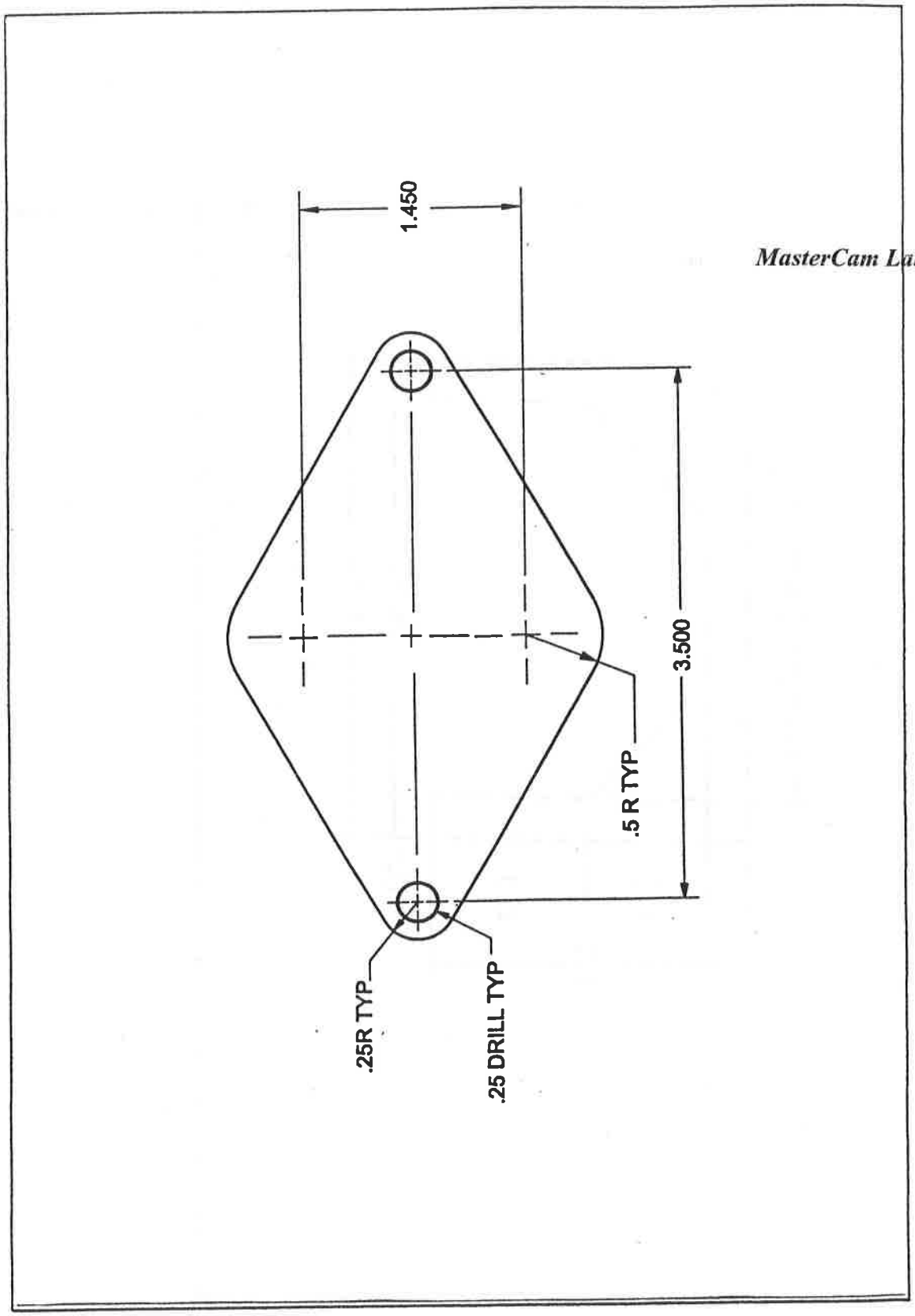

1.200
20.000°
50.000°
4.000
R 1.500
R 2.000
R .250 TYP.
R 2.750
R .250
Part thickness = 1"
Pocket depths = .250" & .500"


3.440
.750
.500
R .125
70°
R .500
R .690
R .500
3.500
2.600
R .690
R .500
PART THICKNESS=0.250"
R .625
R .600
25°
3.600
2.000
45°
10°
1.000
4.500

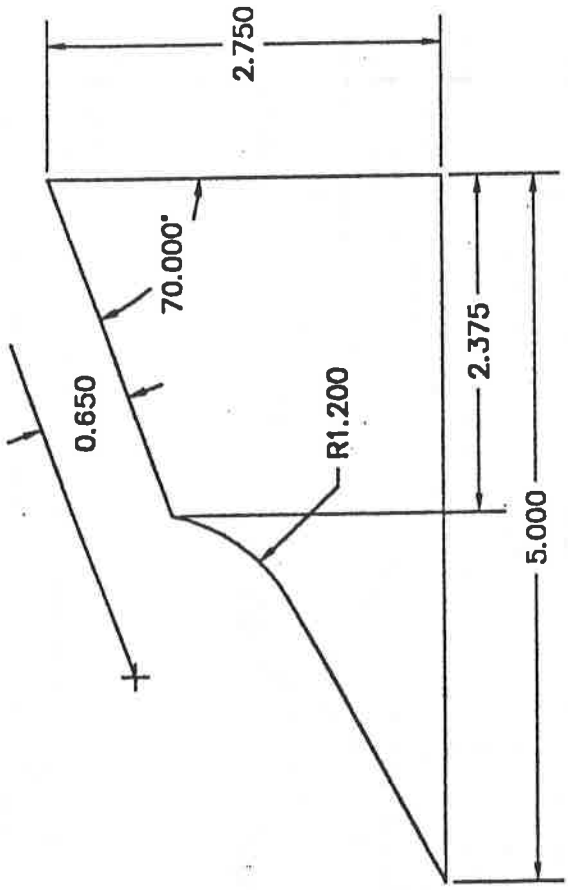

2.500
1.000
1.000
.500
R .250
R .500
.400
.150
.310
R 1.000
ø .1875
3 PLACES
DRILL THRU
.980
R 1.000
R .750
1.810
45°
R .050
R 1.000
60°
TYP.
5.400
3.120
2.000
1.250
R .120
2.500" B.C.D.
1.600
2.900
.750

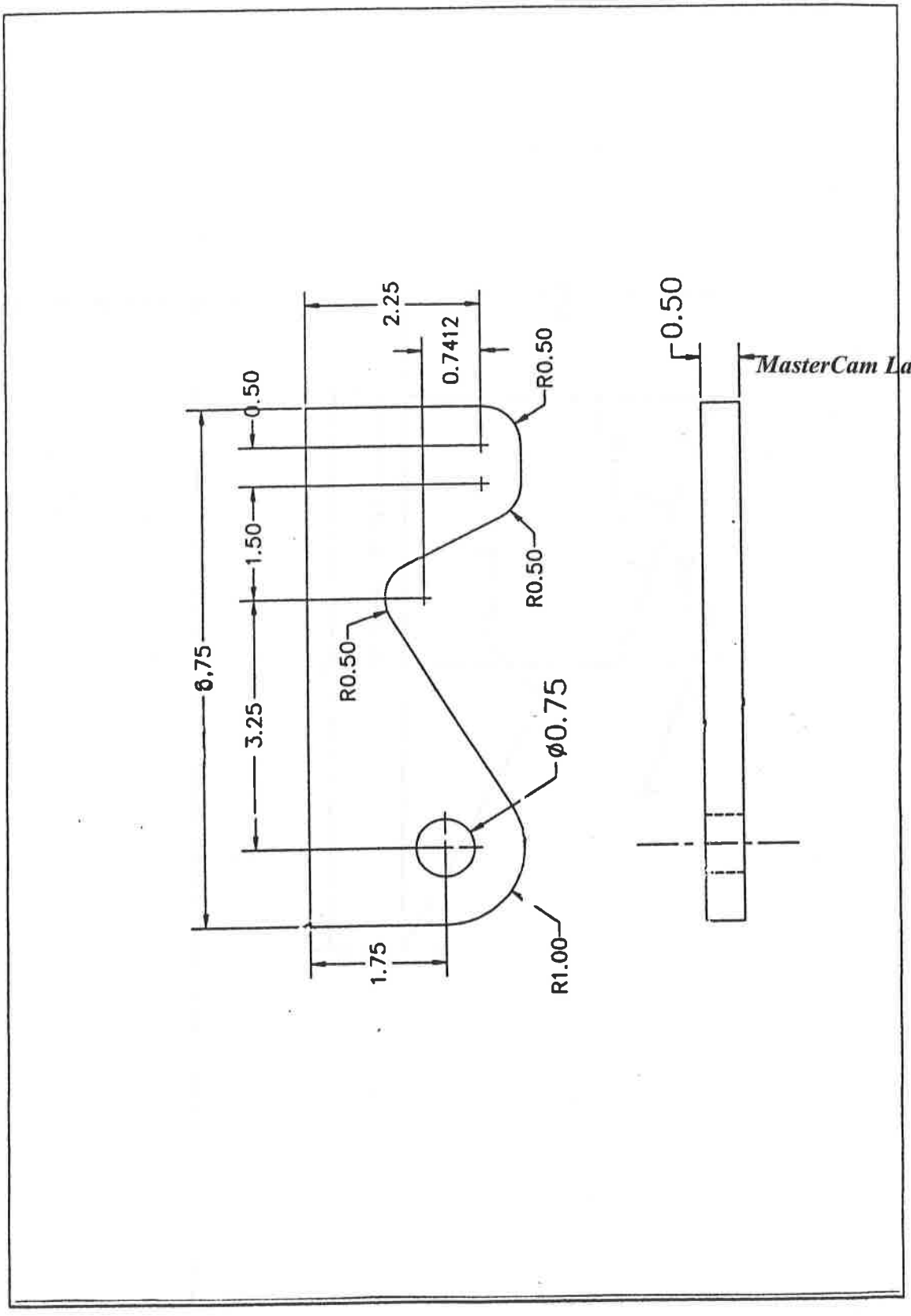
CREATE GEOMETRY IN MASTERCAM

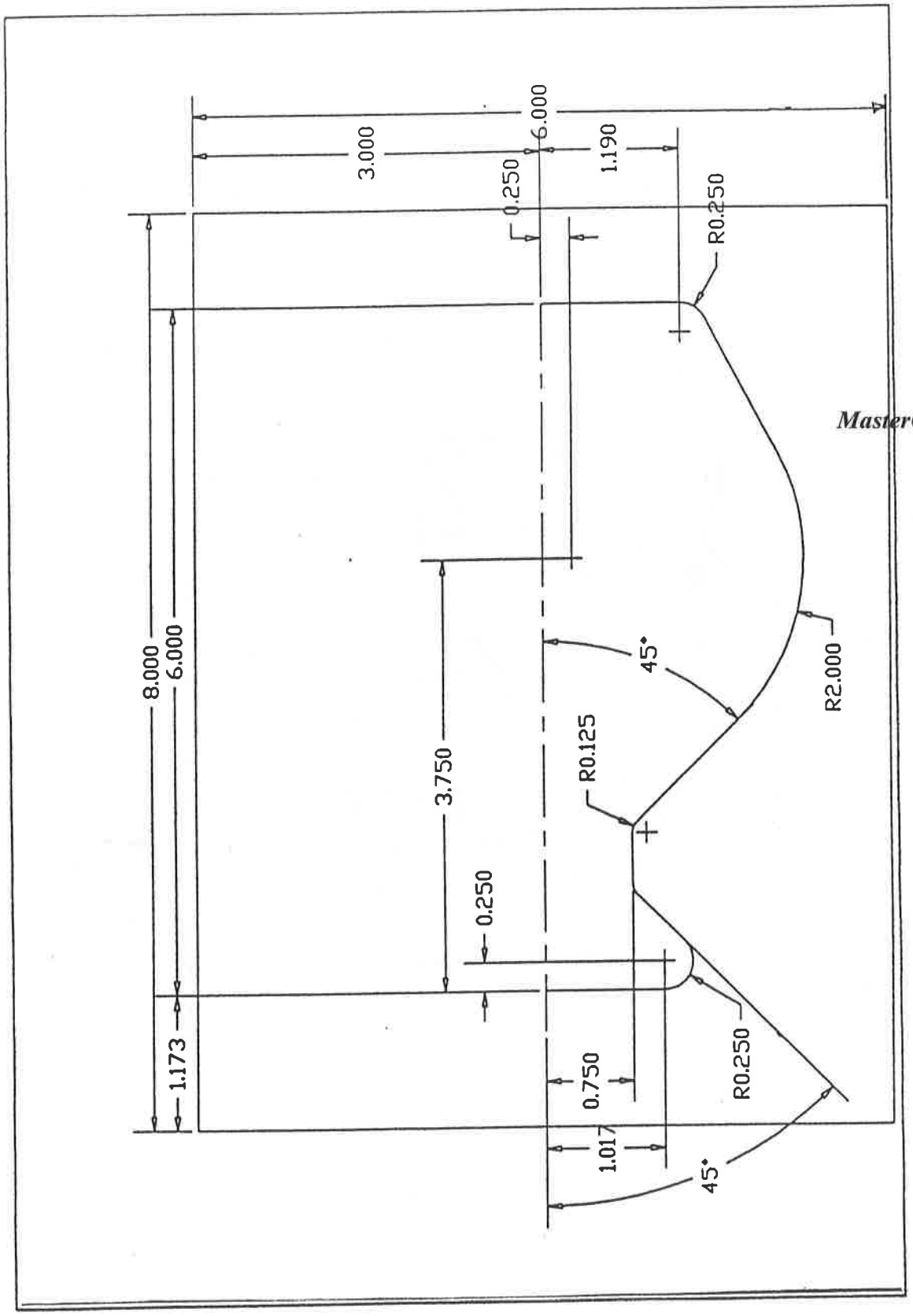



1.450
3.500
.5 R TYP
.25R TYP
.25 DRILL TYP

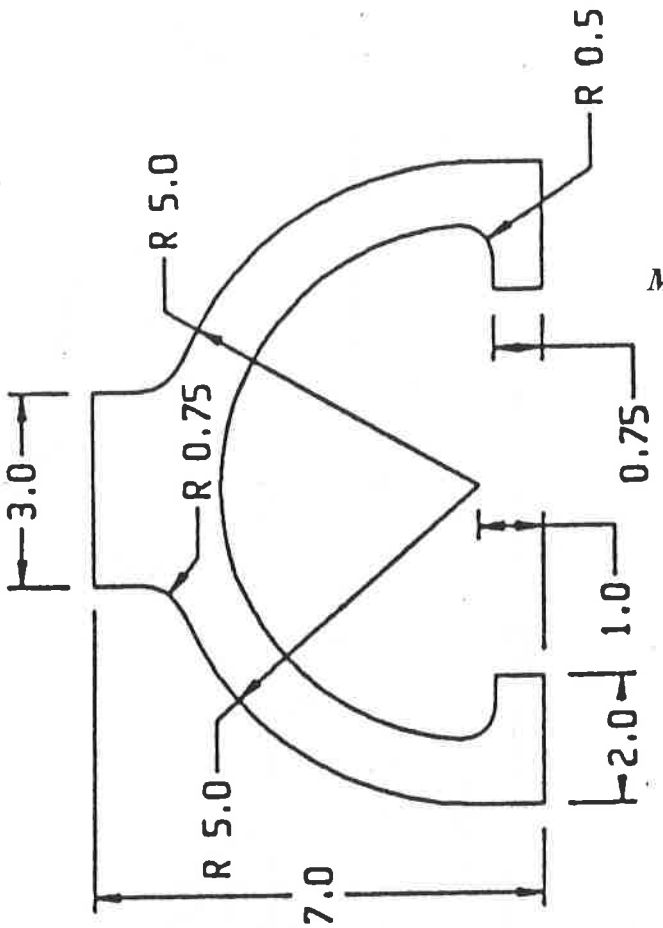
CREATE GEOMETRY IN MASTERCAM

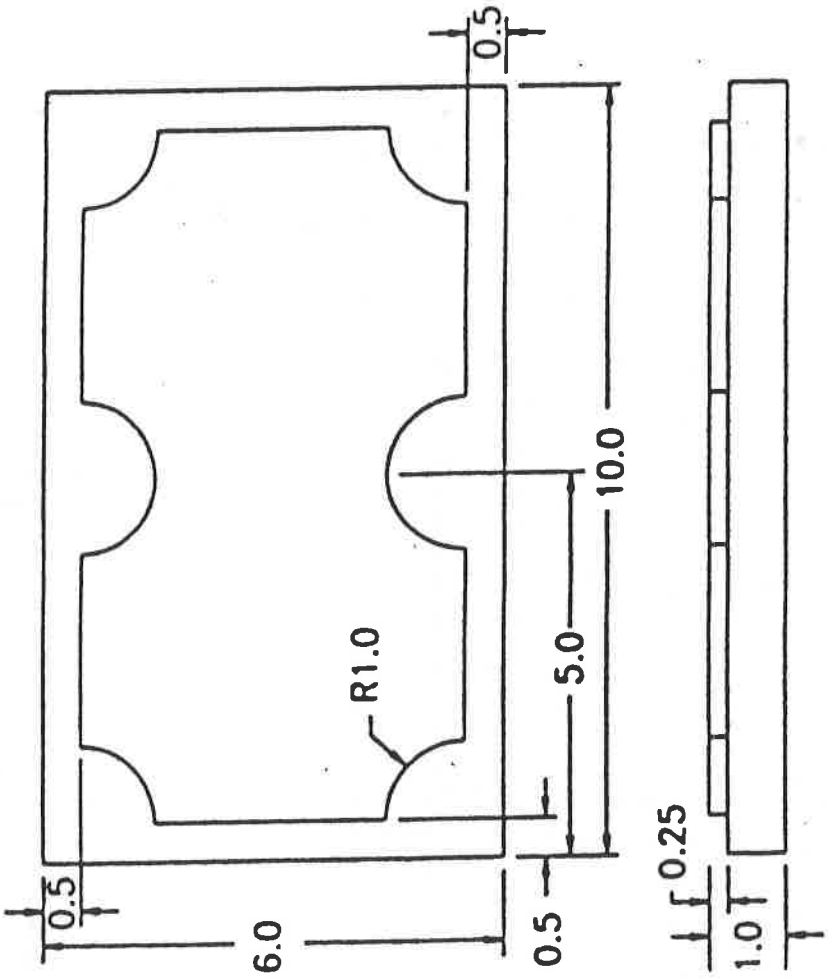


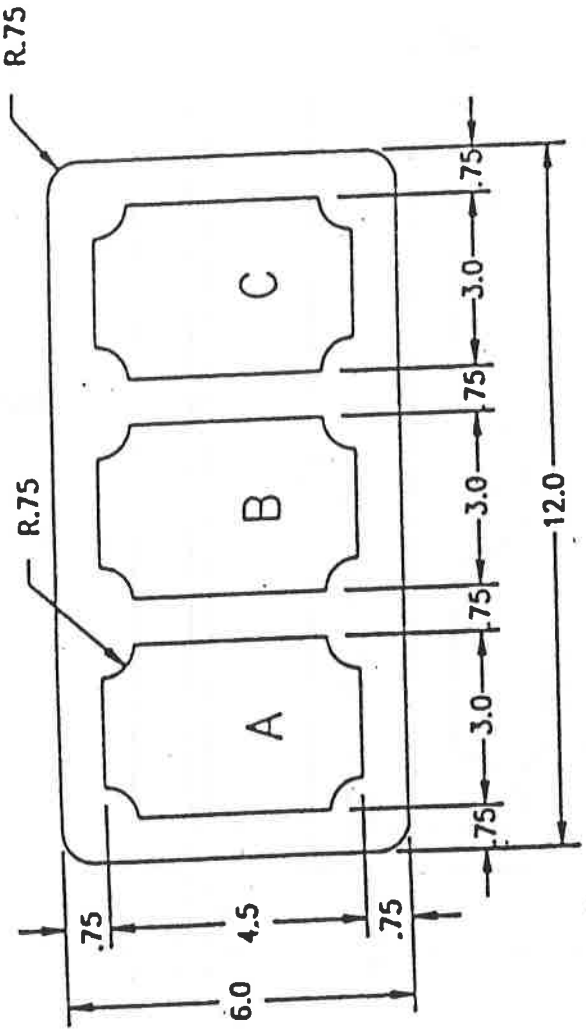

2.25
0.7412
0.50
R0.50
1.50
R0.50
R0.50
6.75
3.25
ø0.75
1.75
R1.00
0.50

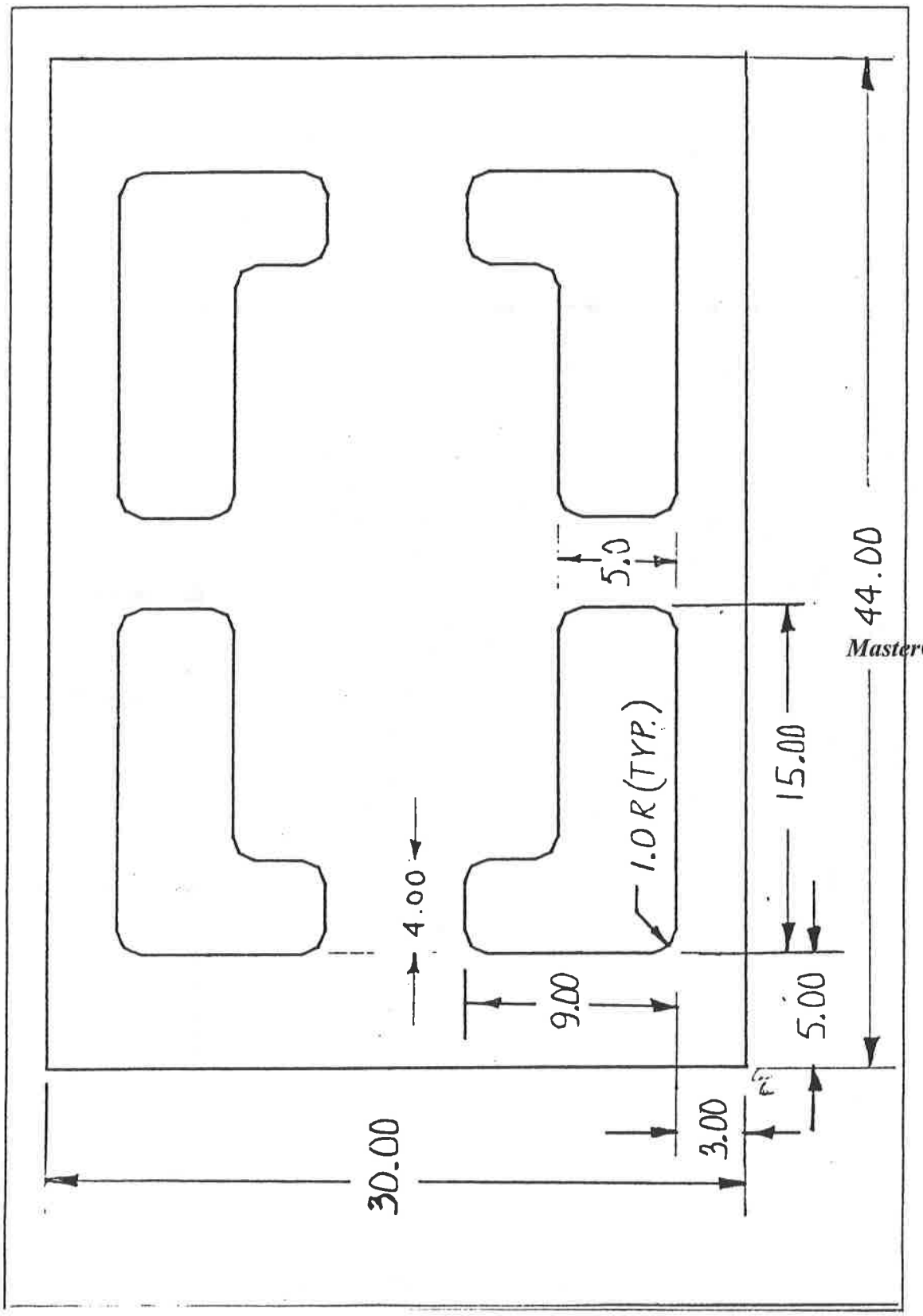

6.000
3.000
1.190
0.250
R0.250
8.000
6.000
45°
R2.000
3.750
R0.125
0.250
1.173
0.750
R0.250
1.017
45°

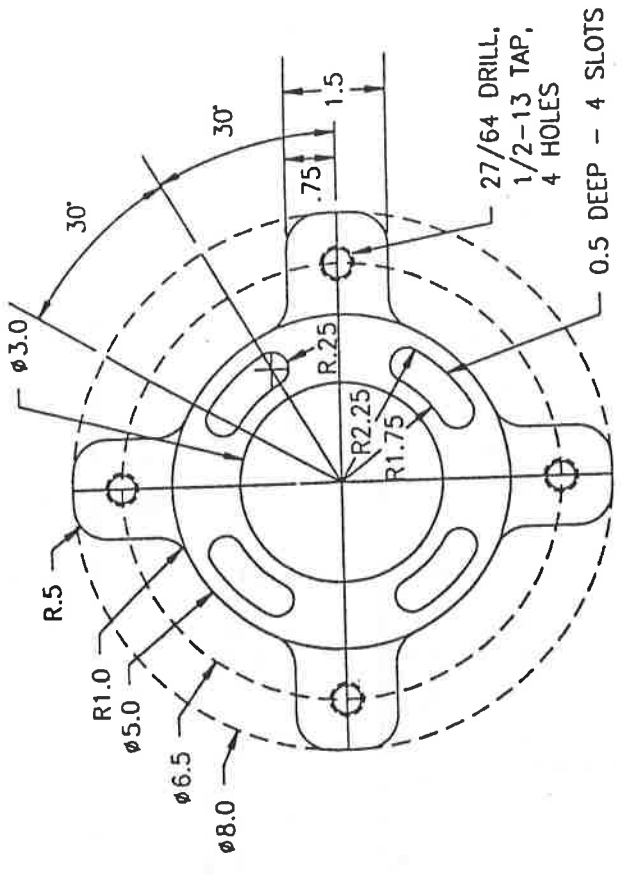
CREATE GEOMETRY IN MASTERCAM

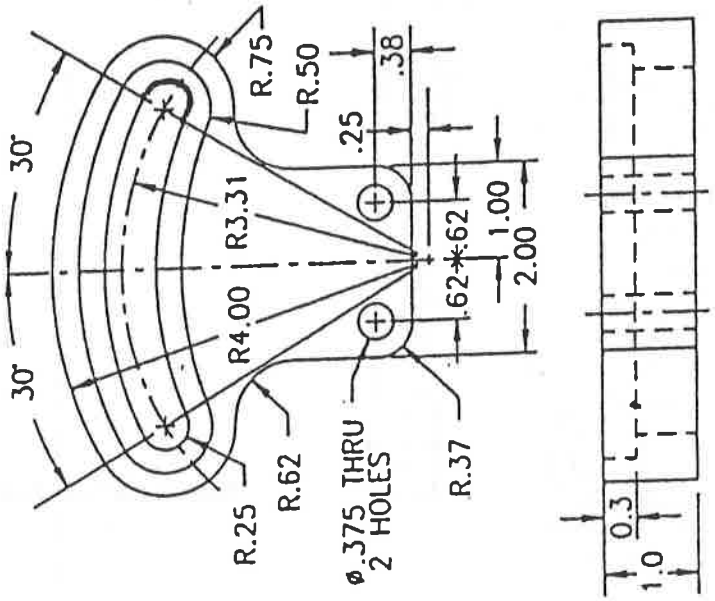


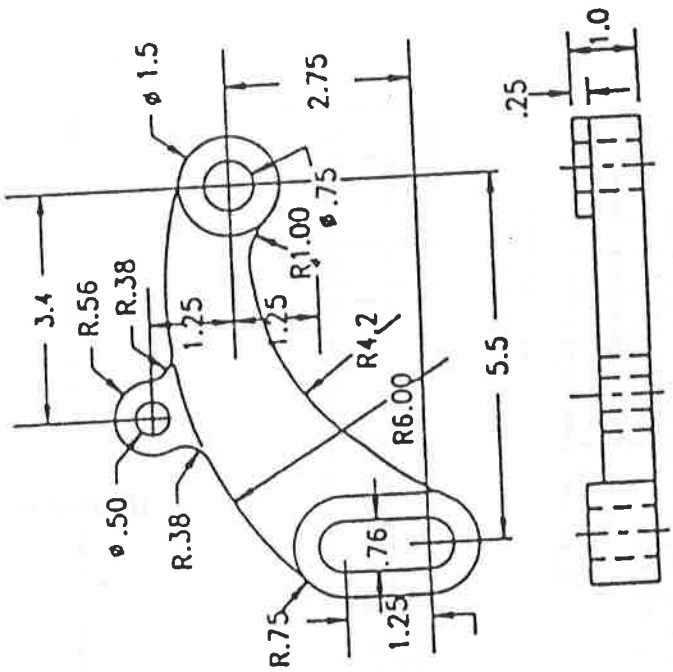

0.5
10.0
R1.0
5.0
0.5
6.0
0.5
0.25
1.0

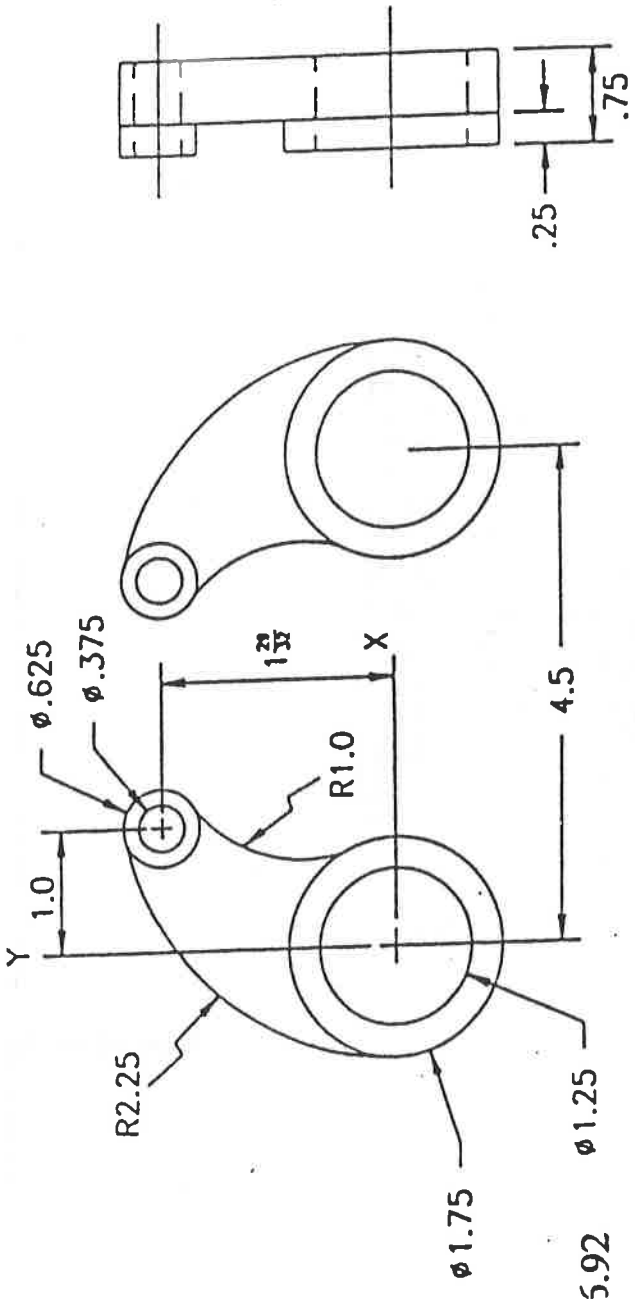

R.75
R.75
A
B
C
.75
3.0
.75
3.0
.75
3.0
.75
12.0
.75
4.5
.75
6.0

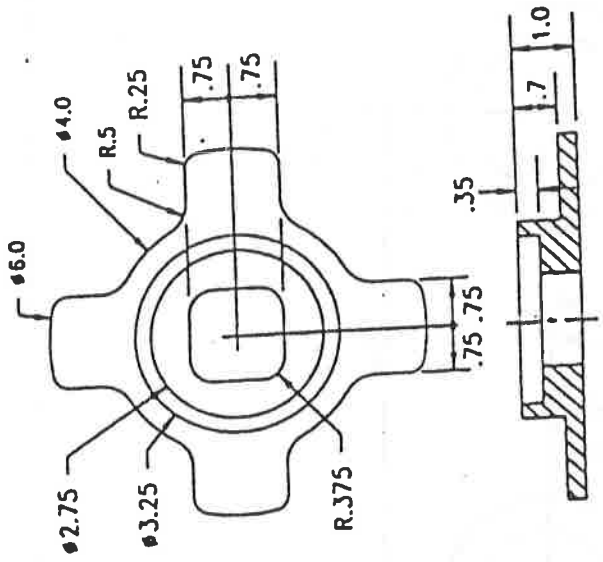

44.00
5.0
15.00
1.0 R (TYP.)
4.00
9.00
5.00
3.00
30.00

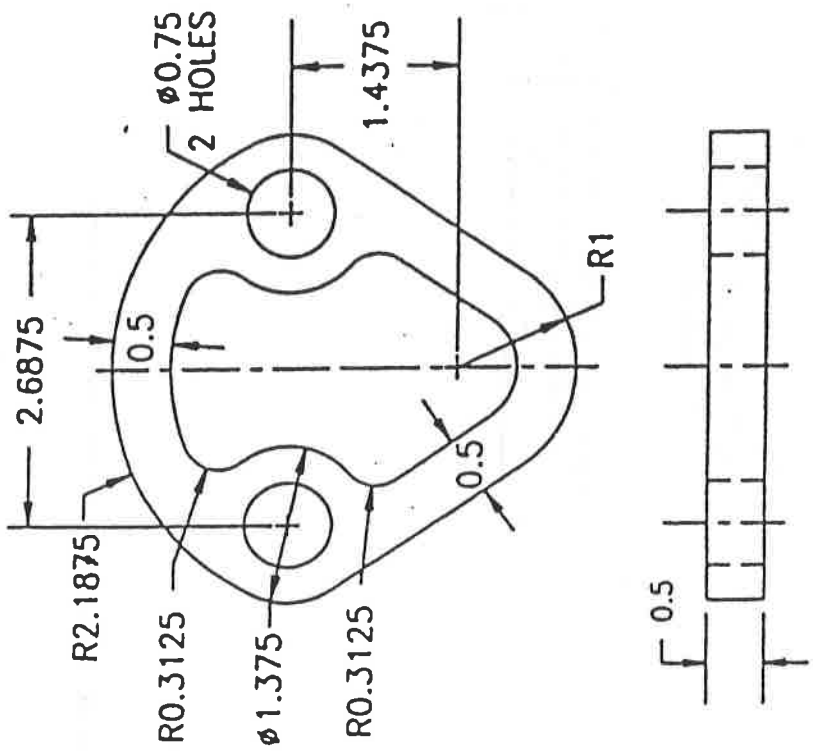

30°
30°
.75
1.5
27/64 DRILL,
1/2-13 TAP,
4 HOLES
0.5 DEEP - 4 SLOTS
ø3.0
R.25
R2.25
R1.75
R.5
R1.0
ø5.0
ø6.5
ø8.0
.75
1.5

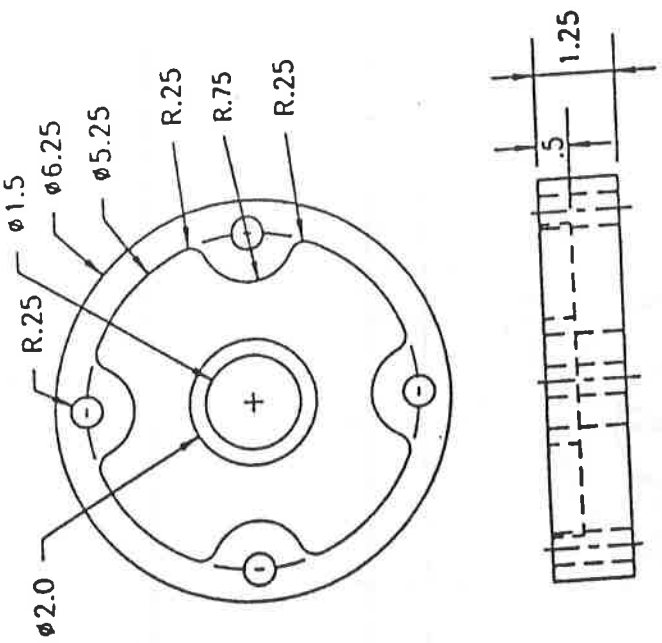

30°
30°
R.75
R.50
.38
.25
R3.31
R4.00
1.00
.62
.62
2.00
R.25
R.62
ø.375 THRU
2 HOLES
R.37
0.3
1.0

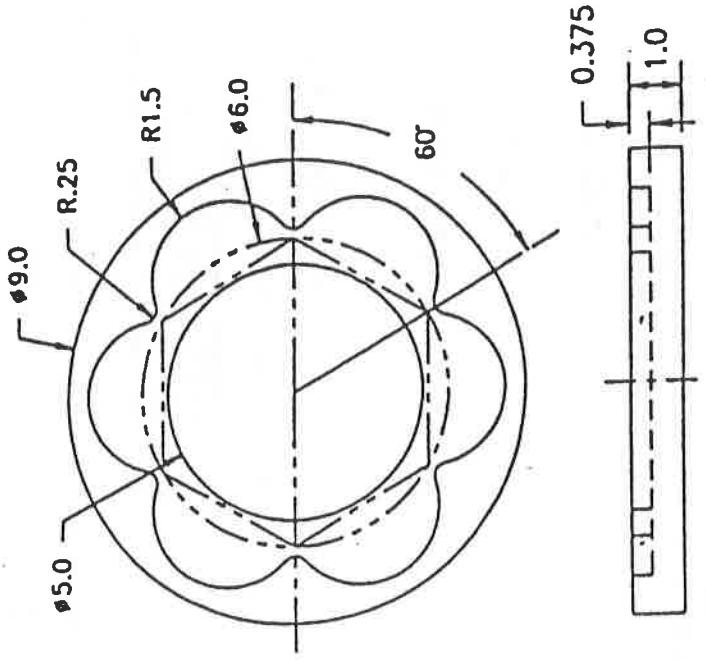

ø 1.5
2.75
.25
1.0
ø.75
R1.00
3.4
R.56
R.38
1.25
1.25
R4.2
5.5
R6.00
ø.50
R.38
.76
R.75
1.25


.75
.25
ø.625
ø.375
1 25/32
X
R1.0
4.5
1.0
Y
R2.25
ø1.25
ø1.75
5.92


Ø6.0
Ø4.0
R.5
R.25
.75
.75
.35
1.0
.7
.75 .75
Ø2.75
Ø3.25
R.375


ø0.75
2 HOLES
1.4375
R1
2.6875
0.5
0.5
R2.1875
R0.3125
ø1.375
R0.3125
0.5


ø1.5
ø6.25
ø5.25
R.25
R.75
R.25
R.25
ø2.0
1.25
.5


0.375
1.0
60°
ø6.0
R1.5
R.25
ø9.0
ø5.0

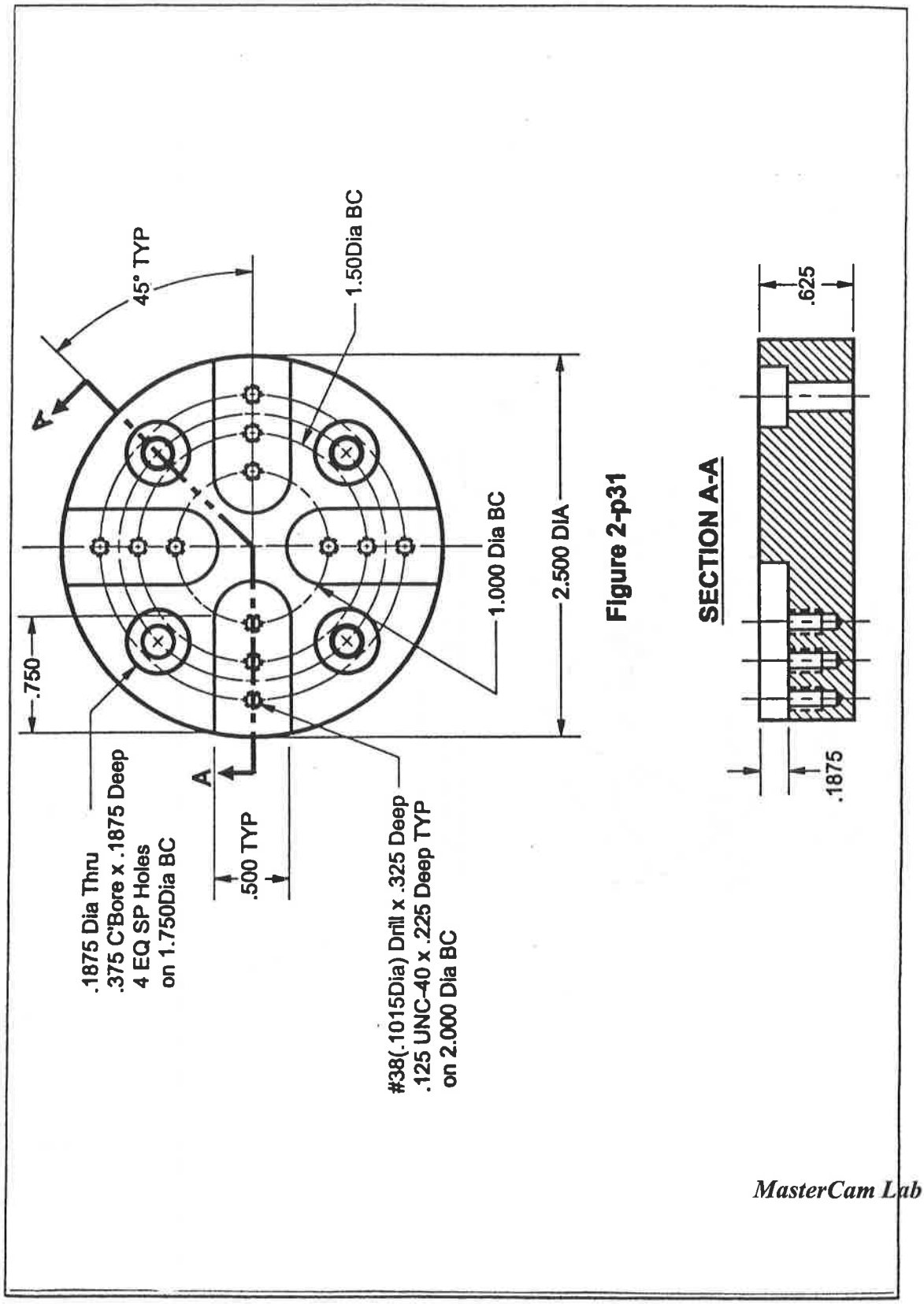
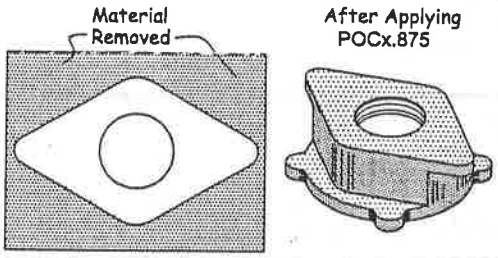
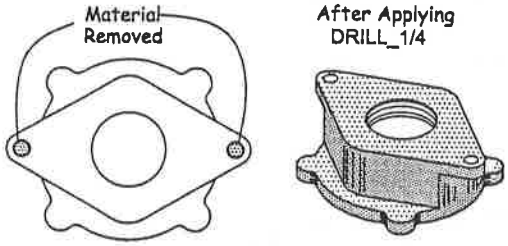
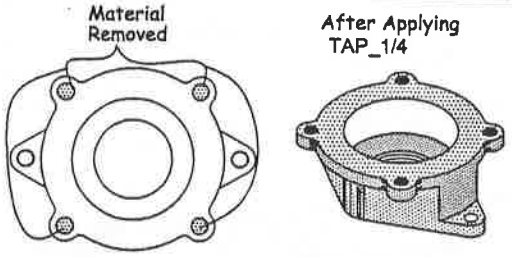
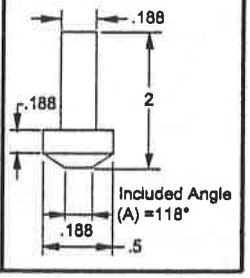
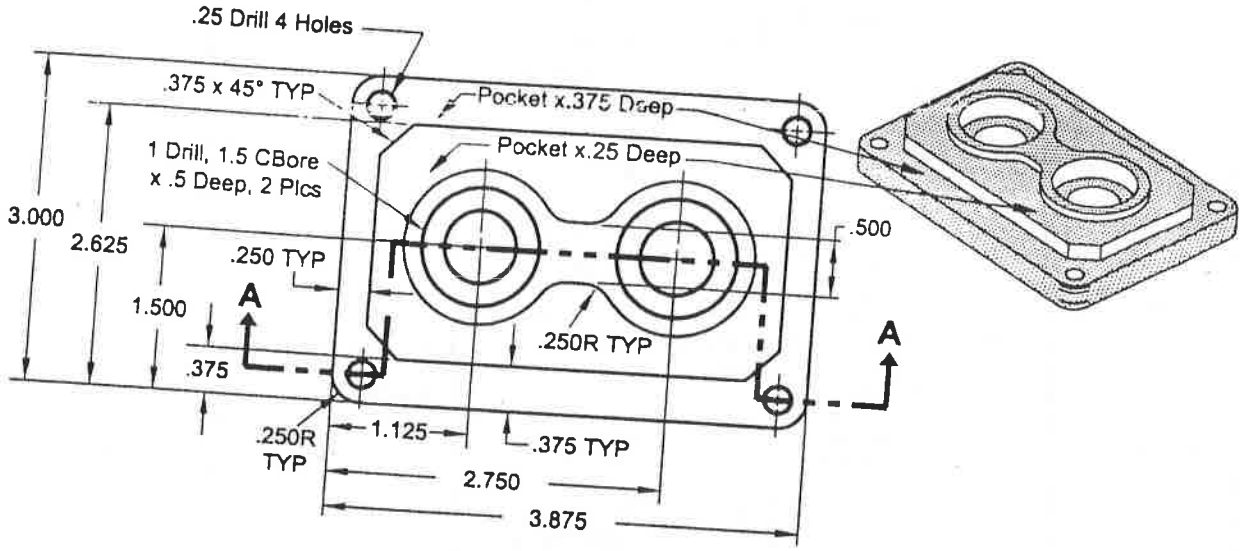

45° TYP
1.50Dia BC
.750
1.000 Dia BC
2.500 DIA
A
.500 TYP
.1875 Dia Thru
.375 C'Bore x .1875 Deep
4 EQ SP Holes
on 1.750Dia BC
#38(.1015Dia) Drill x .325 Deep
.125 UNC-40 x .225 Deep TYP
on 2.000 Dia BC
SECTION A-A
.625
.1875

Figure 2-p31

Cycle Name	Operation	Tooling
Stop program. Turn Part Over So That Bottom Face(face-2) Is Up. Re-clamp part from inside		
POC x .875	Rough and finish pockets x .875 deep. Leave .01 for finish cut.	1/8 End Mill
		
DRILL_1/4	Center Drill x .166 Deep(2 plcs)	1/8 Center Drill
	Peck Drill Thru(2 plcs)	1/4 Drill
		
Stop program. Turn Part Over So That Top Face(face-1) Is Up. Re-clamp part from outside		
TAP_1/4	Center Drill x .166 deep(4 plcs)	1/8 Center Drill
	Peck Drill thru (4 plcs)	#7(.201) Drill
	Tap thru (4 plcs)	.25-UNC-20 Tap
	.02 Chamfer (12 plcs)	.5 Chamfer tool
		



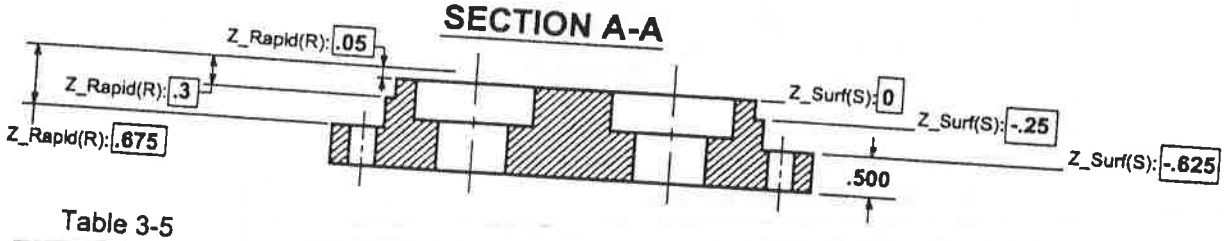


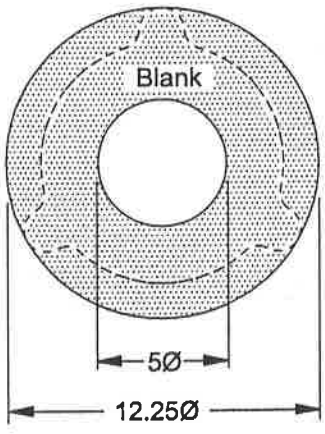
Table 3-5

Cycle Name	Operation	Tooling
CBORE_1.5	Center Drill x .166 Deep	1/8 Center Drill
	Peck Drill Through	1/2 Drill
	CIRCLE MILL 1Dia x 1.125 Deep	1/2 End Mill
	CIRCLE MILL 1.5 Dia x .5 Deep	1/2 End Mill
POC x .25	Rough and finish pocket.x .25 Deep Leave .01 for finish cut.	1/4 End Mill
POC x .375	Rough and finish pocket x .375 Deep Leave .01 for finish cut.	1/4 End Mill
DRILL_1/4	Center Drill x .166 Deep	1/8 Center Drill
	Peck Drill Through	1/4 Drill
CON X .5	Rough and finish outside. Leave .01 for finish cut.	1/4 End Mill

Table 3p-8

Cycle Name	Operation	Tooling
Clamp part from inside.		
POC x 1.25	Rough Pocket x 1.25 Deep. Leave .01 for finish cut.	1/2 Stub End Mill
	Finish Pocket	1/4 End Mill
CON x .5	Rough Outside.Leave .01 for finish cut.	1/2 Stub End Mill
	Finish Outside	1/4 End Mill
DRILL_1/2	Center Drill x .166 Deep	1/8 Center Drill
	Peck Drill Through	1/2 Drill
DRILL_7/8	Center Drill x .166 Deep	1/8 Center Drill
	Peck Drill Through	7/8 Drill

Blank: Part blank is a 12.25in OD , 5in DIA ID cylinder x 1.75 in



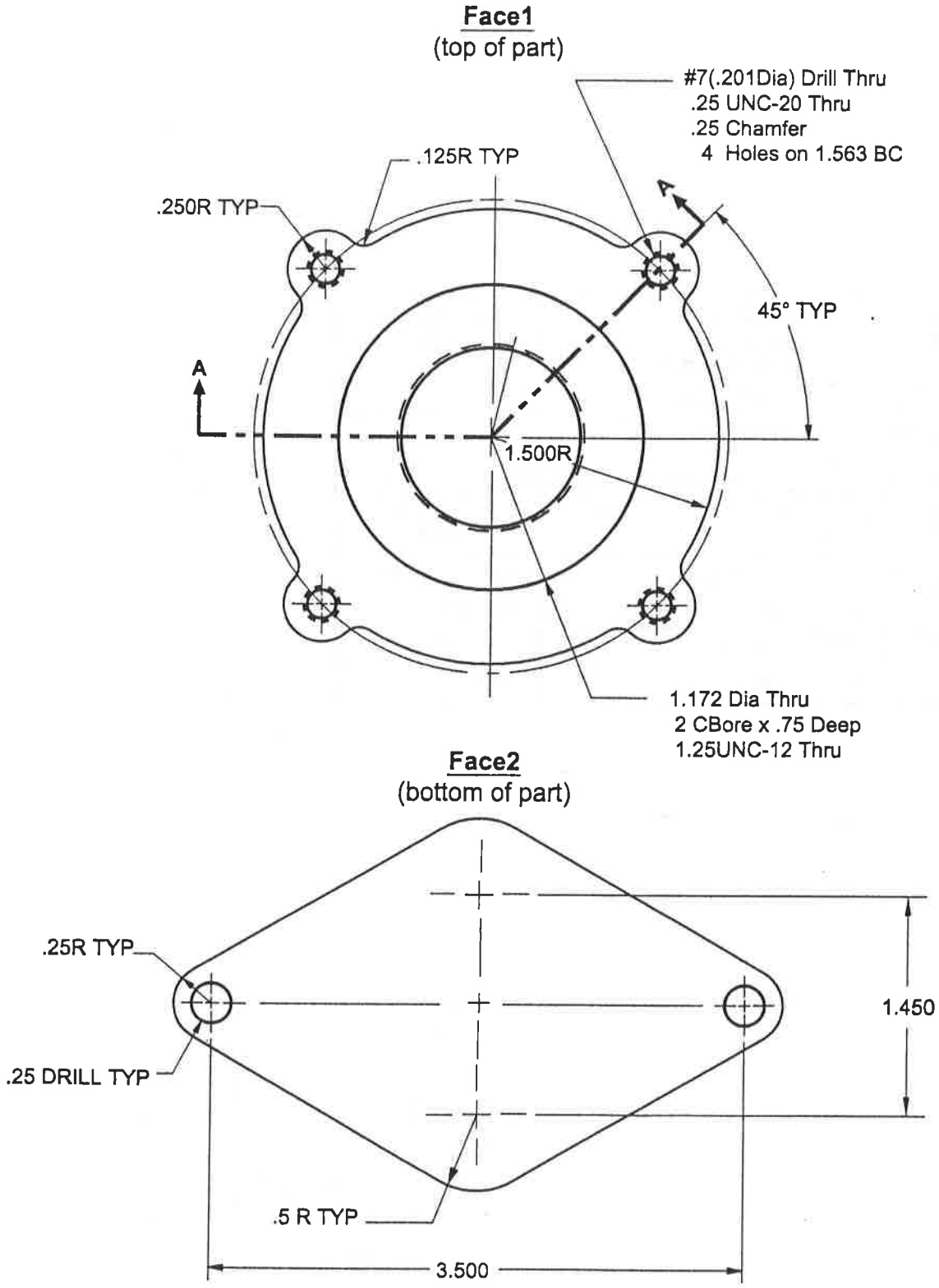
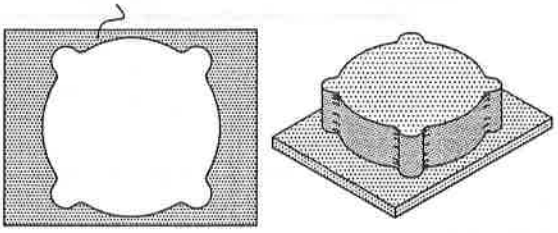
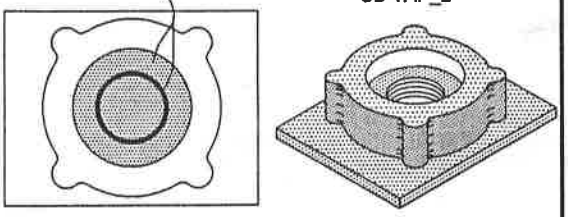
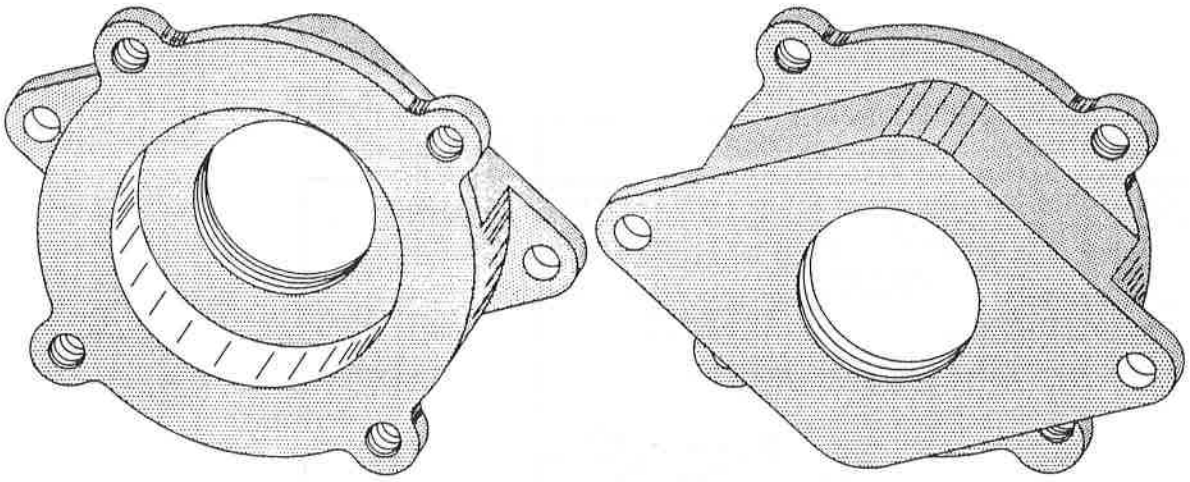

Face1
(top of part)
#7(.201Dia) Drill Thru
.25 UNC-20 Thru
.25 Chamfer
4 Holes on 1.563 BC
.125R TYP
.250R TYP
A
45° TYP
A
1.500R
1.172 Dia Thru
2 CBore x .75 Deep
1.25UNC-12 Thru
Face2
(bottom of part)
.25R TYP
.25 DRILL TYP
1.450
.5 R TYP
3.500

Figure 3p-15

Cycle Name	Operation	Tooling
Clamp Part From Outside with Top Face(face-1) Up.		
POC x .875	Rough and finish pockets x .875 deep. Leave .01 for finish cut.	1/8 End Mill
	Material Removed / After Applying POCx.875 	
CB-TAP_2	Center Drill x .166 Deep	1/8 Center Drill
	Peck Drill Thru	1/2 Drill
	Circle Mill 1.172 Dia Thru	1/2 End Mill
	Circle Mill 2.25 Dia x .75 Deep	1/2 End Mill
	Tap x .375 deep	1.25-UNF-12 Tap
	Material Removed / After Applying CB-TAP_2 	

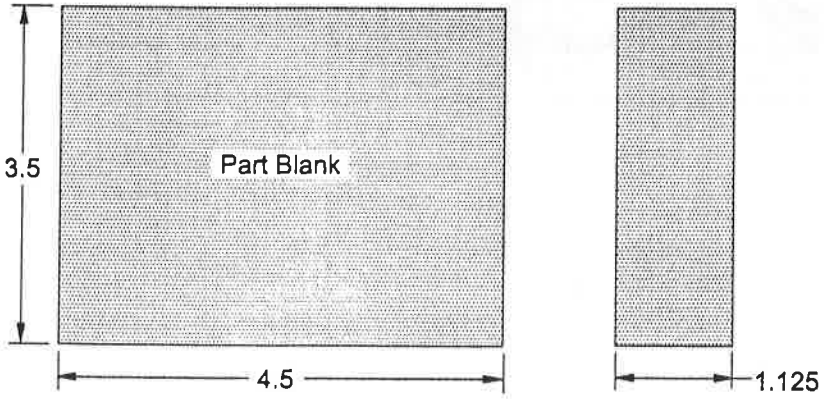


view of top of part

view of bottom of part

Figure 3p-16

Blank: Part blank is a 4.5in x 3.5in x 1.125 plate.



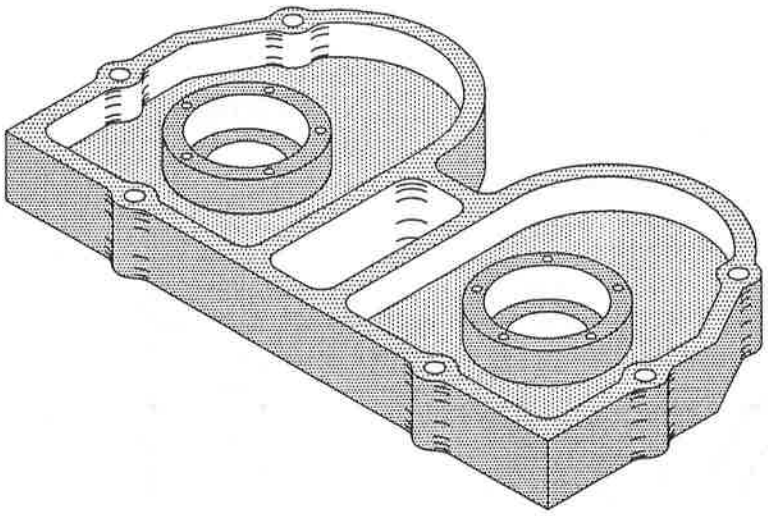
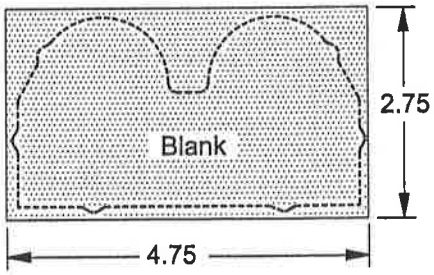


Figure 3p-12

Table 3p-11

Cycle Name	Operation	Tooling
Clamp part from outside		
DRILL-_1/8	Center Drill x .166 Deep(5 plcs)	1/8 Center Drill
	Peck Drill Through (5 plcs)	1/8 Drill
TAP_.073	Center Drill x .1 Deep(10 plcs)	1/32 Center Drill
	Peck Drill x .198 Deep(10 plcs)	#53(.06Dia) Drill
	Tap x .135 Deep(10 plcs)	.073 UNC-64 Tap
CBORE_3/4	Center Drill x .166 Deep(2 plcs)	1/8 Center Drill
	Peck Drill Thru(2 plcs)	1/2 Drill
	Circular Mill 3/4 Dia x .25 Deep(2 plcs)	1/4 End Mill
SLOT x .5	Rough and finish .5 x 1.25 slot. Leave .01 for finish cut.	1/8 End Mill
POC x .25	Rough and finish two pockets. .Leave .01 for finish cut.	1/8 End Mill
Stop program. Re-clamp part from inside		
CON x .5	Rough and finish outside Leave .01 for finish cut.	1/8 End Mill

Blank: Part blank is a 4.75in x 2.75in plate



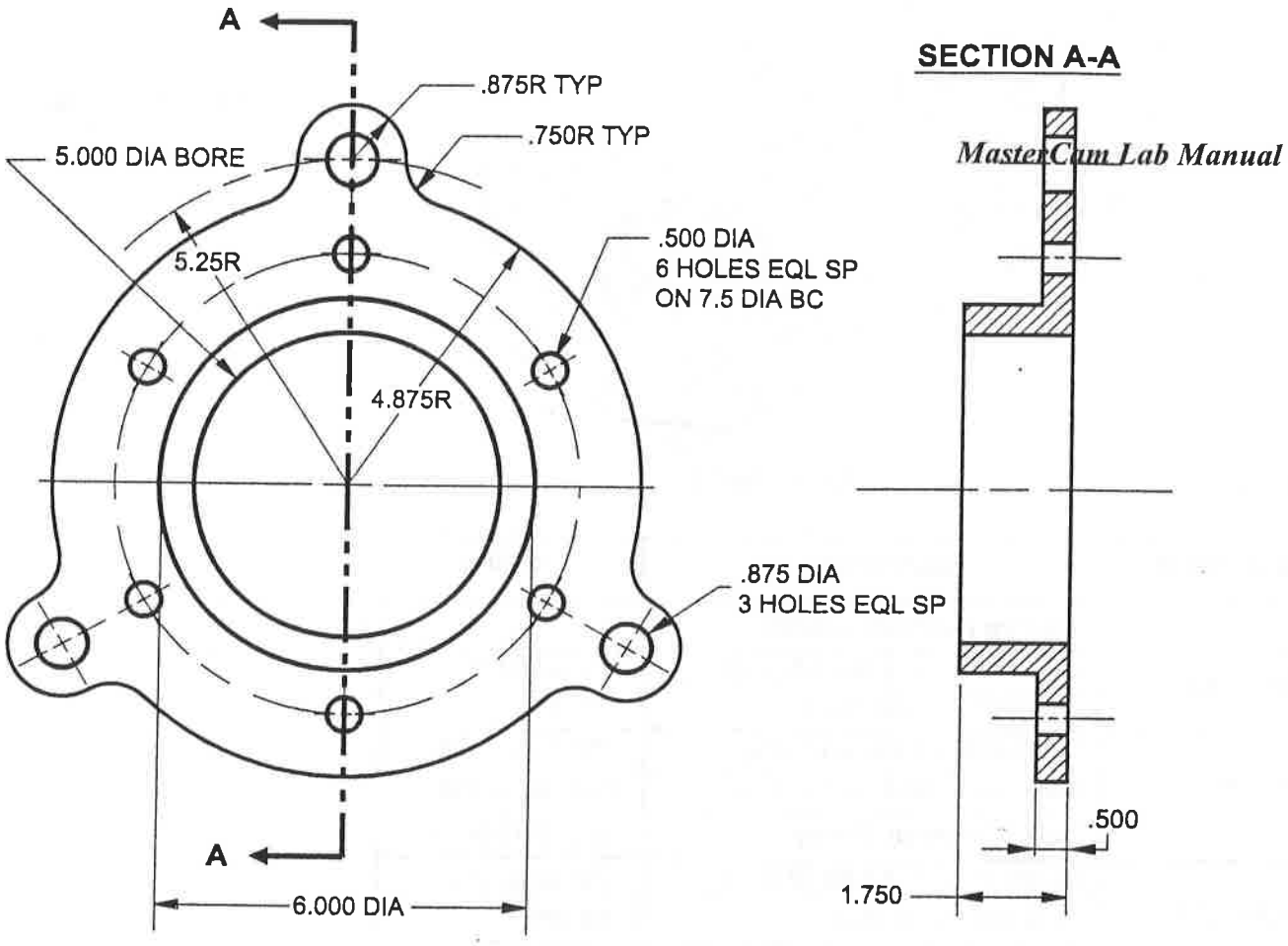


Figure 3p-5

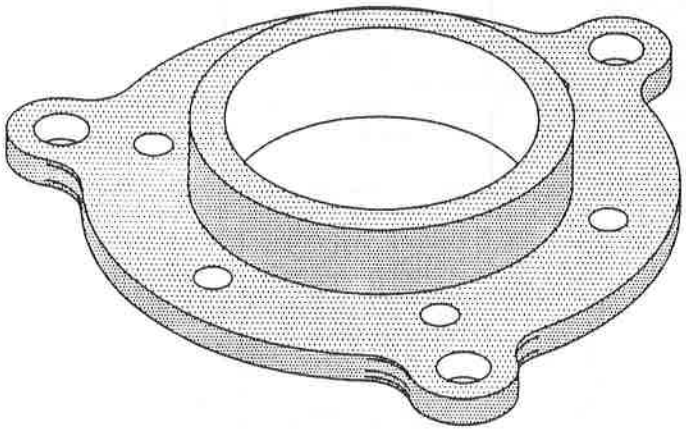
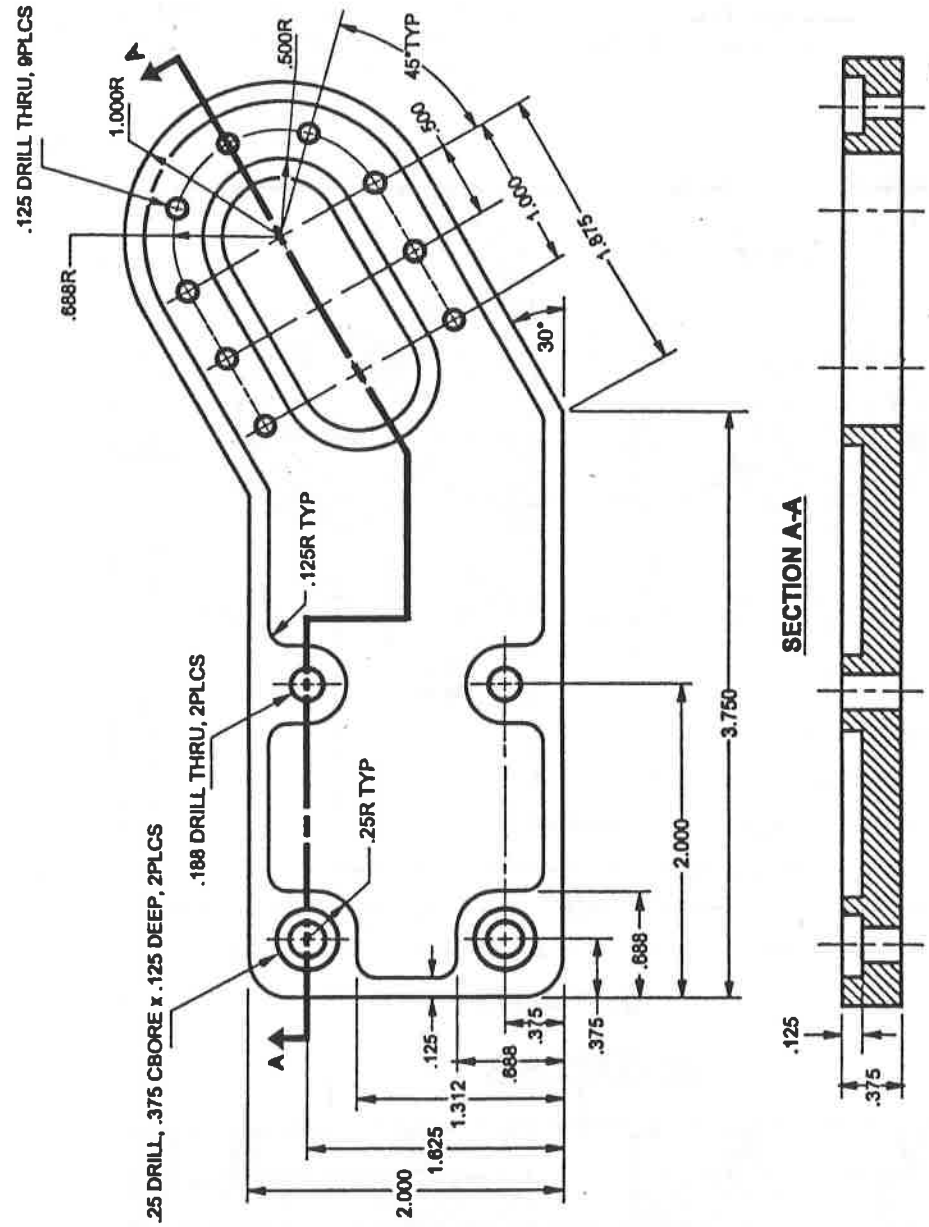


Figure 3p-6


.125 DRILL THRU, 9PLCS
1.000R
.500R
45°TYP
.500
1.000
1.875
.688R
30°
.125R TYP
.188 DRILL THRU, 2PLCS
.25R TYP
.25 DRILL, .375 CBORE x .125 DEEP, 2PLCS
A
A
3.750
2.000
.688
.375
.125
.688
.375
1.312
1.625
2.000
SECTION A-A
.125
.375

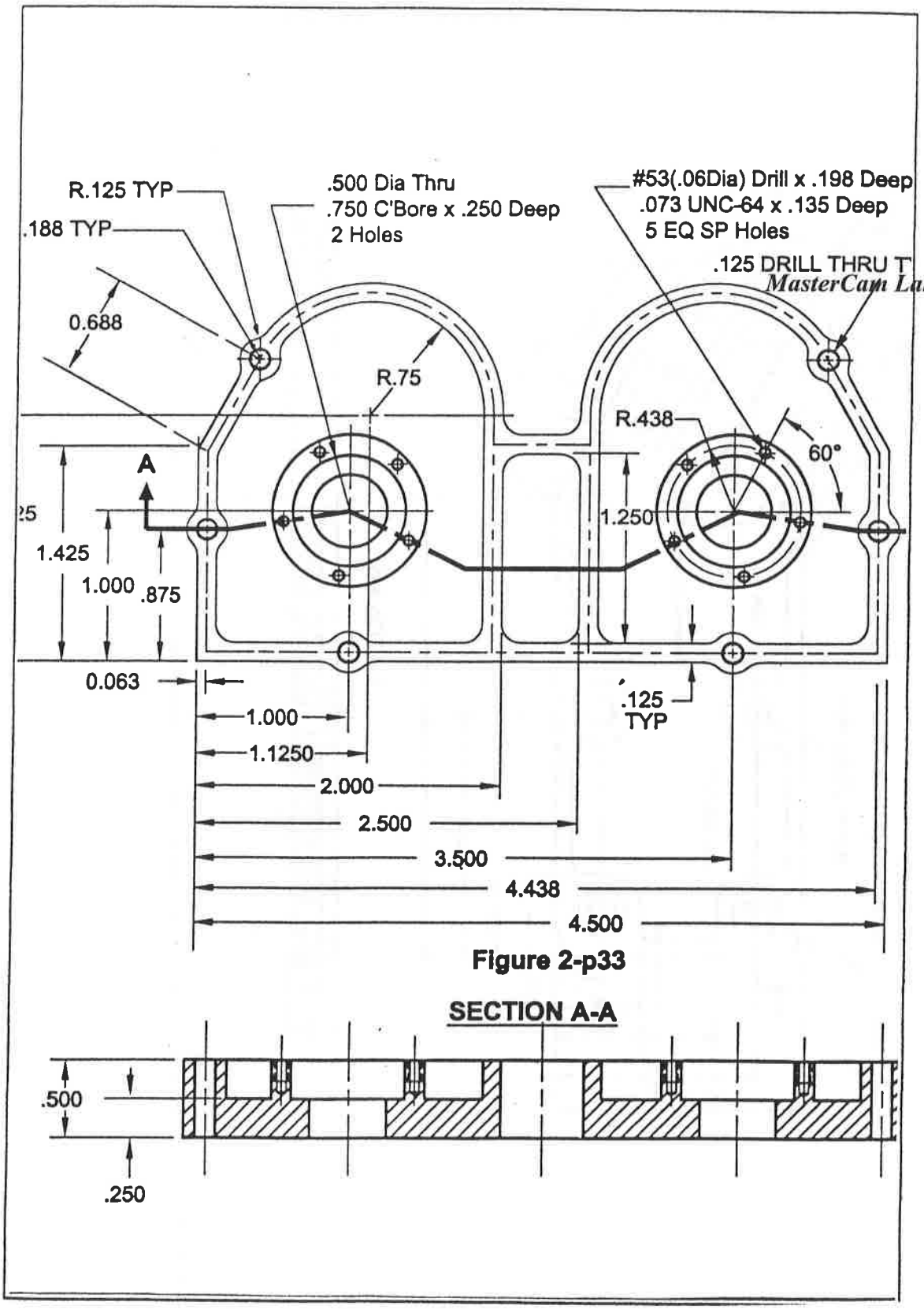


Figure 2-p33

SECTION A-A

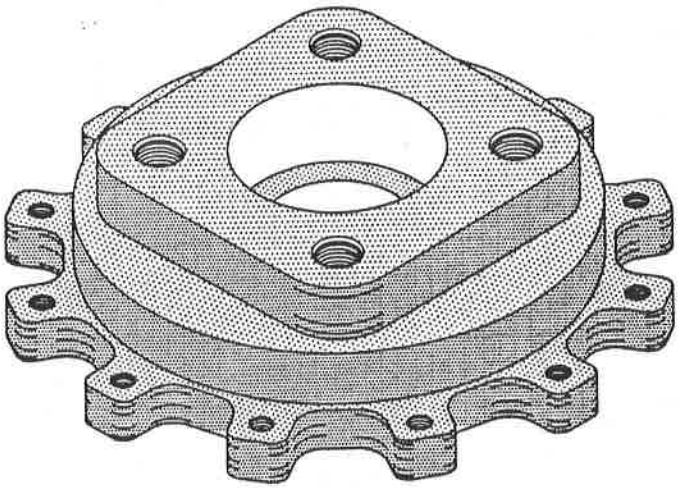
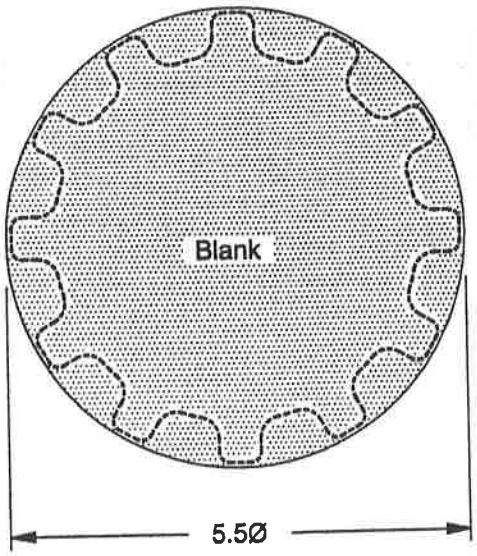
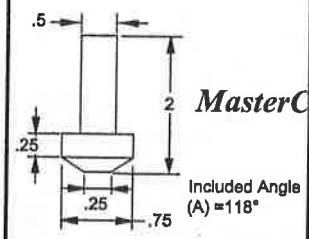
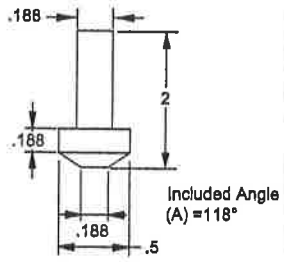


Figure 3p-14

Blank: Part blank is a 5.5in Dia x 1.375in cylinder



Cycle Name	Operation	Tooling
Clamp part from outside		
TAP_1/2	Center Drill x .2 deep(4 plcs)	#7(7/32) Center Drill
	Peck Drill x 1 deep (4 plcs)	27/64(.422) Drill
	Tap x .8 deep (4 plcs)	.5-UNC-14 Tap
	.05 Chamfer (4 plcs)	.75 Chamfer tool 
CBORE_1.75	Center Drill x .166 Deep	1/8 Center Drill
	Peck Drill Thru	1/2 Drill
	Circle Mill 1.5 Dia x .5 Deep	1/2 End Mill
	Circle Mill 2.25 Dia x .25 Deep	1/2 End Mill
Stop program. Re-clamp part from inside		
POC x .5	Rough and finish pocket x .5 deep. Leave a 3x3 island. Leave .01 for finish cut.	1/2 End Mill
POC x .5	Rough and finish pocket x .5 deep. Leave a 4.25 Dia island. Leave .01 for finish cut.	1/4 End Mill
CON x .5	Rough and finish outside Leave .01 for finish cut.	1/4 End Mill
TAP_1/4	Center Drill x .166 deep(12 plcs)	1/8 Center Drill
	Peck Drill x .375 deep (12 plcs)	#7(.201) Drill
	Tap x .375 deep (12 plcs)	.25-UNC-20 Tap
	.02 Chamfer (12 plcs)	.5 Chamfer tool 

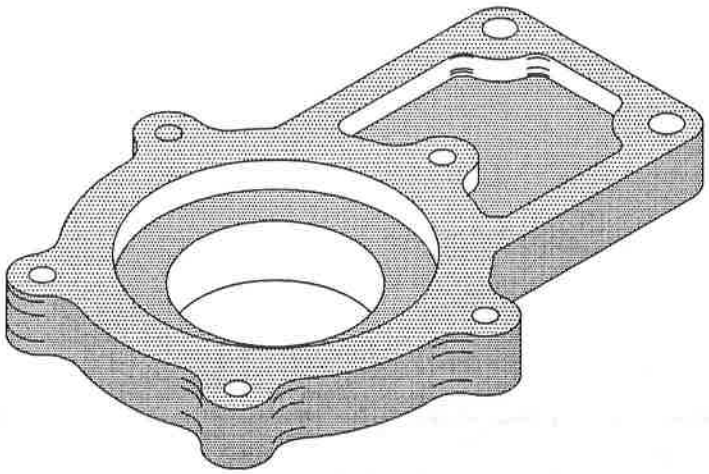
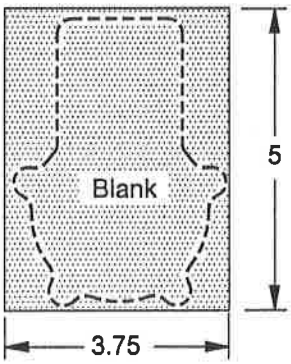


Figure 3p-10

Table 3p-10

Cycle Name	Operation	Tooling
Clamp part from outside		
DRILL_3/16	Center Drill x .166 Deep	1/8 Center Drill
	Peck Drill Through	3/16 Drill
TAP_1/4	Center Drill x .166 Deep	1/8 Center Drill
	Peck Drill Through	#7(.201) Drill
	Tap(2 plcs)	1/4 UNC-20 Tap
CBORE_2.25	Center Drill x .166 Deep	1/8 Center Drill
	Drill Thru	1/2 Drill
	Circle Mill 1.5 Dia x .5 Deep	1/2 End Mill
	Circle Mill 2.25 Dia x .25 Deep	1/2 End Mill
POC x .188	Rough and finish Pocket. .Leave .01 for finish cut.	1/8 End Mill
Stop program. Re-clamp part from inside		
CON x .5	Rough and finish outside Leave .01 for finish cut.	1/4 End Mill

Blank: Part blank is a 3.75in x 5in plate



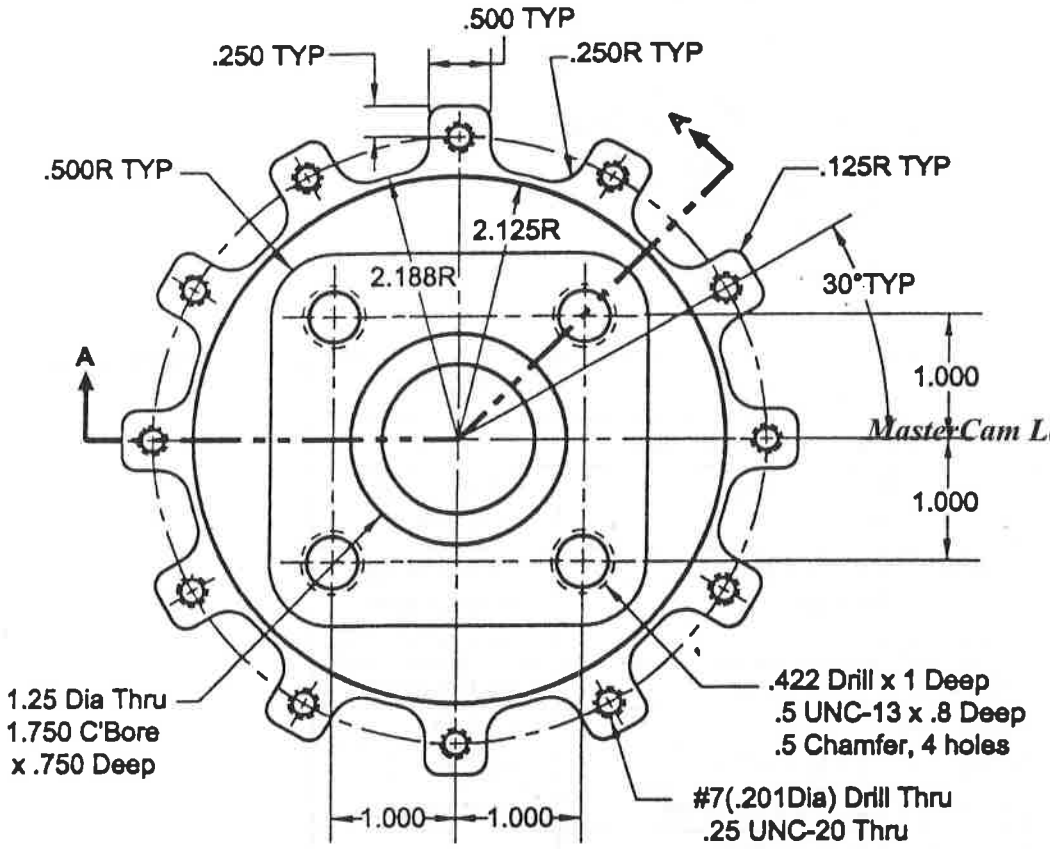
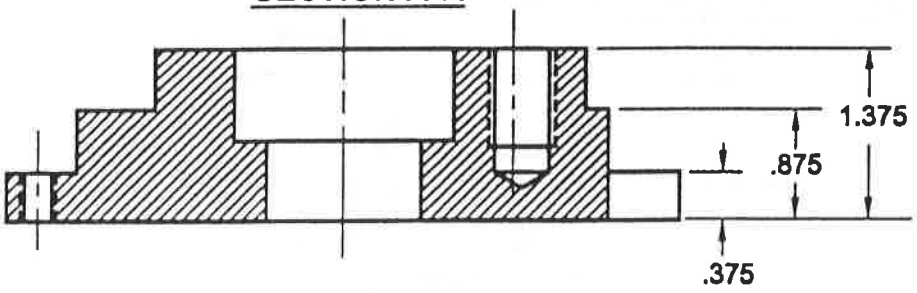
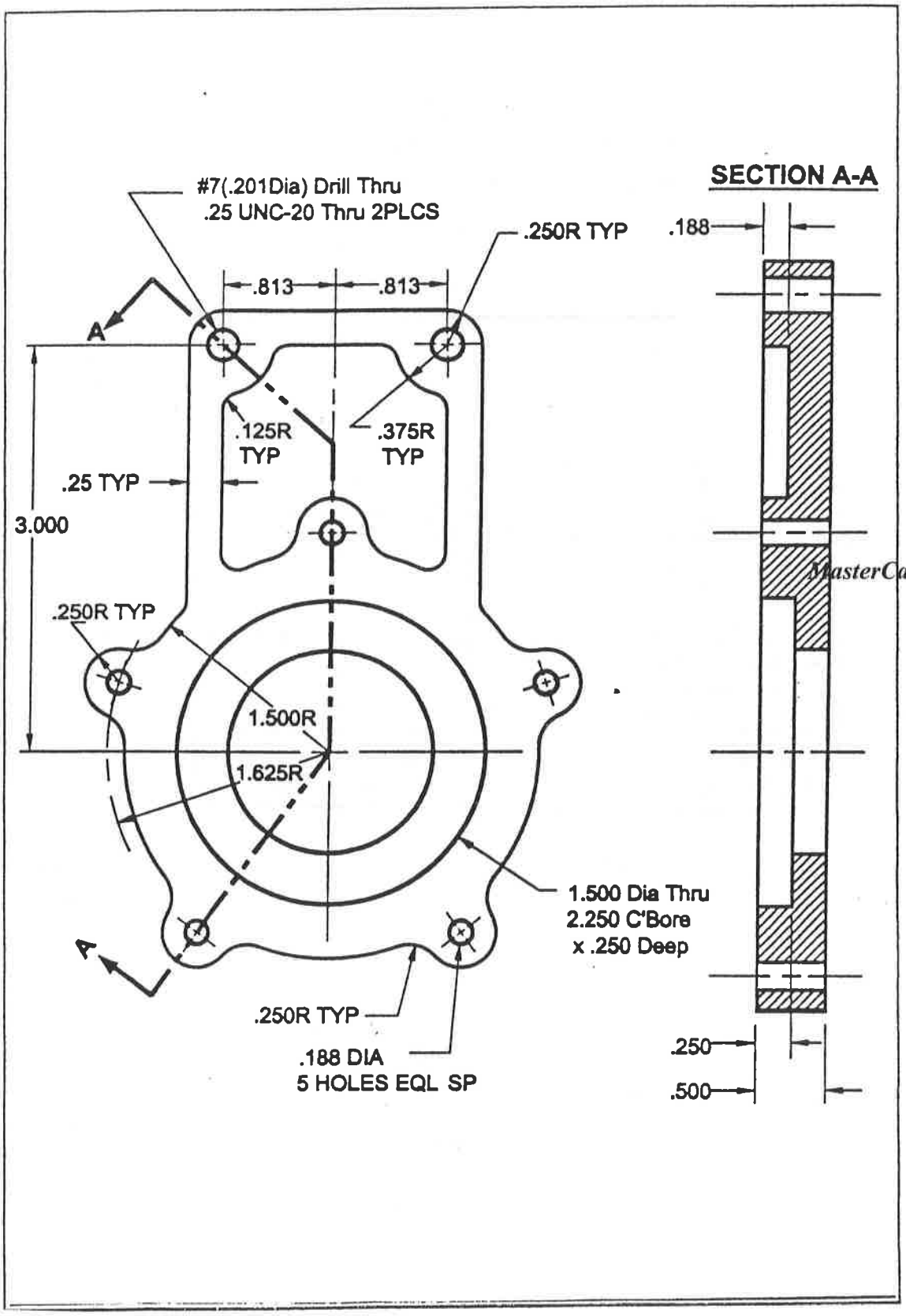
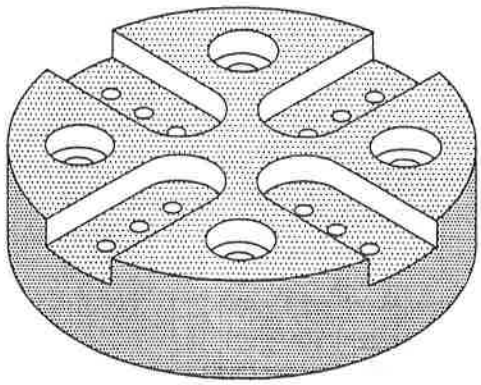


Figure 2-p34

SECTION A-A

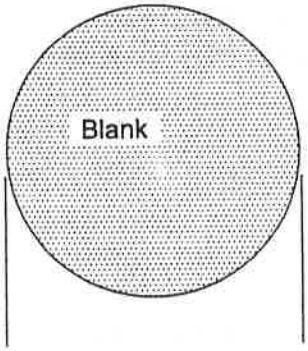


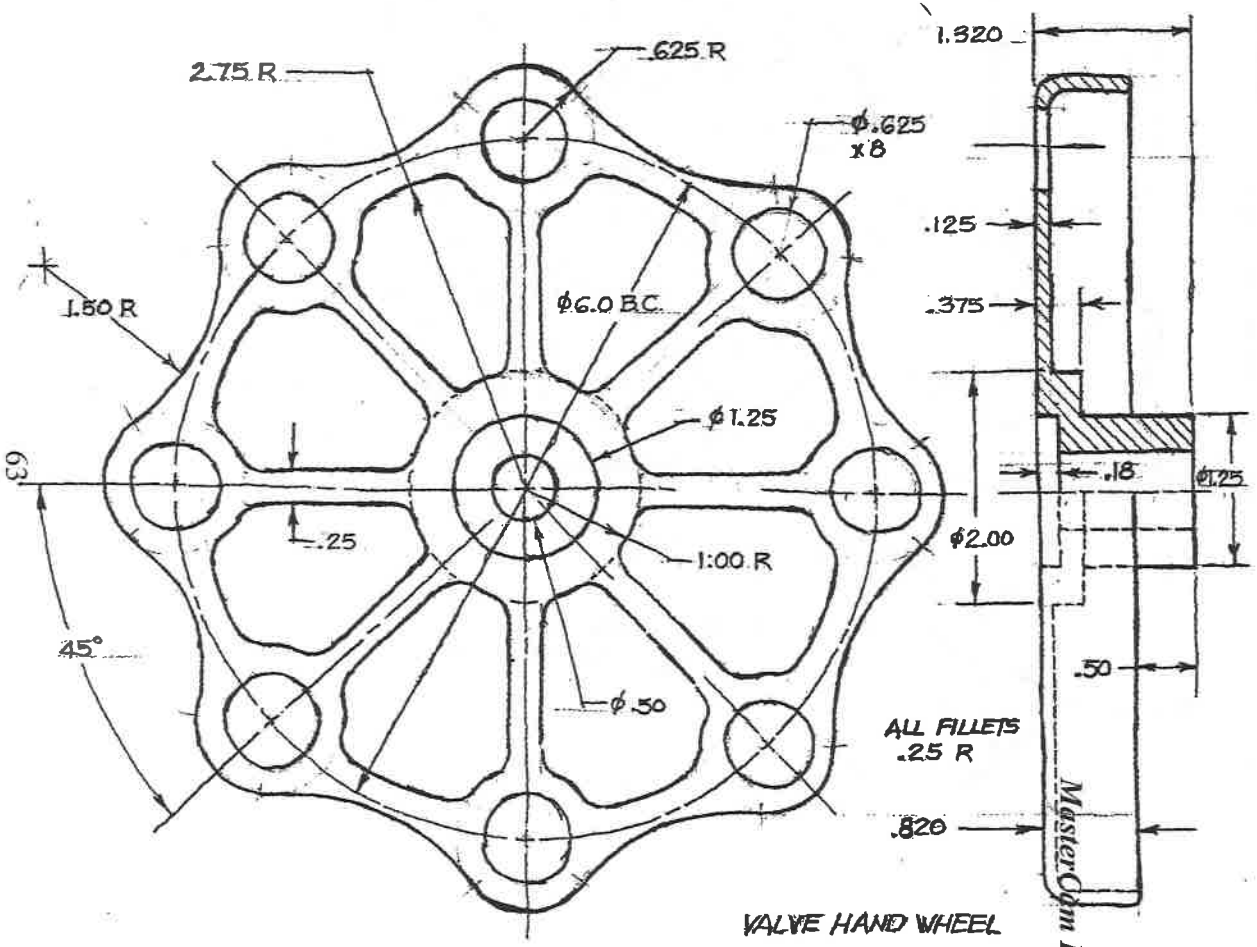

#7(.201Dia) Drill Thru
.25 UNC-20 Thru 2PLCS
.250R TYP
.813
.813
A
.125R
TYP
.375R
TYP
.25 TYP
3.000
.250R TYP
1.500R
1.625R
A
1.500 Dia Thru
2.250 C'Bore
x .250 Deep
.250R TYP
.188 DIA
5 HOLES EQL SP
SECTION A-A
.188
.250
.500

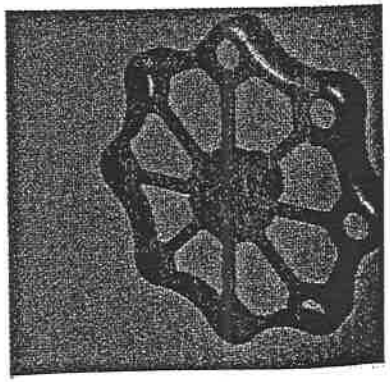


Cycle Name	Operation	Tooling
Clamp part from outside in a three jaw chuck		
CBORE-B-_3/8	Center Drill x .166 Deep	1/8 Center Drill
	Peck Drill Through	3/16 Drill
	Bore x .1875 Deep	1/4 End Mill
POC x .1875	Rough and finish Pocket. Leave .01 for finish cut.	1/4 End Mill
TAP-B_1/8	Center Drill x .1 Deep	#0(.031Dia) Center Drill
	Peck Drill x .325 Deep	#38(.102Dia) Drill
	Tap x .225 Deep	.125 UNC-40 Tap

Blank: Part blank is a 2.5in x .625in cylinder







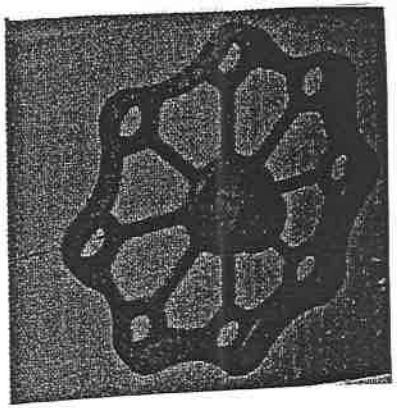


Figure 16.88

Valve handwheel

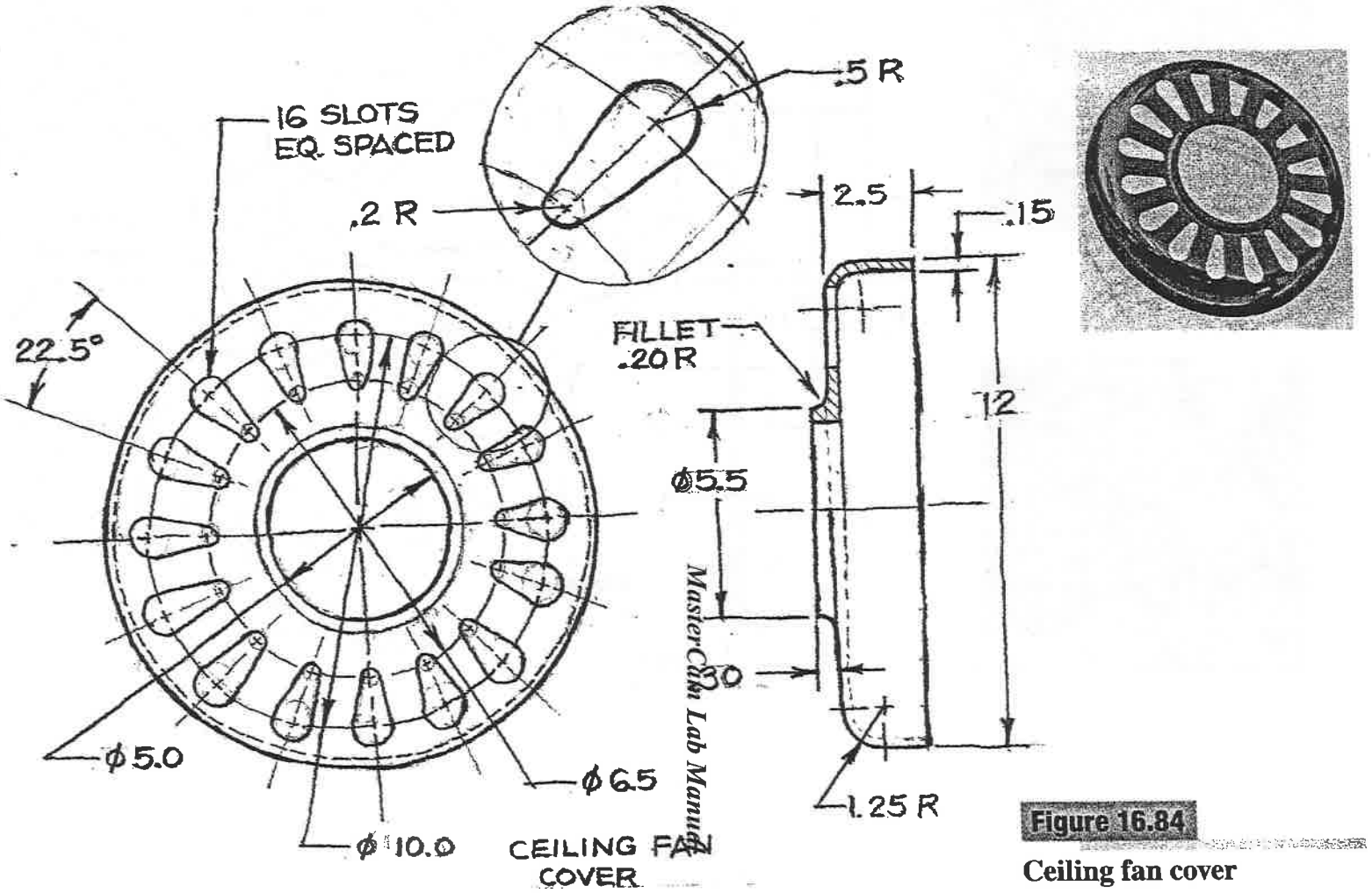


Figure 16.84
Ceiling fan cover

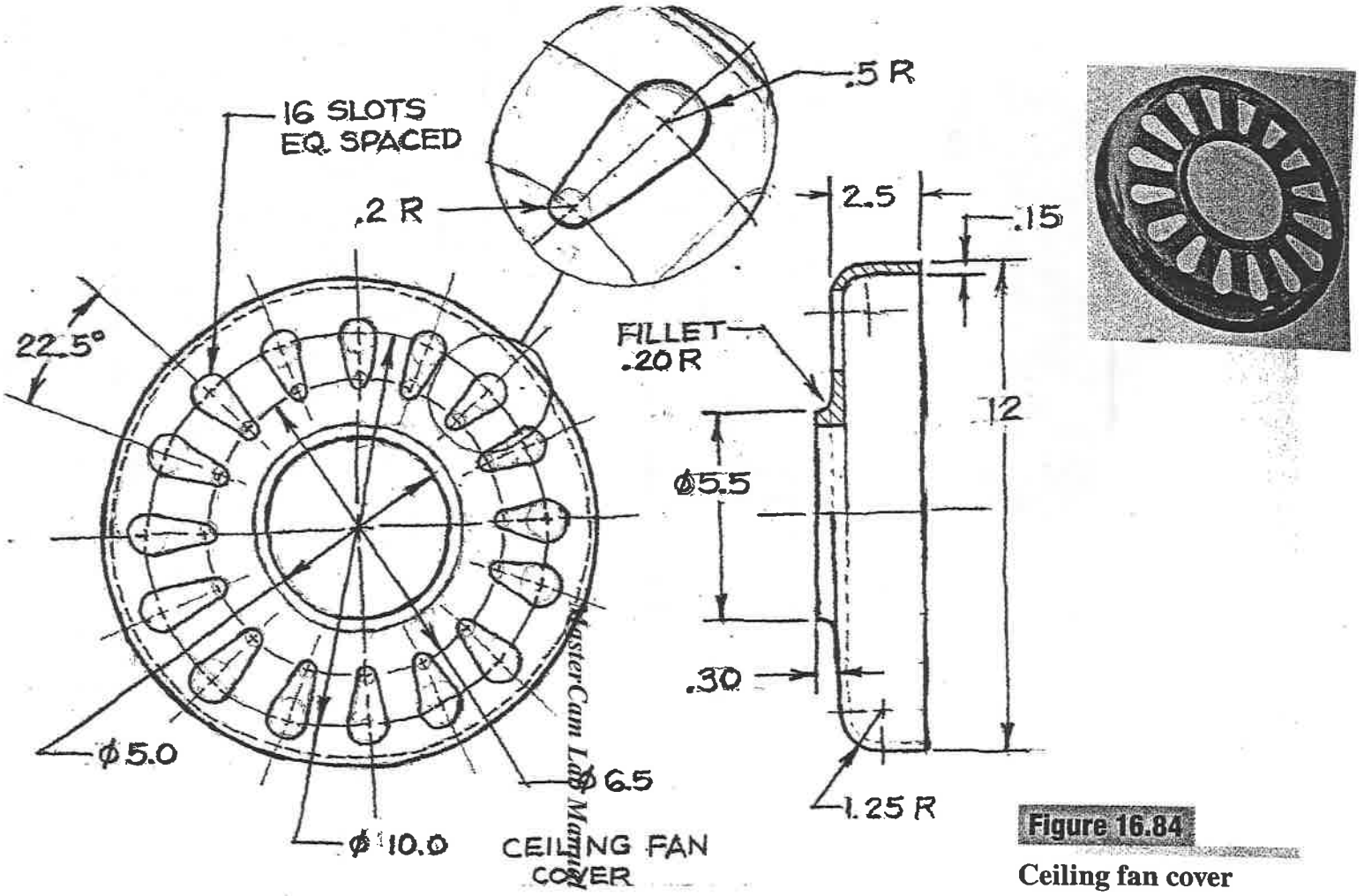
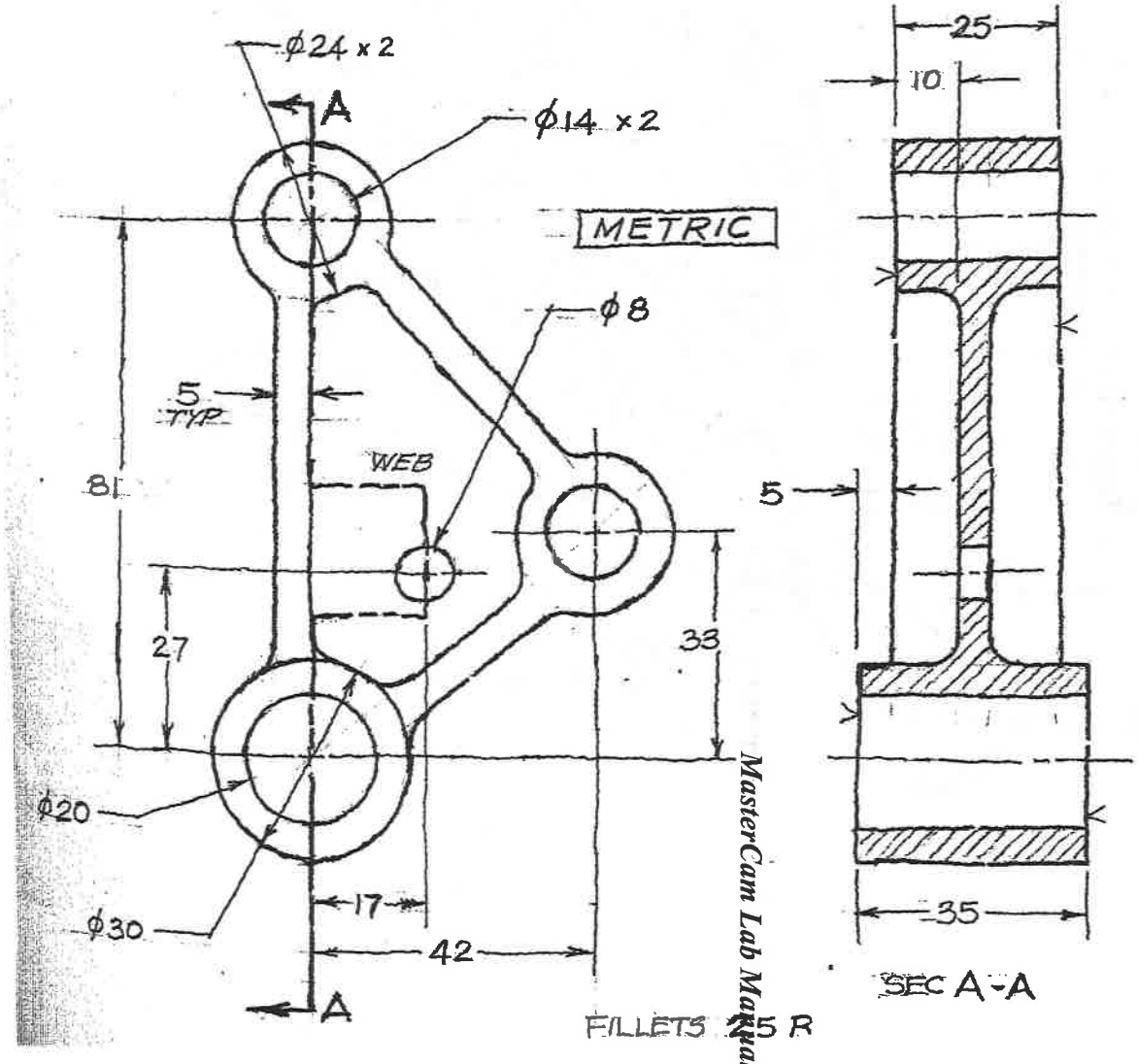


Figure 16.84

Ceiling fan cover



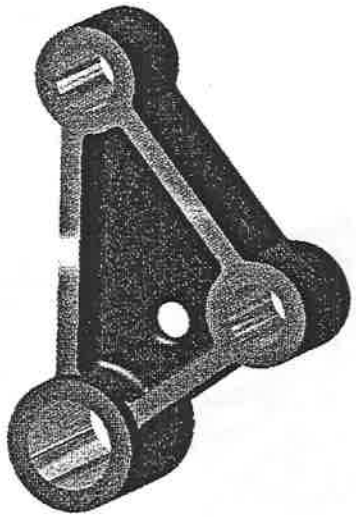
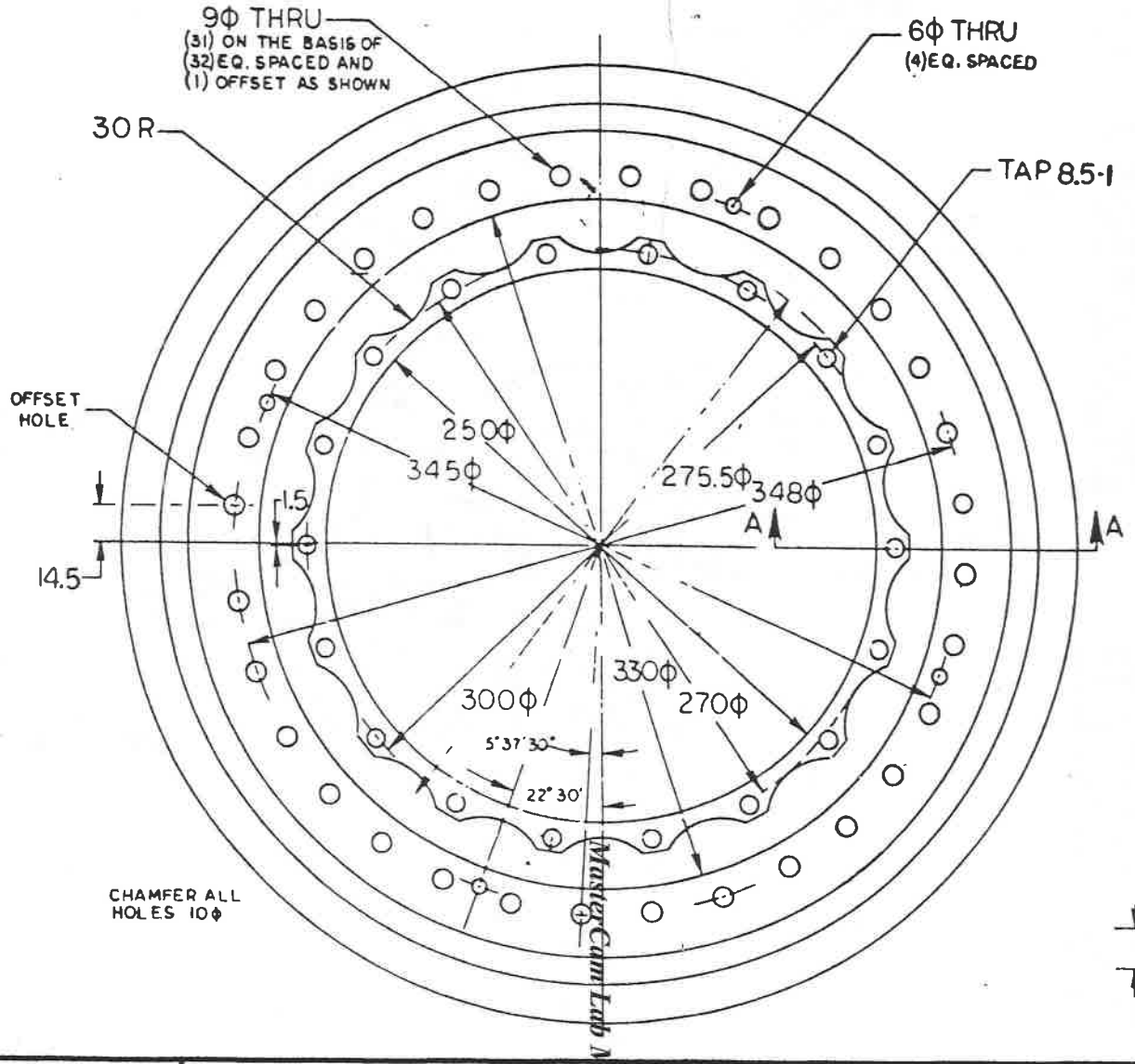
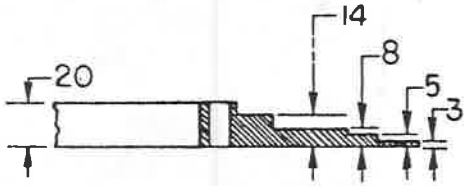


Figure 16.90

Shift link





VIEW A-A

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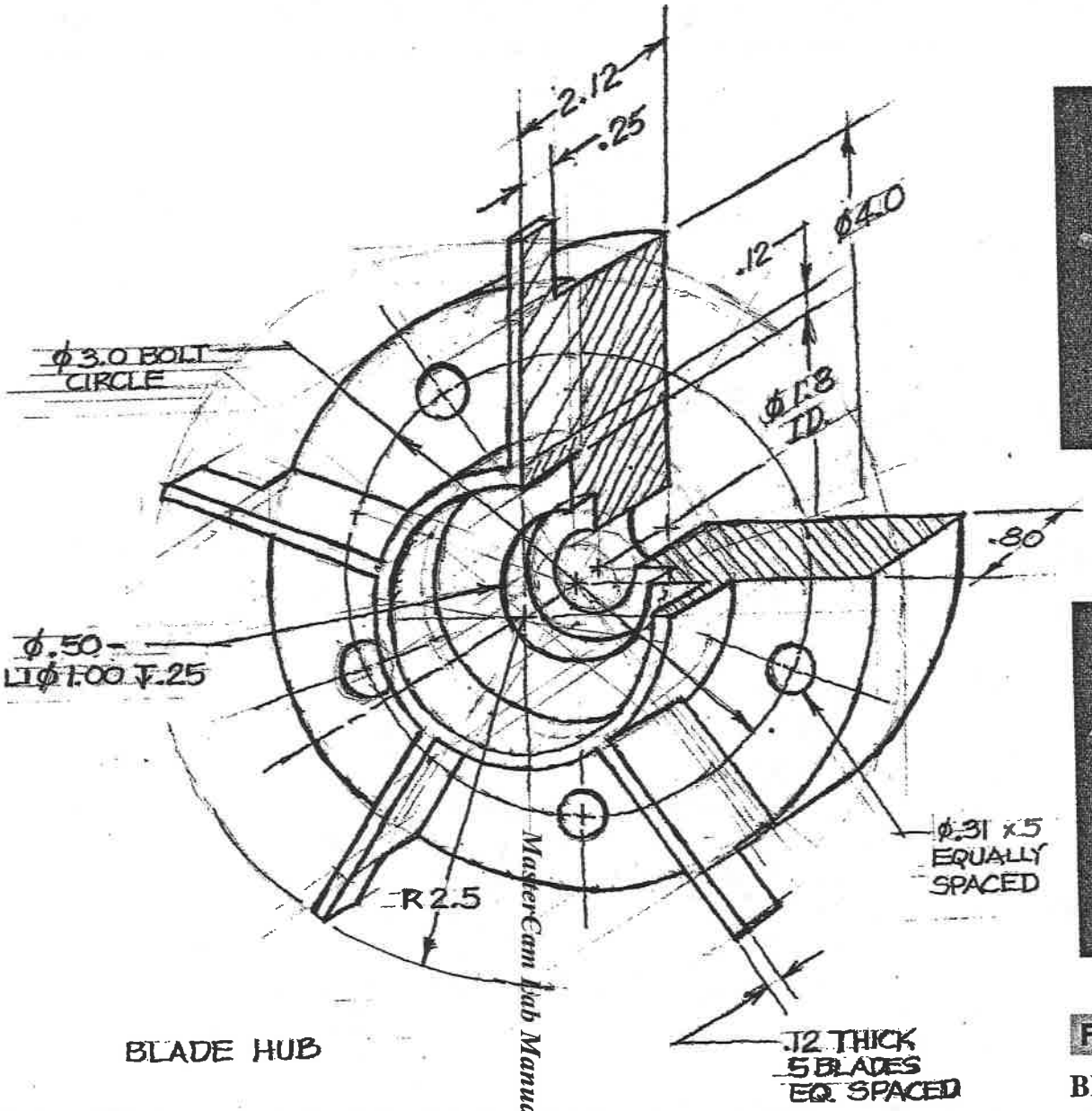
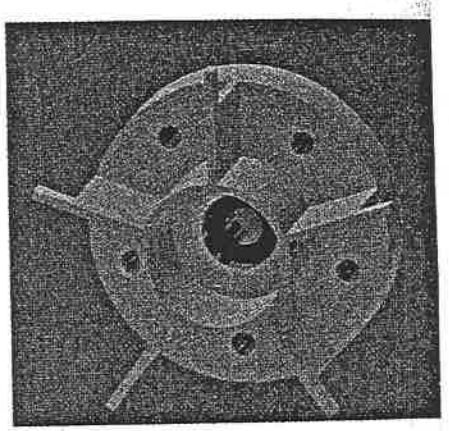




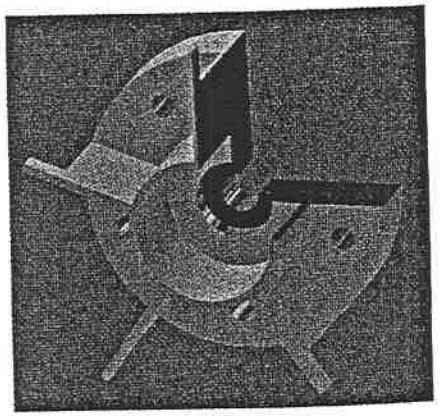
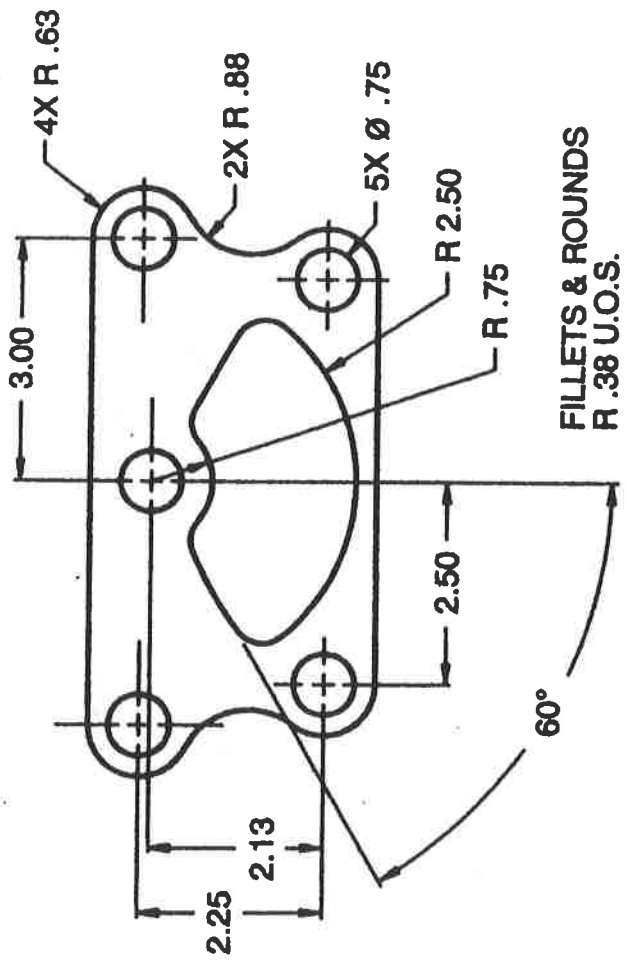


Figure 16.85

Blade hub



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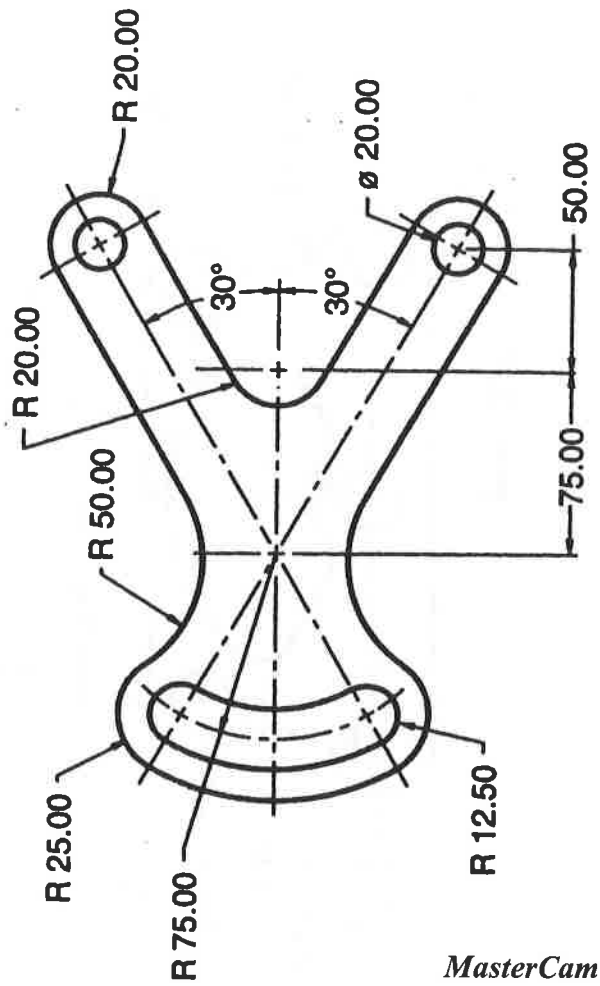

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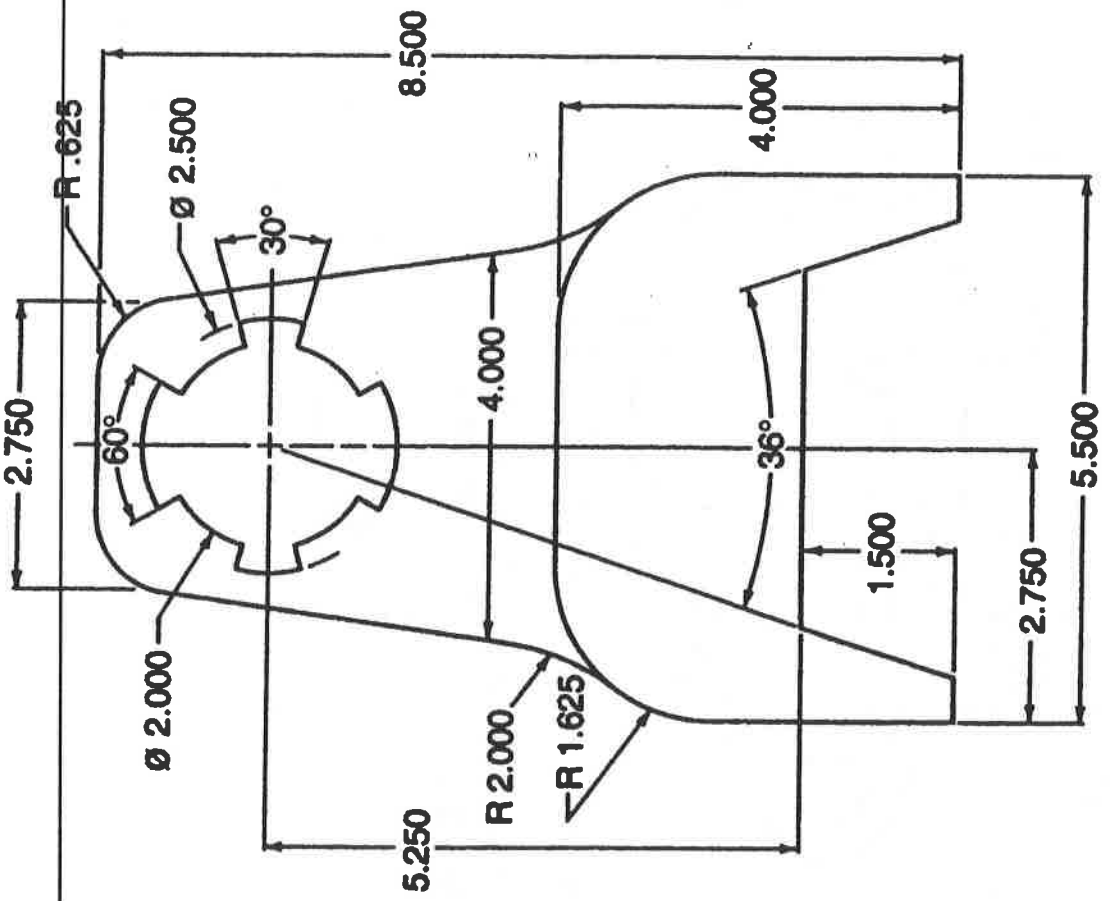

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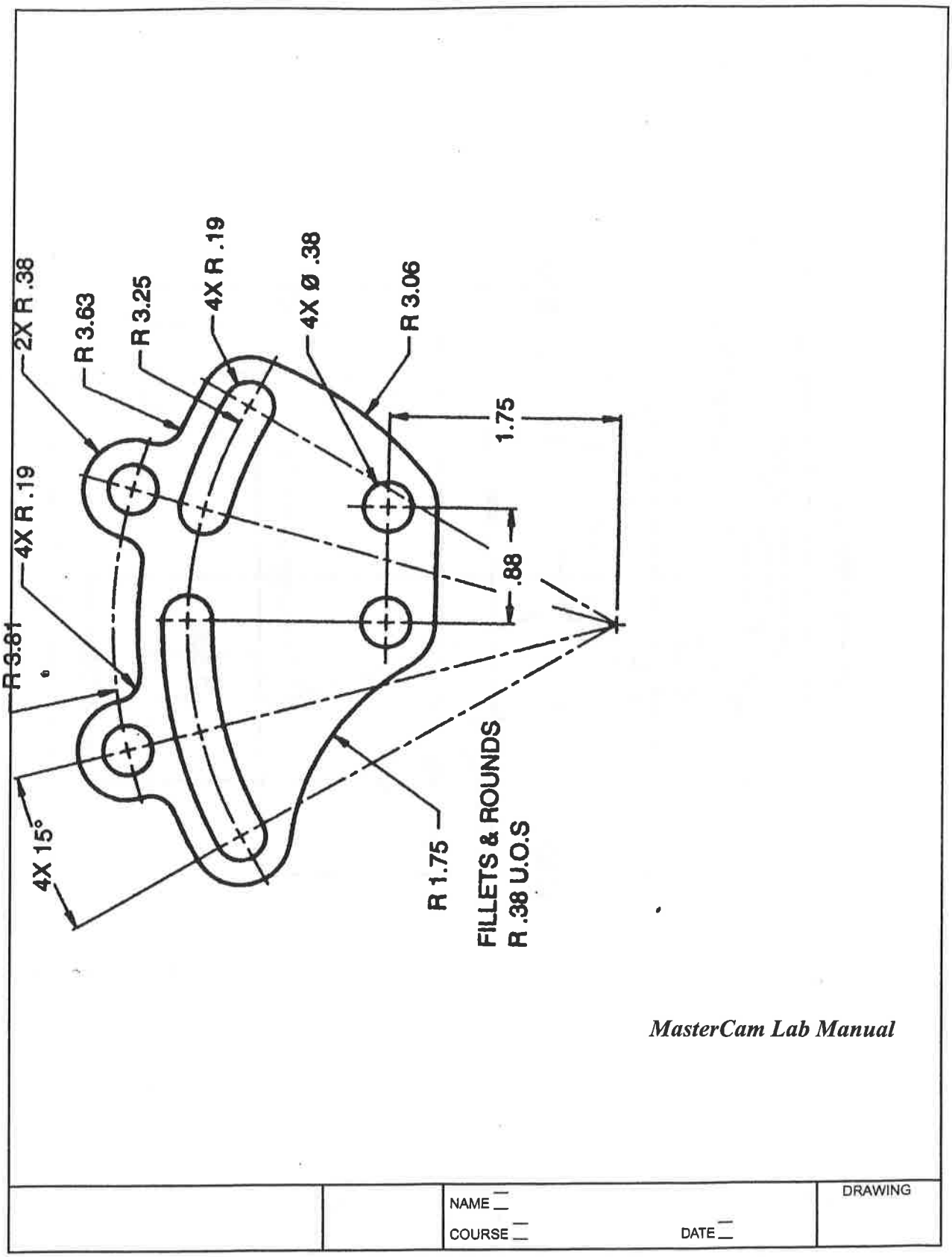

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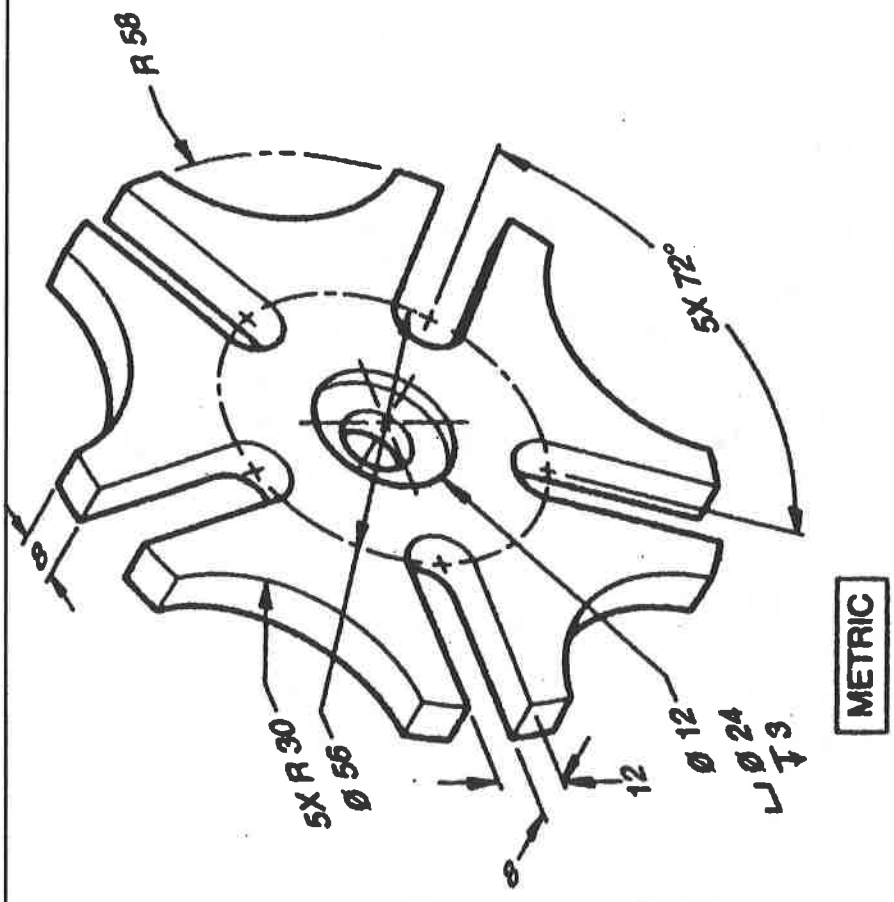

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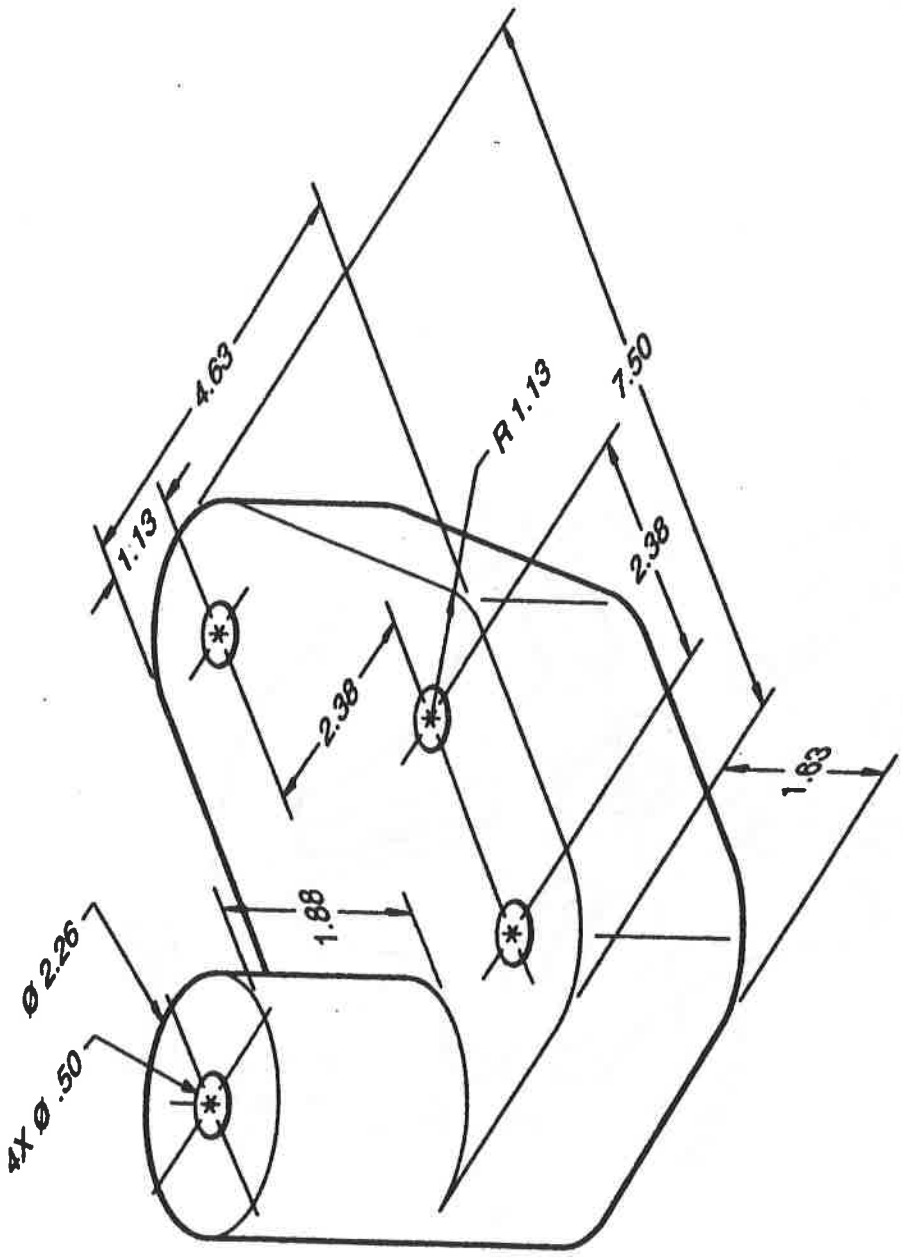

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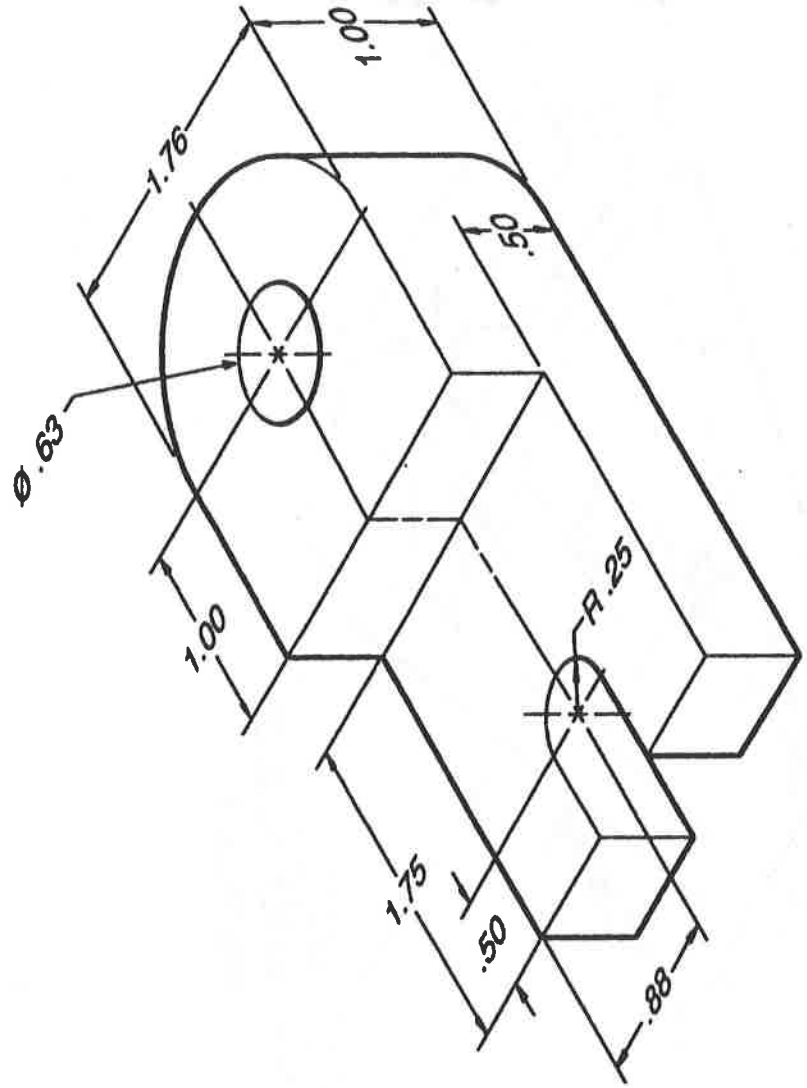

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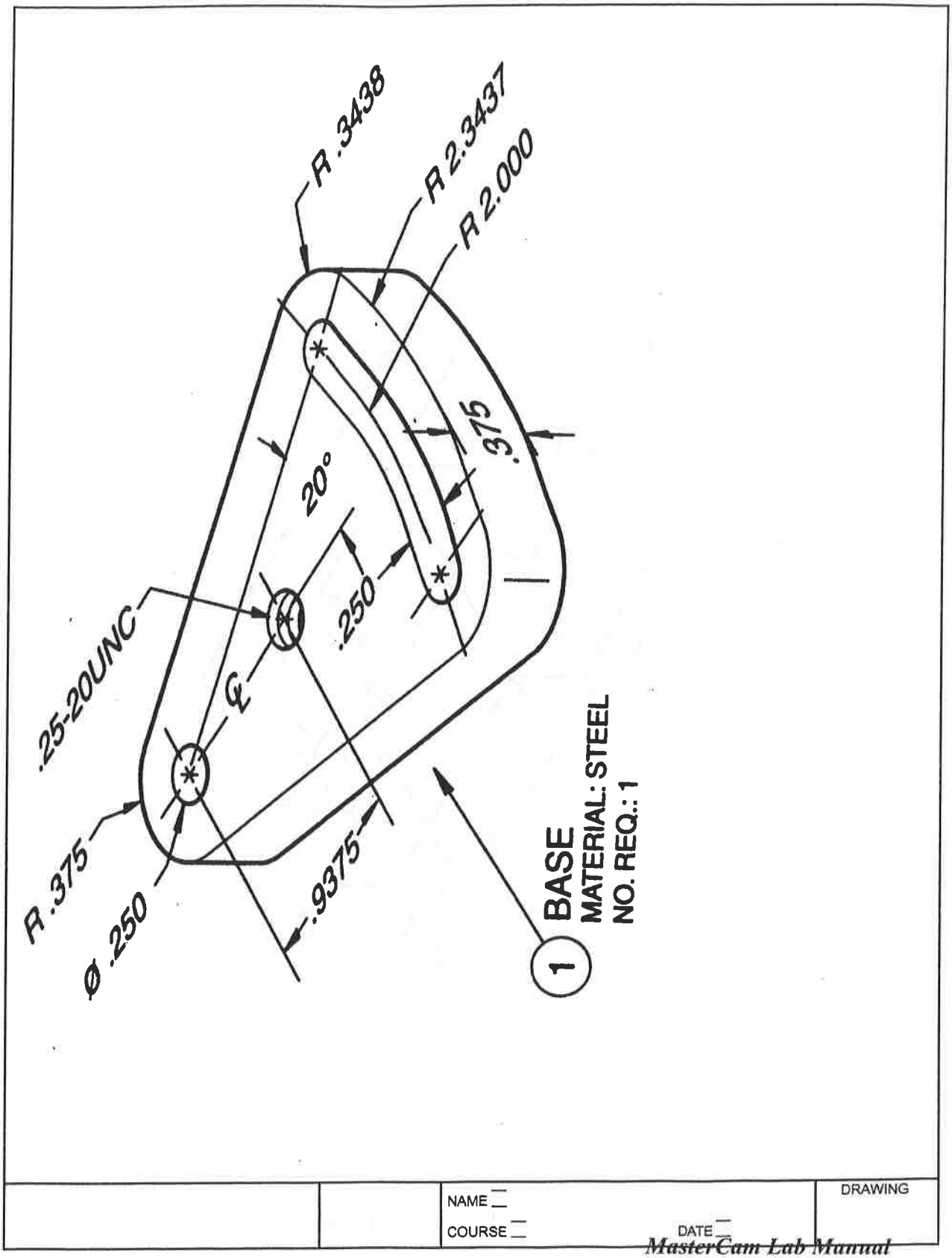
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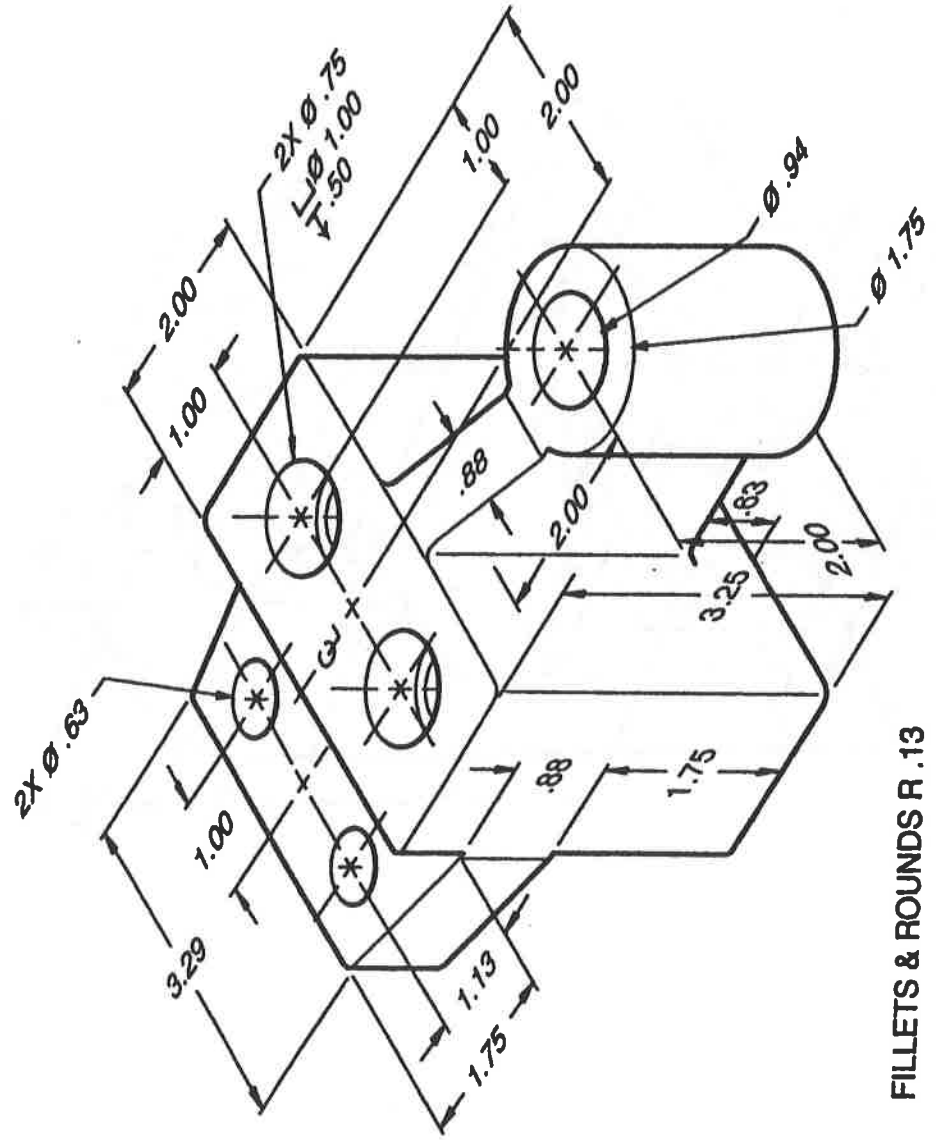

FILLETS & ROUNDS R .13

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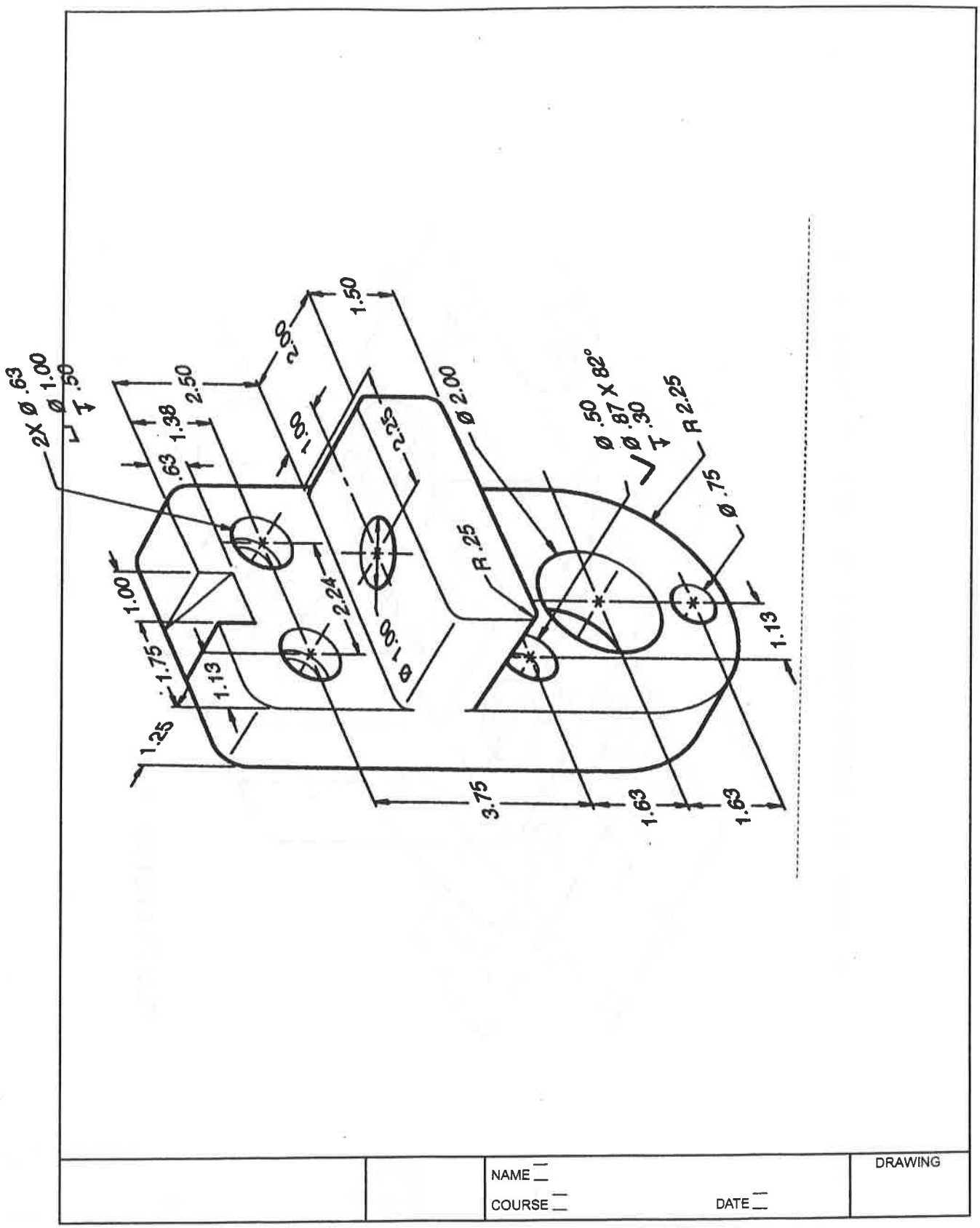
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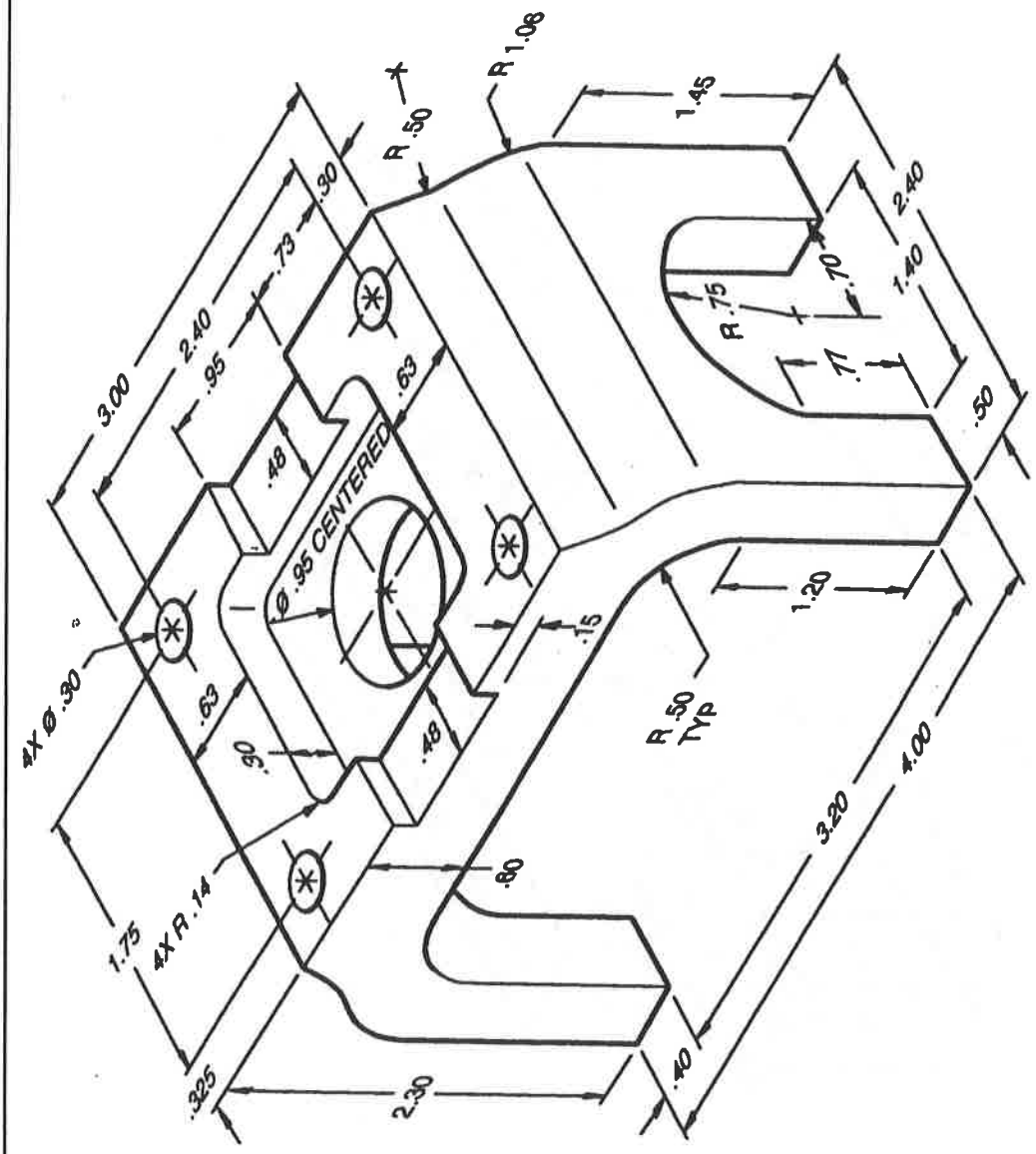

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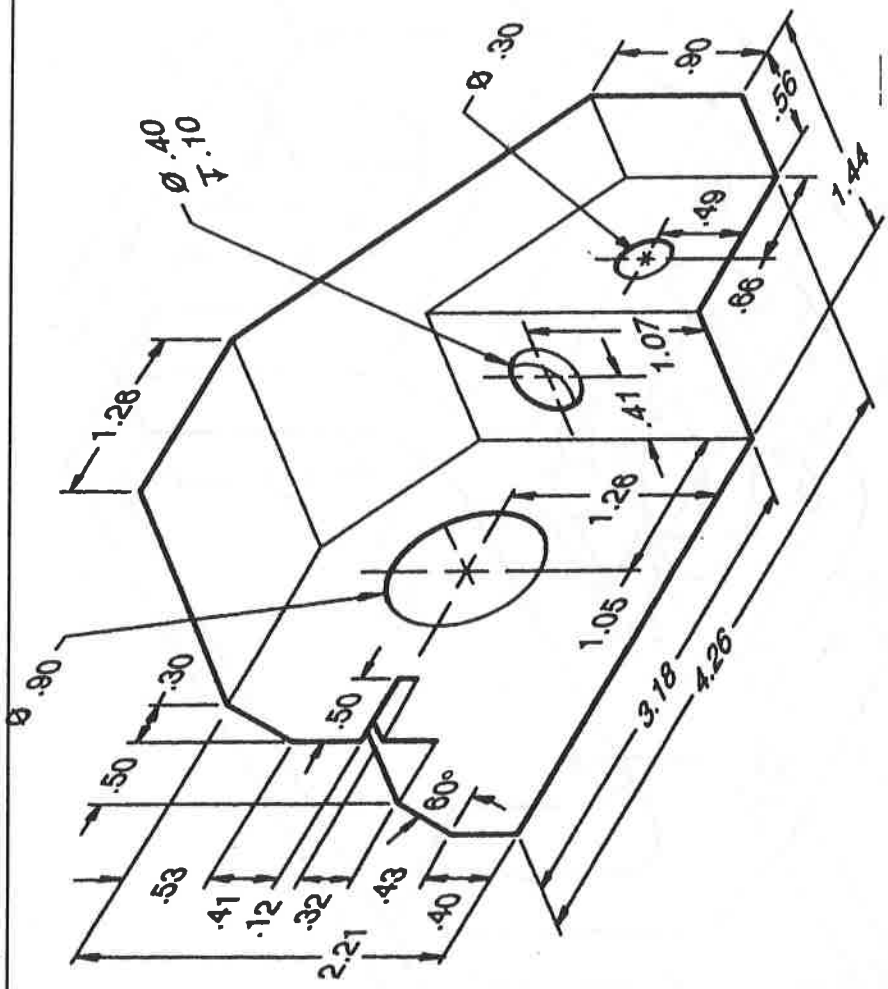

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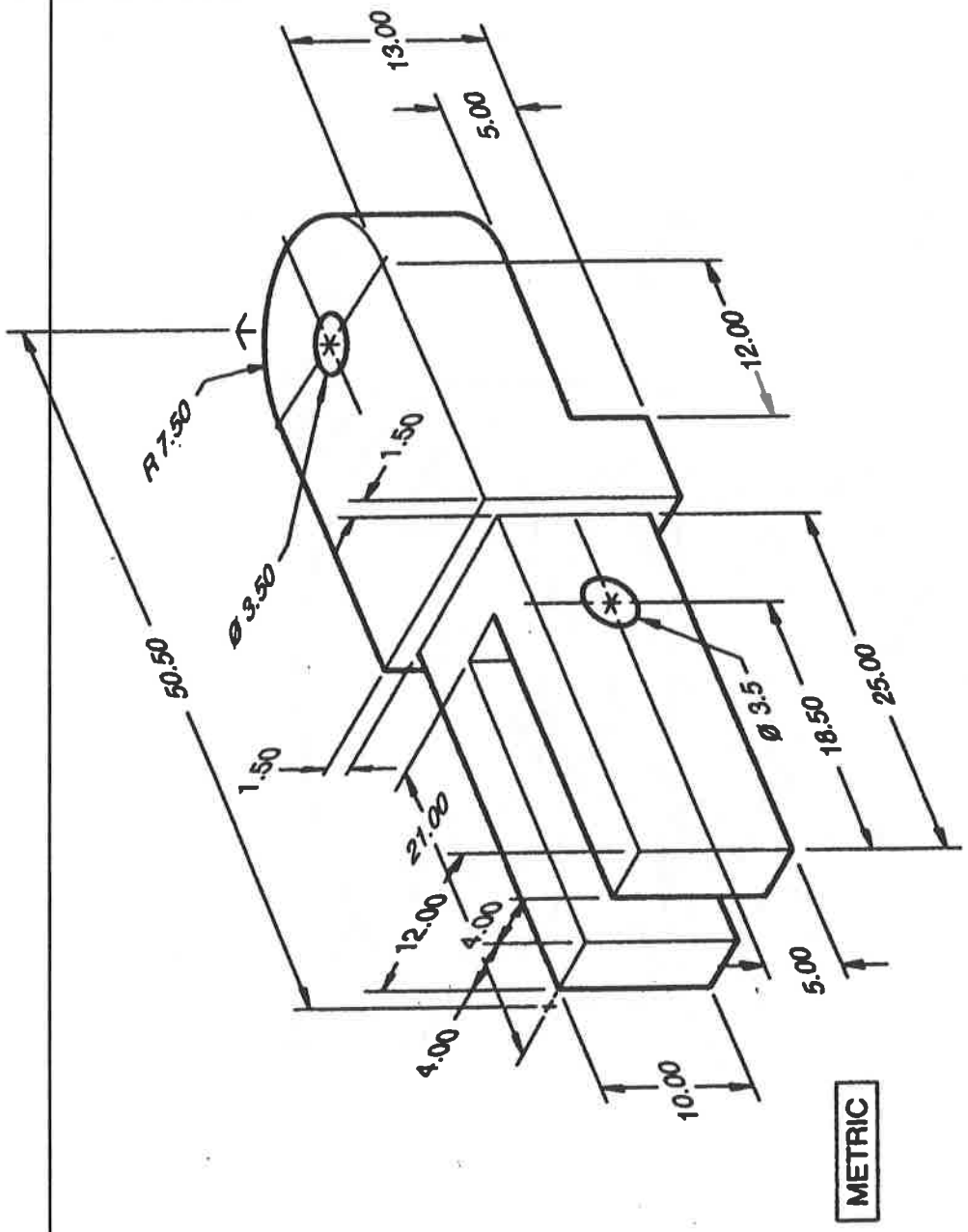

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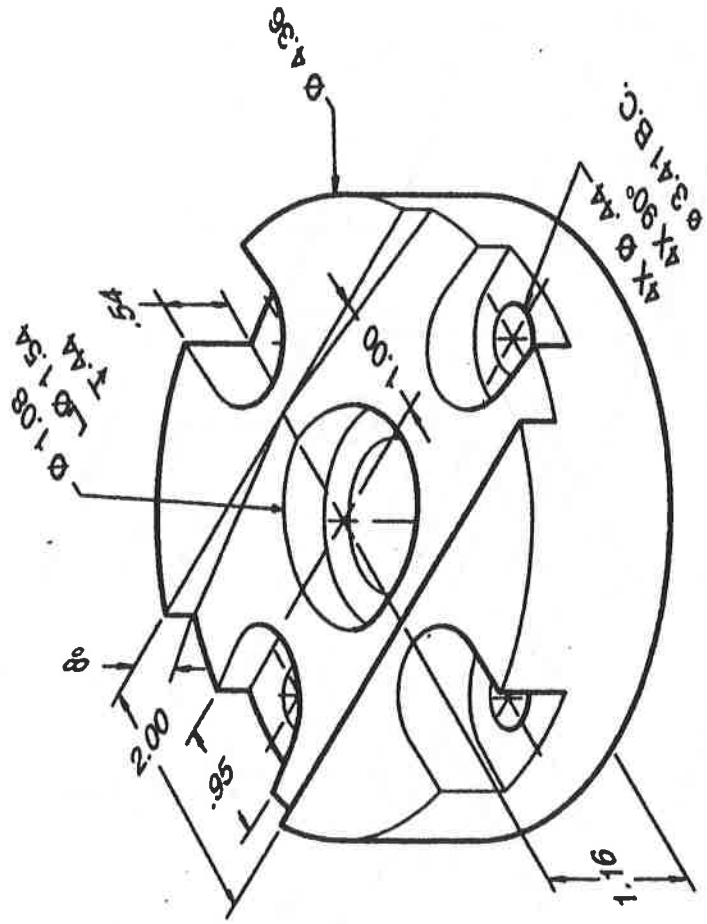

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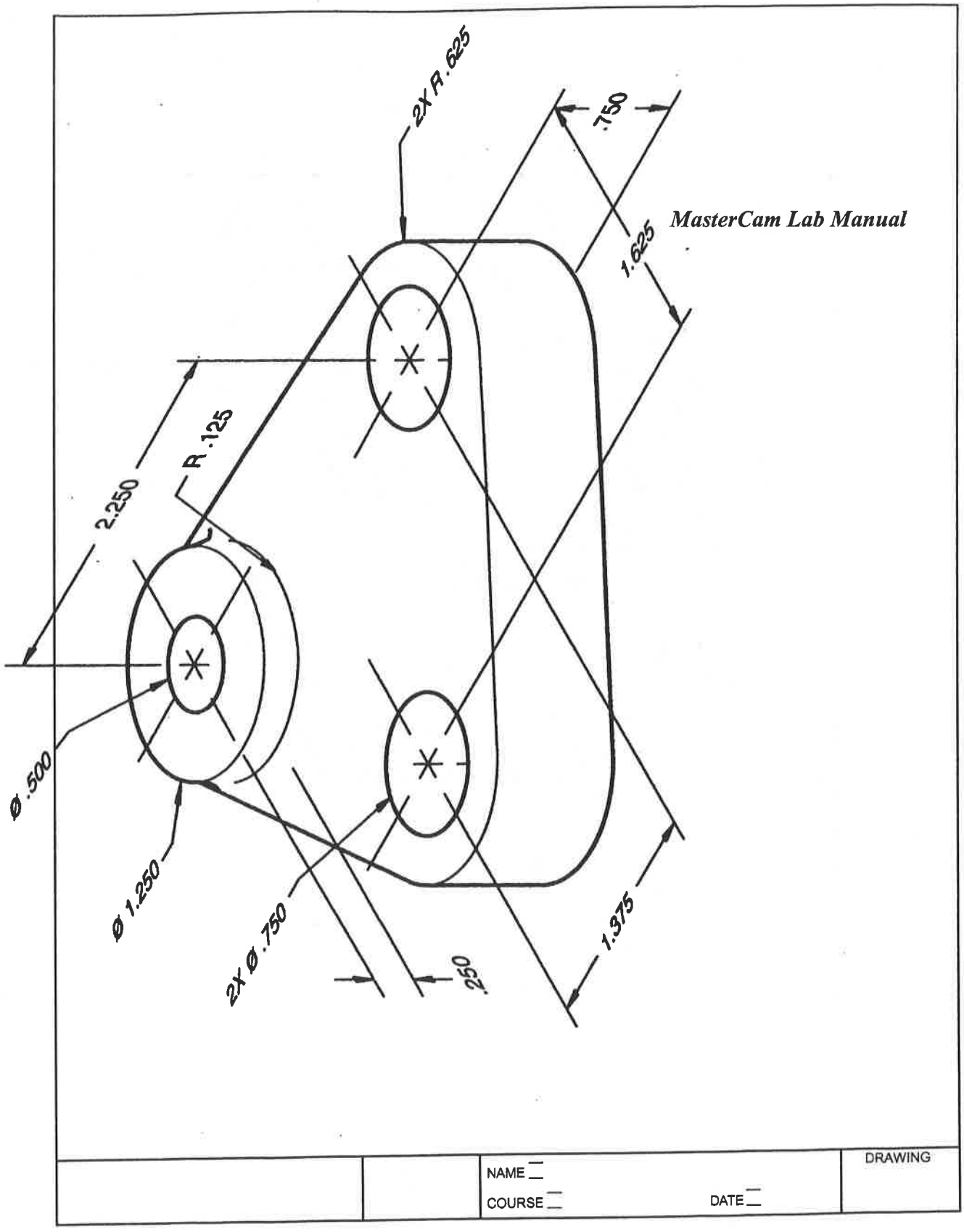
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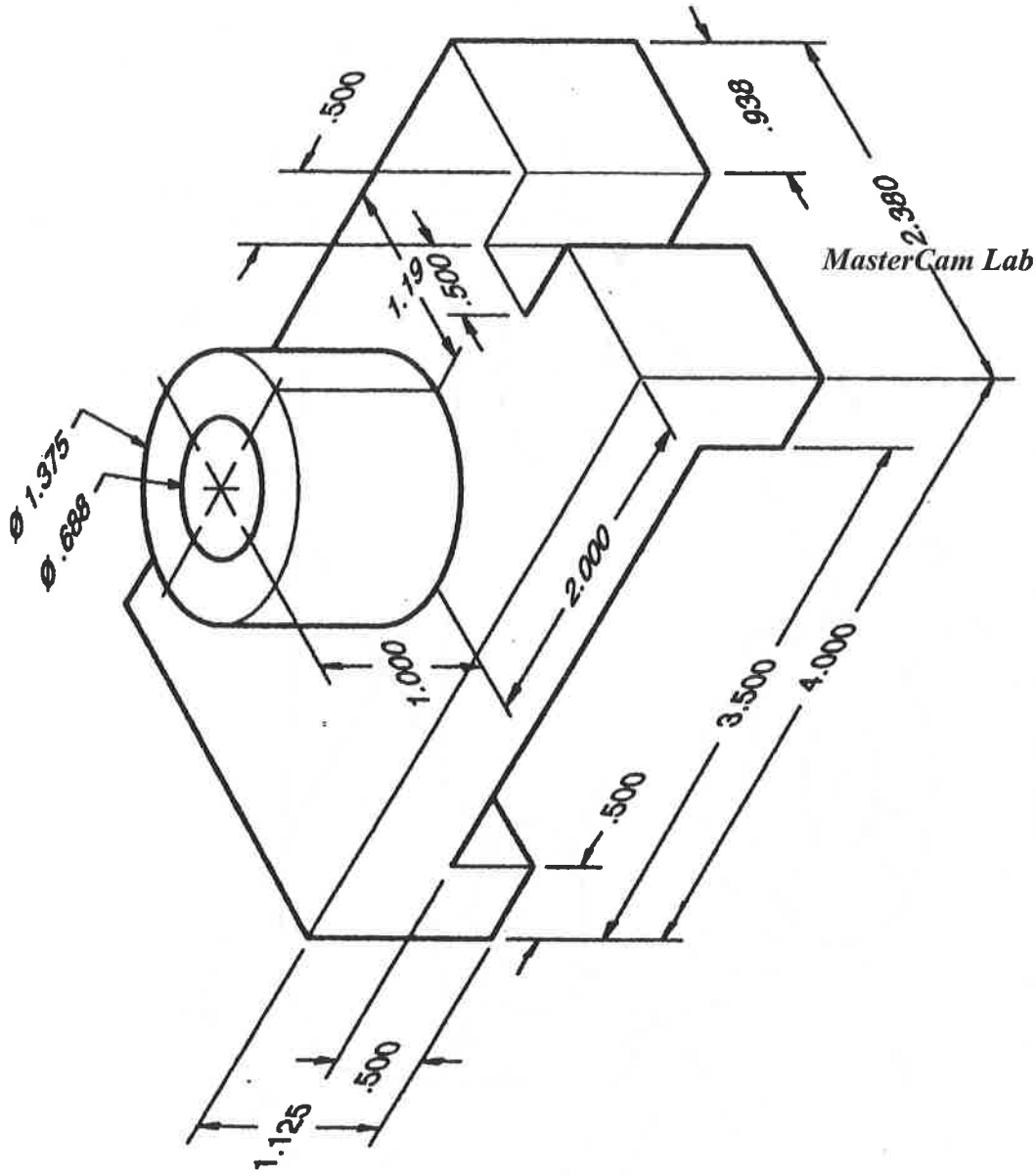

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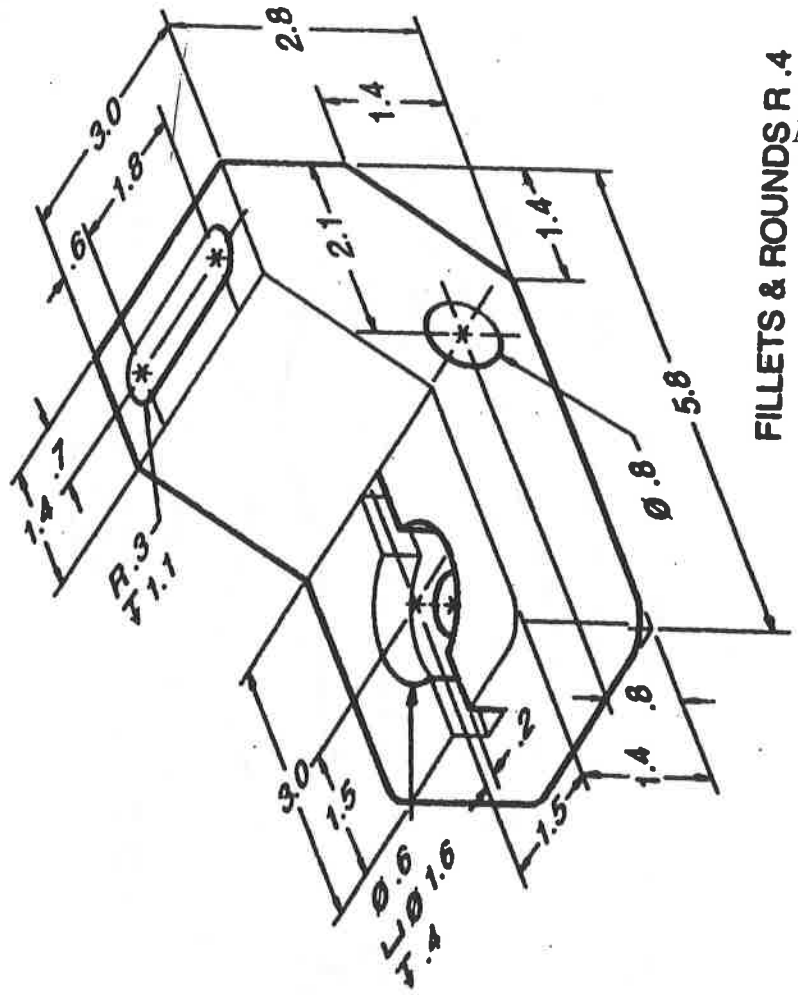

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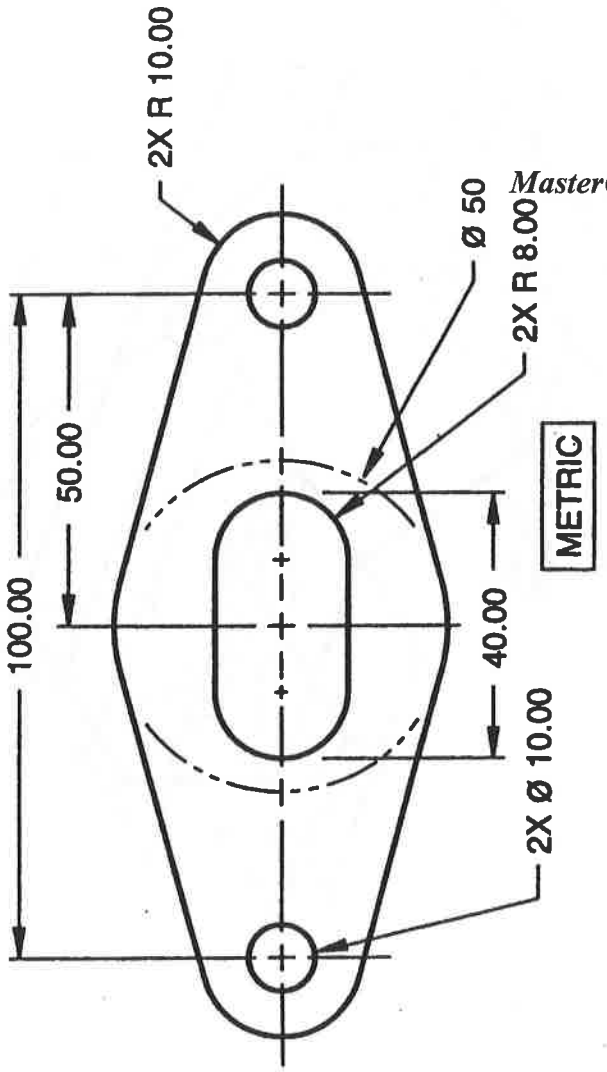

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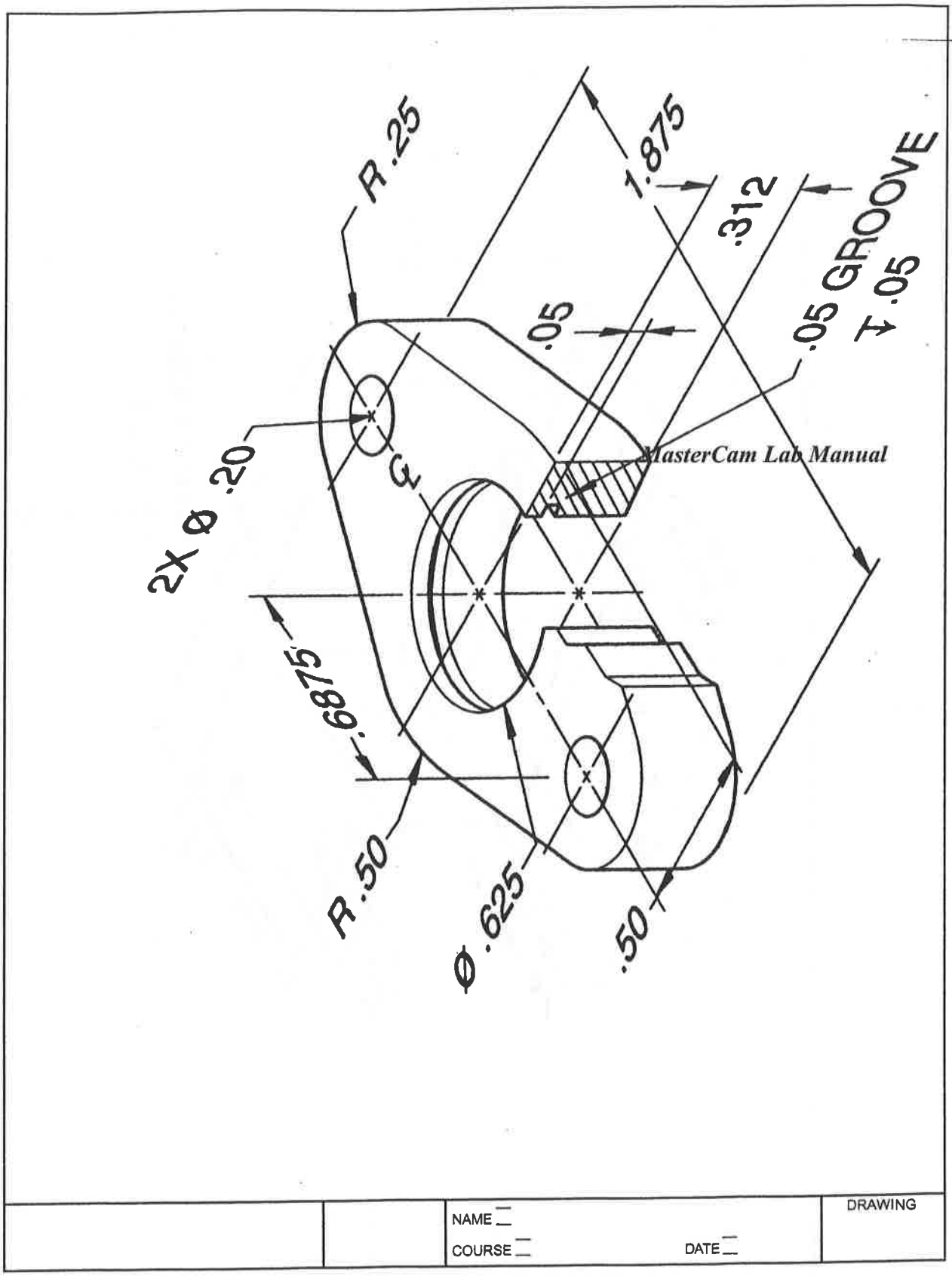
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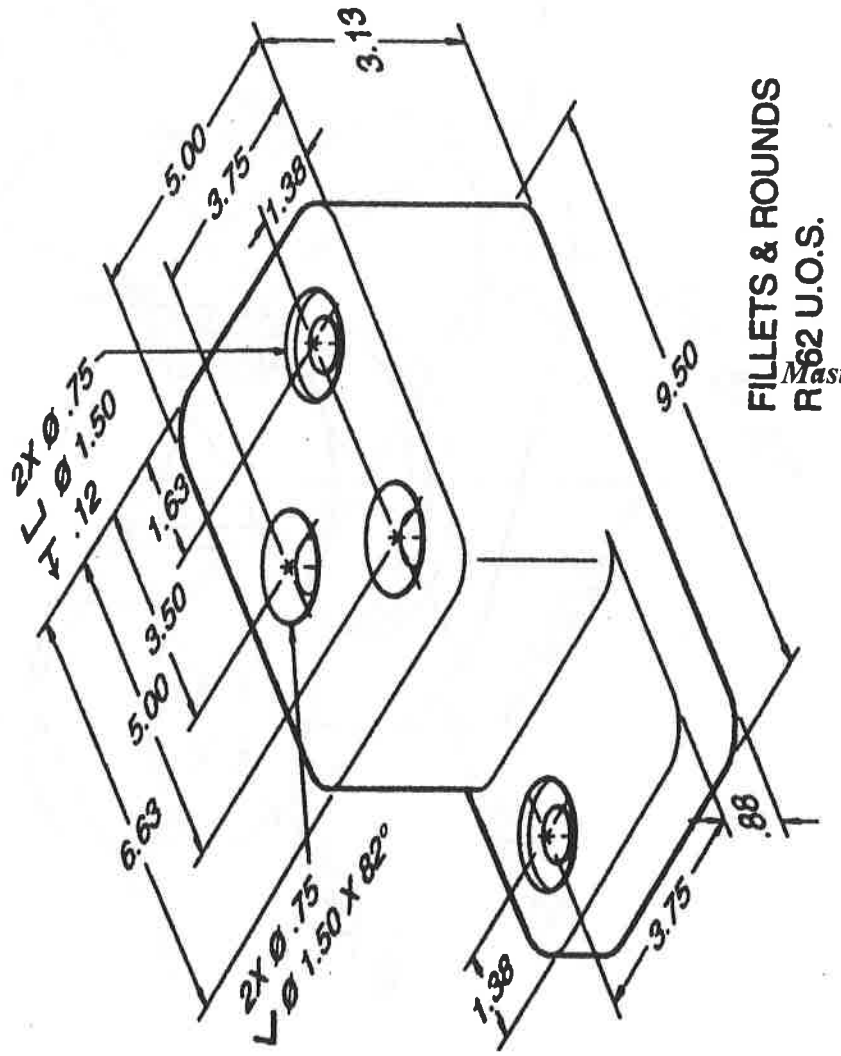

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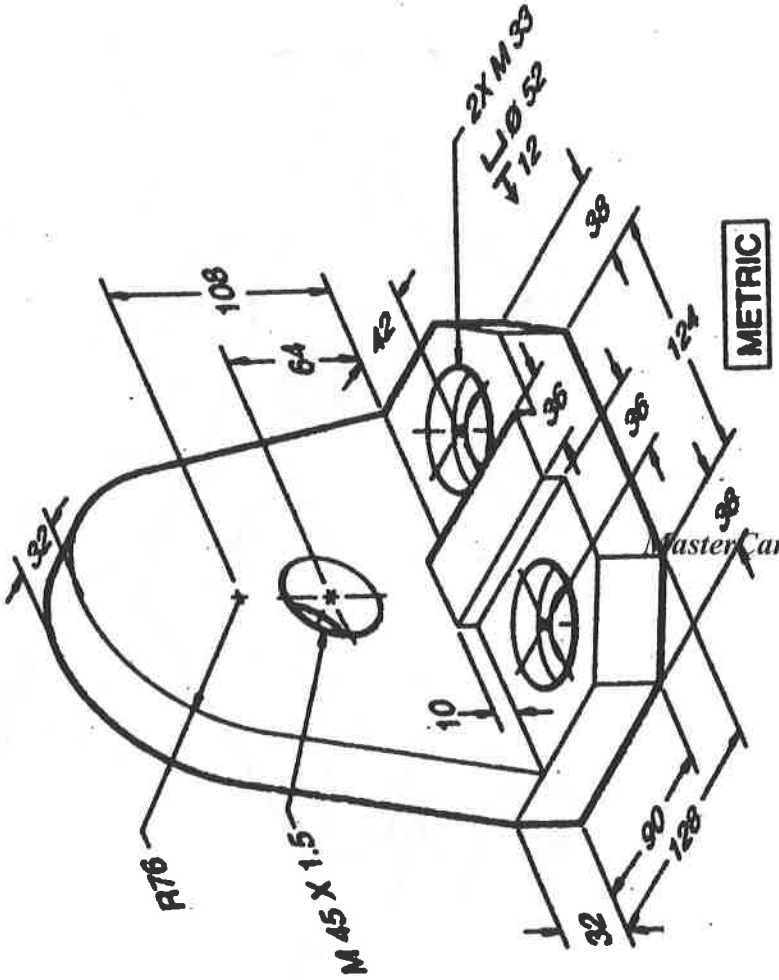

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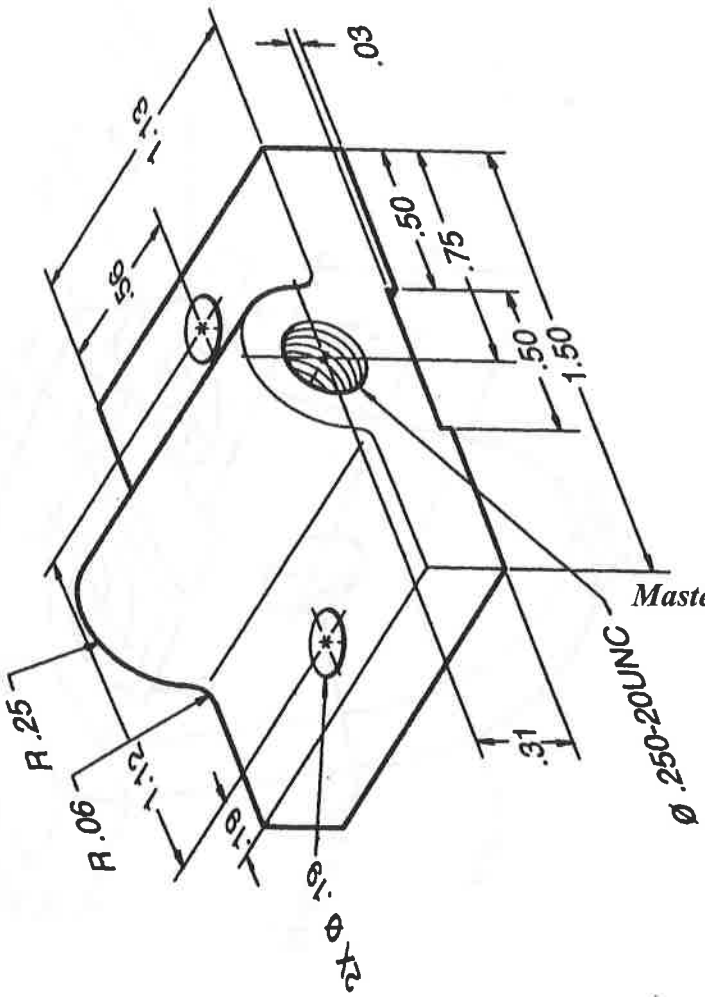

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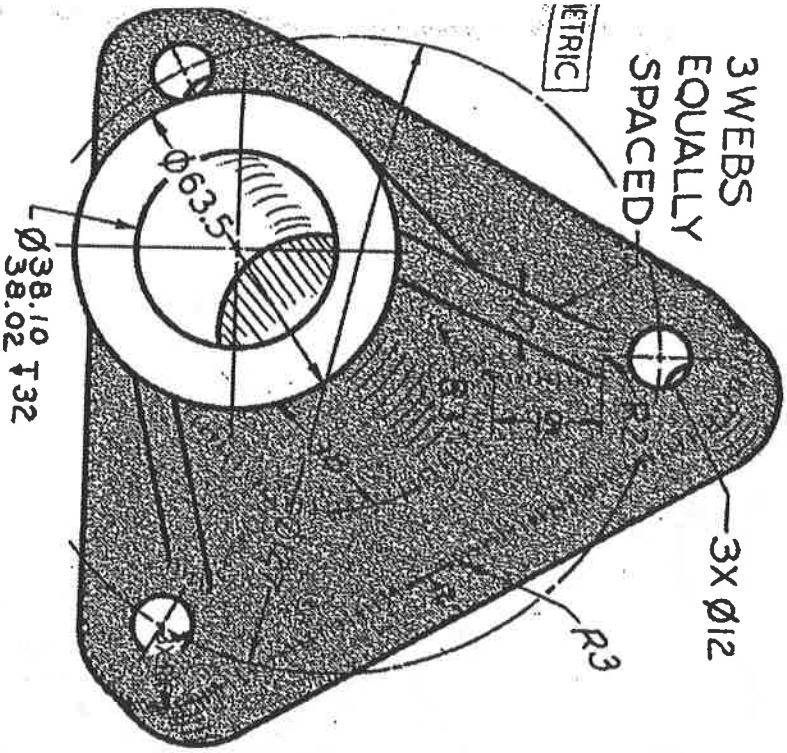

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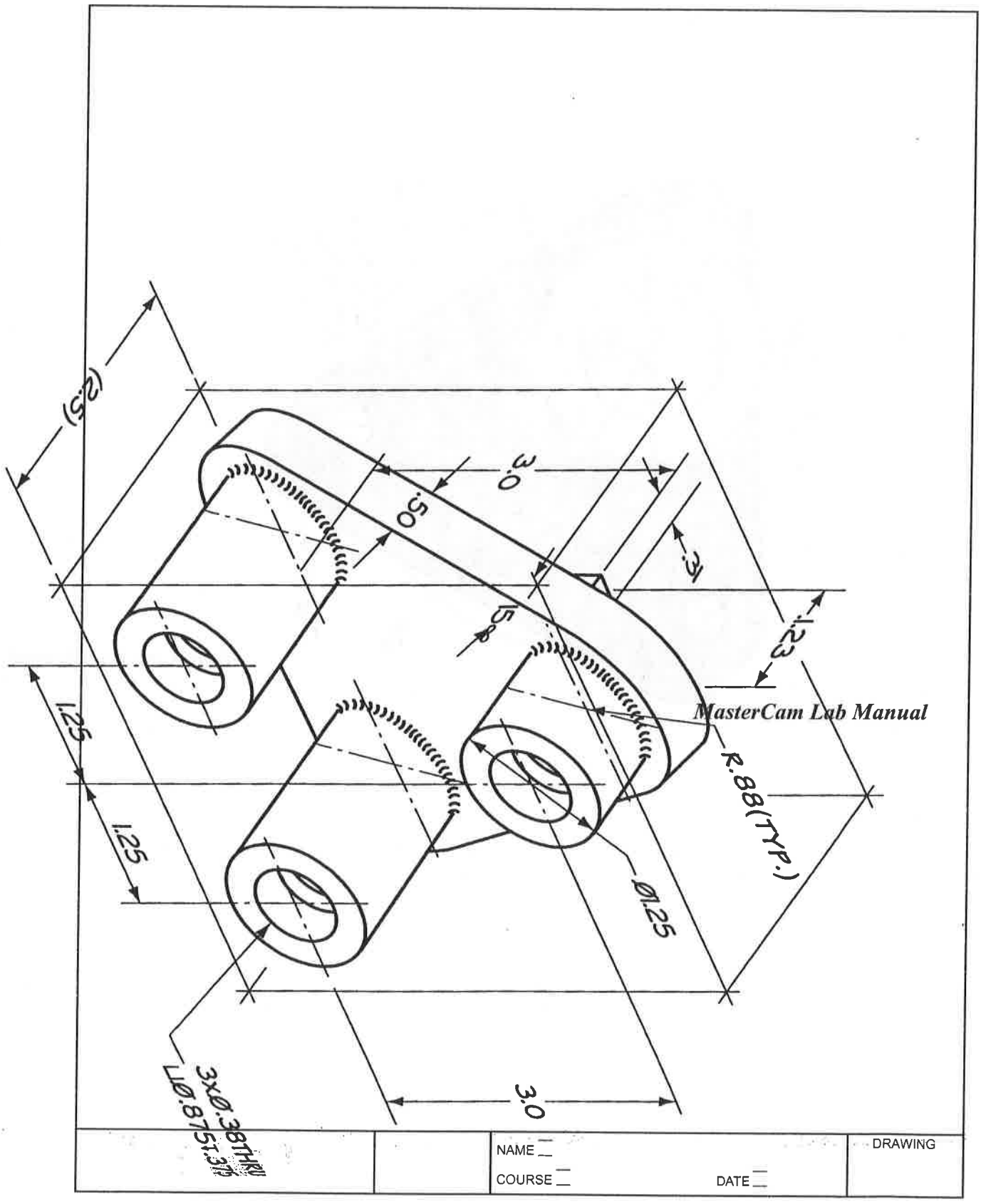
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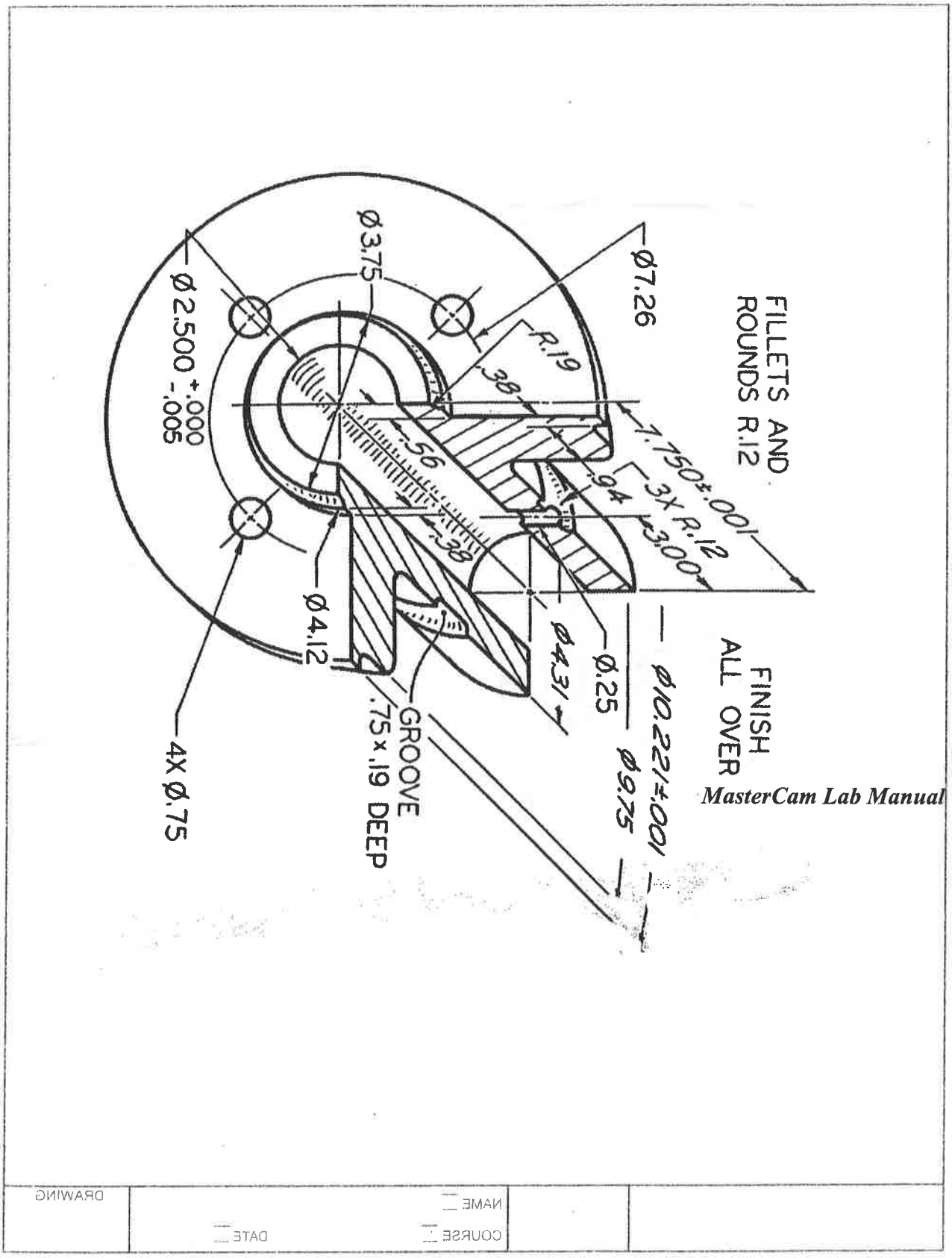
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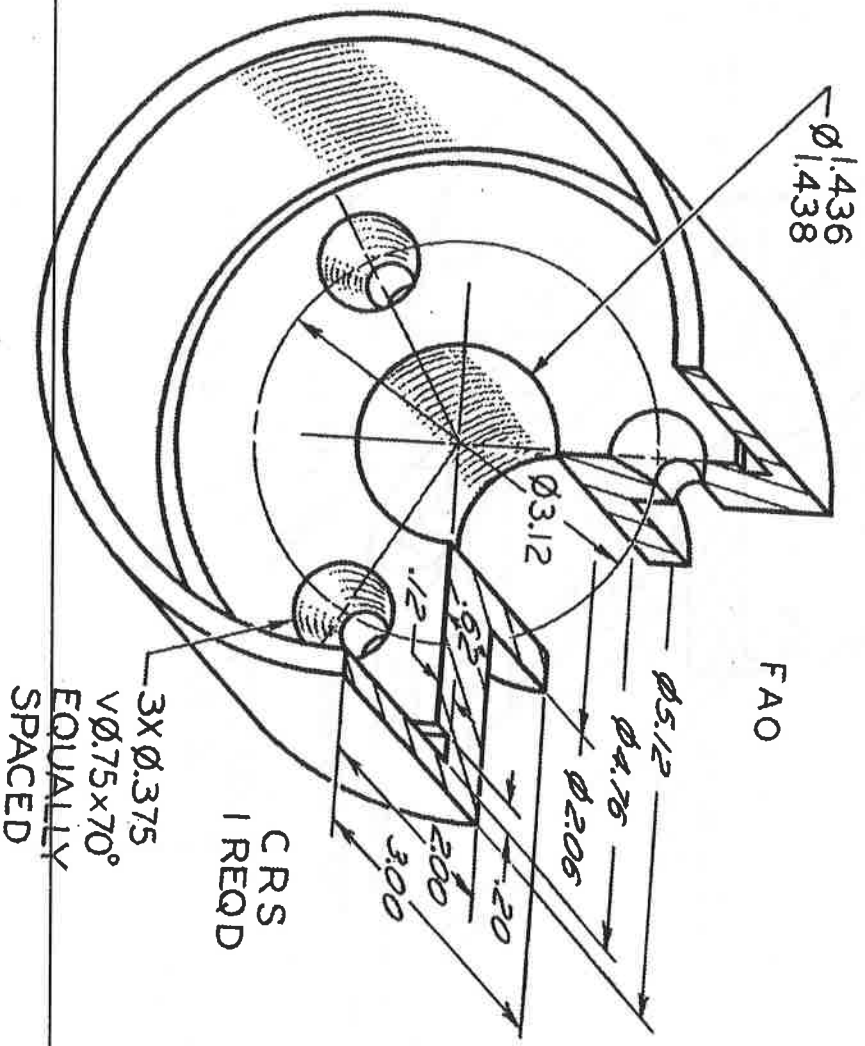

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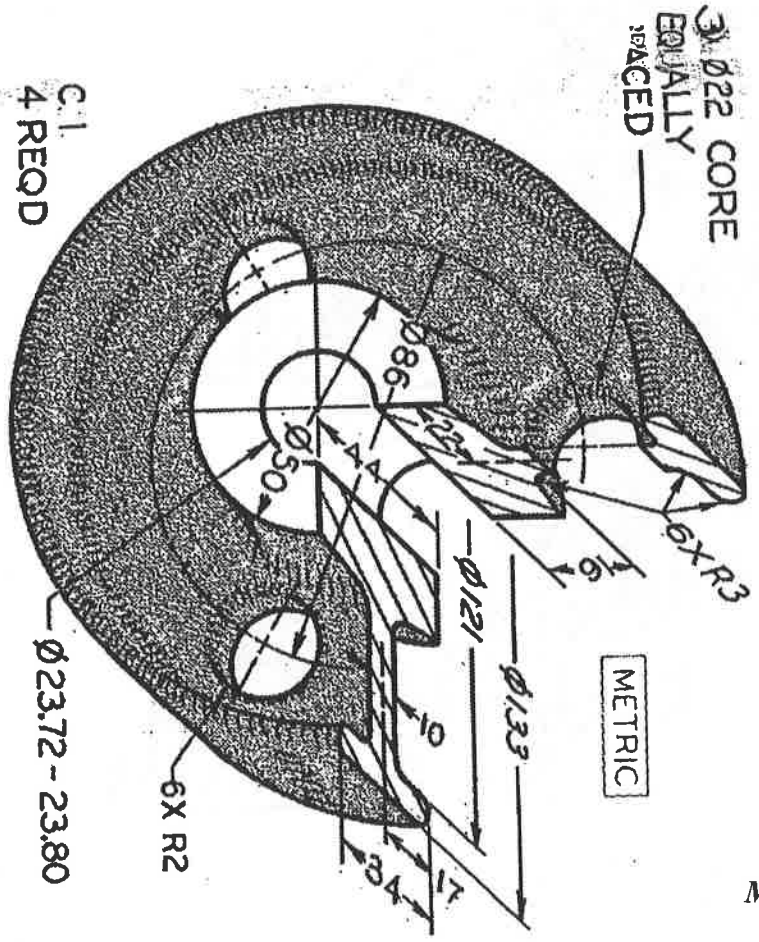

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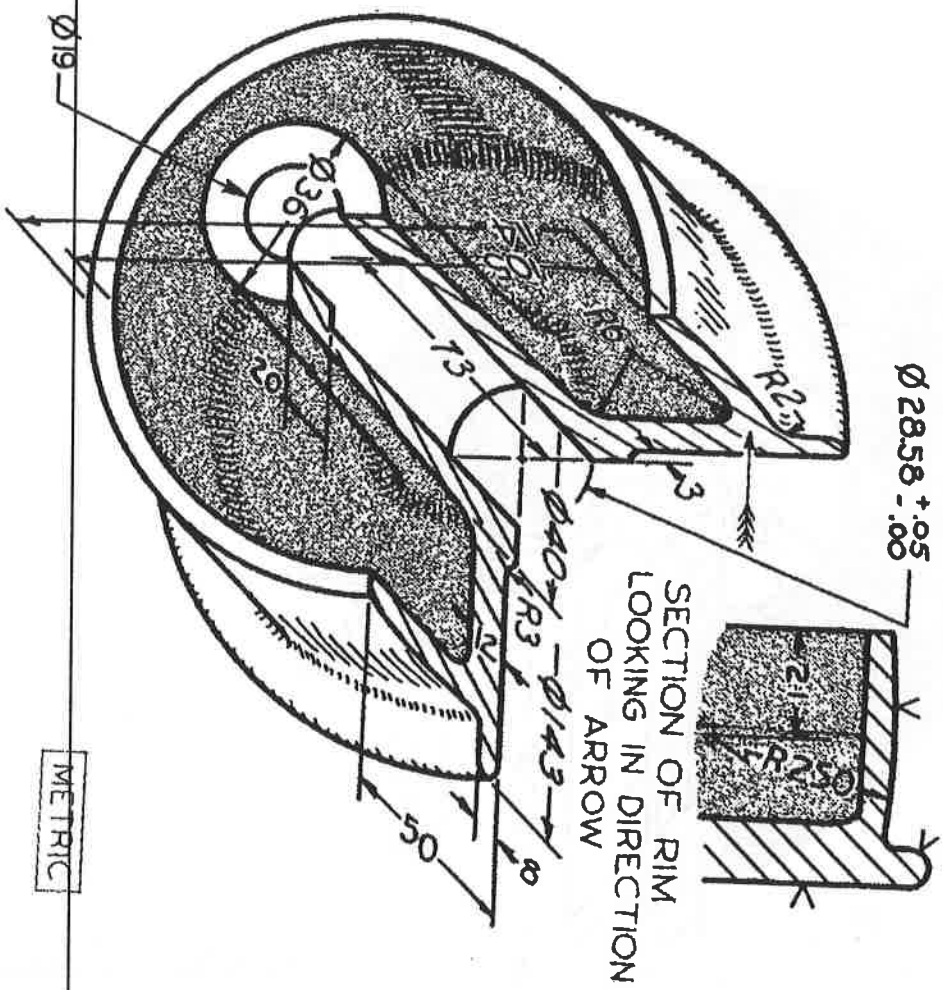

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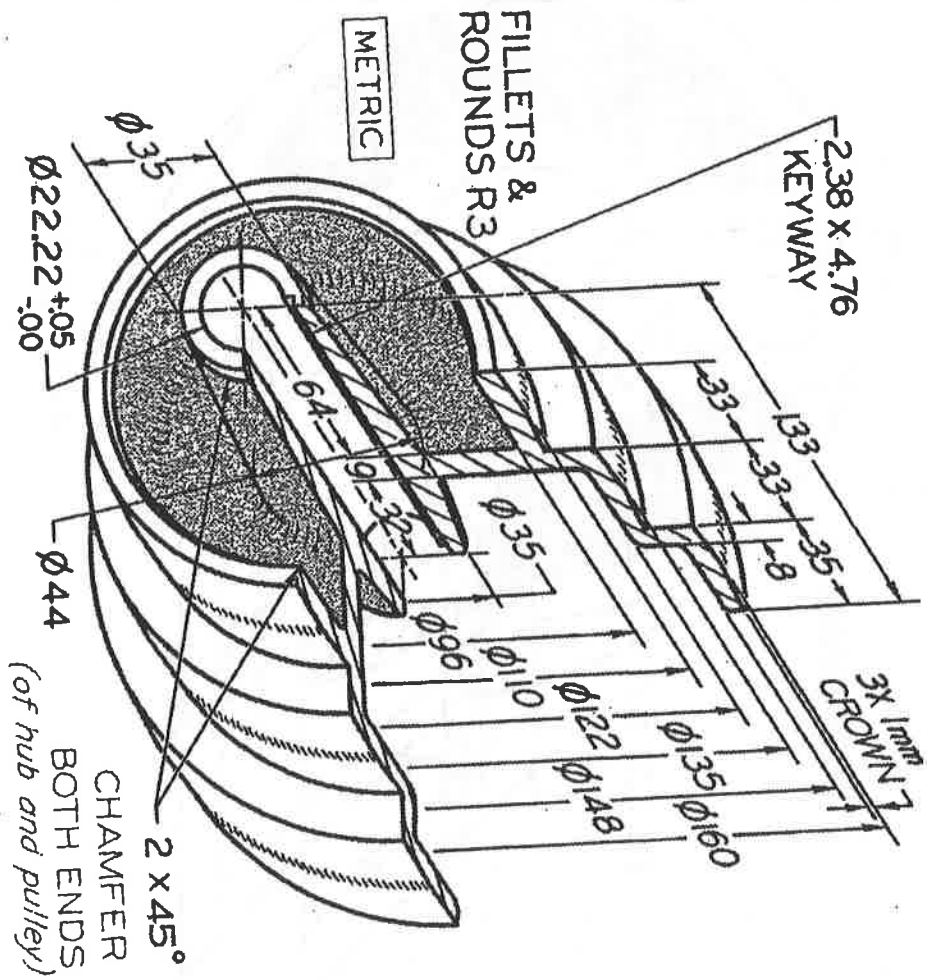

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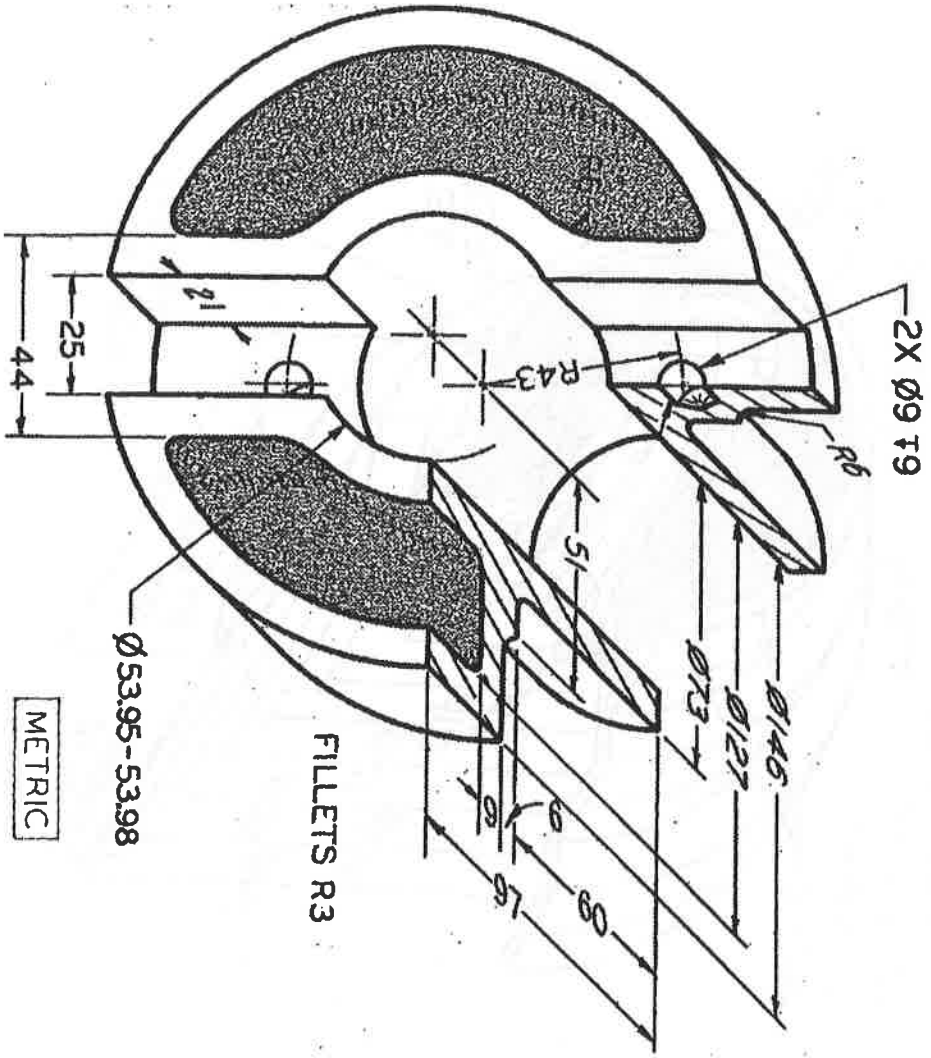

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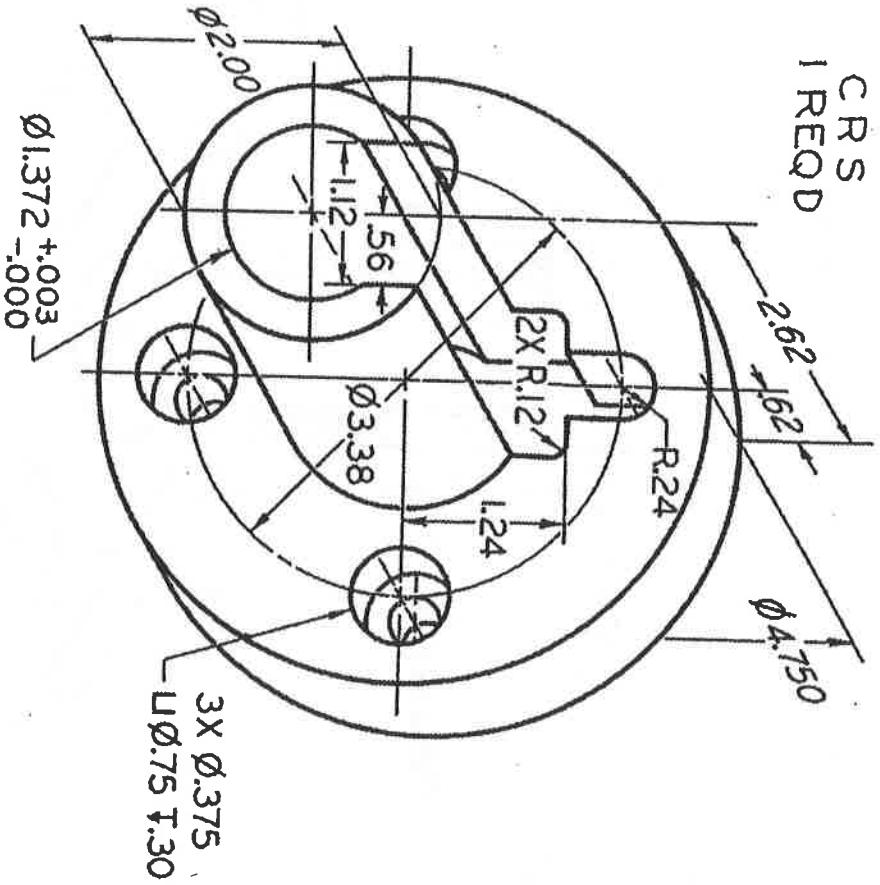

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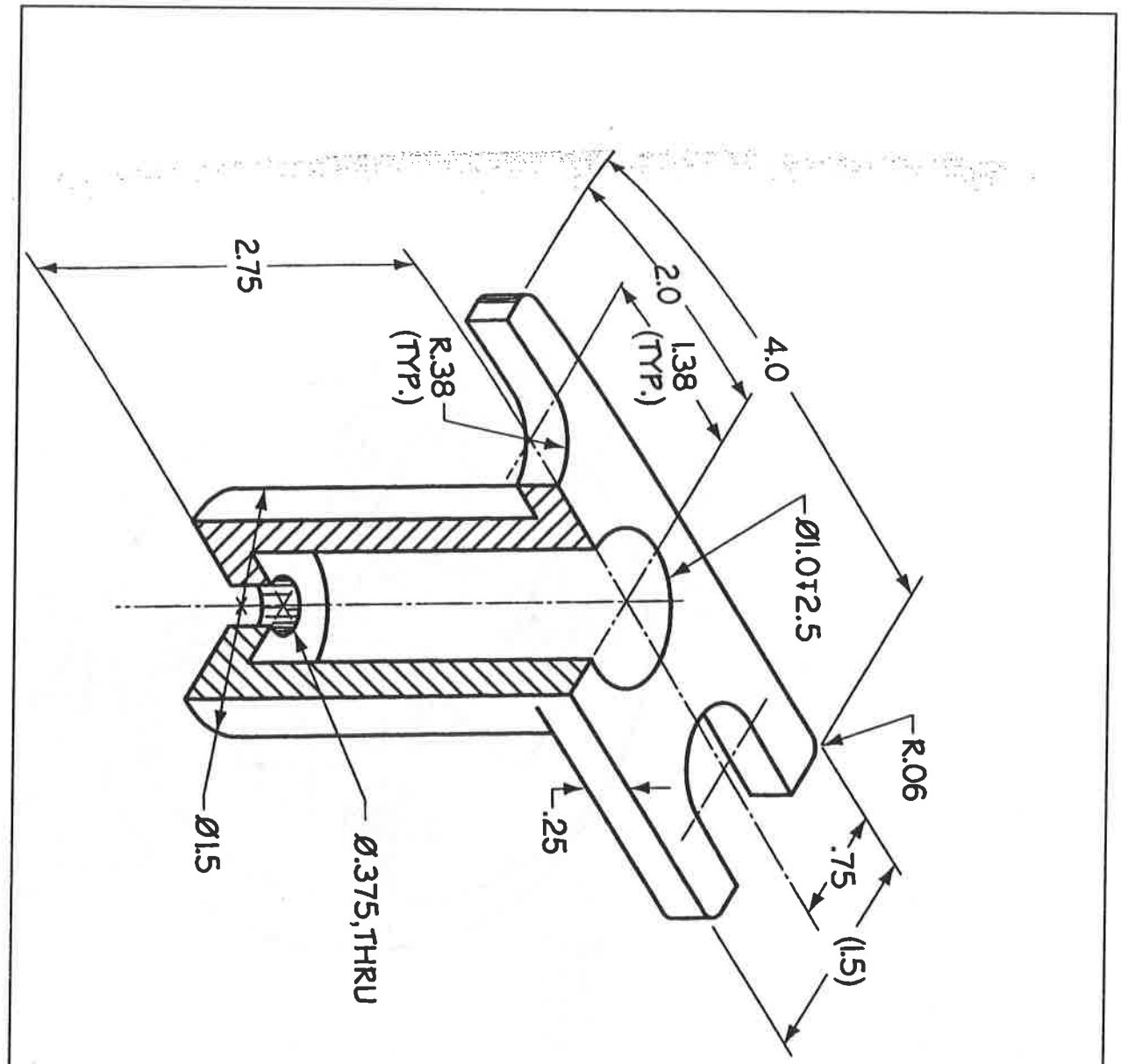

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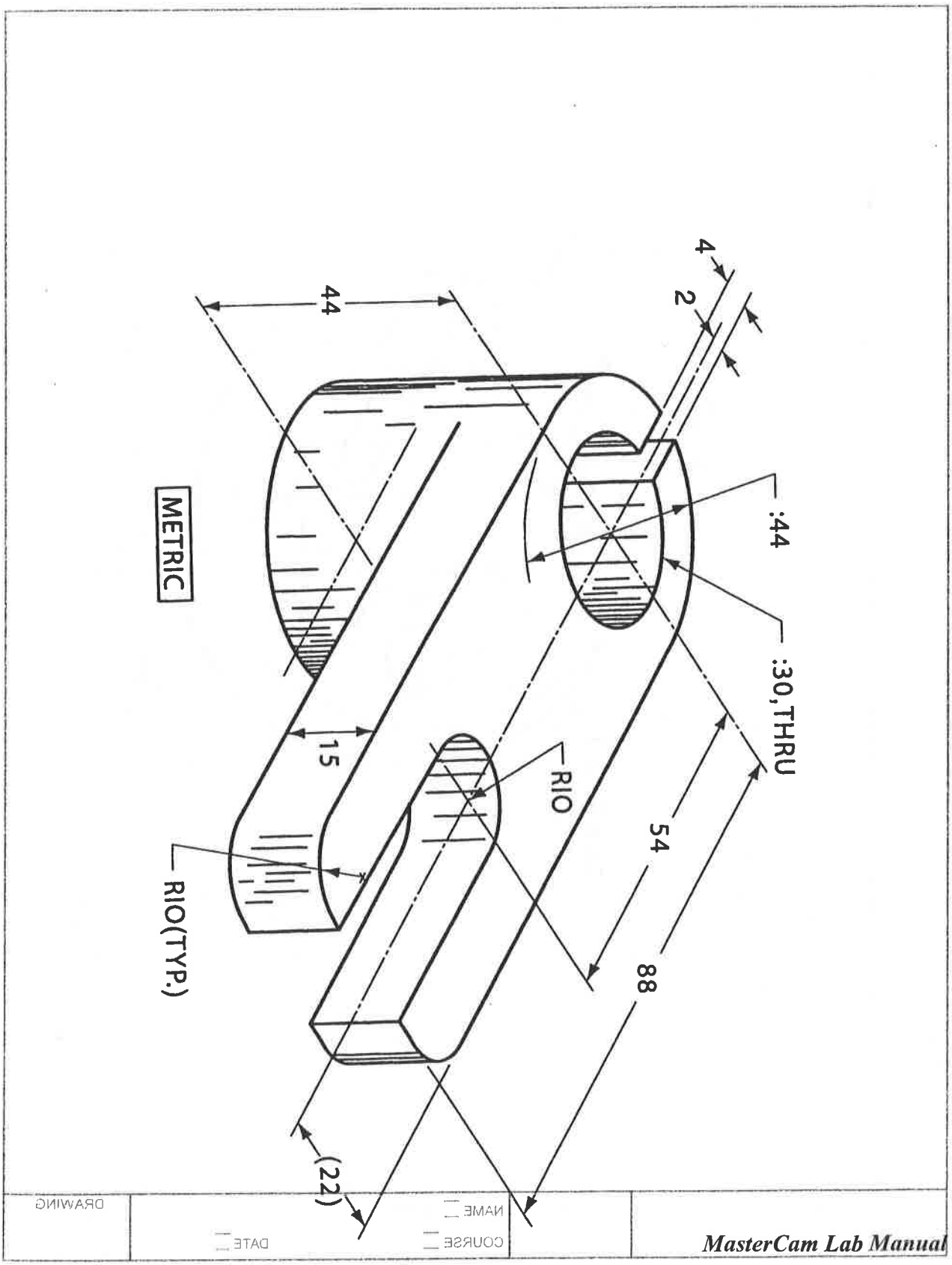
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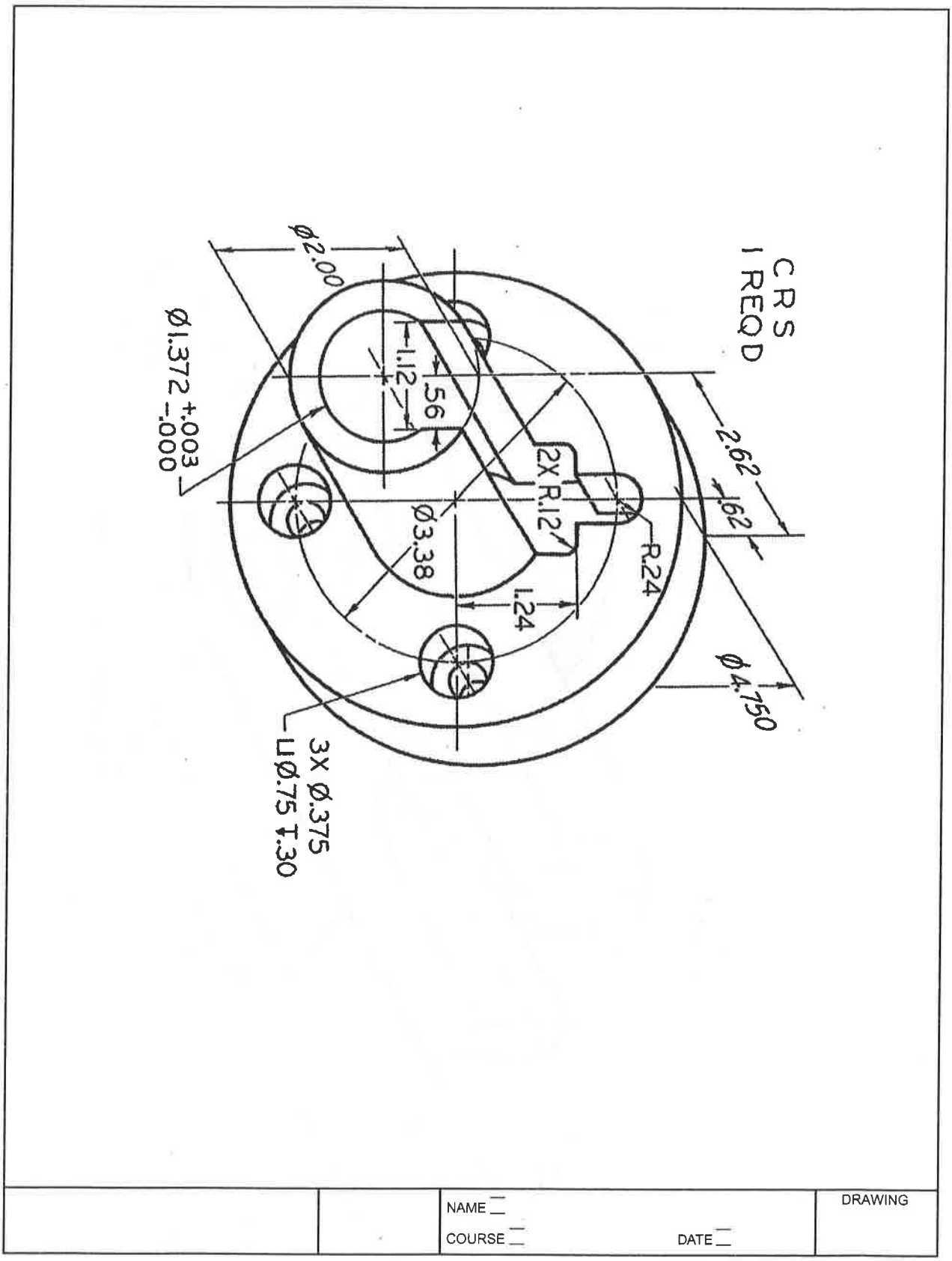
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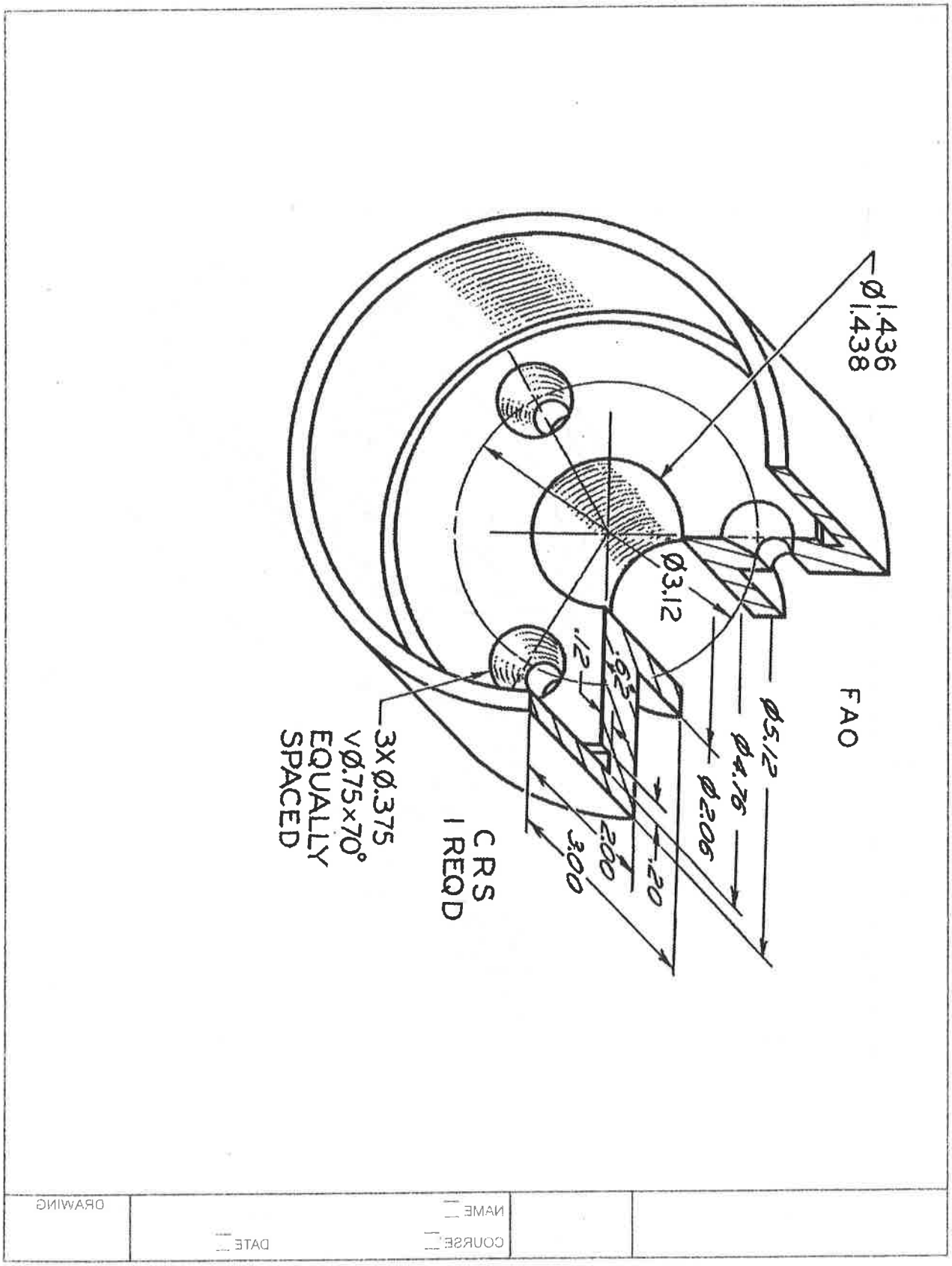
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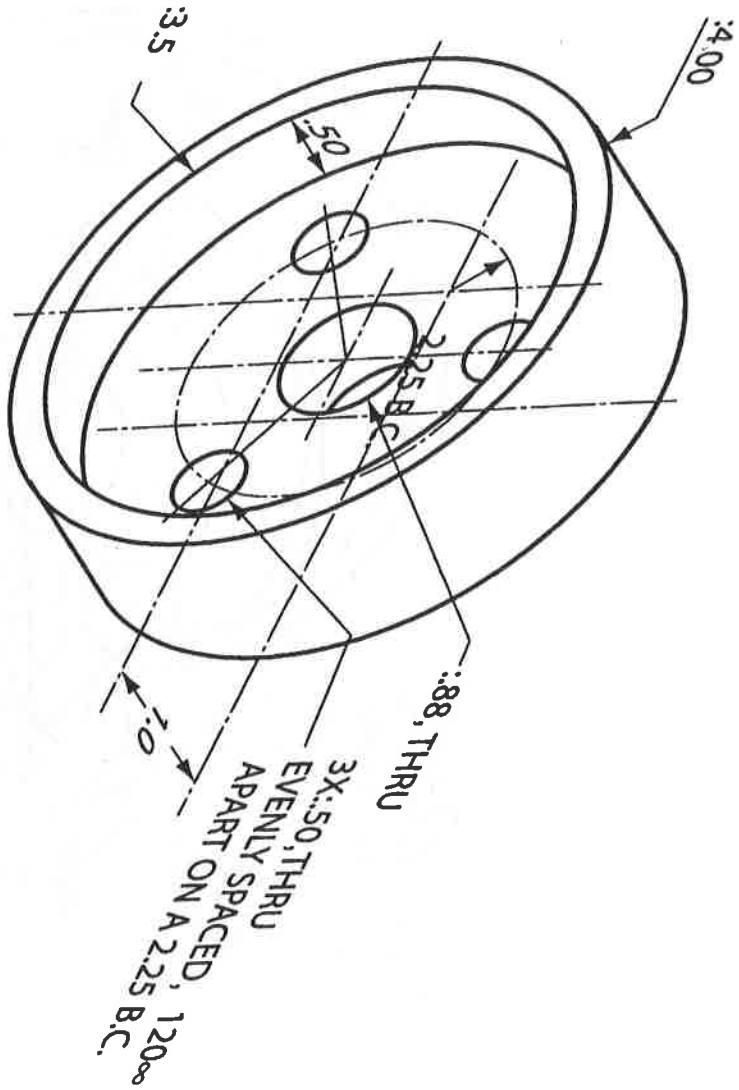
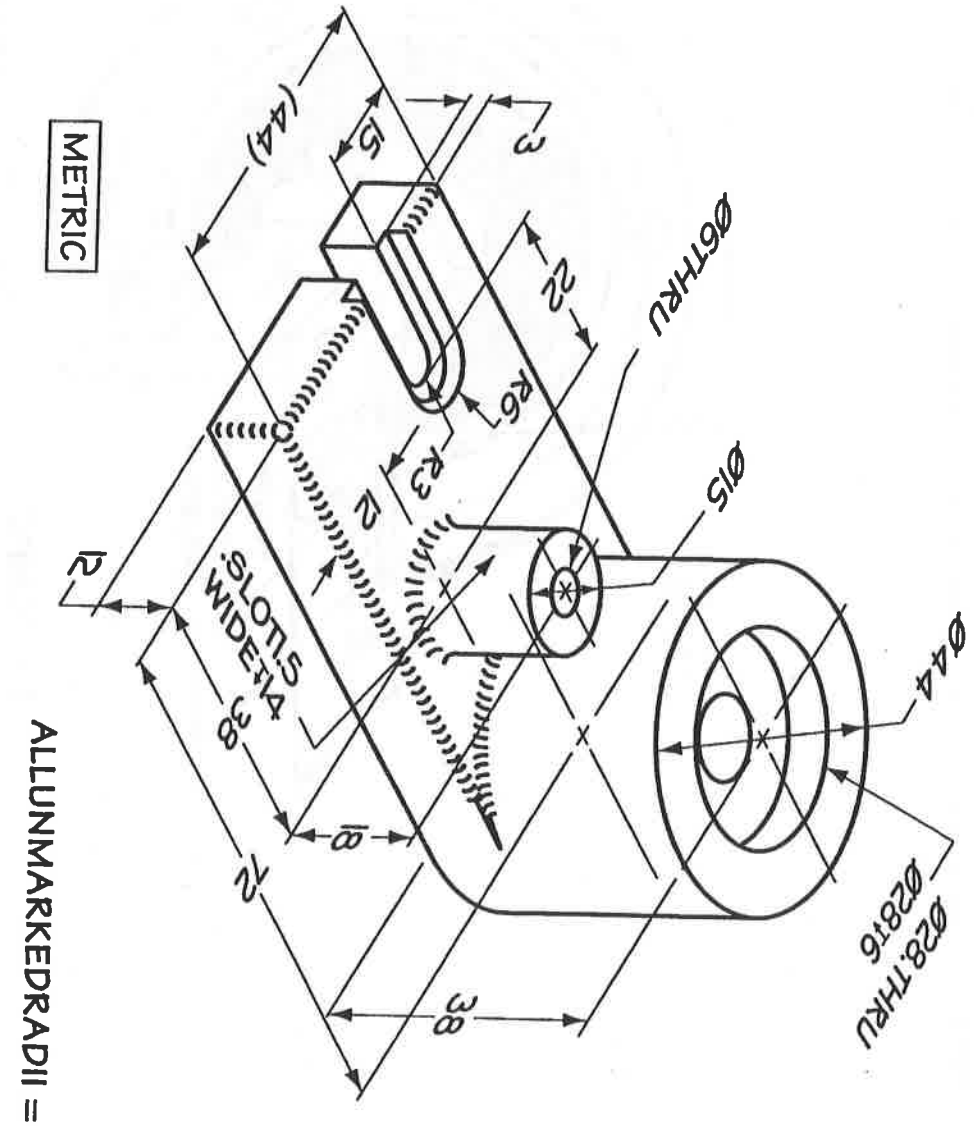
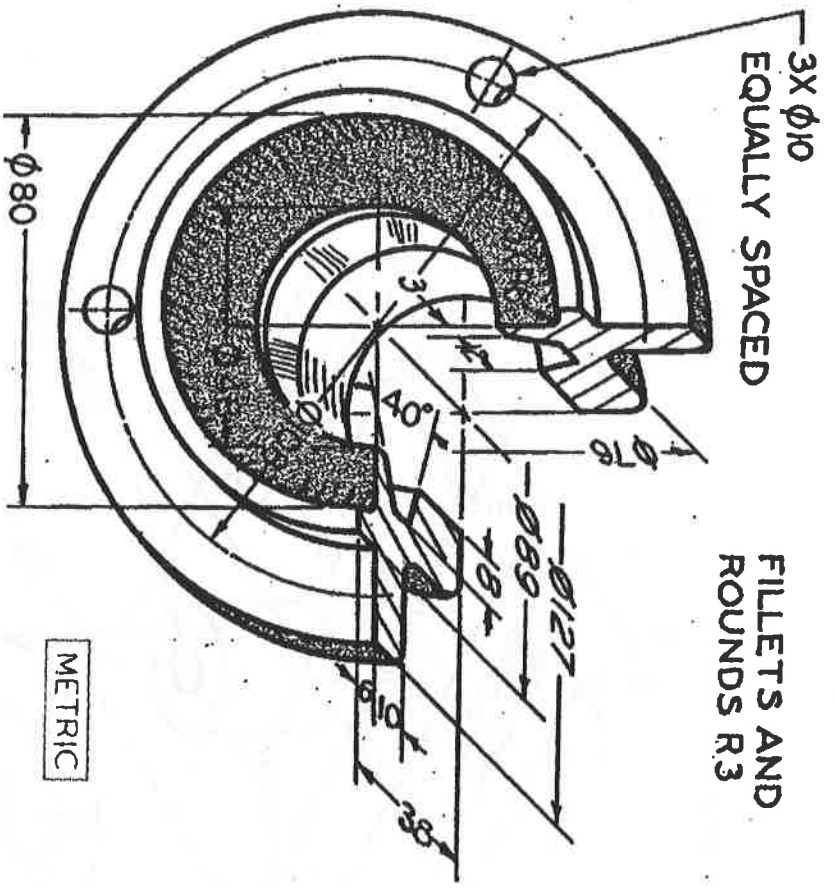


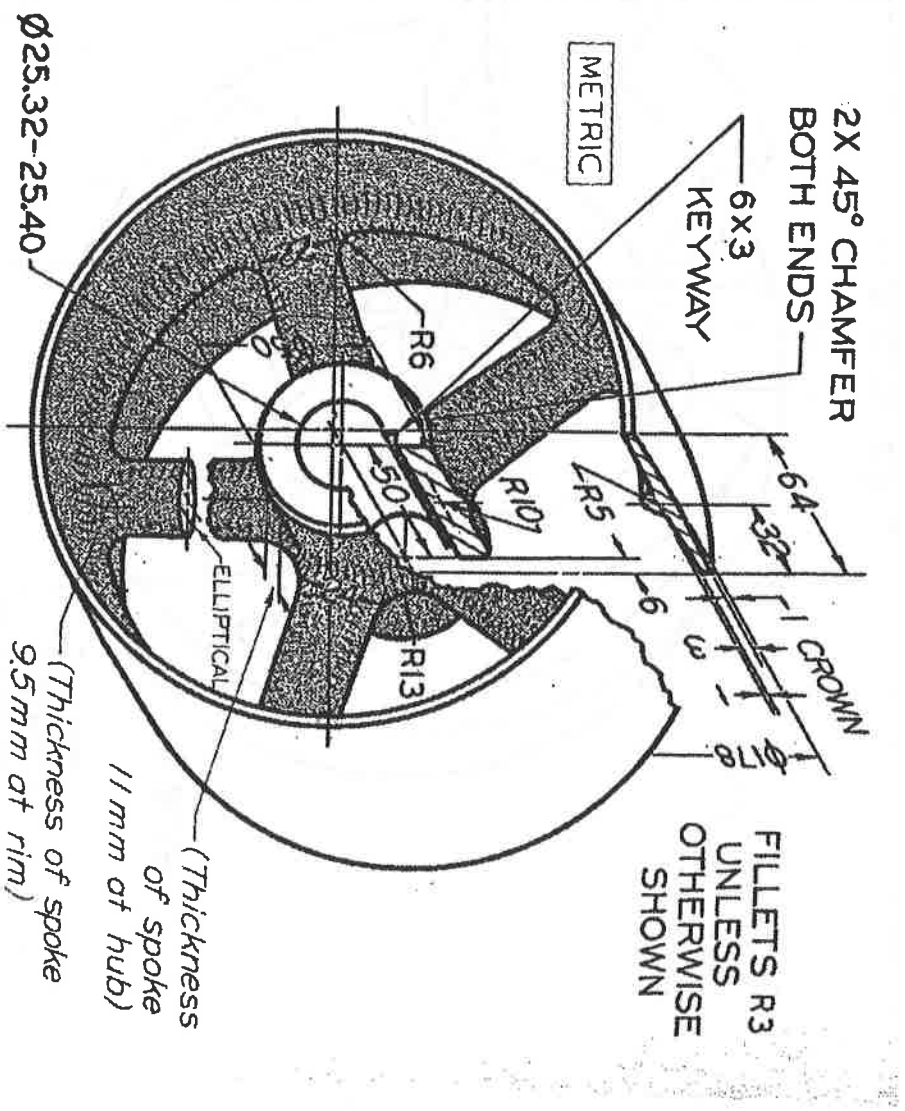
		NAME _ COURSE _ DATE _	DRAWING



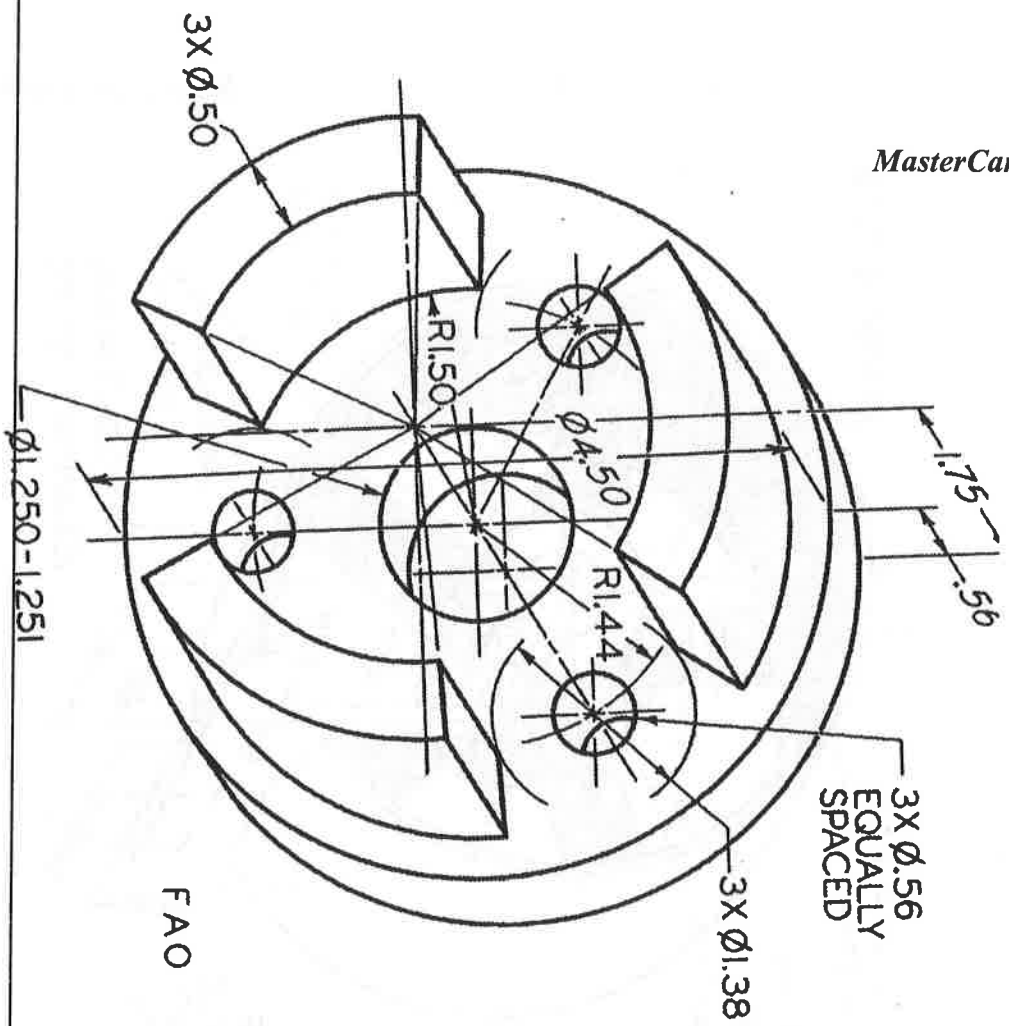
DRAWING	NAME COURSE	DATE	



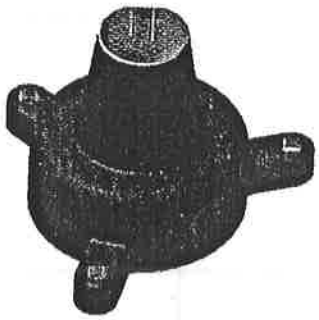
		NAME _____ COURSE _____ DATE _____	DRAWING



DRAWING	NAME COURSE	DATE	

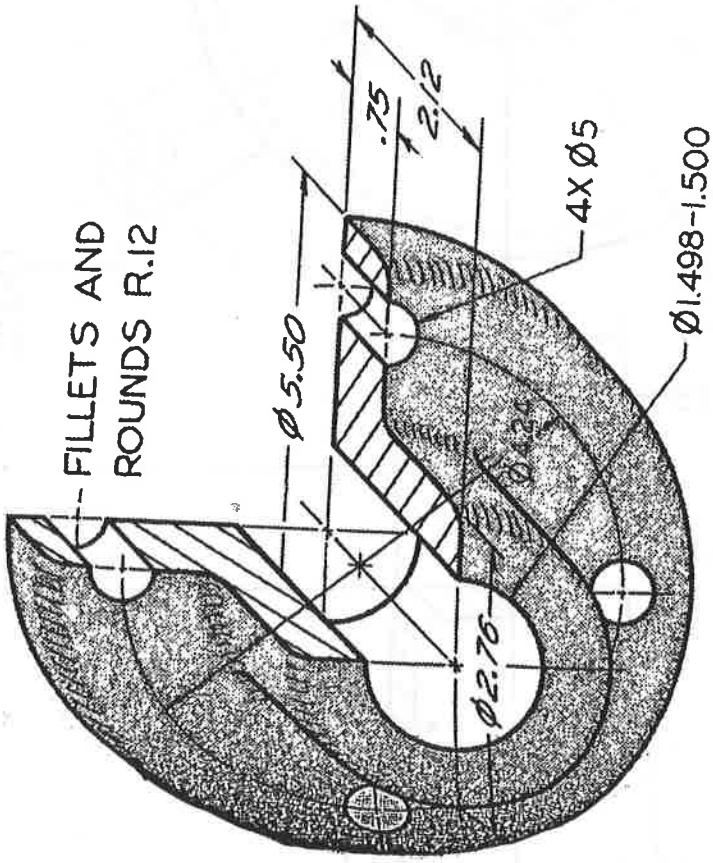


		NAME COURSE DATE	DRAWING

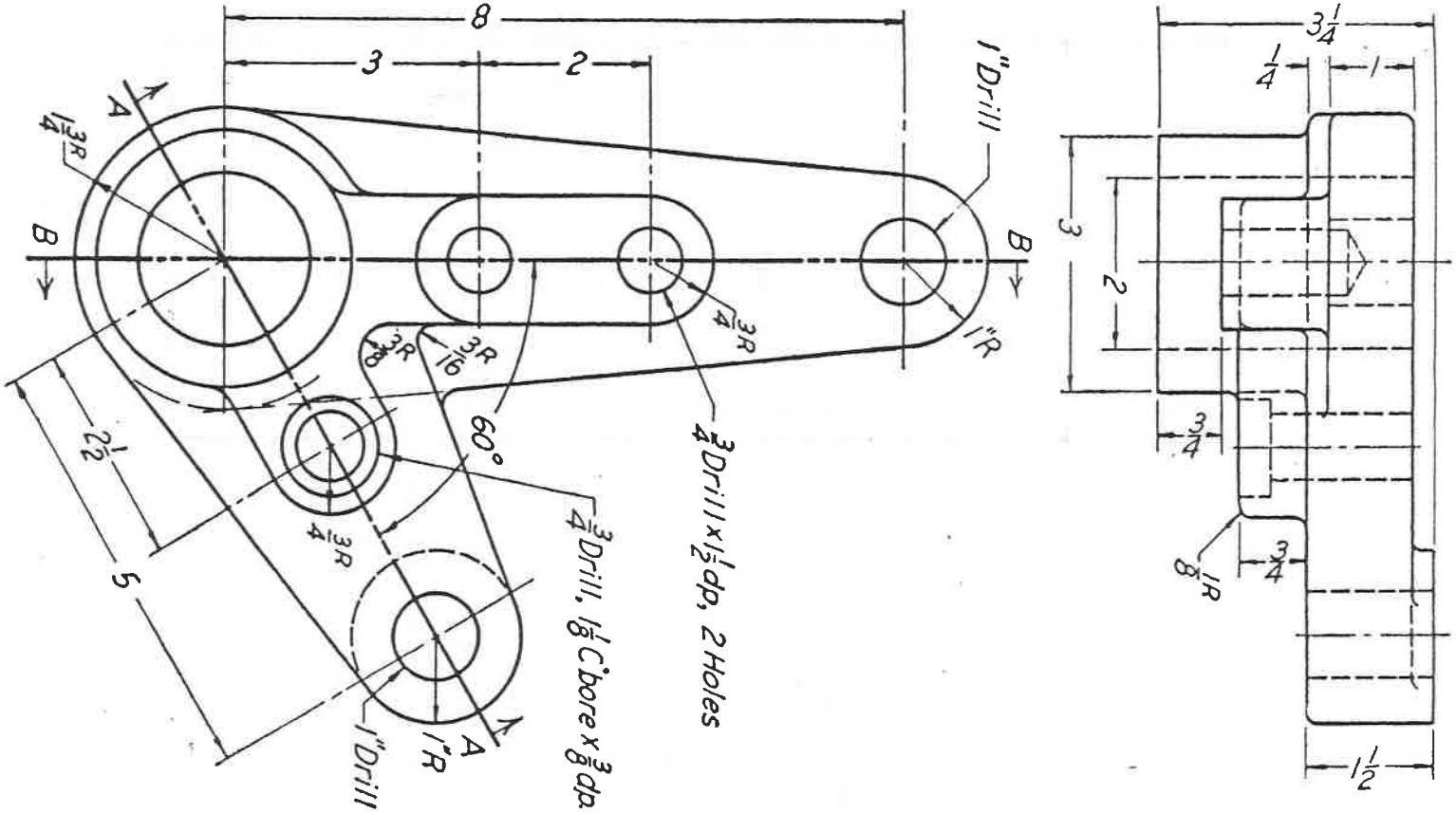



BOTTOM VIEW

ϕ4.25
ϕ3.0
30°
DRILL .188 THRU
CBORE .313 x .188 DP.
(3 HOLES)
ϕ1.25
ϕ.373
.02 x 45°
CHAMFER
.80
SHELL .25
5.05
3.00
.31 R
ϕ1.75
.31 R
1.25
.50



		NAME _ COURSE _ DATE _	DRAWING

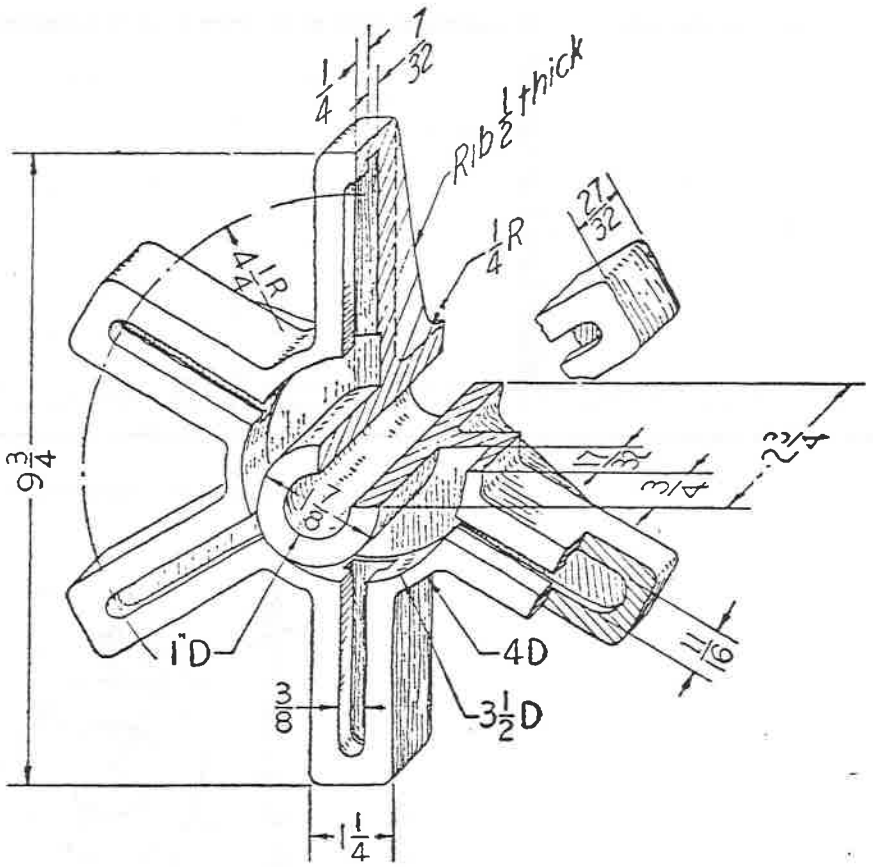


Write a plan to machine the part by filling out the table below.

Tool#	Tool description	Operation (what will the tool cut)	Notes
1			
2			
3			
4			
5			
6			
7			

For feeds and speeds use material 6061 Aluminum (the computer will do the calculations)

*Write a **Mastercam** program to machine the following part:*



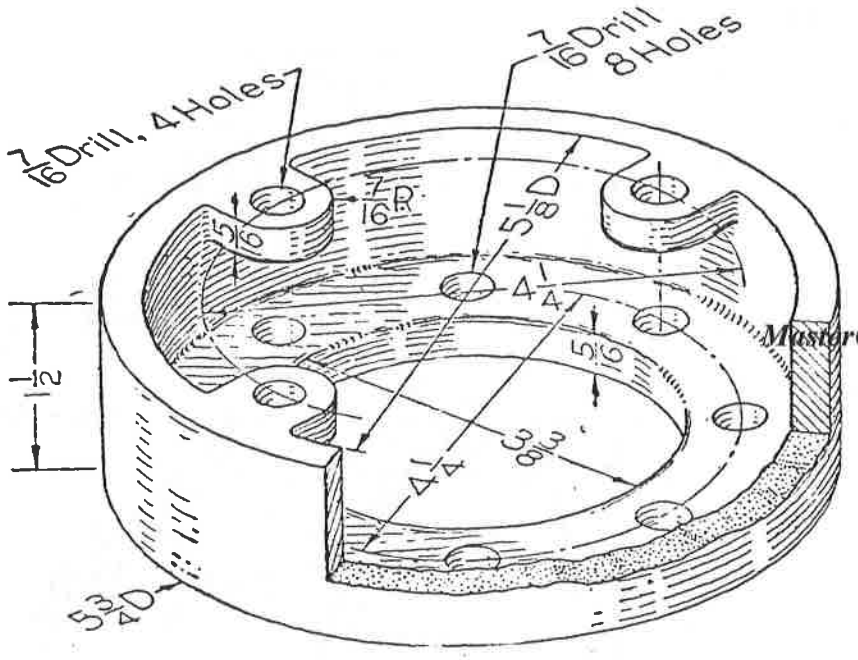
Write a plan to machine the part by filling out the table below.

Tool#	Tool description	Operation (what will the tool cut)	Notes
1			
2			
3			
4			
5			
6			
7			

For feeds and speeds use material 6061 Aluminum (the computer will do the

MASTERCAM ASSIGNMENT #21

*Write a **Mastercam** program to machine the following part:*

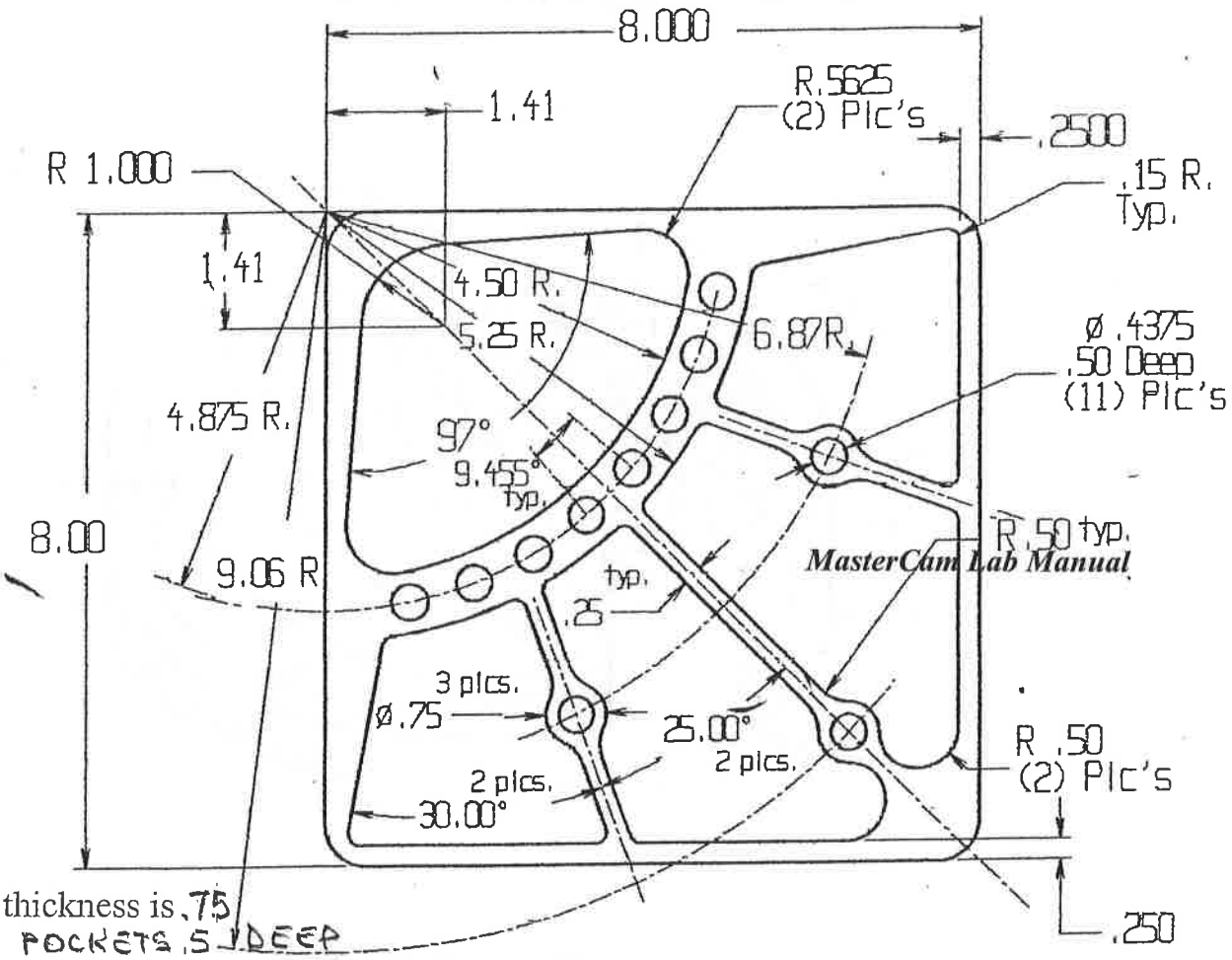


Write a plan to machine the part by filling out the table below.

Tool#	Tool description	Operation (what will the tool cut)	Notes
1			
2			
3			
4			
5			
6			
7			

For feeds and speeds use material 304 Stainless Steel (the computer will do the calculations)

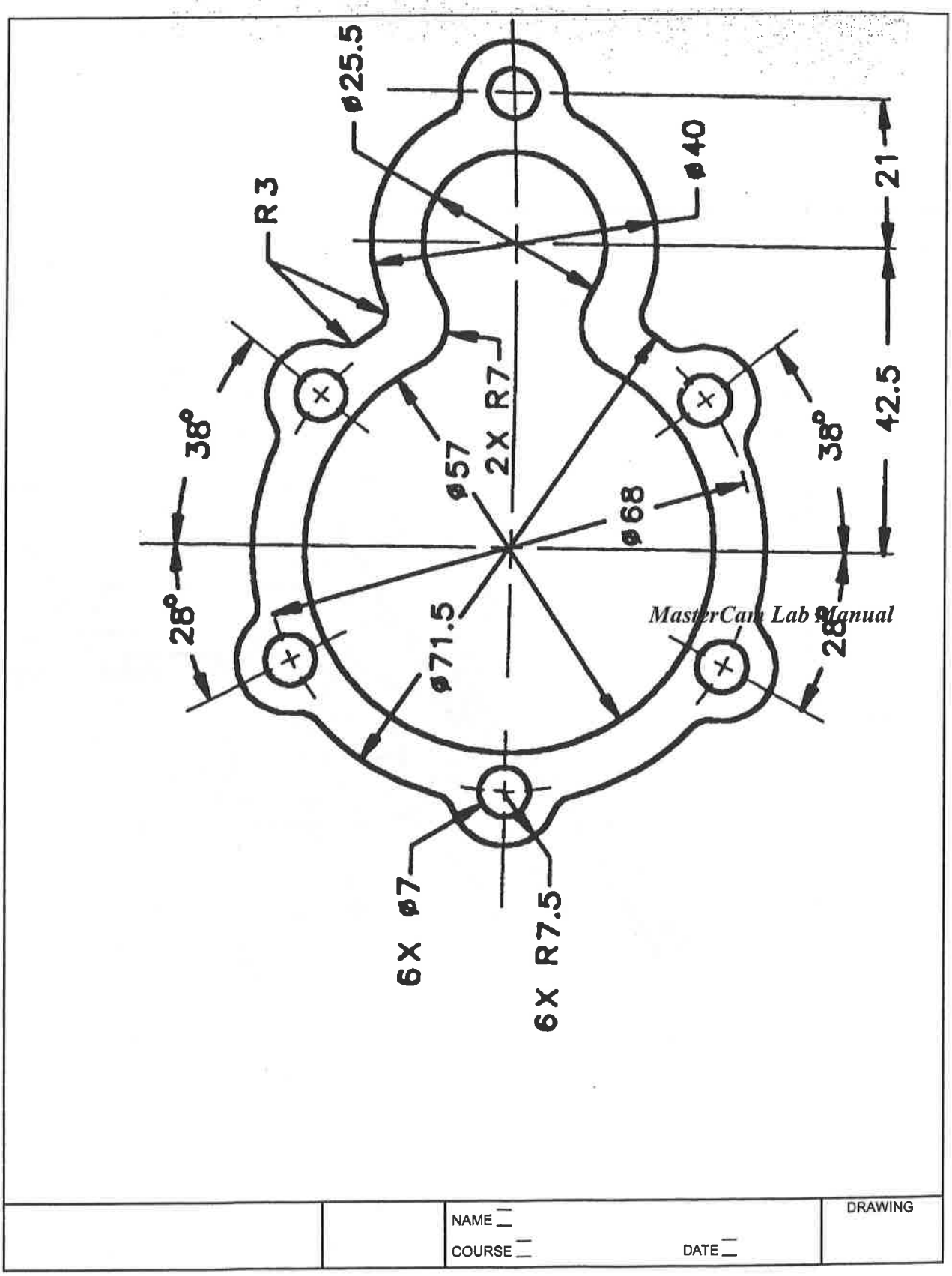
MASTERCAM ASSIGNMENT #22

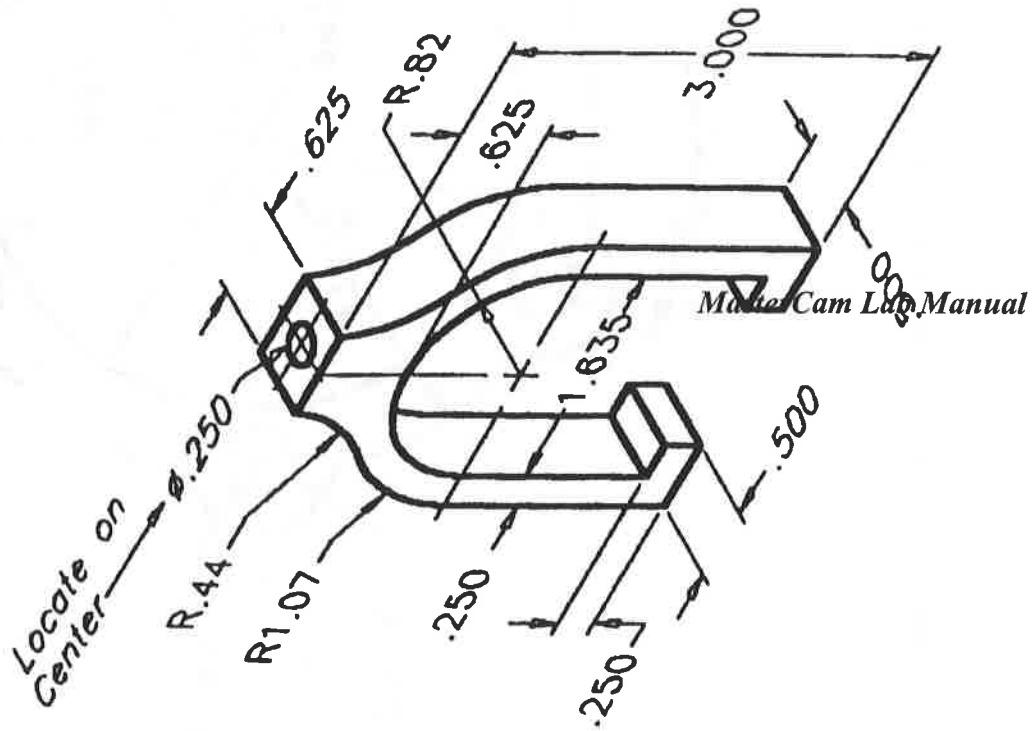


Write a plan to machine the part by filling out the table below.

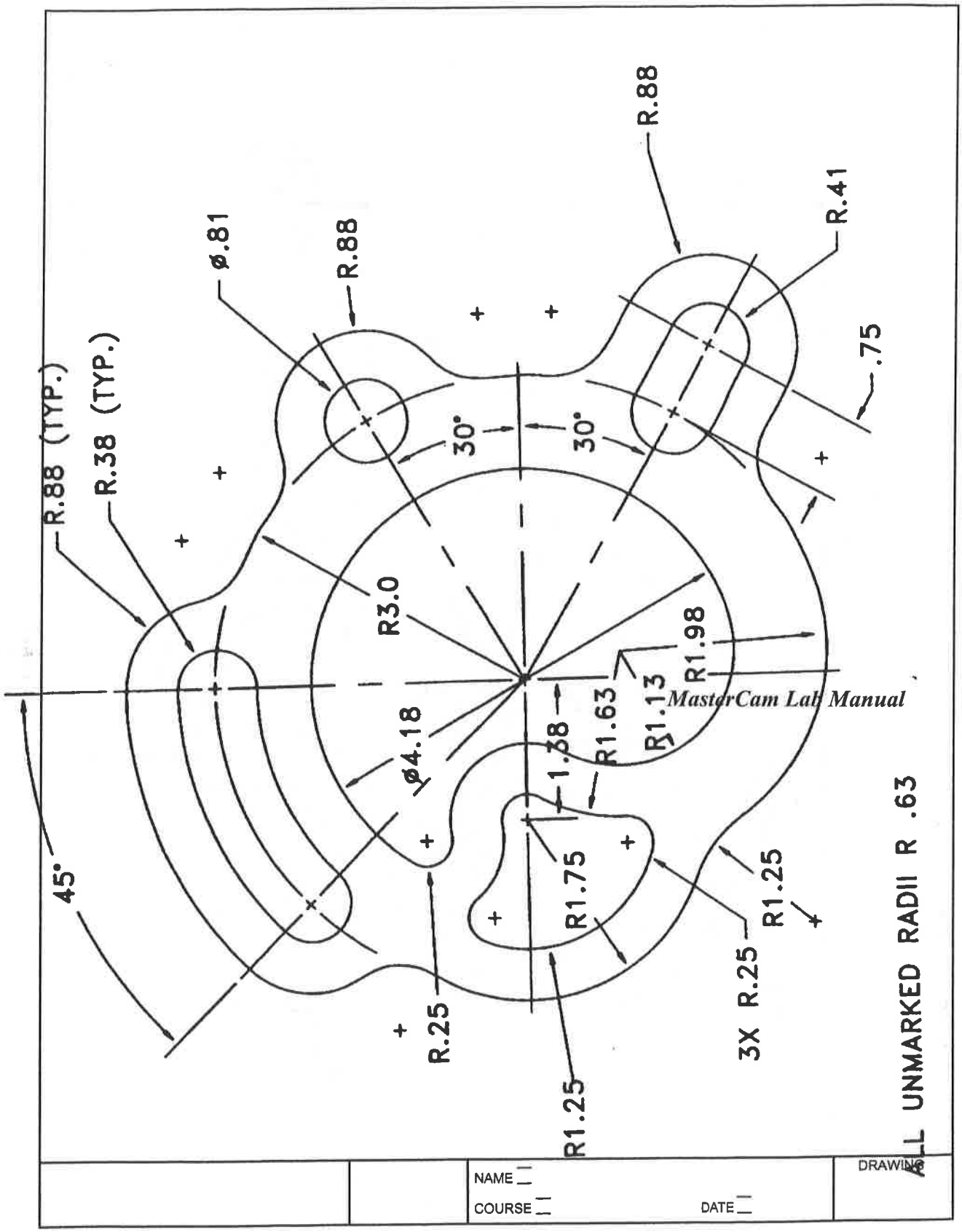
Tool#	Tool description	Operation (what will the tool cut)	Notes
1			
2			
3			
4			
5			
6			
7			

For feeds and speeds use material 6061 Aluminum (the computer will do the calculations)

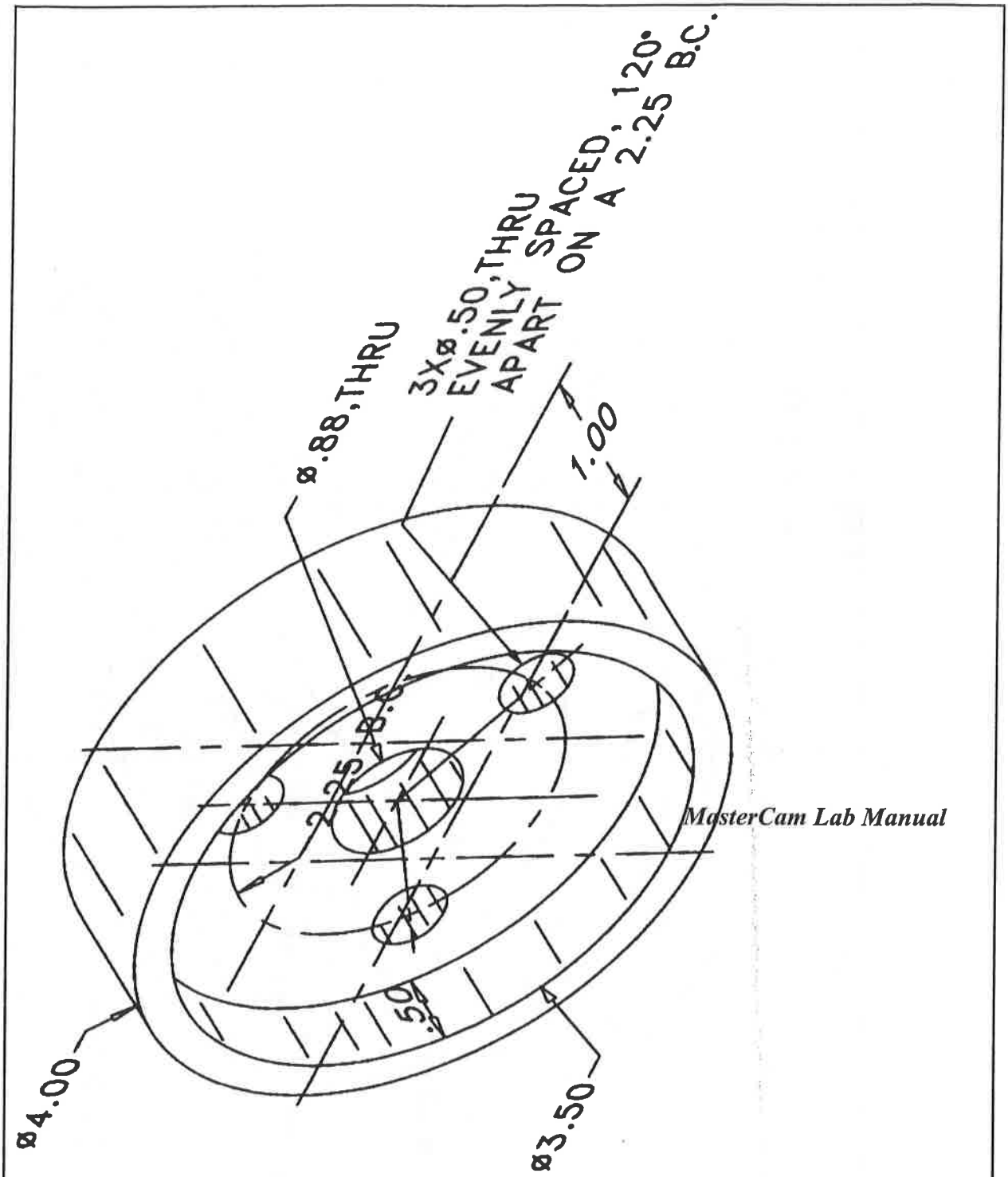




		NAME COURSE DATE	DRAWING

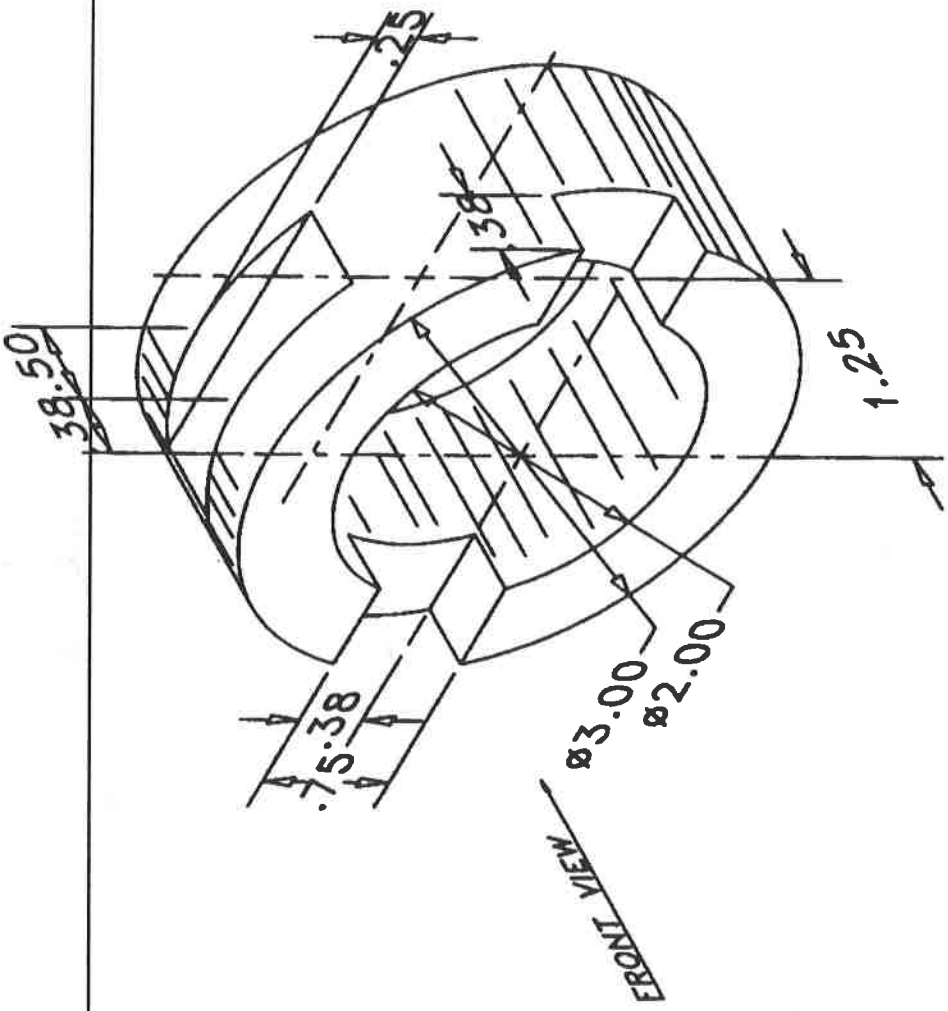


MasterCam Lab Manual



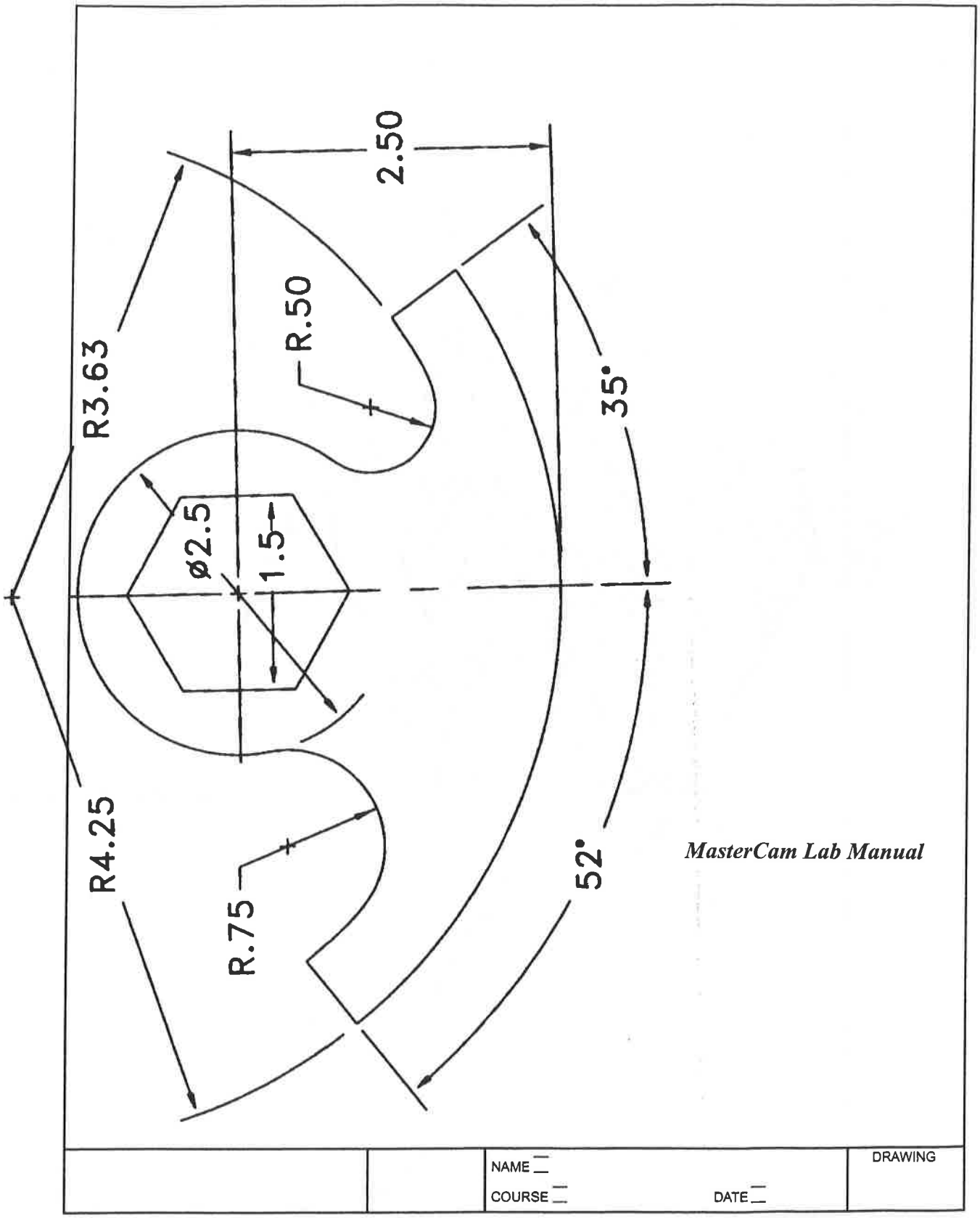
MasterCam Lab Manual

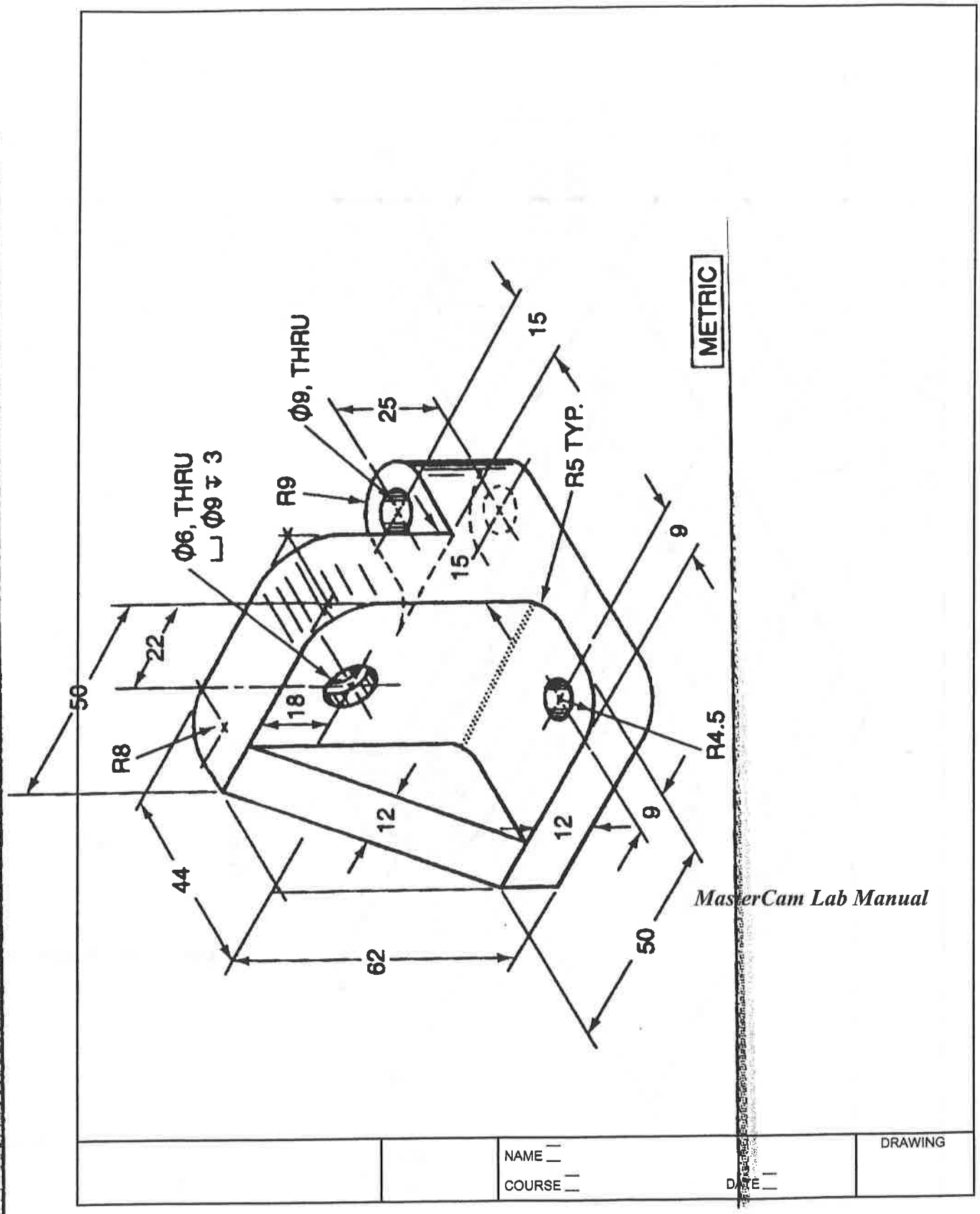
		NAME COURSE DATE	DRAWING

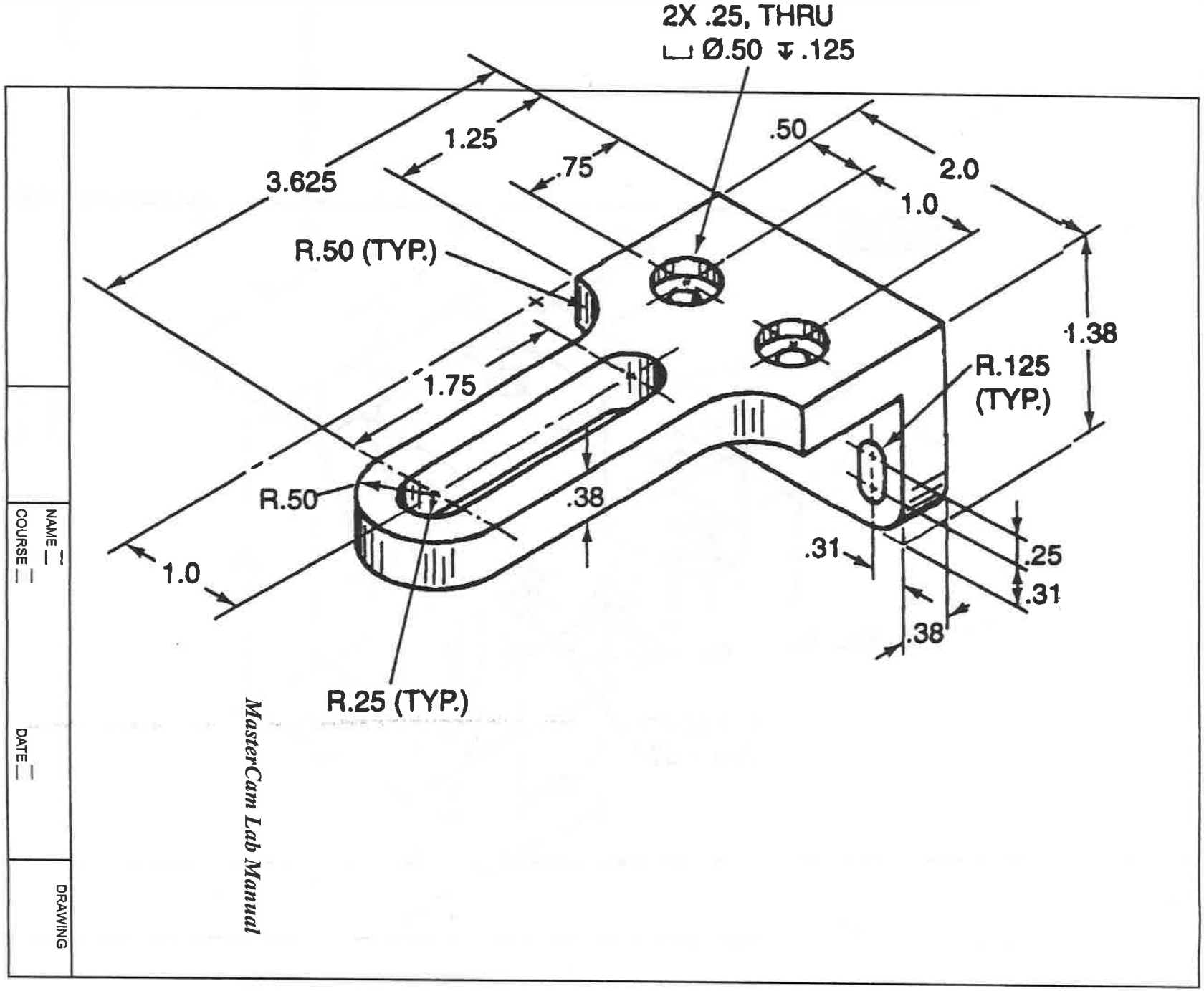


MasterCam Lab Manual

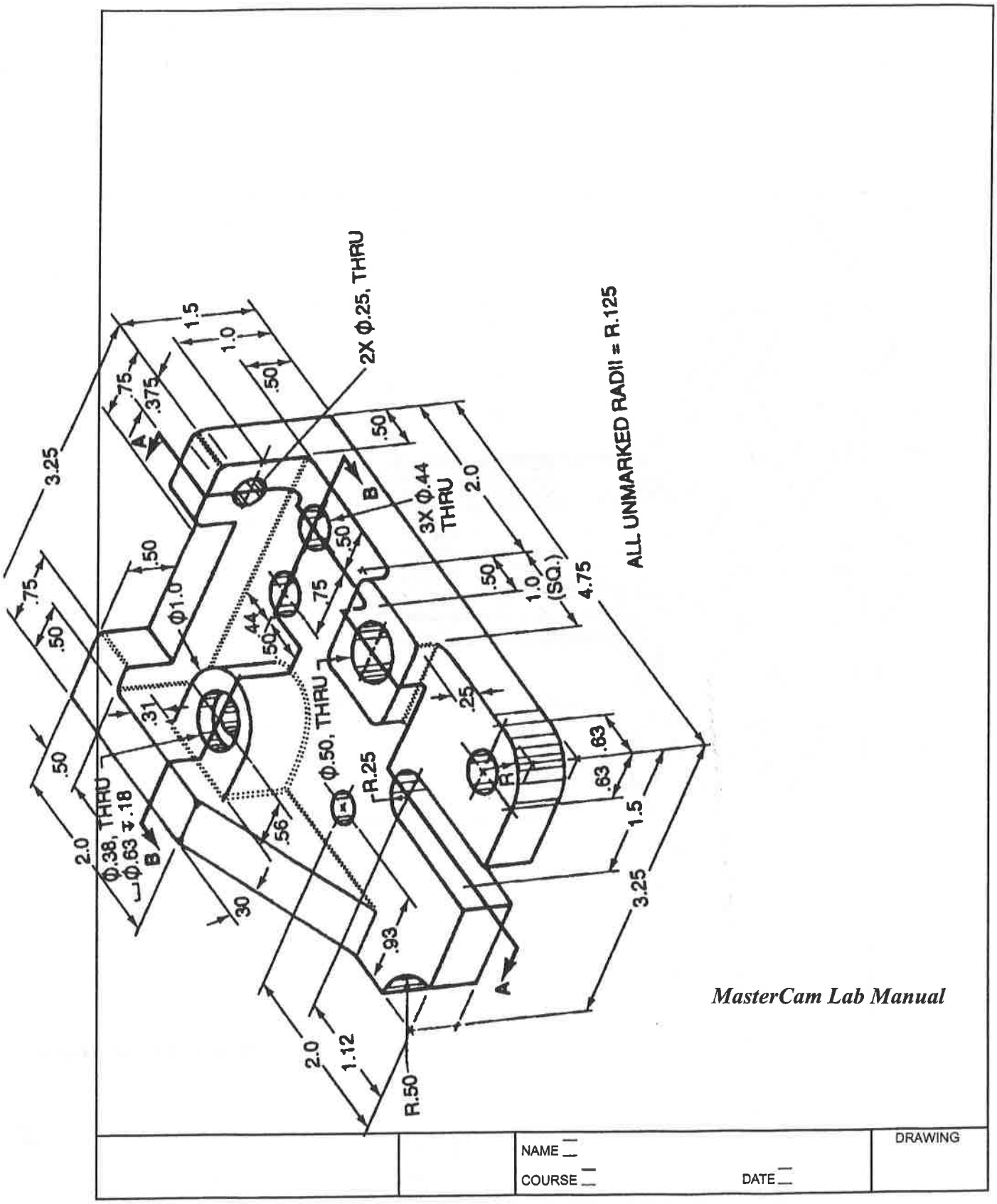
		NAME _ COURSE _ DATE _	DRAWING


2.50
R3.63
R.50
35°
ø2.5
1.5
R4.25
R.75
52°
MasterCam Lab Manual
NAME
COURSE
DATE
DRAWING

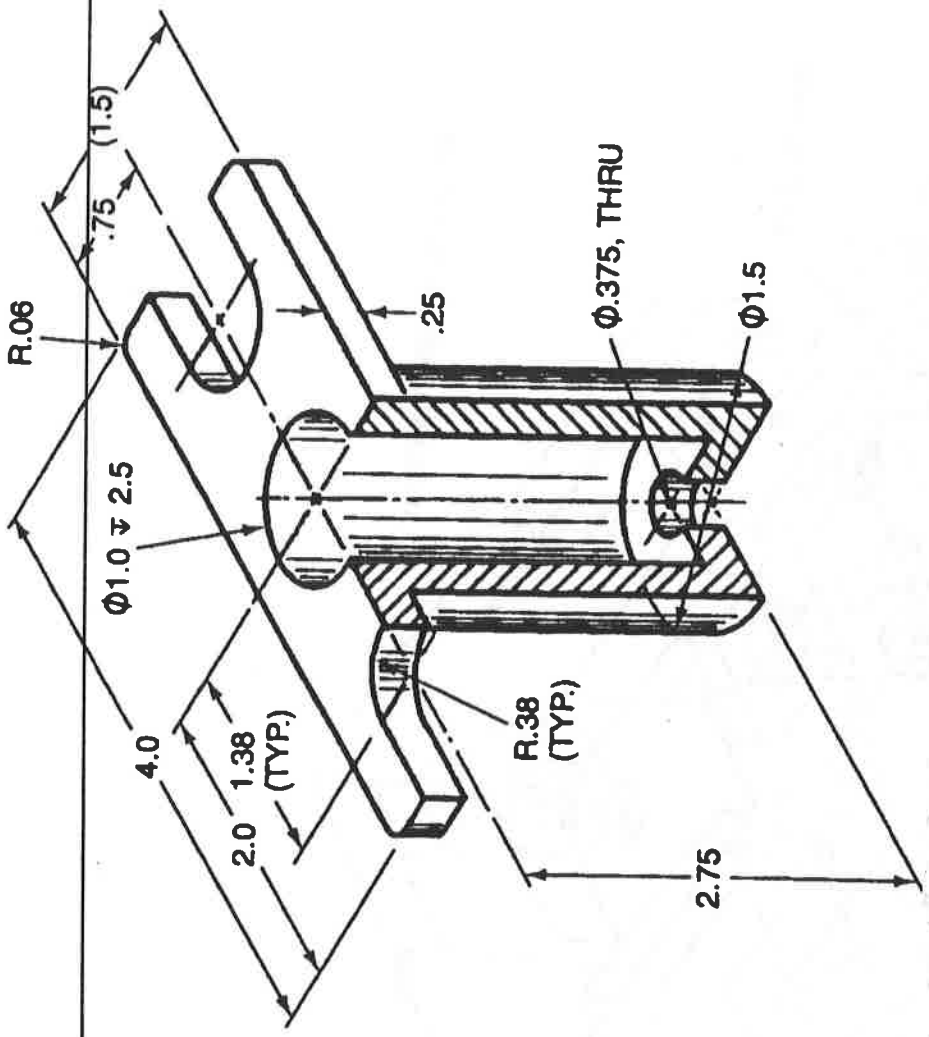

METRIC
Φ9, THRU
25
15
R5 TYP.
Φ6, THRU
⌴ Φ9 ↧ 3
R9
15
9
22
50
18
R8
R4.5
12
12
9
44
62
50
NAME
COURSE
DATE
DRAWING



MasterCam Lab Manual

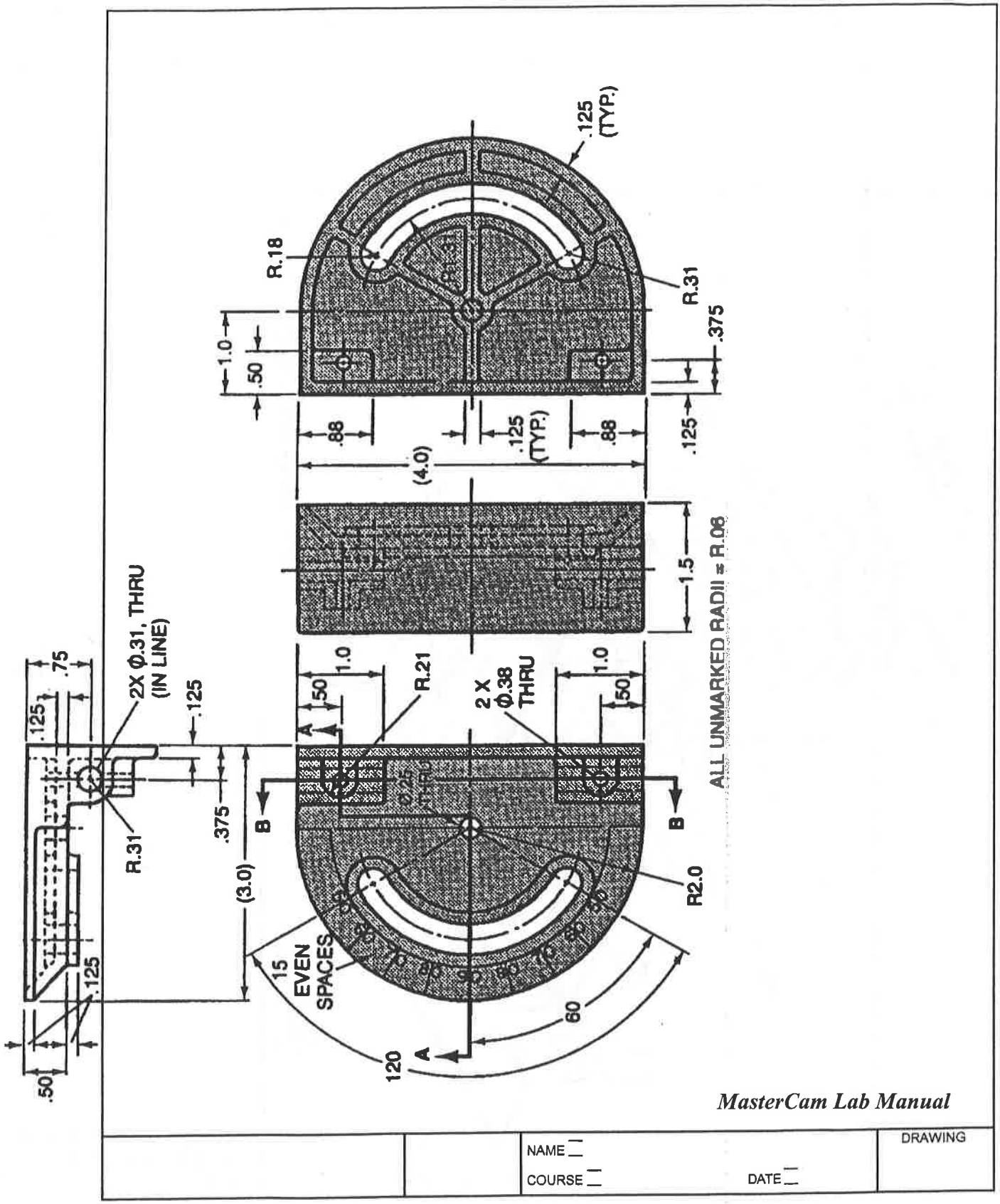


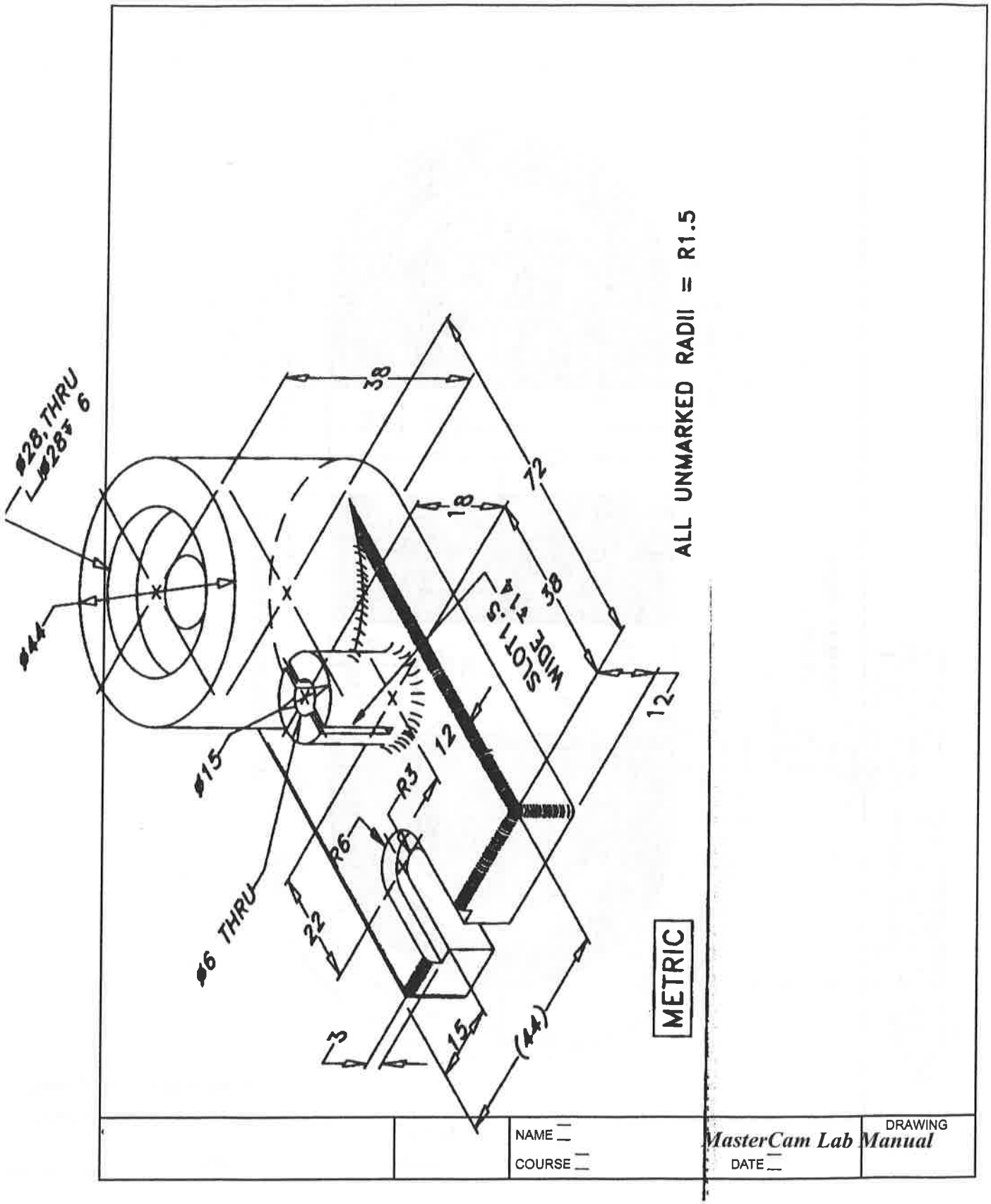
MasterCam Lab Manual

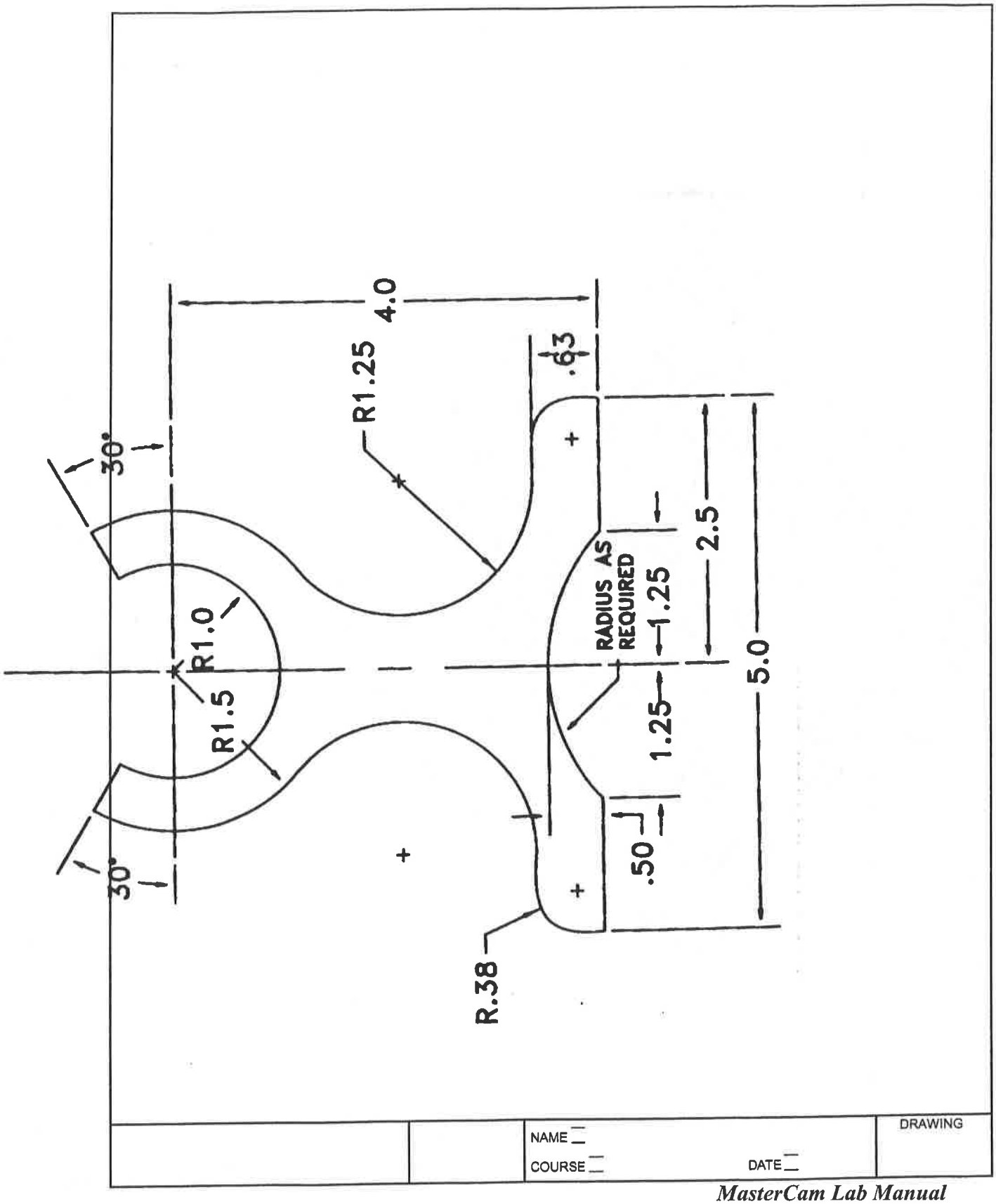


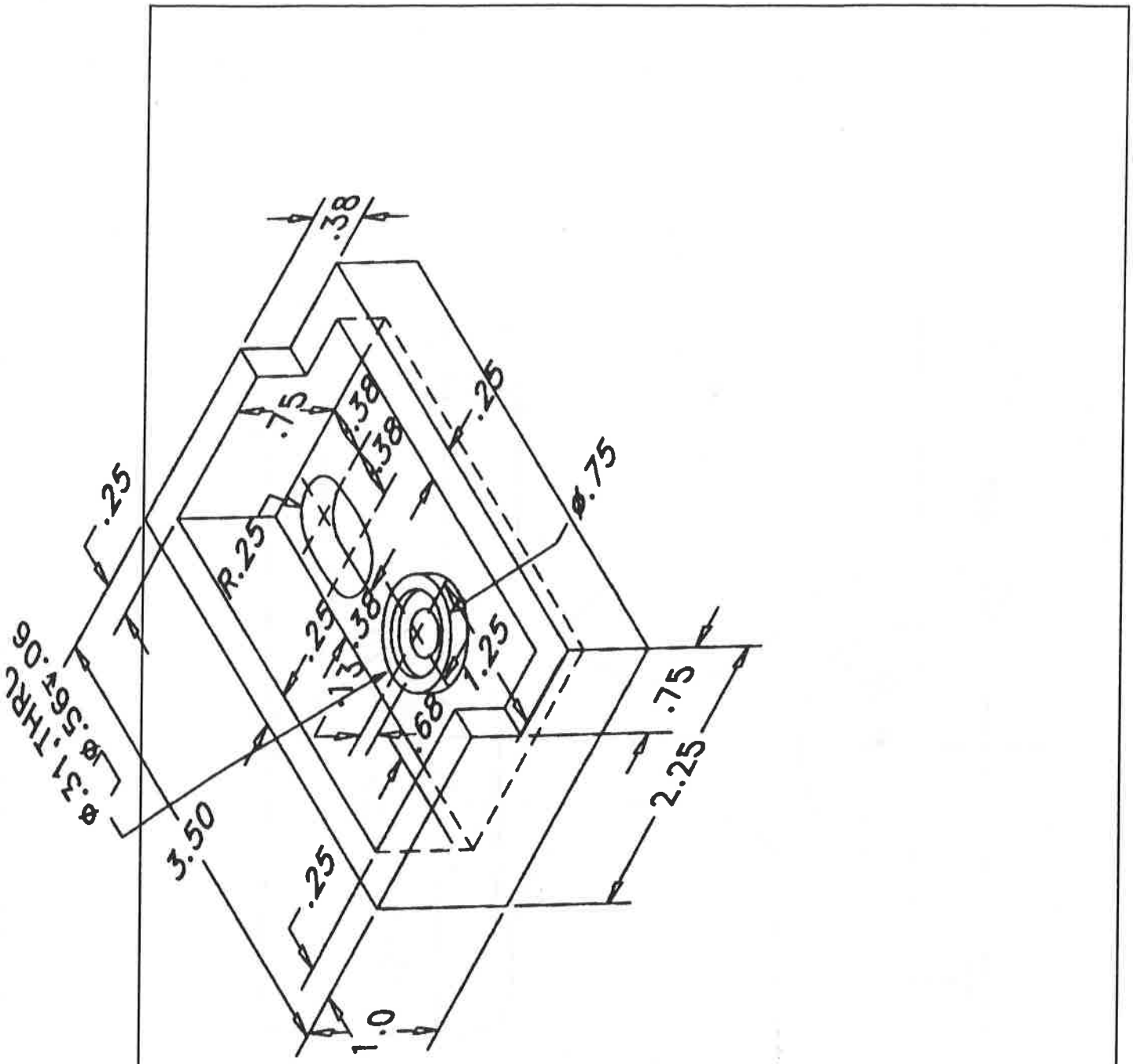
MasterCam Lab Manual

NAME
COURSE
DATE
DRAWING

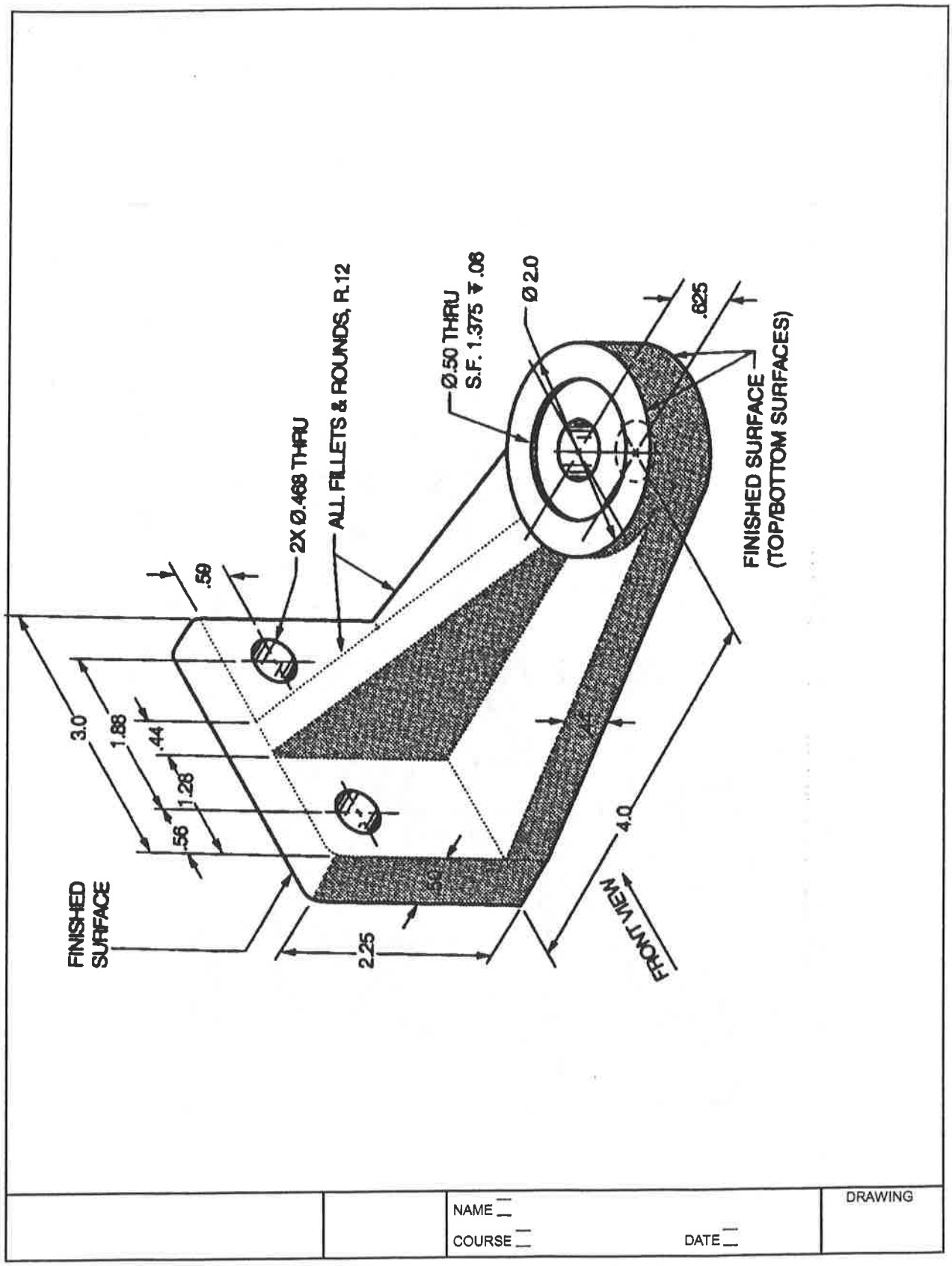

.125 (TYP.)
R.18
R.31
.375
1.0
.50
.88
.125 (TYP.)
.88
.125
(4.0)
1.5
ALL UNMARKED RADII = R.06
2X Φ.31, THRU (IN LINE)
.75
.125
.125
.375
(3.0)
.125
.50
R.31
1.0
.50
R.21
2 X Φ.38 THRU
1.0
.50
B
B
A
A
R2.0
15 EVEN SPACES
120
60
MasterCam Lab Manual
NAME
COURSE
DATE
DRAWING

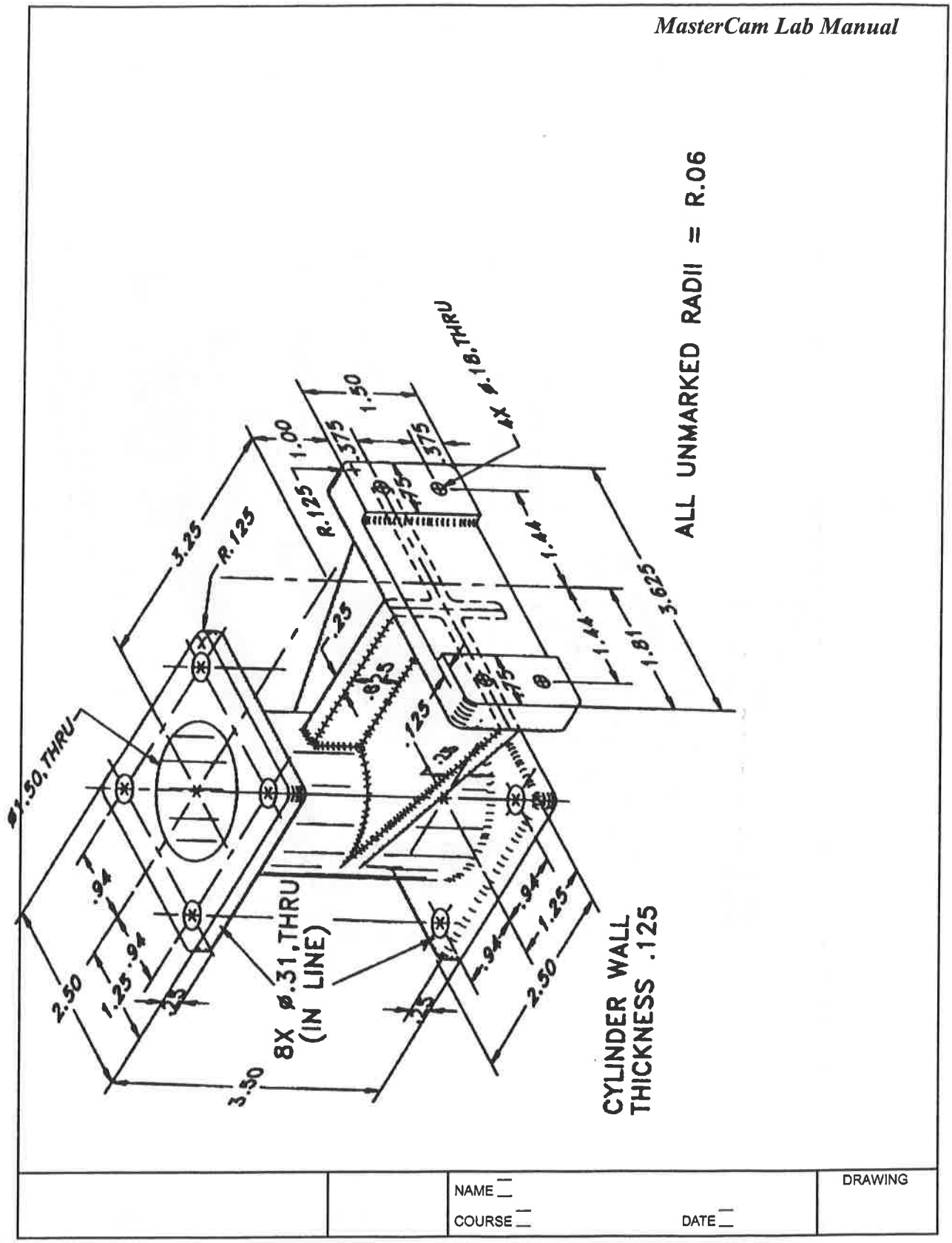

ALL UNMARKED RADII = R1.5
METRIC
NAME
COURSE
DATE
DRAWING
MasterCam Lab Manual
38
72
18
38
12
SLOT 1.5 WIDE
12
R3
R6
22
3
15
(44)
12
Ø15
Ø6 THRU
Ø44
Ø28, THRU
Ø28 ↧ 6


4.0
.63
R1.25
30°
30°
R1.0
R1.5
RADIUS AS REQUIRED
1.25
2.5
5.0
1.25
.50
R.38
NAME
COURSE
DATE
DRAWING

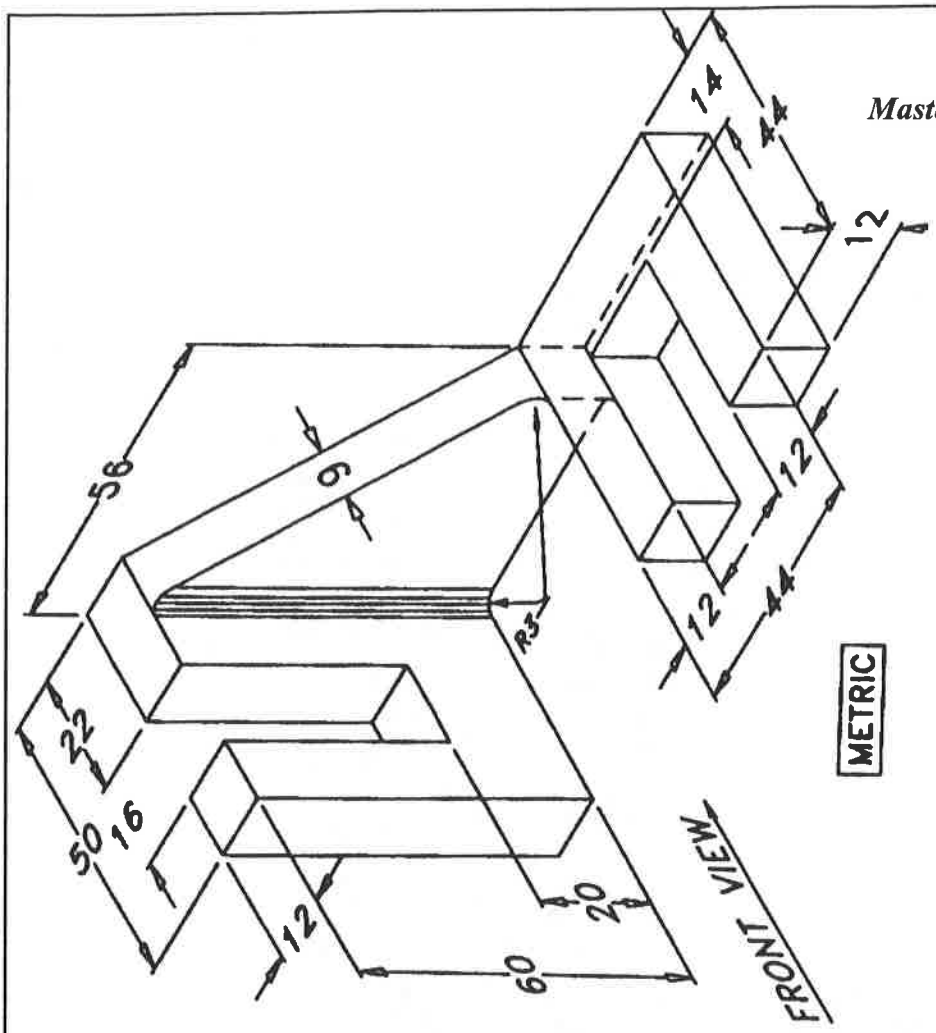


		NAME _	DRAWING
		COURSE _ DATE _	

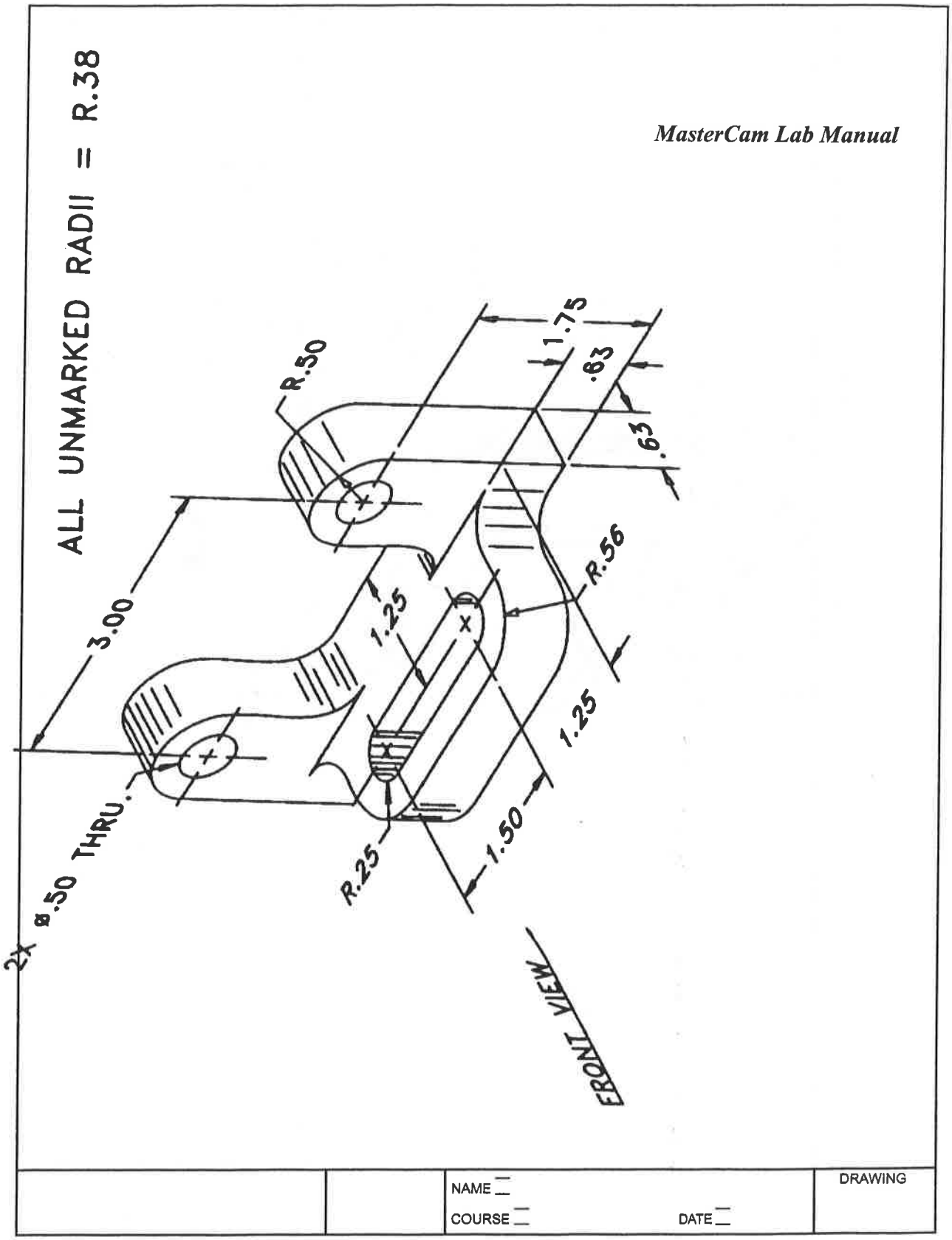

2X Ø.468 THRU
ALL FILLETS & ROUNDS, R.12
Ø.50 THRU
S.F. 1.375 ∓ .08
Ø2.0
.825
FINISHED SURFACE
(TOP/BOTTOM SURFACES)
.59
3.0
1.88
.44
1.28
.56
FINISHED
SURFACE
2.25
.50
4.0
FRONT VIEW
NAME
COURSE
DATE
DRAWING

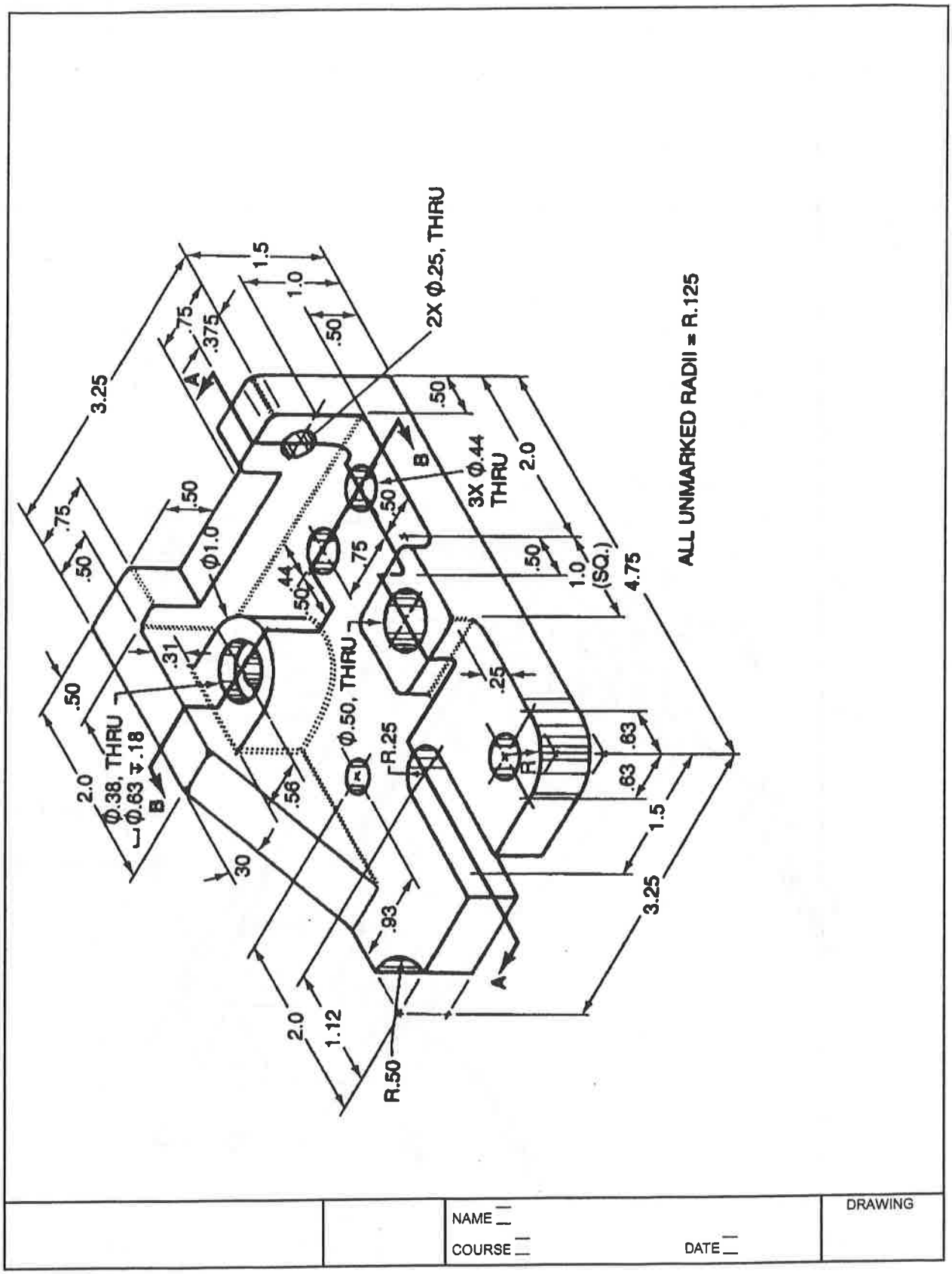


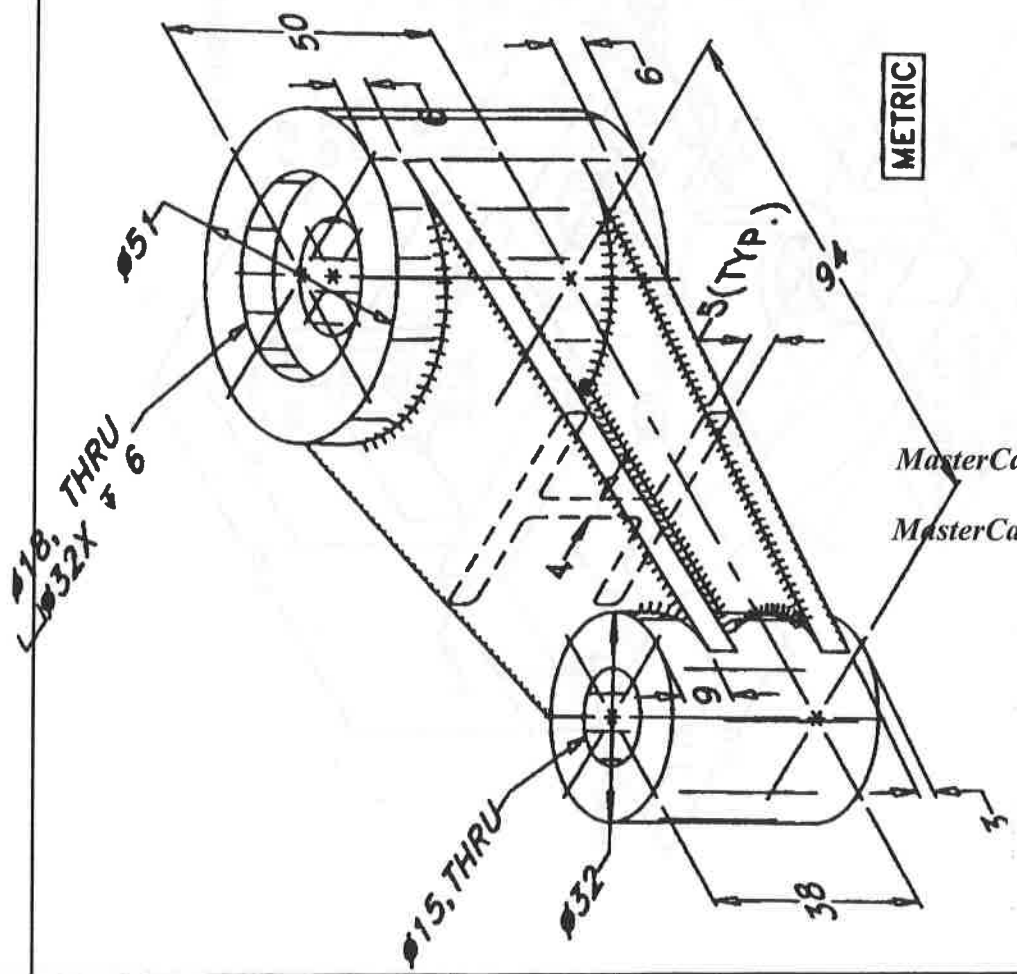
		NAME _ COURSE _ DATE _	DRAWING



		NAME COURSE DATE	DRAWING


ALL UNMARKED RADII = R.38
1.75
.63
.63
R.50
R.56
3.00
1.25
1.25
1.50
R.25
2X ø.50 THRU
FRONT VIEW
NAME
COURSE
DATE
DRAWING


ALL UNMARKED RADII = R.125
2X Φ.25, THRU
3X Φ.44 THRU
Φ.38, THRU ⌴Φ.63 ↧.18
Φ.50, THRU
Φ1.0
R.25
R.50
3.25
2.0
1.5
1.0
.75
.50
.375
.31
.44
.56
.30
.93
1.12
4.75
(SQ.)
.63
.25
NAME
COURSE
DATE
DRAWING



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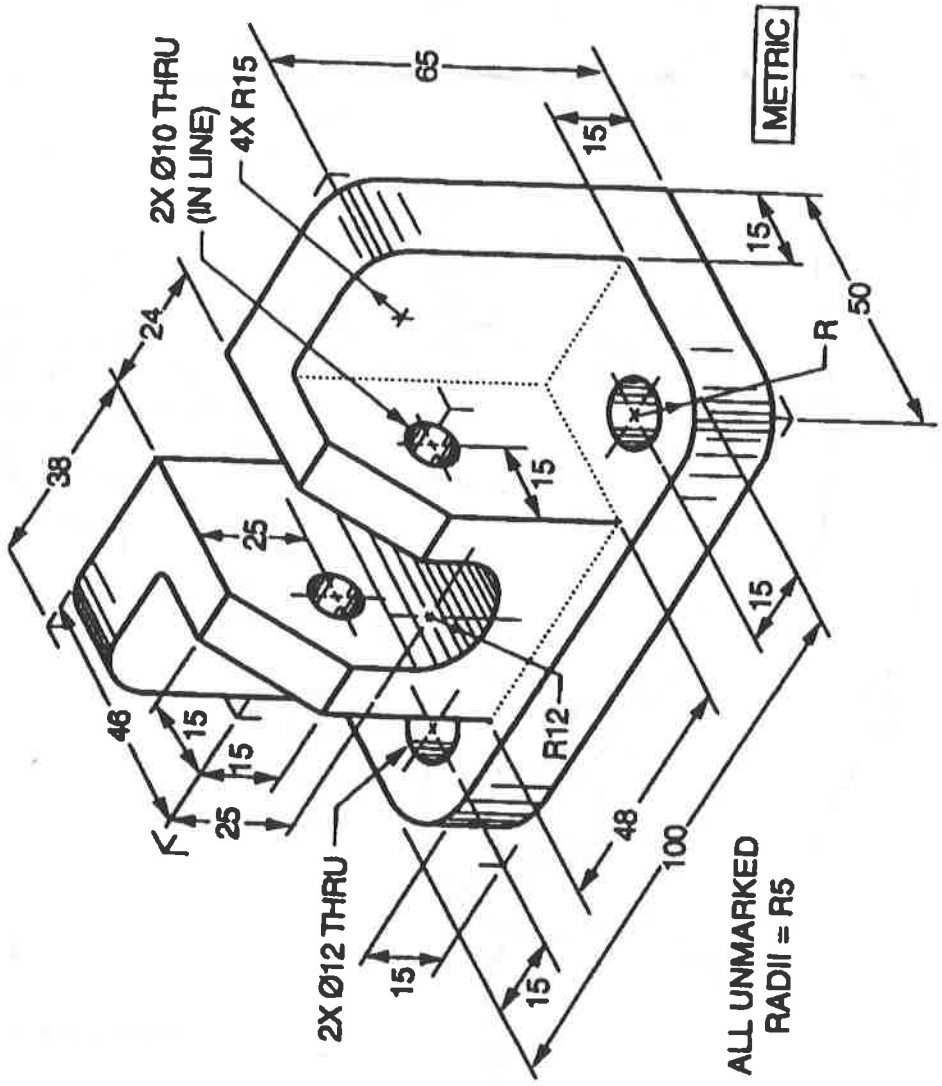
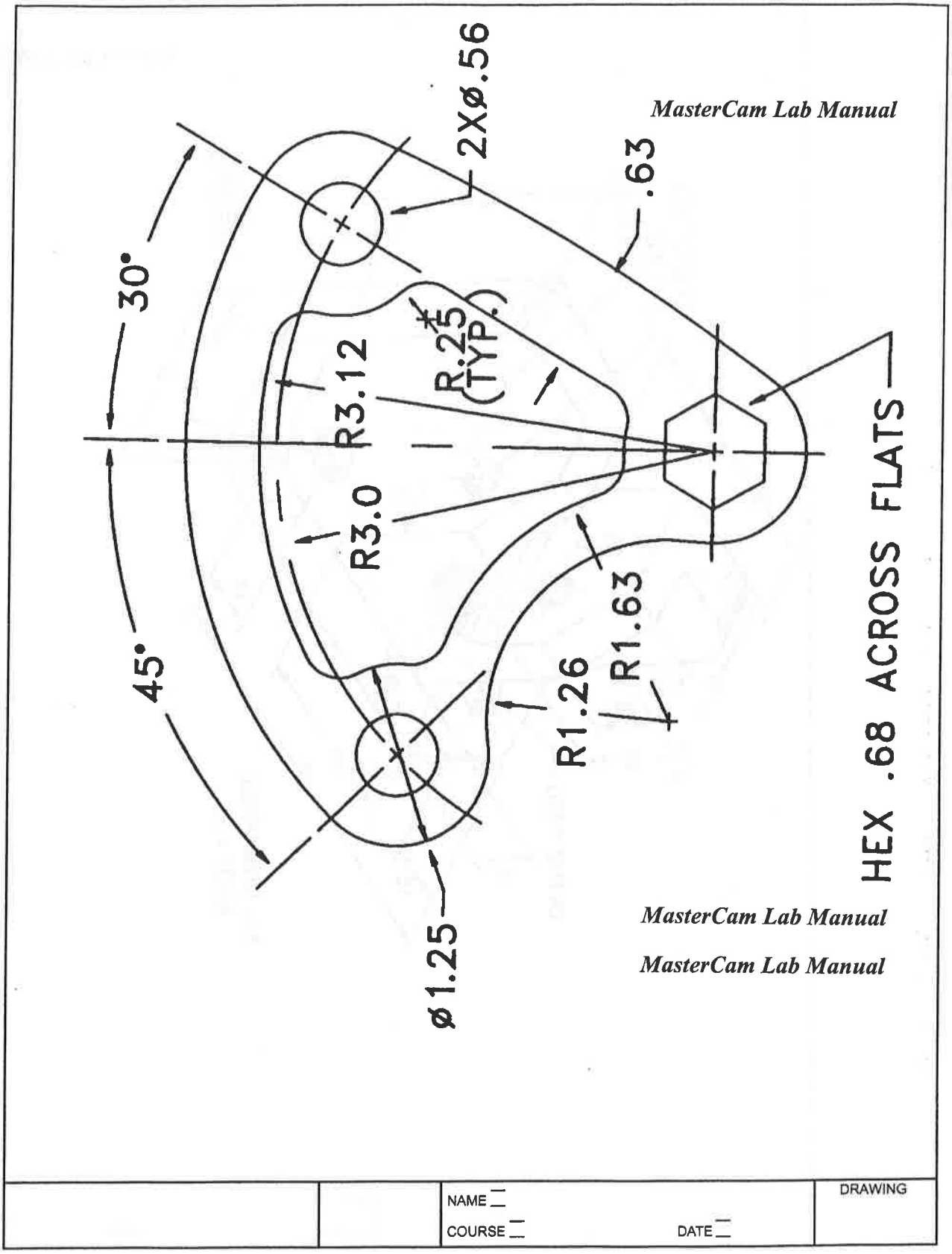
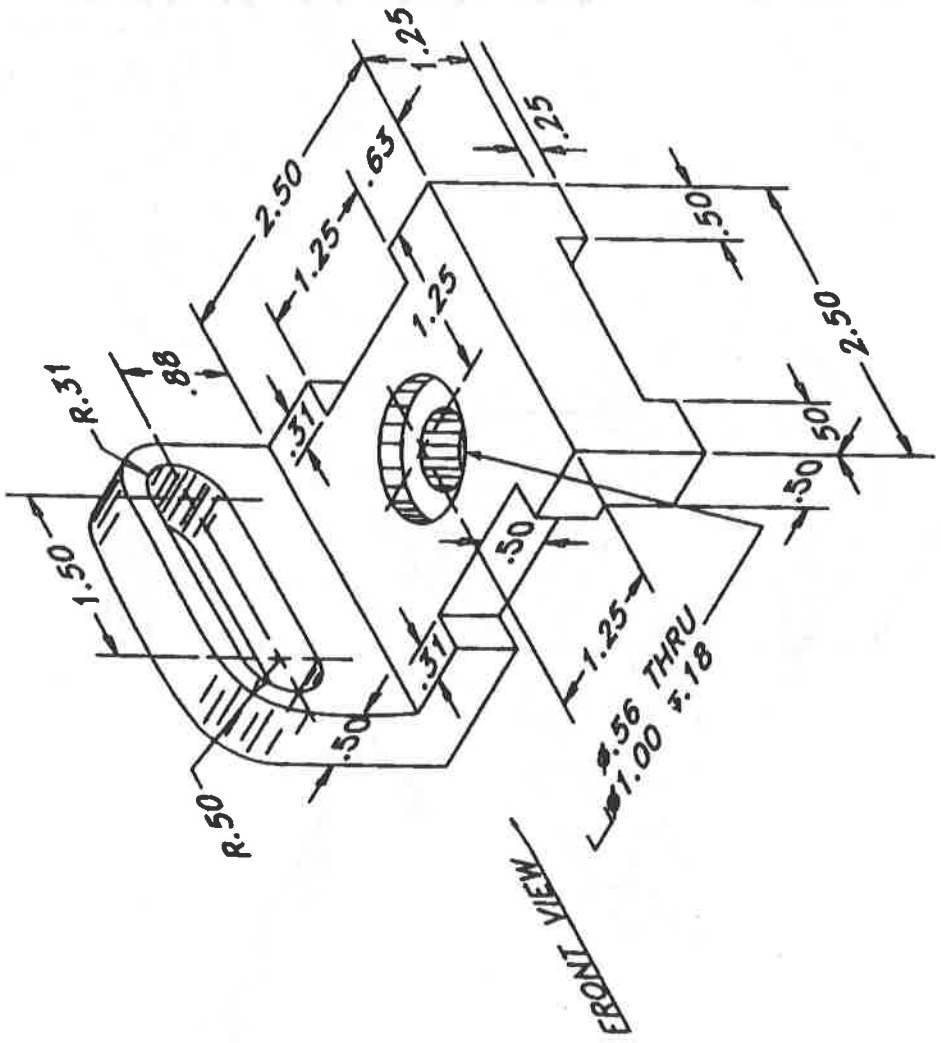
		NAME _ COURSE _ DATE _	DRAWING

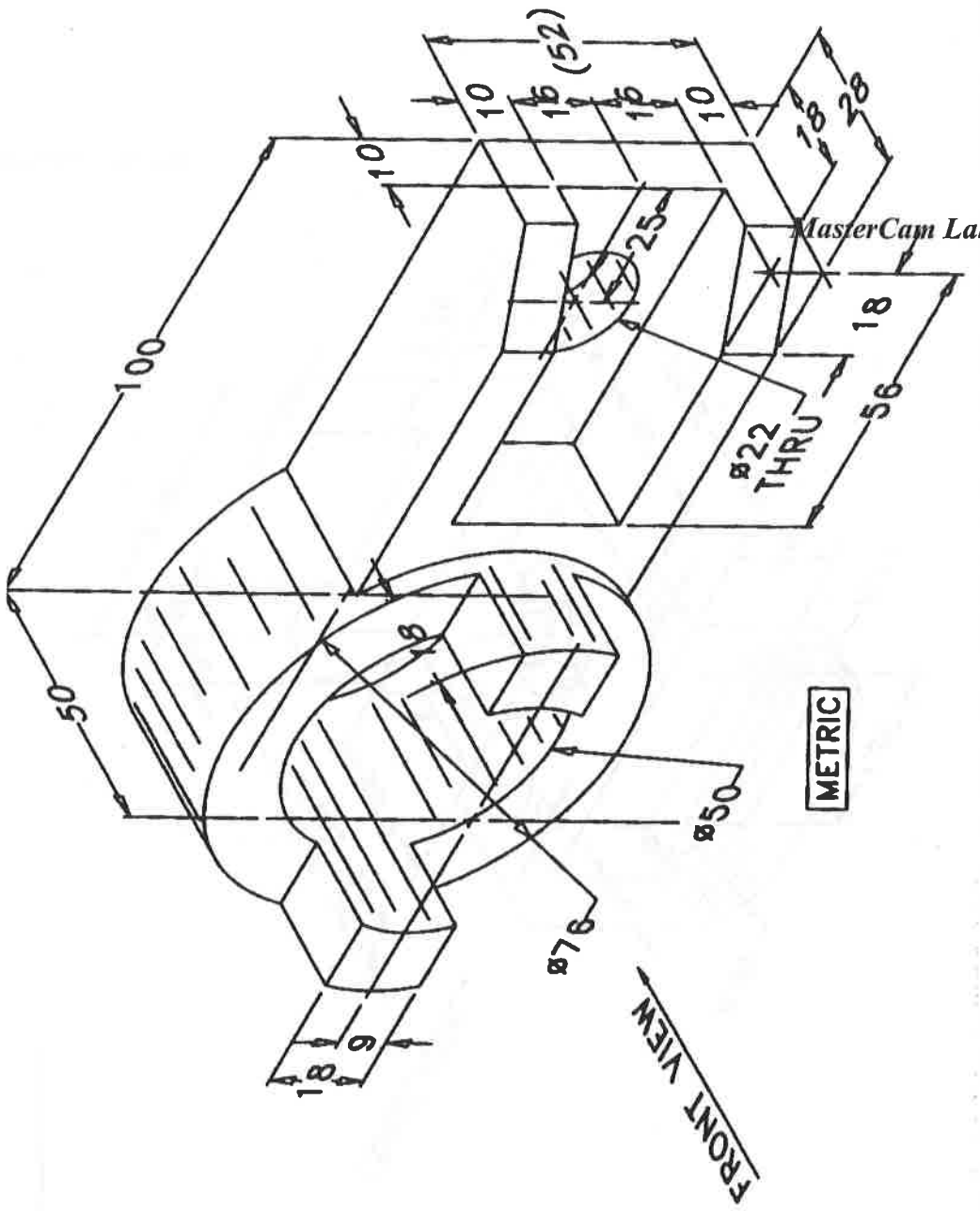


		NAME _ COURSE _ DATE _	DRAWING


MasterCam Lab Manual
2XØ.56
.63
30°
R.25 (TYP.)
R3.12
R3.0
45°
R1.63
R1.26
HEX .68 ACROSS FLATS
Ø1.25
MasterCam Lab Manual
MasterCam Lab Manual
NAME
COURSE
DATE
DRAWING



		NAME _ COURSE _ DATE _	DRAWING



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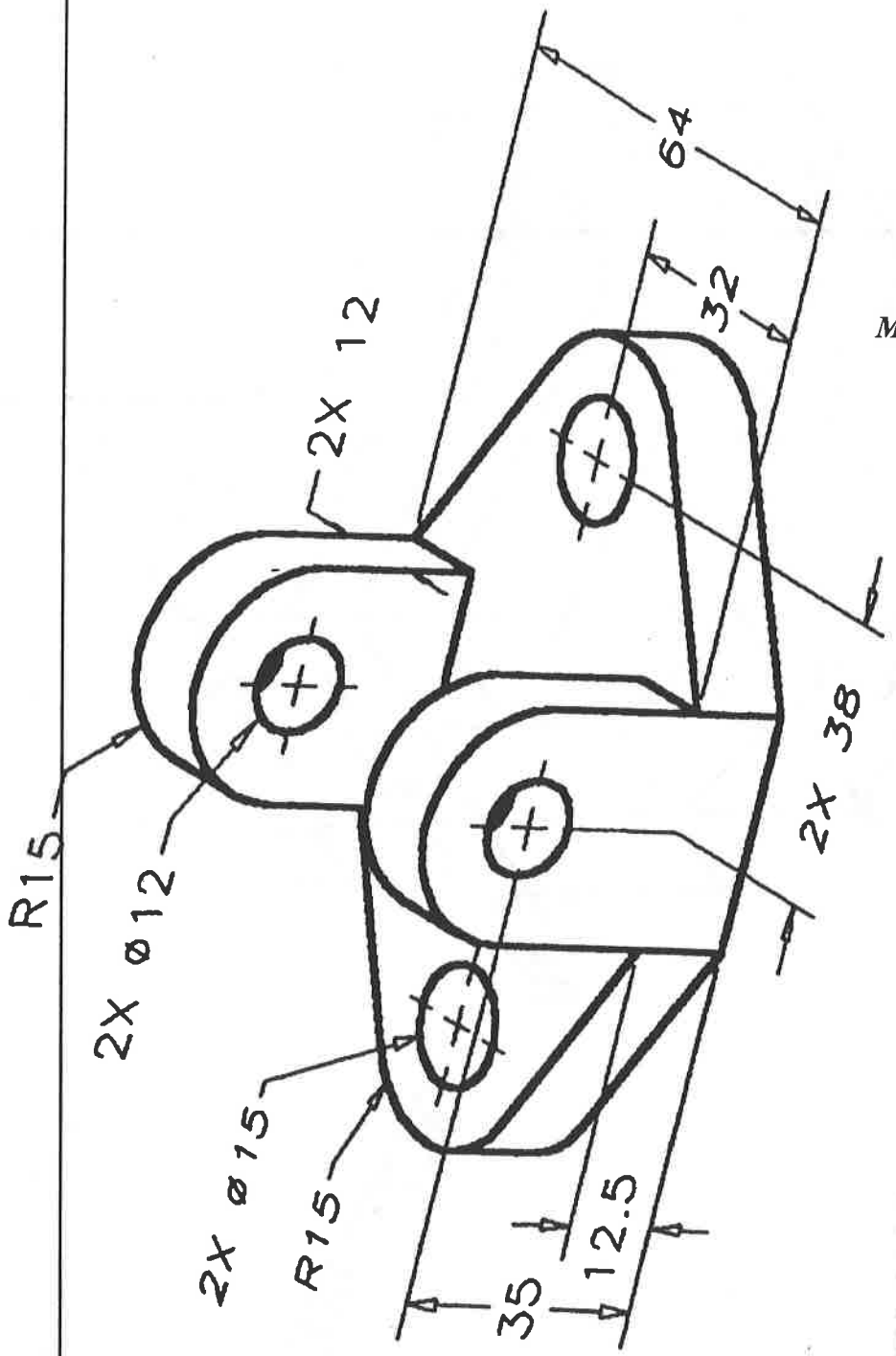
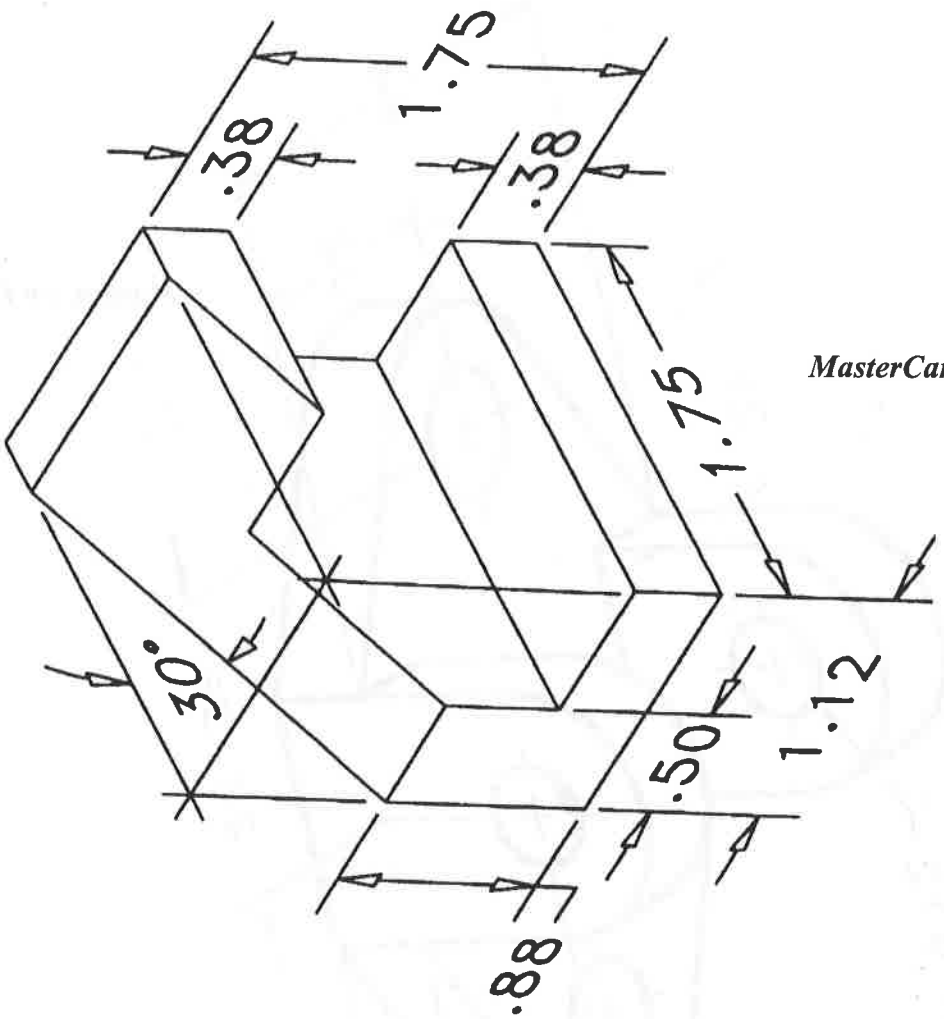
		NAME _ COURSE _ DATE _	DRAWING



		NAME _ COURSE _ DATE _	DRAWING



MasterCam Lab Manual

MasterCam Lab Manual

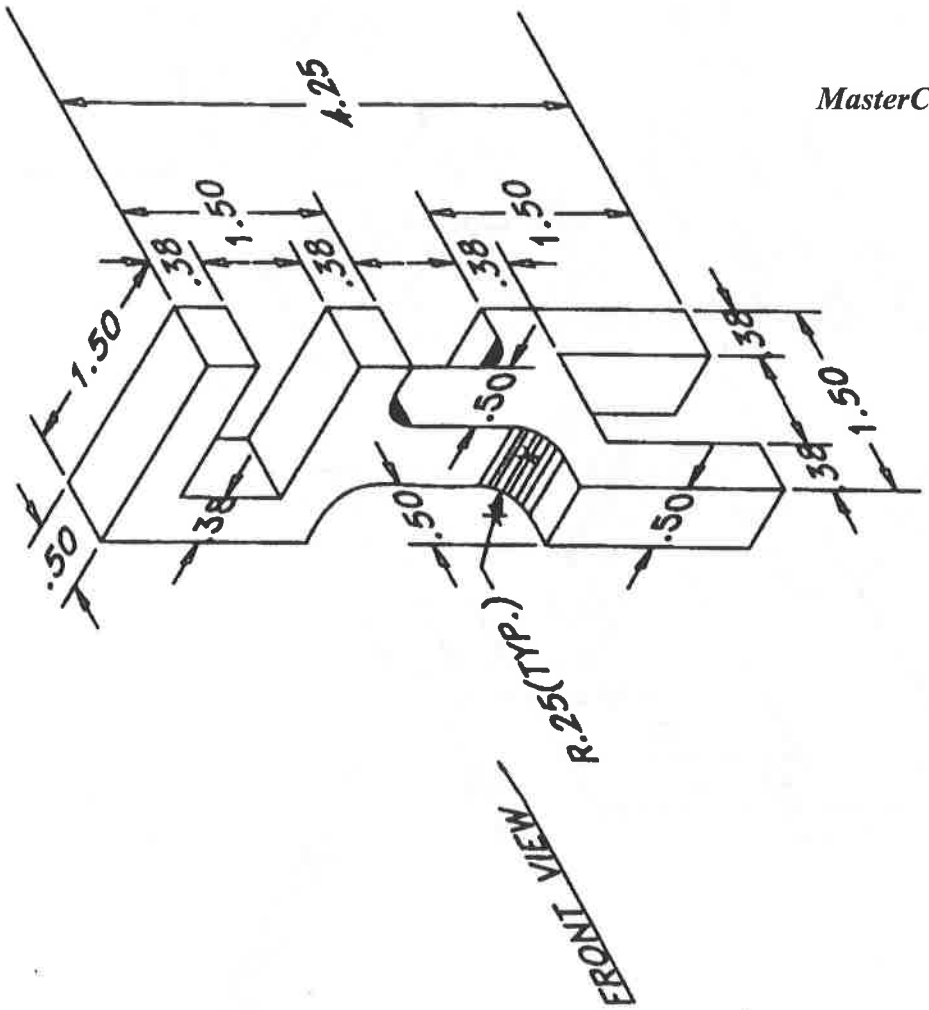
MasterCam Lab Manual

NAME

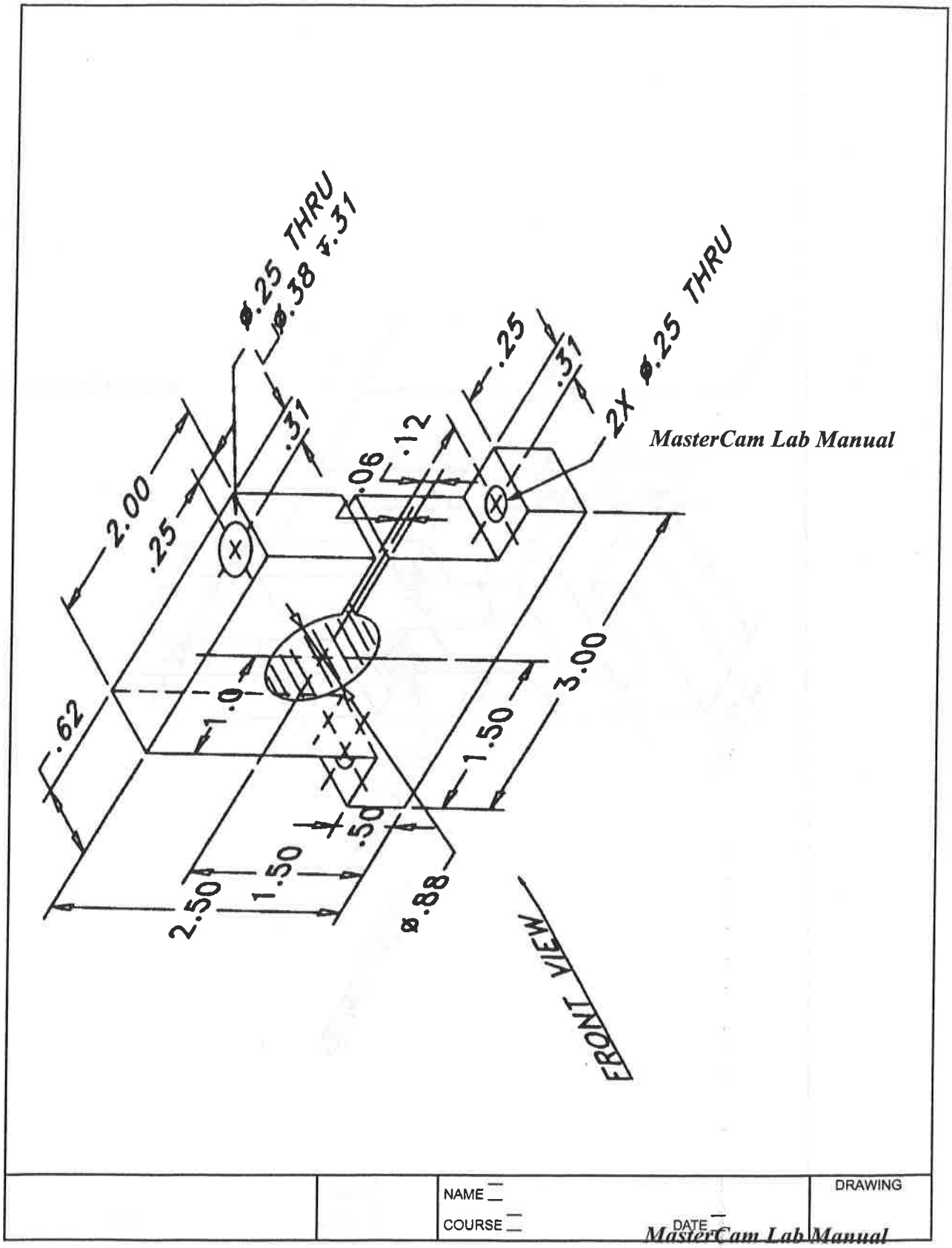
COURSE

DATE

DRAWING



		NAME COURSE DATE	DRAWING



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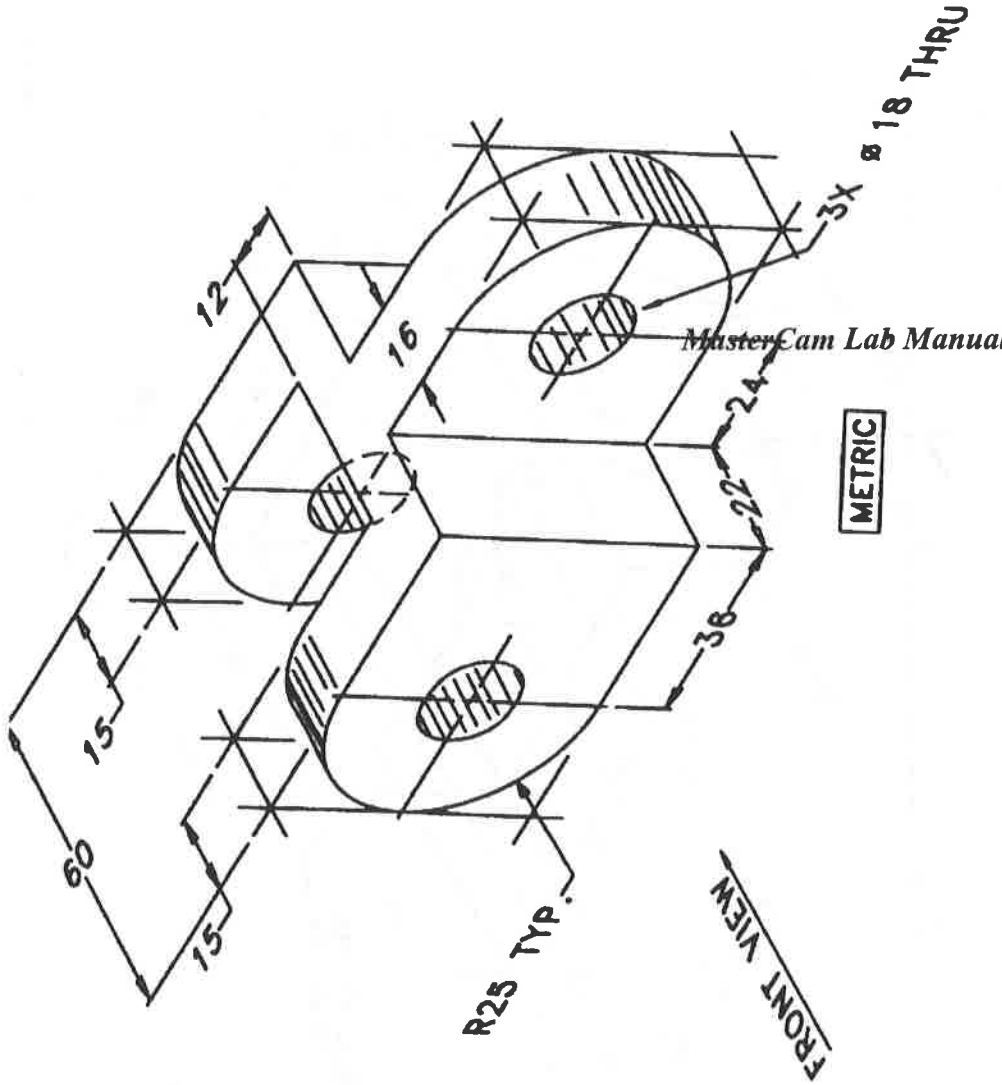
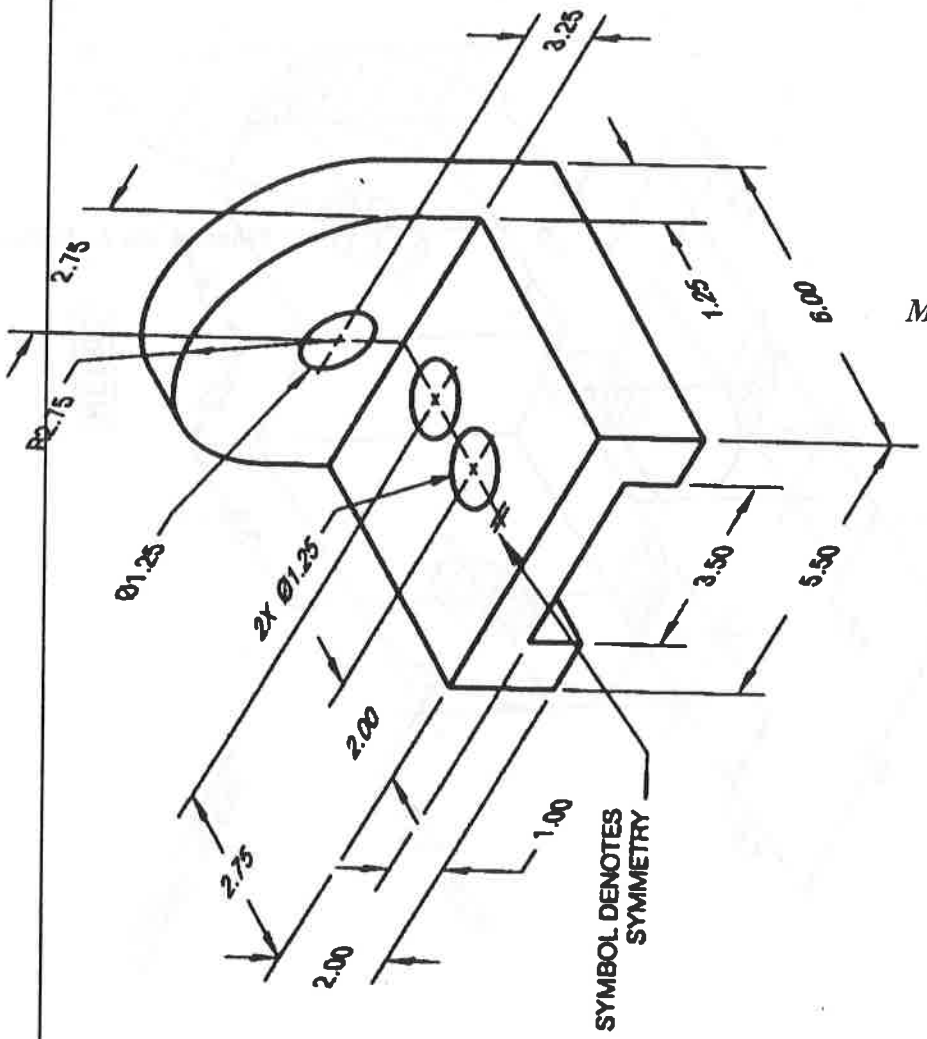


		NAME _ COURSE _ DATE _	DRAWING



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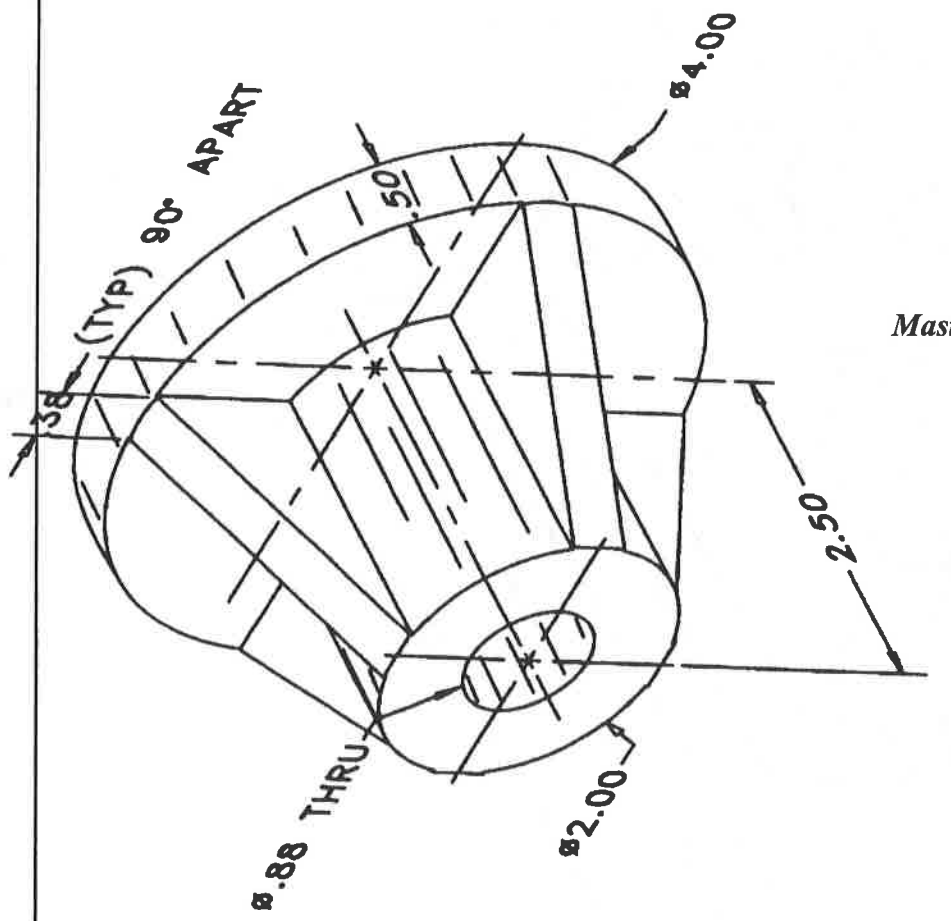
		NAME _ COURSE _ DATE _	DRAWING



		NAME _ COURSE _ DATE _	DRAWING

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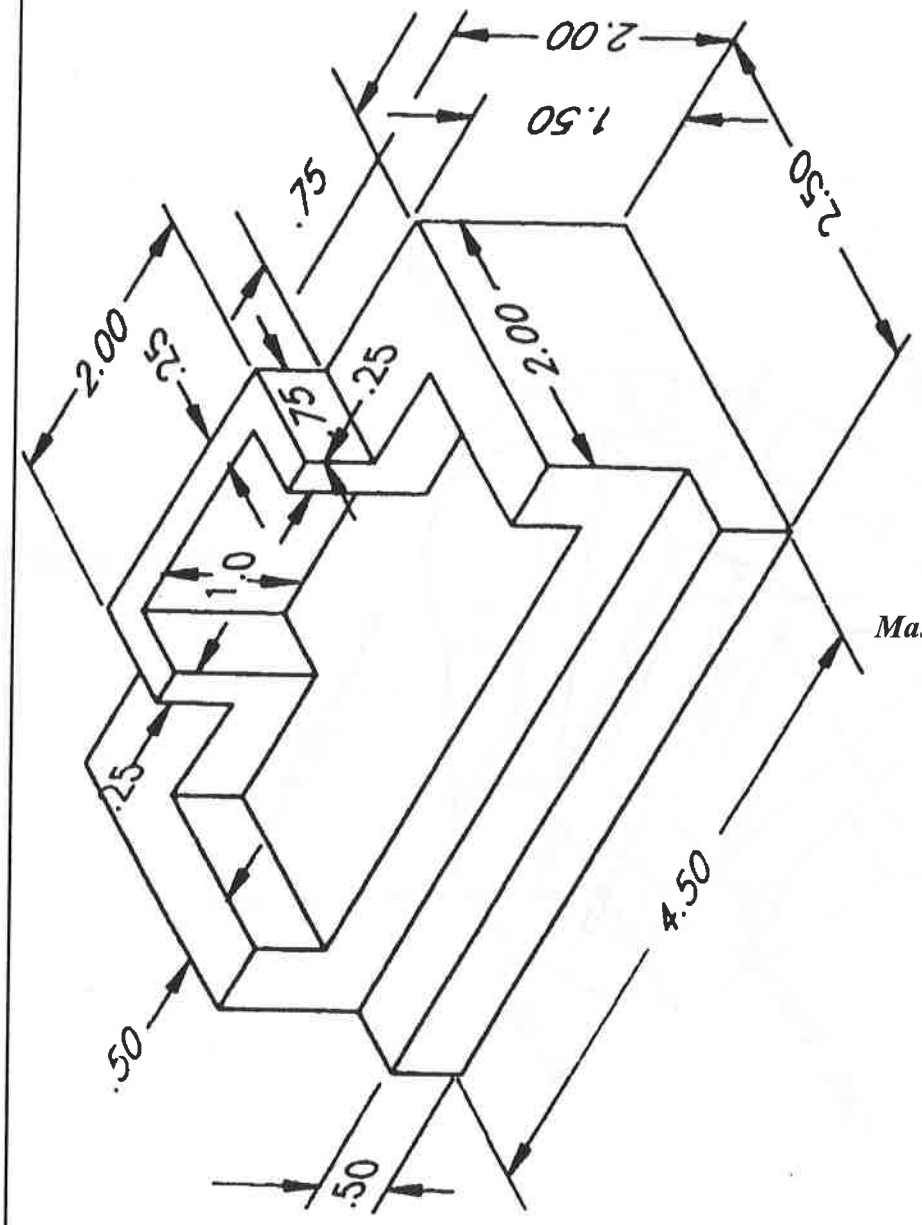
MasterCam Lab Manual



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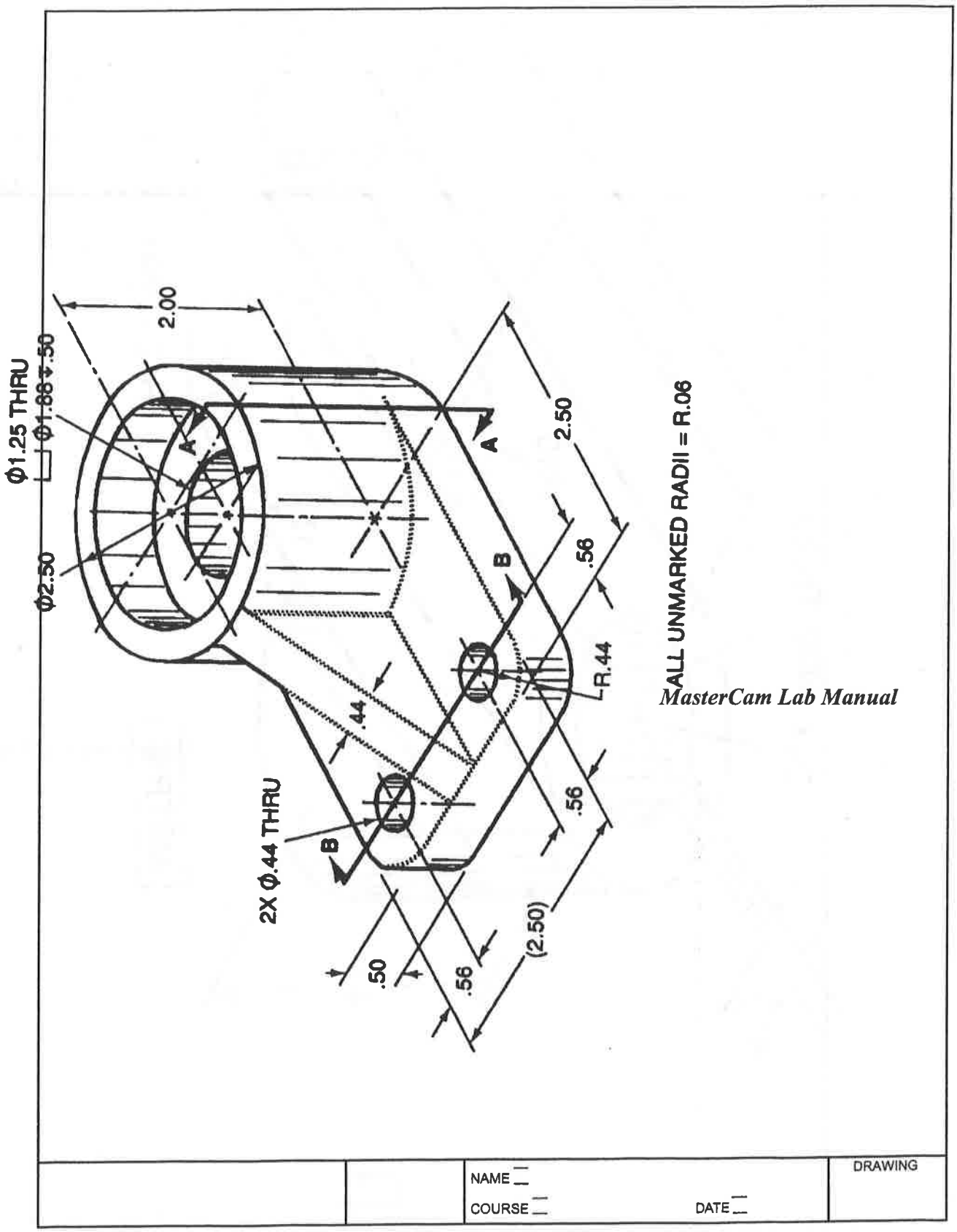
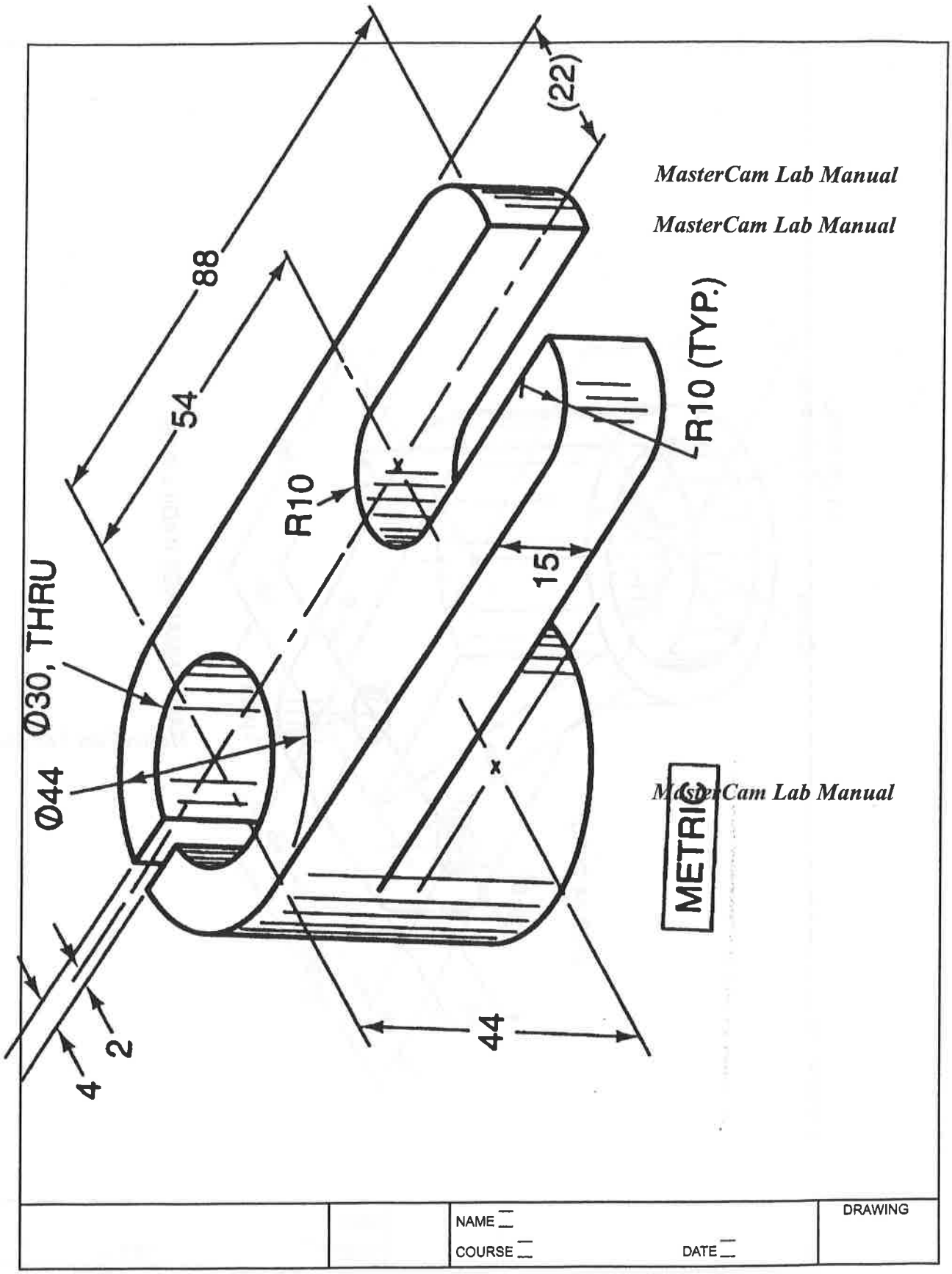
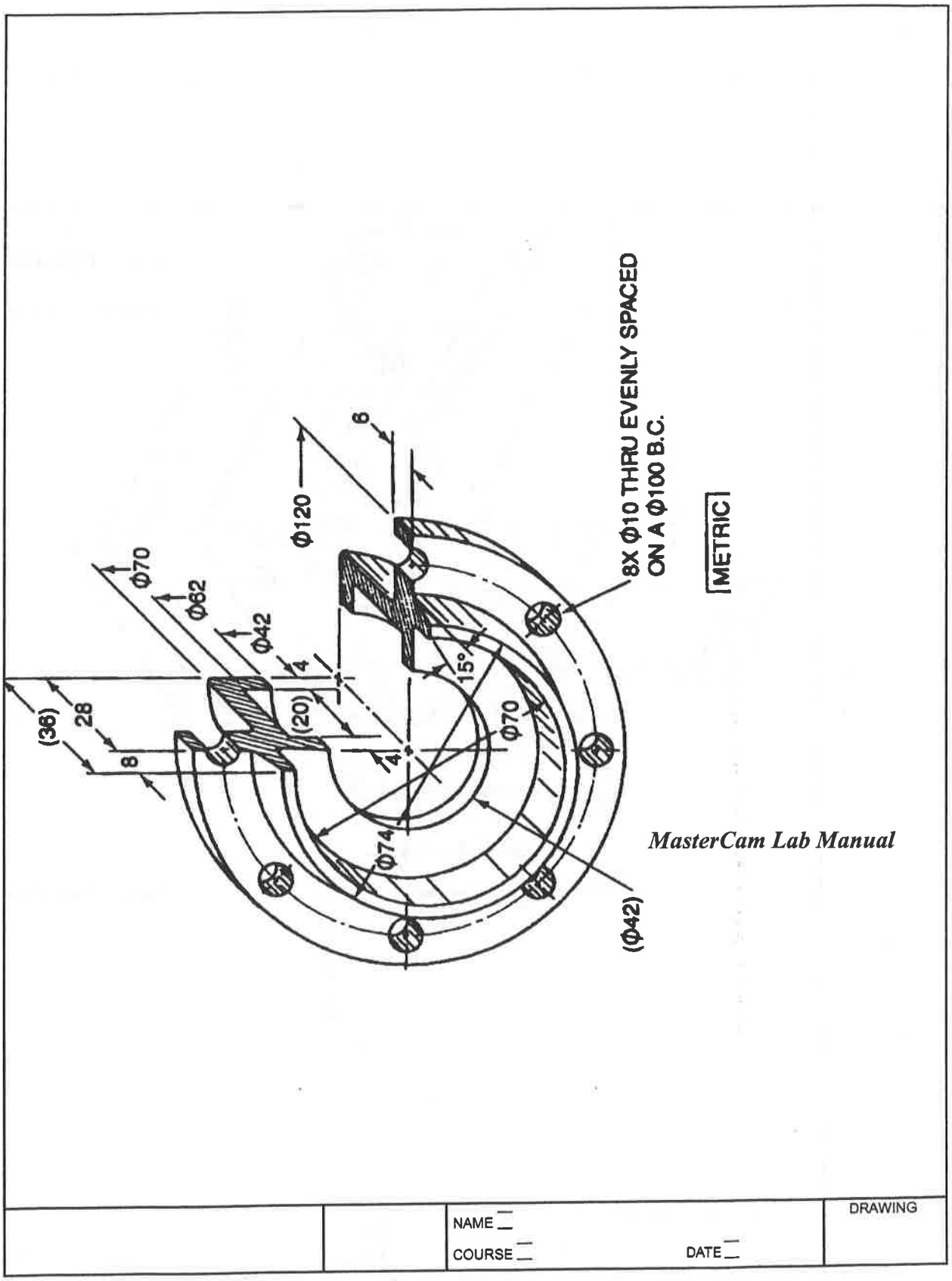
		NAME COURSE DATE	DRAWING


ALL UNMARKED RADII = R.06
2.00
2.50
Φ1.25 THRU
⌴ Φ1.88 ↧.50
Φ2.50
A
A
B
B
.56
R.44
.44
2X Φ.44 THRU
.56
.50
.56
(2.50)
NAME
COURSE
DATE
DRAWING


MasterCam Lab Manual
MasterCam Lab Manual
MasterCam Lab Manual
METRIC
(22)
88
54
R10
R10 (TYP.)
15
Ø30, THRU
Ø44
44
2
4
NAME
COURSE
DATE
DRAWING



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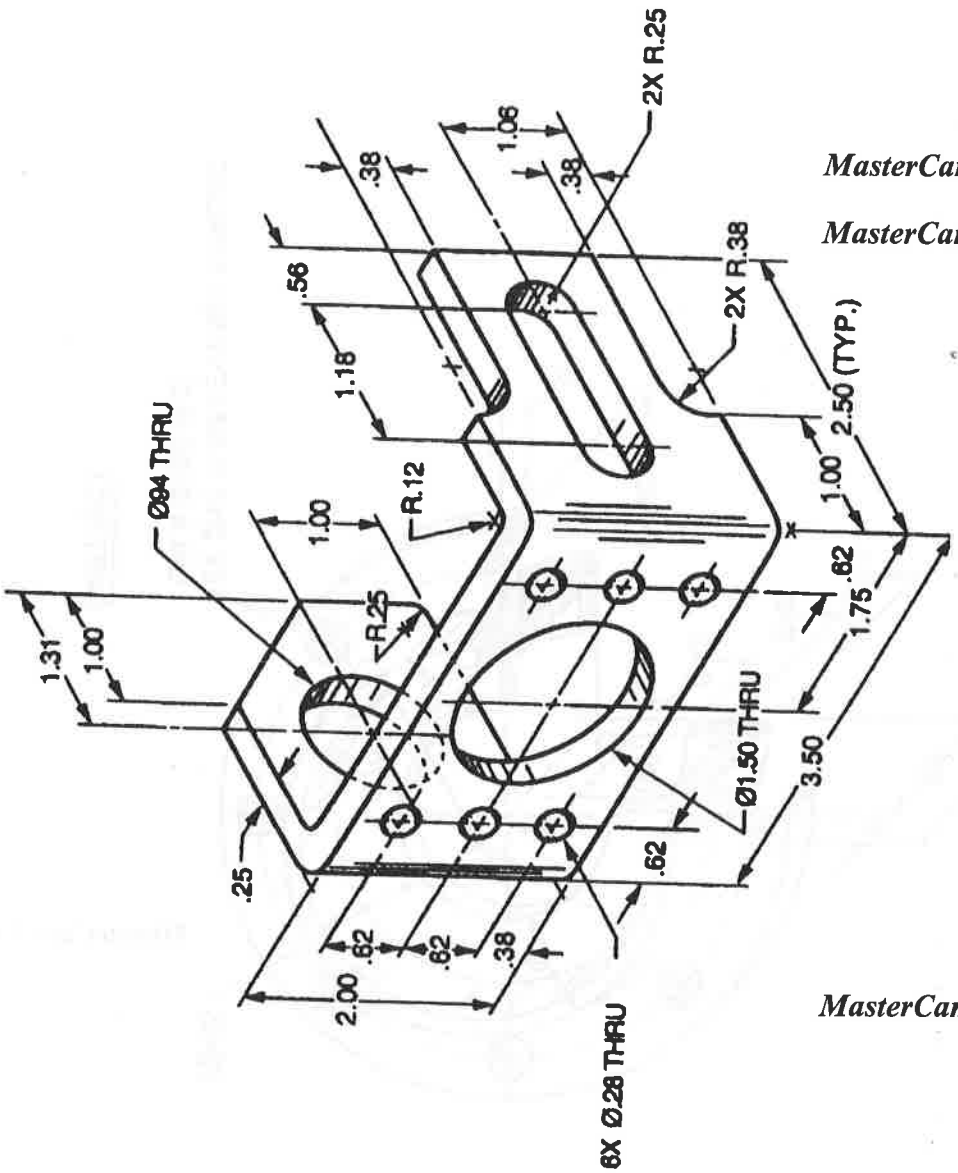

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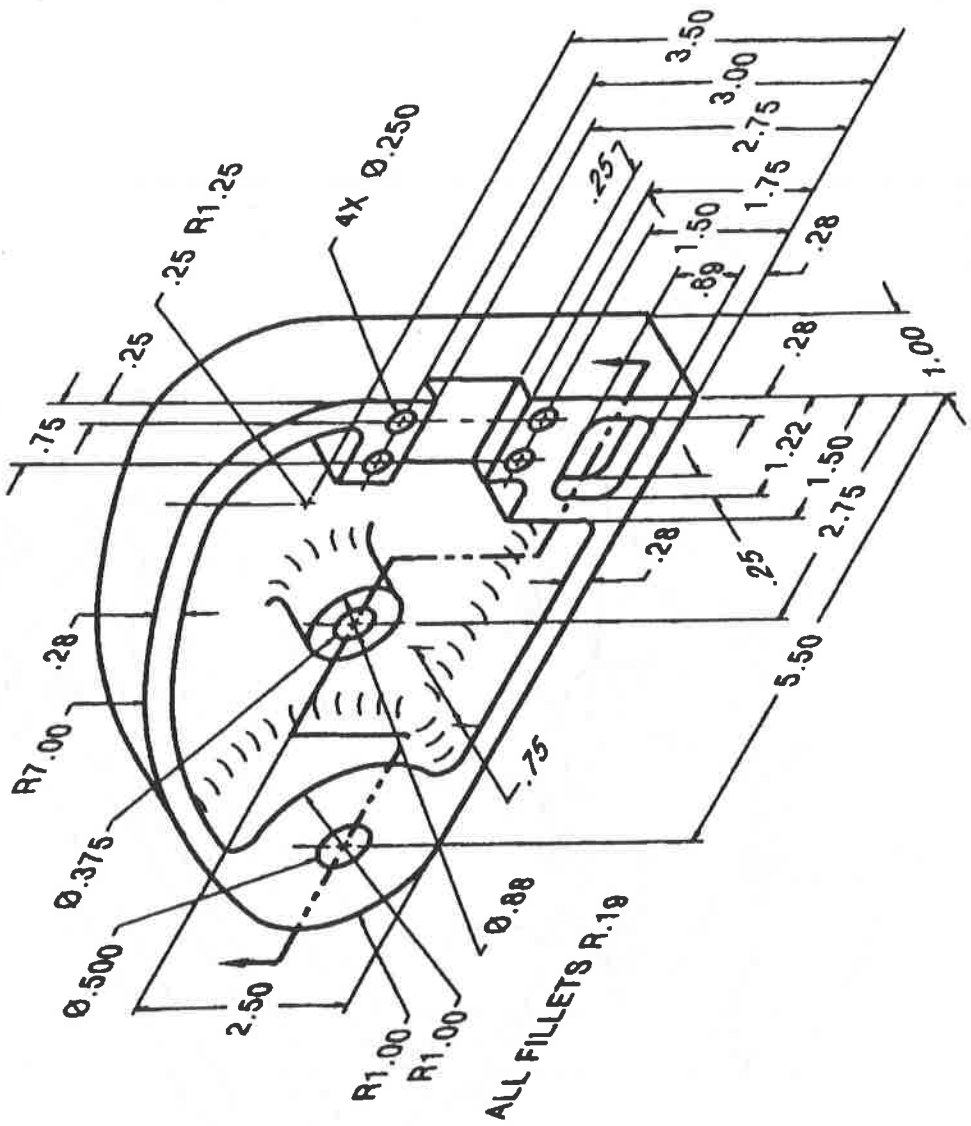

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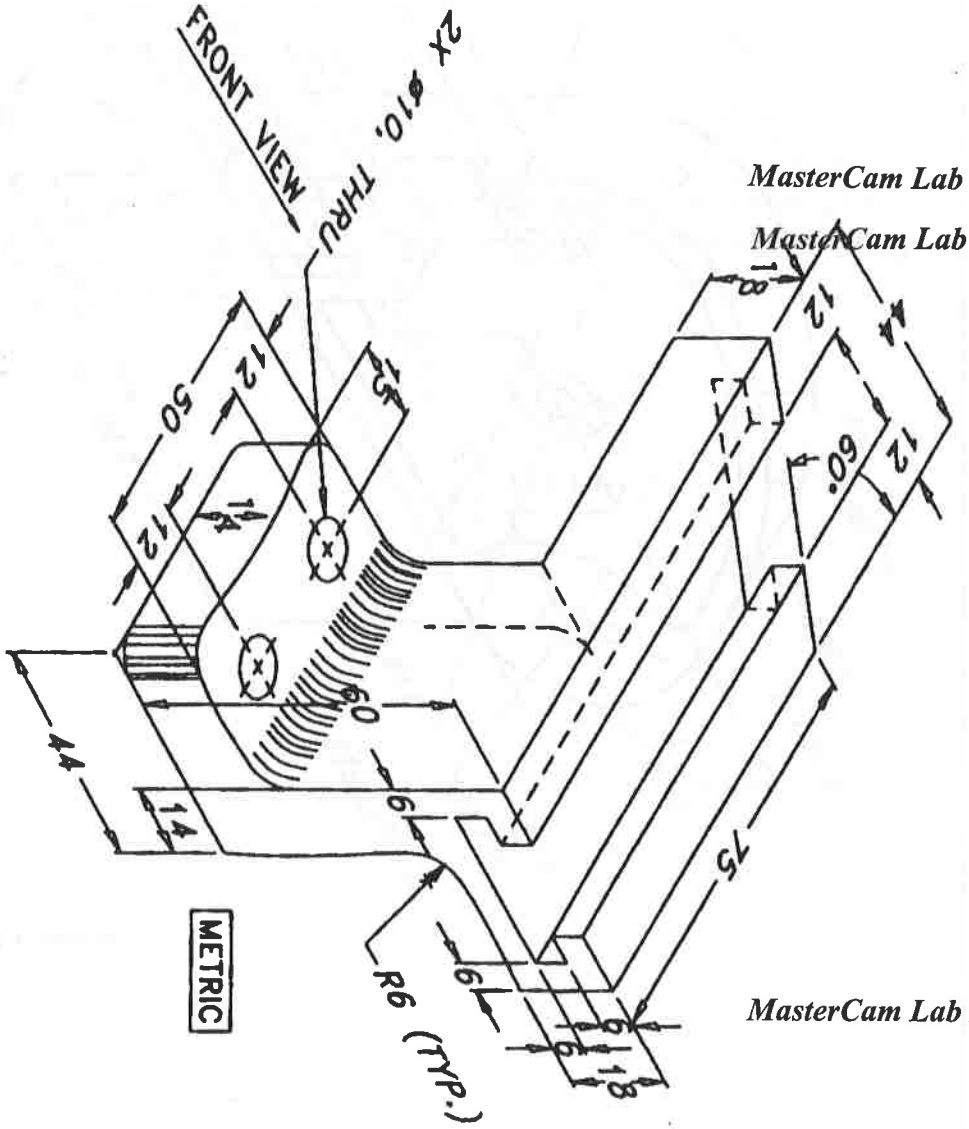

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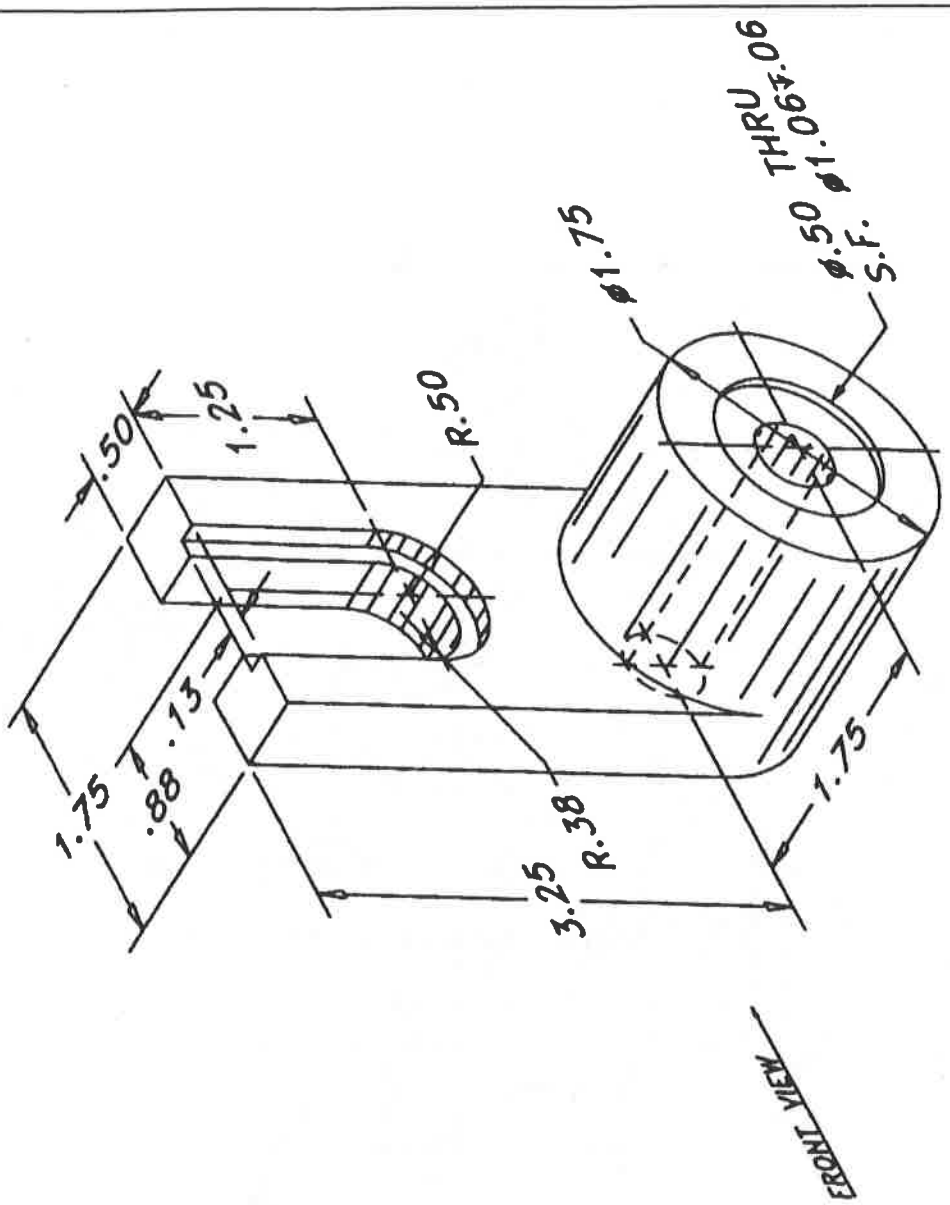

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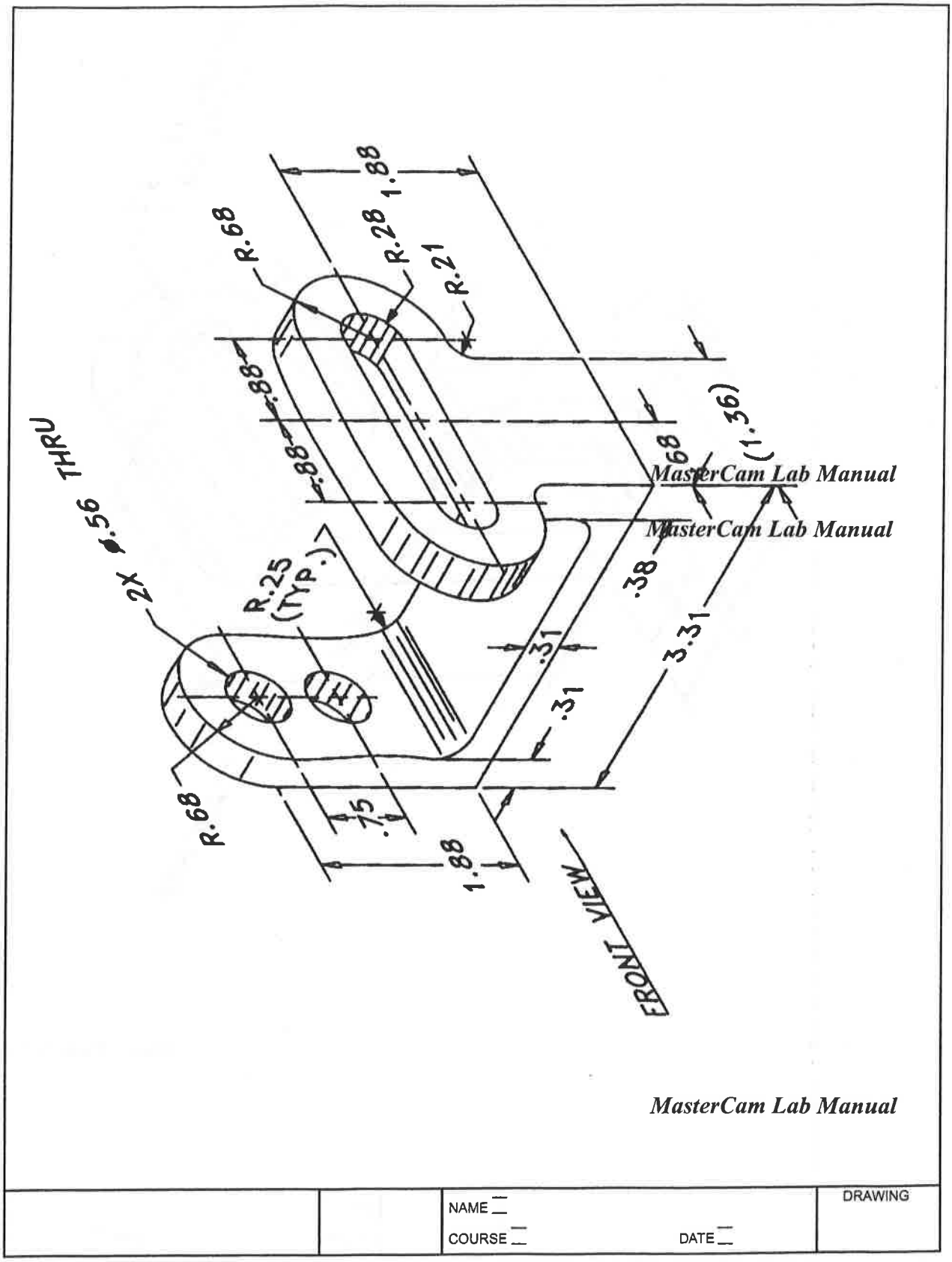
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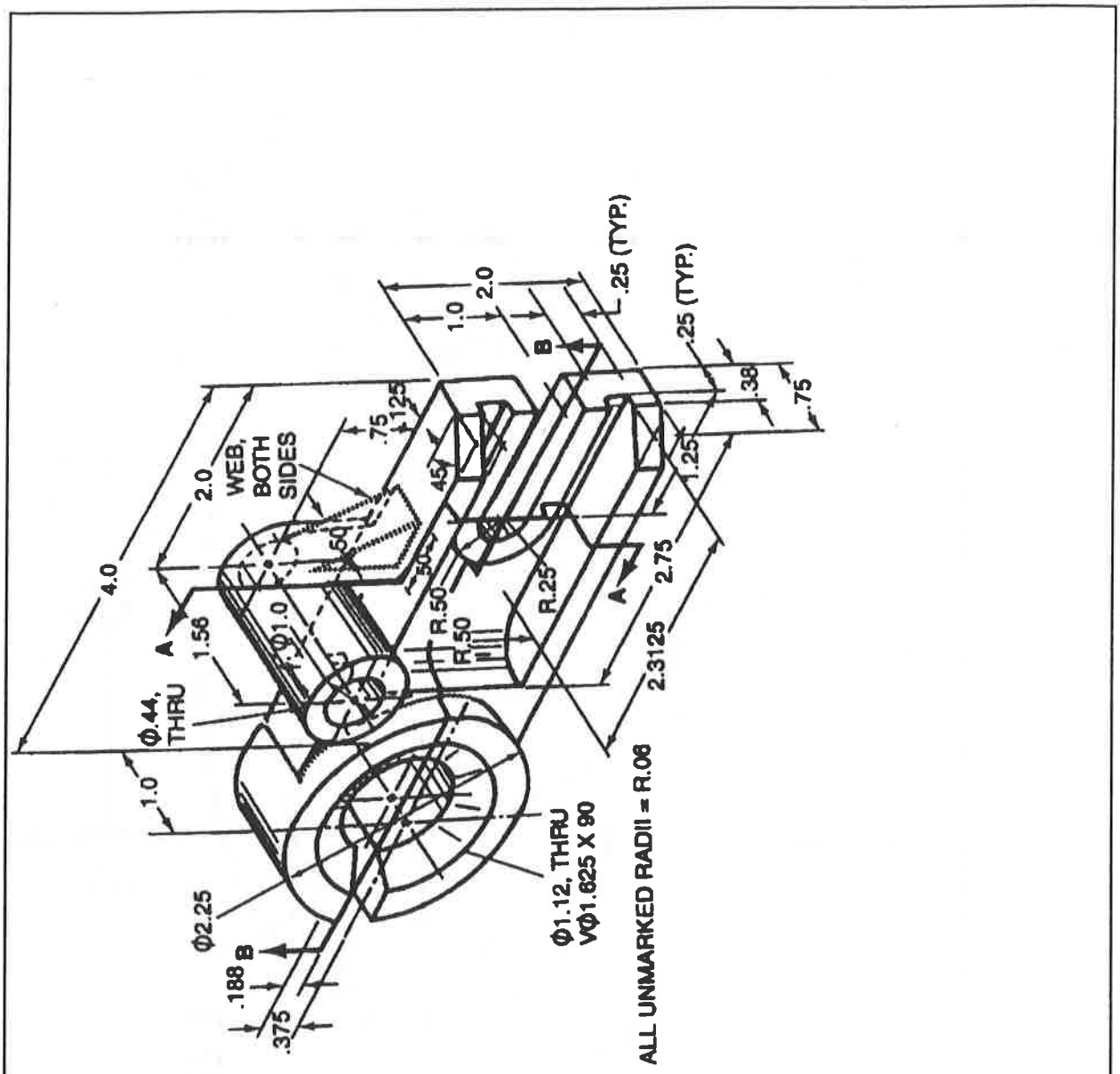

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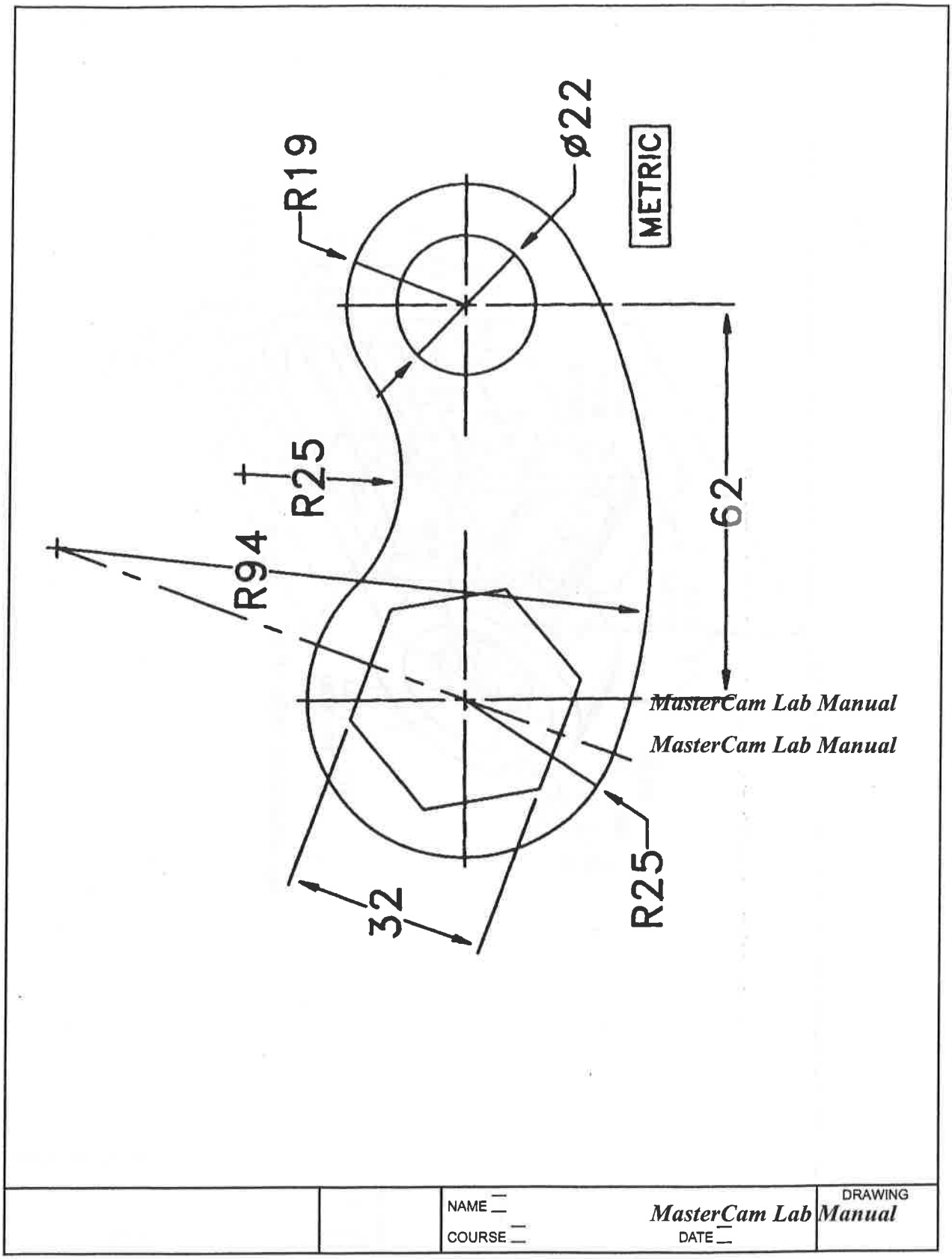
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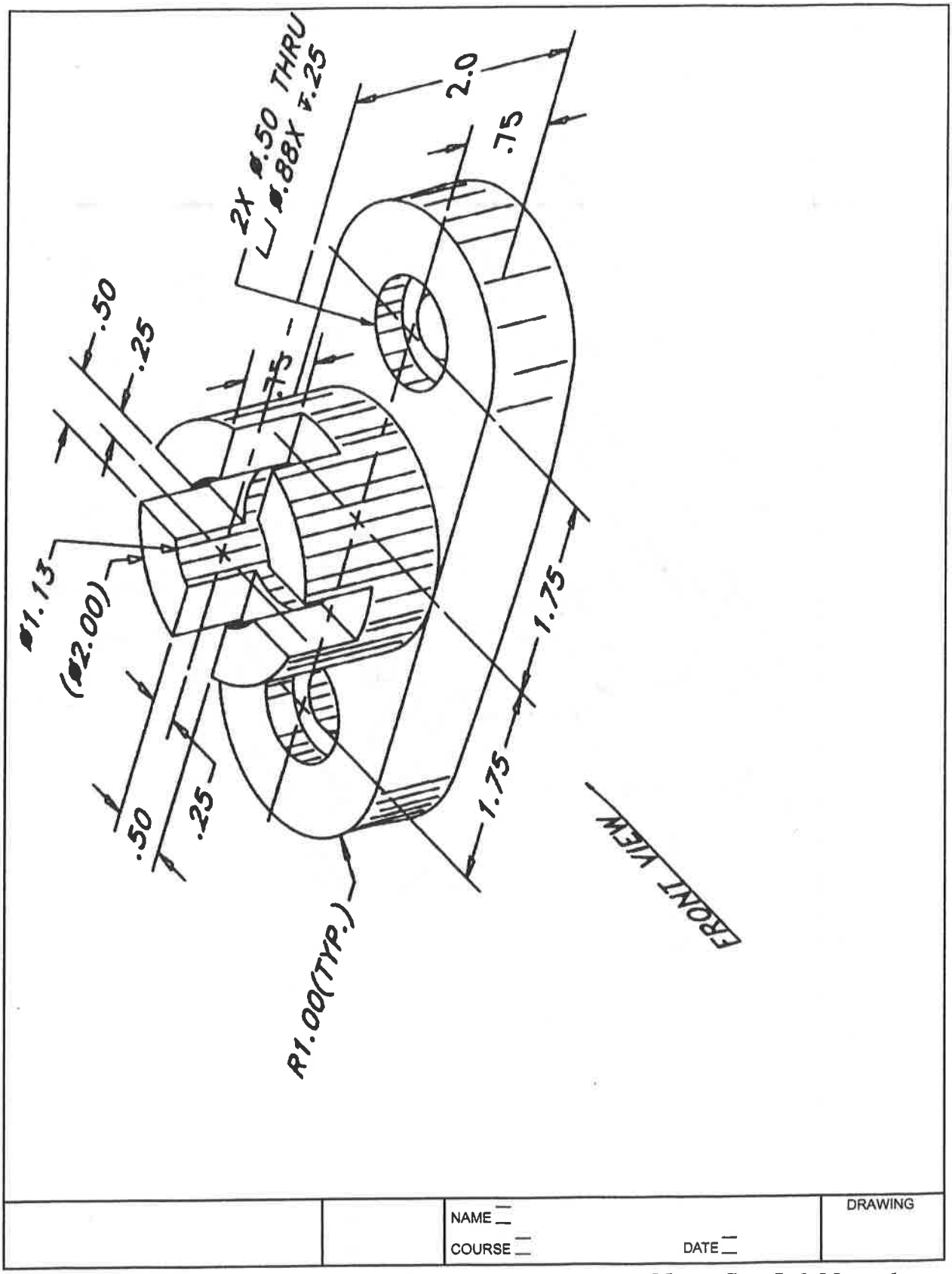

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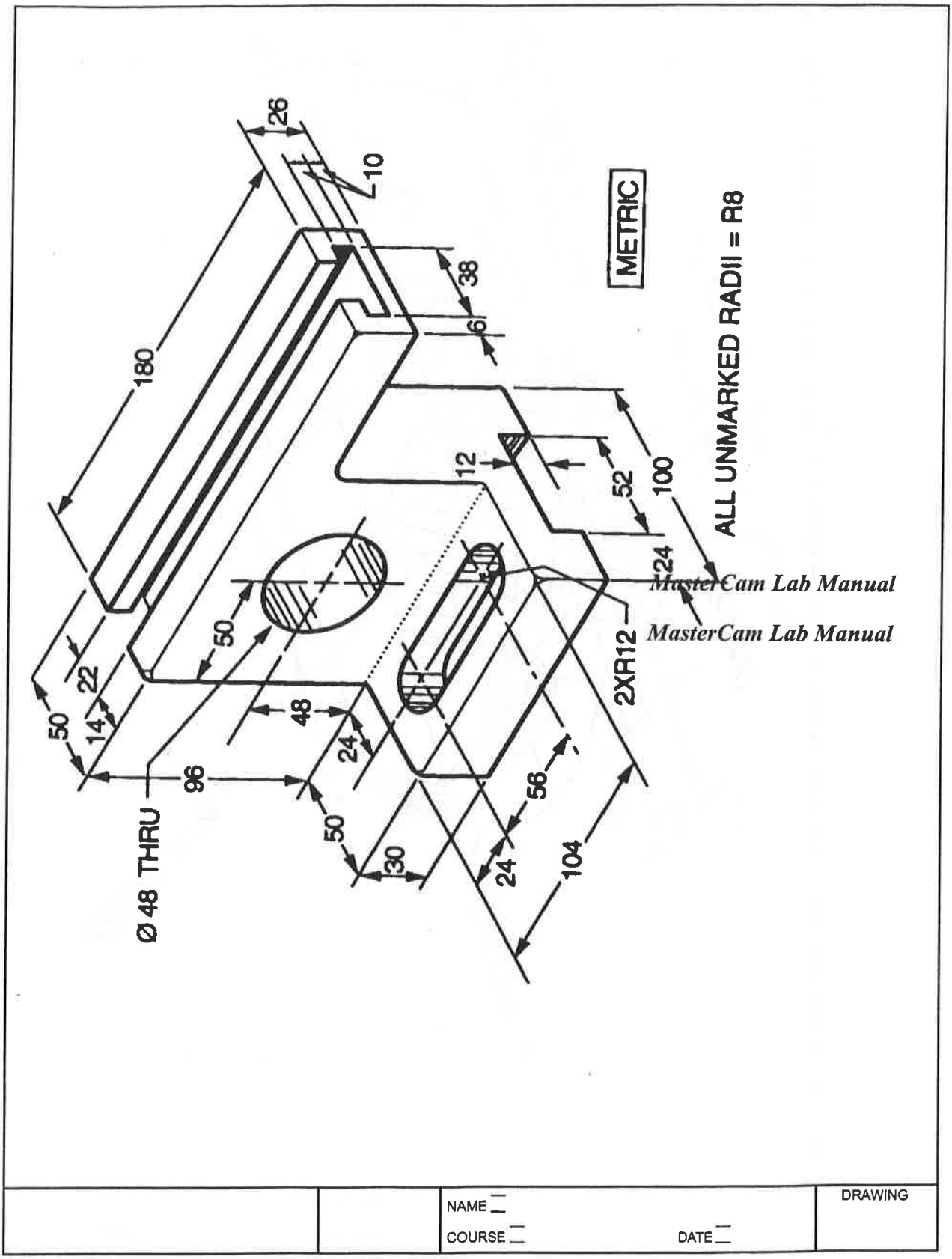
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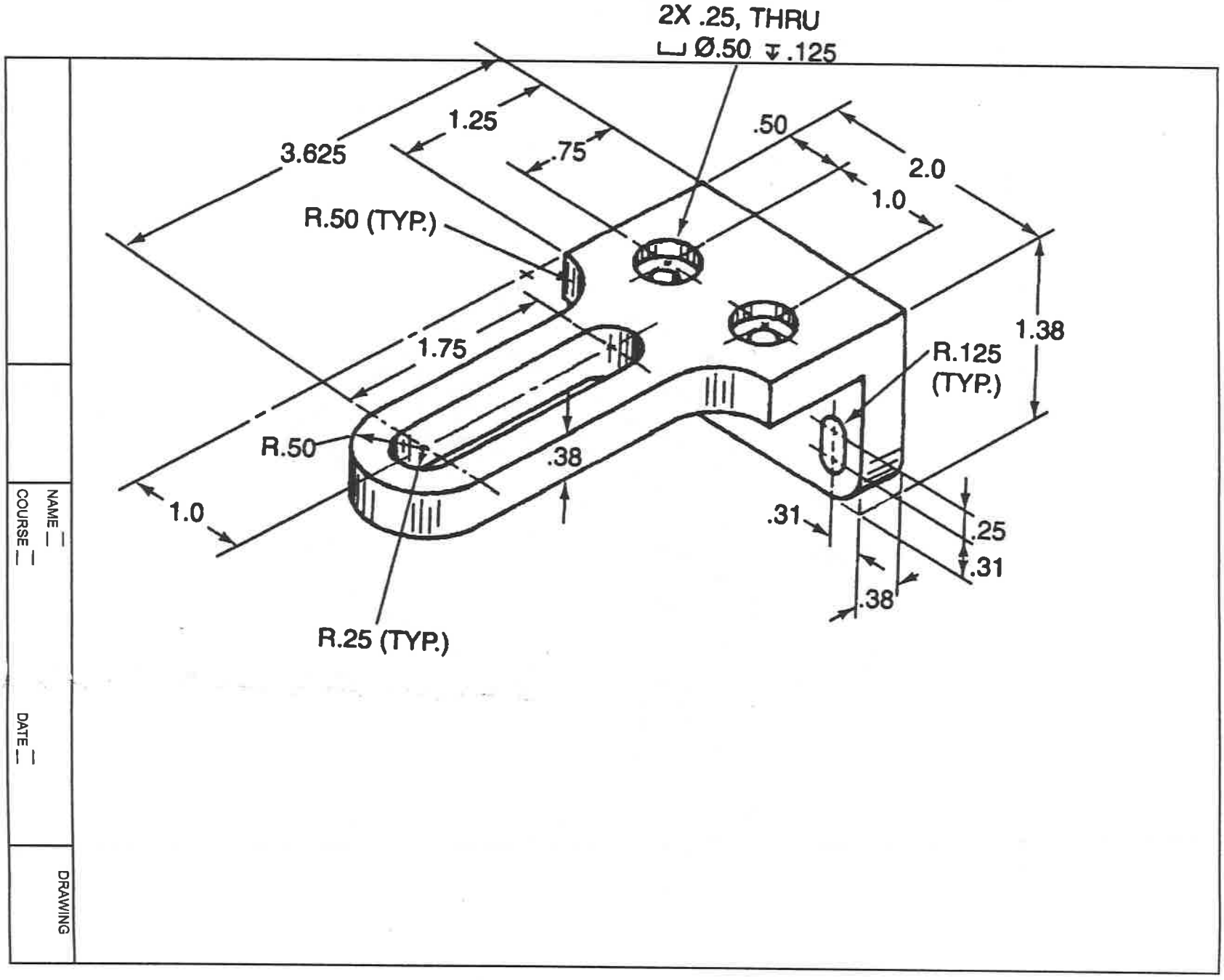
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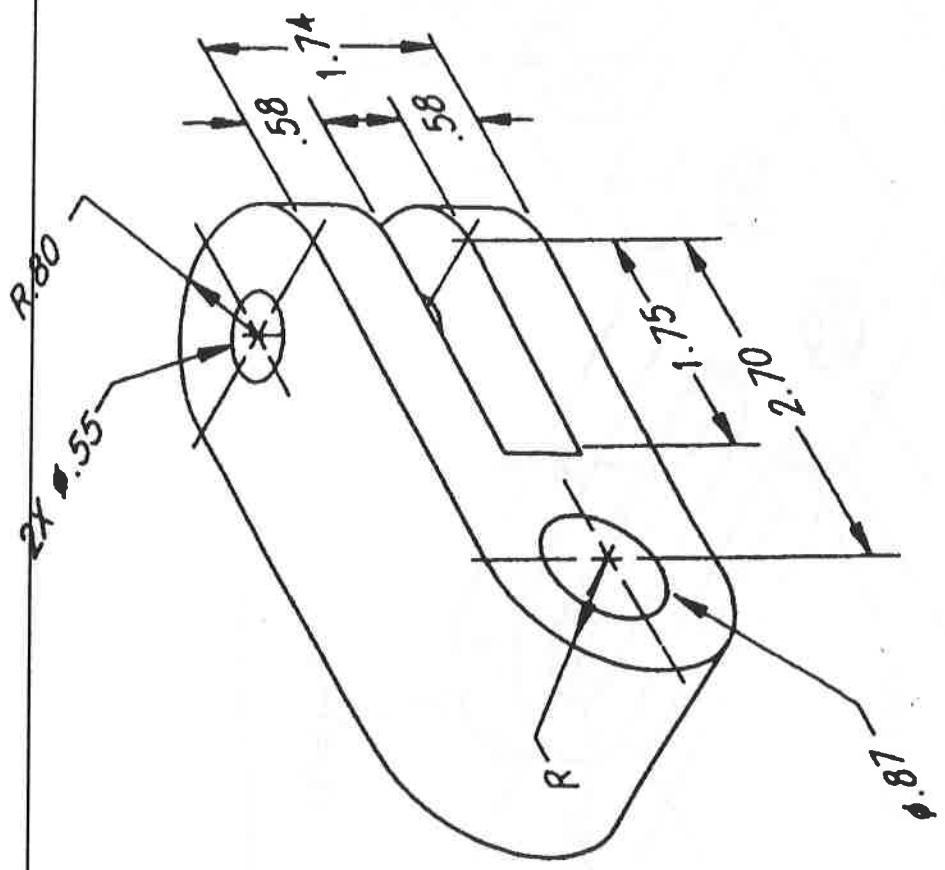


		NAME COURSE DATE	DRAWING

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#3 CENTER DRL	C'DRILL (3) HOLES .25 DEEP	
2	3/8 DIA DRILL	PECK DRILL .38 DIA HOLE THRU	
3	9/16 DIA DRILL	PECK DRILL .56 DIA HOLE THRU	
4	¼ DIA END MILL	PRIFILE OUTSIDE +.01 IN (3)	
		LEVELS + (1) FINISH CUT	

Fig 2-p2 of the Mastercam Book

Notes: Material: 6066 Aluminum.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#3 CENTER DRL	C'DRILL (1) HOLE .25 DEEP	
2	5/8 DIA DRILL	PECK DRL .625 DIA HOLE THRU	
3	1/2 DIA END MILL	FINISH MACHINING TOP OF THE PART +PRIFILE OUTSIDE +.01 IN (3) LEVELS + (1) FINISH CUT	

Fig 2-p3 of the Mastercam Book

Notes: Material: 6066 Aluminum.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#3 CENTER DRL	C'DRILL (2) HOLES .25 DEEP	Use these holes as
2	3/8 DIA DRILL	PECK DRL SAME THRU	Entrance holes for (2) openings in the part
3	¼ DIA END MILL	FINISH MACHINING THE SLOT+ RECTANGLE + PROFILE	PART IS .375 THICK

Fig 2-p4 of the Mastercam Book

Notes: Material: 6066 Aluminum.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL (4) .188 HOLES .25 DEEP	
2	3/16 DIA DRILL	PECK DRL SAME THRU	
3	1/8 DIA E/ MILL	FINISH MACHINING THE HEX	USE (5) ROUGHING AND (1) FIN. CUTS
4	½ E/MILL	ROUGH TOP OF PART + PROFILE	
5	¼ E/MILL	FINISH TOP AND PART PRILES	

Fig 2-p5 of the Mastercam Book

Notes: Material: 7075 ALUMINUM

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL (1) .34 HOLE + PENTAGON, .25 DEEP	
2	LTR "R" DRILL	PECK DRL SAME THRU	
3	1/8 DIA E/ MILL	FINISH PROFILE THE HEX	USE (5) ROUGHING AND (1) FIN. CUTS
4	½ E/MILL	FINISH TOP OF PART + RGH PROFILE	
5	¼ E/MILL	FINISH PART PROFILE	

Fig 2-p6 of the Mastercam Book

Notes: Material: 7075 ALUMINUM

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL (2) .15 HOLE + DOUBLE-D + HEPTAGON, .25 DEEP	
2	#25 DRILL	PECK DRL (2) .15 THRU	
3	.25 E/MILL	C'BORE SAME .25 DEEP	
4	½ DRL	PECK DRILL (THRU) ENTRANCE HOLES TO DOUBLE-D + HEPTAGON	
5	1/8 DIA E/ MILL	FINISH PROFILE THE HEX	USE (5) ROUGHING AND (1) FIN. CUTS
6	½ E/MILL	FINISH TOP OF PART + DOUBLE-D + RGH HEPTAGON & PROFILE	
7	¼ E/MILL	FINISH HEPTAGON + PART PROFILE	

Fig 2-p7 of the Mastercam Book

Notes: Material: 17-4 PH Steel

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#6 CENTER DRL	C'DRILL (4) HOLES + RECTANG-LE ENTRANCE HOLE, .35 DEEP	
2	¾ DIA DRILL	PECK DRL (2) .75 DIA HOLES + rectangle entrance hole	
3	1' DRL	PECK DRILL (2) 1" HOLES	
4	5/8 END MILL	RGH + FIN. PROFILE THE RECTANGLE	
5	¾ DIA E/ MILL	RGH + FINISH PART TOP + PROFILE	

Fig 2-p8 of the Mastercam Book

Notes: Material: 17-4 PH Steel

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL ALL HOLES .25 DEEP	
2	3/8 DRILL	PECK DRILL (2) .38 HOLES THRU	
3	½ DRILL	PECK DRILL (6) .50 HOLES THRU	
4	17/32 DRILL	PECK DRILL .53 & 3. HOLES THRU	
5	11/16 DRILL	PECK DRILL .68 HOLE THRU	
6	½ END MILL	PRIFILE 3" HOLE & THE OUTSIDE	USE 3 ROUGHING AND 1 FINISHING PASS
7			

Pg 1 of the lab manual exercise.

Notes: Part thickness is .75.
Material: 17-4 PH Steel.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL ALL HOLES .25 DEEP	
2	¼ DRILL	PECK DRILL (6) .25 HOLES THRU	
3	½ DRILL	PECK DRILL (4) .50 HOLES THRU	
4	½ END MILL	PRIFILE SLOTS	

Pg 9 of the lab manual exercise.

Notes: Material: 6066 Aluminum.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL ALL HOLES .25 DEEP	
2	½ DRILL	PECK DRL (4) .50 HOLES TO .5 DEPTH	
3	½ END MILL	PRIFILE OUTSIDE	USE 3 ROGHING (+.01)& 1 FINISHING PASSES

Pg 10 of the lab manual exercise.

Notes: Material: 7075 ALUMINUM

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL ALL HOLES .25 DEEP	
2	½ DRILL	PECK DRL (4) .50 HOLES THRU	
3	¾ END MILL	PRIFILE INSIDE POCKET & OUTSIDE	

Pg 11 of the lab manual exercise.

Notes: Material: 303 STL STEEL

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL ALL HOLES .25 DEEP	
2	#7 (.201dia) DRL	PECK DRL ALL HOLES THRU	
3	¼-20 TAP	TAP ALL HOLES THRU	
4	½ C'SINK	C'SINK ALL HOLES TO.375 DIA	

Pg 16 of the lab manual exercise.

Notes: Material: 6066 Aluminum.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL ALL HOLES .25 DEEP	
2	3/8 (.375) DRL	PECK DRL ALL HOLES THRU	
3	½ C'SINK	C'SINK ALL HOLES TO. 5 DIA	
4			

Pg 19 of the lab manual exercise.

Notes: Material: 6066 Aluminum.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL (4) HOLES .25 DEEP	
2	13/32 DRILL	PECK DRL (4) .406 HOLES THRU	
3	17/32 FLAT DRL	C'BORE .531 DIA TO .406 DEPTH	Use 2 sec fo the cycle
4	½ END MILL	COMPLETE POCKET	USE 1 ROGHING (+.01)& 1 FINISHING PASSES

Pg 22 of the lab manual exercise.

Notes: Material: 7075 ALUMINUM

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL ALL HOLES .25 DEEP	
2	3/16 DRILL	PECK DRL (3) .1875 HOLES THRU	
3	¼ DRL	DRILL (5) .25 HOLES THRU	
4	¾ END MILL	COMPLETE PROFILE	USE 2 ROUGHING (+.01)& 1 FINISHING PASSES

Pg 28 of the lab manual exercise.

Notes: Material: 303 STL STEEL.
Part thickness is .75.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL (4) HOLES .25 DEEP	
2	27/64 DRILL	PECK DRL (4) 27/64 HOLES THRU	
3	½-13TAP	TAP (4) ½-13 HOLES THRU	USE THREADING CYCLE
4	3/8 END MILL	COMPLETE (4) SLOTS AS REQUIRED	
5	¾ END MILL	COMPLETE PART PROFILE	

Pg 38 of the lab manual exercise.

Notes: Material: 303 STL STEEL.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#2 CENTER DRL	C'DRILL (4) HOLES .25 DEEP	
2	3/8 DRILL	PECK DRL (2) .375 HOLES THRU	
3	3/8 END MILL	COMPLETE SLOTS AS REQUIRED	MAKE SURE YOUR END MILL IS AT LEAST 1.125 LONG
4	¾ END MILL	COMPLETE PART PROFILE	USE (3) RGH & (1) FINISH PASS

Pg 39 of the lab manual exercise.

Notes: Material: 7075 ALUMINUM.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#5 CENTER DRL	C'DRILL (2) HOLES .35 DEEP	
2	½ DRILL	PECK DRL (1) . 5 HOLE THRU	
3	¾ DRILL	PECK DRILL (1) .75 HOLE THRU	
4	1/2 END MILL	COMPLETE SLOT AS REQUIRED	MAKE SURE YOUR END MILL IS AT LEAST 1.125 LONG
	5/8 END MILL	COMPLETE PART TOP CONTOUR + PROFILE	USE (3) RGH & (1) FINISH PASS FOR CONTOURING

Pg 40 of the lab manual exercise.

Notes: Material: 7075 ALUMINUM.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#52 CENTER DRL	C'DRILL (4) HOLES .25 DEEP	
2	¼ DRILL	PECK DRL (4) .25 HOLE THRU	
3	1/2 END MILL	CONTOUR 1.5 DIA HOLE + FINISH POCKET	FOR CONTOURING USE (3) RGH +1 FINISH PASS

Pg 44 of the lab manual exercise.

Notes: Material: 7075 ALUMINUM.
Use 6.25 diameter round stock.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	1/2 END MILL	COMPLETE INSIDE AS REQUIRED	

Pg 45 of the lab manual exercise.

Notes: Material: 7075 ALUMINUM.
Use 9"dia round stock.

TL#	TOOL DESCRIP.	OPERATION	COMMENTS
1	#1 CENTER DRL	C'DRILL ALL HOLES .25 DEEP	
2	#38 DRILL	PECK DRILL (12) .101 HOLES	
3	1/8-40 TAP	CUT THREAD (12) HOLES	
4	3/16 DRILL	PECK DRILL (4) .1875 HOLES THRU	
5	3/8 FLAT DRL	C'BORE (4) .375 DIA TO .1875 DPTH	USE 2 SEC. DWELL
6	3/8 END MILL	CUT (4) SLOTS AS REQ-D	
7			

Pg 46 of the lab manual exercise.

Notes: Material: 17-4 PH Steel
Use 2.5 Dia round stock.

QUEENSBOROUGH AT 50
CELEBRATE ACHIEVEMENT

Department of Mechanical Engineering Technology

MT-369

LABORATORY PROJECTS OUTLINE

REQUIREMENTS FOR SUBMITTING MT-369 PROJECTS

You are required to submit a folder with (4) projects:

Project#1: By using Mastercam, design and create a CNC program to machine a part containing different holes (as described in the Lab Manual requirements).

Project#2: By using Mastercam, design and create a CNC program to machine a part containing pockets with and without islands (as described in the Lab Manual requirements).

Project#3: By using Mastercam, design and create a CNC program to machine a part where you will be using transform to translate, rotate or mirror existing toolpath (as described in the Lab Manual requirements).

Project#4: By using Mastercam, design and create a CNC program to machine a part which requires profile milling, pocketing, hole operations. (as described in the Lab Manual requirements).

Content: each project must include a page for:

- Program outline;
- Drawing with dimensions;
- Programming code;
- Screen print of the machined part.

Note: *you might be asked to present the motion simulation and inspection for all or some of your projects.*

The following format should be followed:

- ✓ *Cover page, which includes:*
  - *The number of the course (MT-369);*
  - *The name of the course (Computer Applications in Engineering Technology);*
  - *Teachers name;*
  - *Your name;*
  - *Semester (Fall, Spring); Year*
- ✓ *Table of Content with page numbers;*
- ✓ *Introduction;*
- ✓ *Content as described above (with page numbers);*
- ✓ *Conclusion;*
- ✓ *Bibliography (if you used any outside sources for the project);*

The report should be bound in a folder with a clear front page.

In order to receive credit for this class, submit your report
not later than the last Laboratory class.

MT 369 Project #1 outline

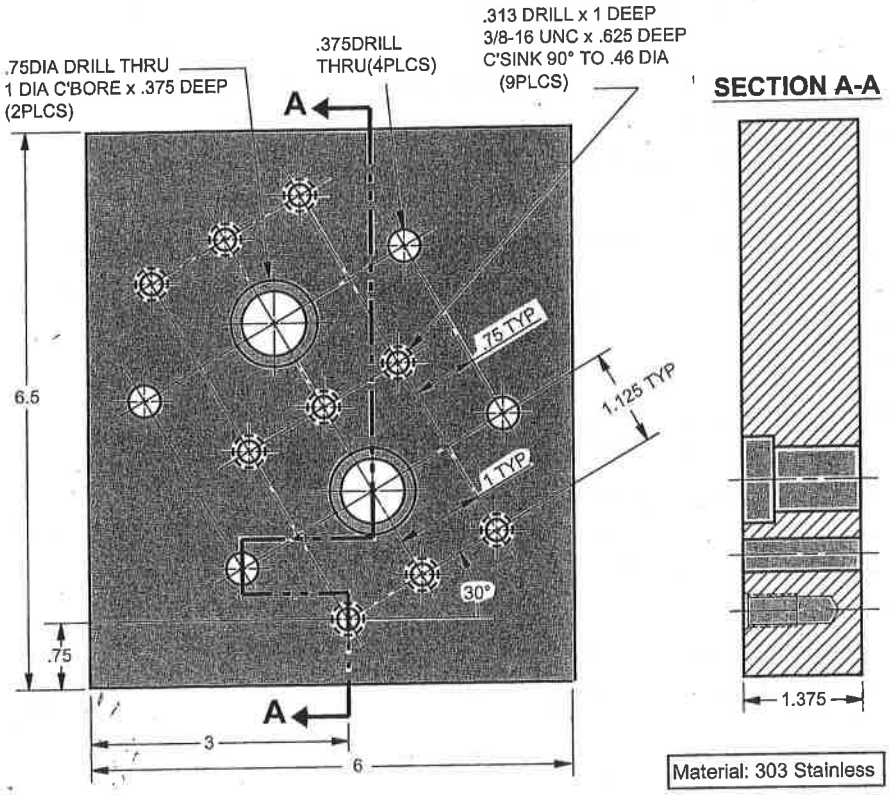
By using ***Mastercam***, design a part which requires "hole" operations:

1. C'drilling, shallow hole drilling, blind hole and/or deep hole drilling:
2. C'boring, c'sinking, spot facing;
3. Tapping;
4. Reaming;
5. Boring.

There is no limitation to size and shape of the part and the holes.
Your design will have *at list four (4) types of holes.*
The total number of holes should *be at least 24.*

- Get the design approved by your instructor.
- Plan the sequence of machining operations: specify tooling, feeds, and speeds.
- Write a Mastercam program to complete machining the part.
- Verify the tool motion.
- Document your project as required.

Design example:



PROCESS PLAN

No.	Operation	Tooling
1	CENTER DRILL X .2 DEEP(ALL HOLES)	1/8 CENTER DRILL
2	PECK DRILL X 1 DEEP(9PLCS)	5/16 DRILL
3	TAP X .625 - [illegible]	

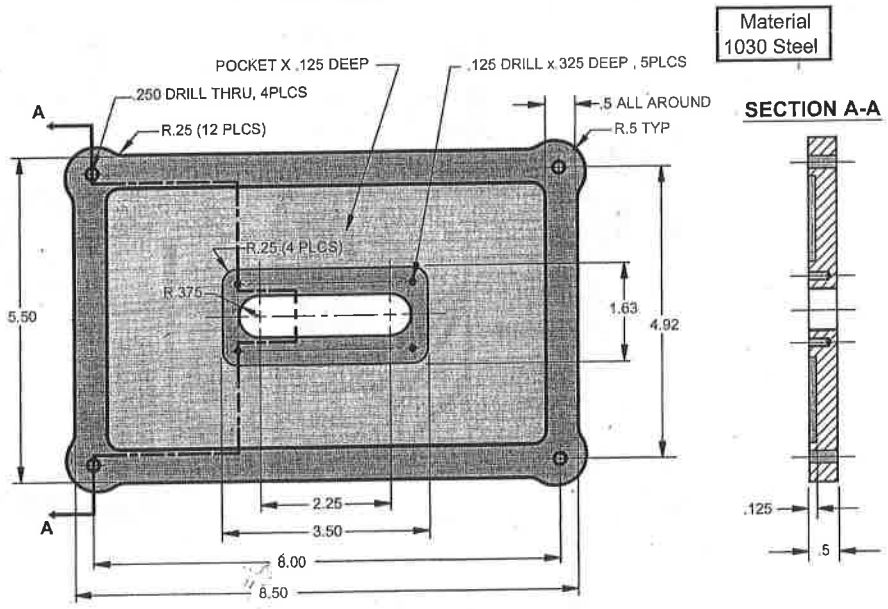
MT 369 Project #2 outline

By using ***Mastercam***, design a part which requires external and internal profiling and "pocketing":

There is no limitation to the size and shape of the part and the pockets.
Your design will have *at list 3 pockets and at least one "window".*
Some pockets should be with islands, some without.

- Get the design approved by your instructor.
- Plan the sequence of machining operations: specify tooling, feeds, and speeds.
- Write a Mastercam program to complete machining the part.
- Verify the tool motion.
- Document your project as required.

Design example:



PROCESS PLAN

No.	Operation	Tooling
1	SPOT DRILL X .166 DEEP (4 HOLES)	1/8 SPOT DRILLL
2	PECK DRILL THRU(4 HOLES)	1/4 DRILL
3	SPOT DRILL X .125 DEEP (5 HOLES)	1/32 SPOT DRILL(.31-FLUTE LENGTH;1.5-OAL)
4	PECK DRILL X .325 DEEP	1/8 DRILL
5	PROFILE X .5 DEEP LEAVE .01 FOR FINISH CUTS IN XY AND Z	1/4 FLAT END MILL
6	MILL SLOT X .5 DEEP LEAVE .01	FLAT END MILL

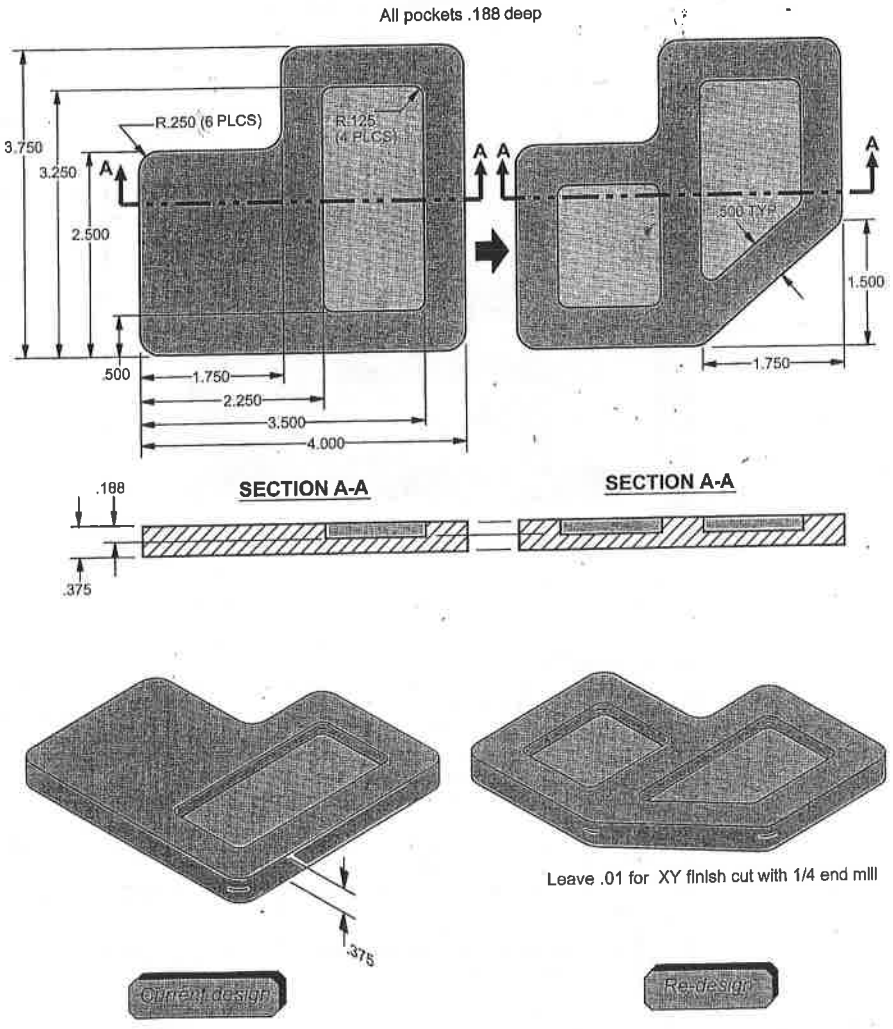
MT 369 Project #3 outline

By using ***Mastercam***, design a part which you later will "morph" by editing existing operations into a redesigned part.

There is no limitation to the size and shape of the part and its elements.
Your design will have *some pockets and some holes.*

- Get the design approved by your instructor.
- Plan the sequence of machining operations: specify tooling, feeds, and speeds.
- Write a Mastercam program to complete machining the part.
- Verify the tool motion.
- Document your project as required.

Design example:



MT 369 Project #4 outline

By using ***Mastercam***, create a *solid model* of a part where contouring, pocketing, drilling is required. Don't forget to specify the stock size and material. There is no limitation to the size and shape of the part and its elements.

- Get the design approved by your instructor.
- Plan the sequence of machining operations: specify tooling, feeds, and speeds.
- Write a Mastercam program to complete machine the part.
- Verify the tool motion.
- Generate a word address part program.
- Document your project as required.

Design example: