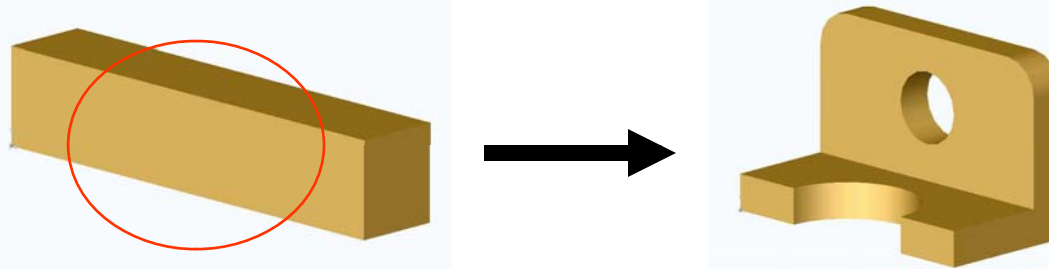


# Process planning

How would you machine this part?



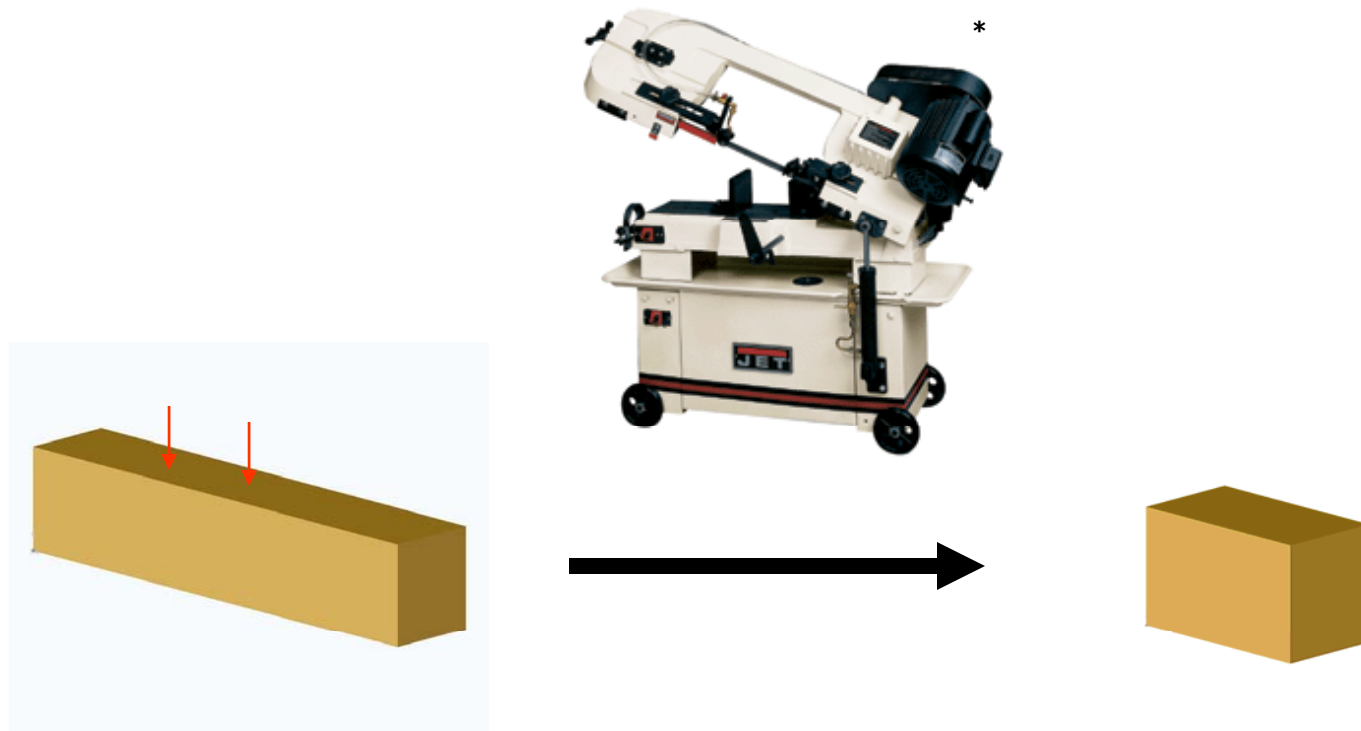
Assumption:

1. We begin with a stock size of 2.5" X 2.25" X 12"
2. This will be manufactured in a job shop for very low quantity

We will use:

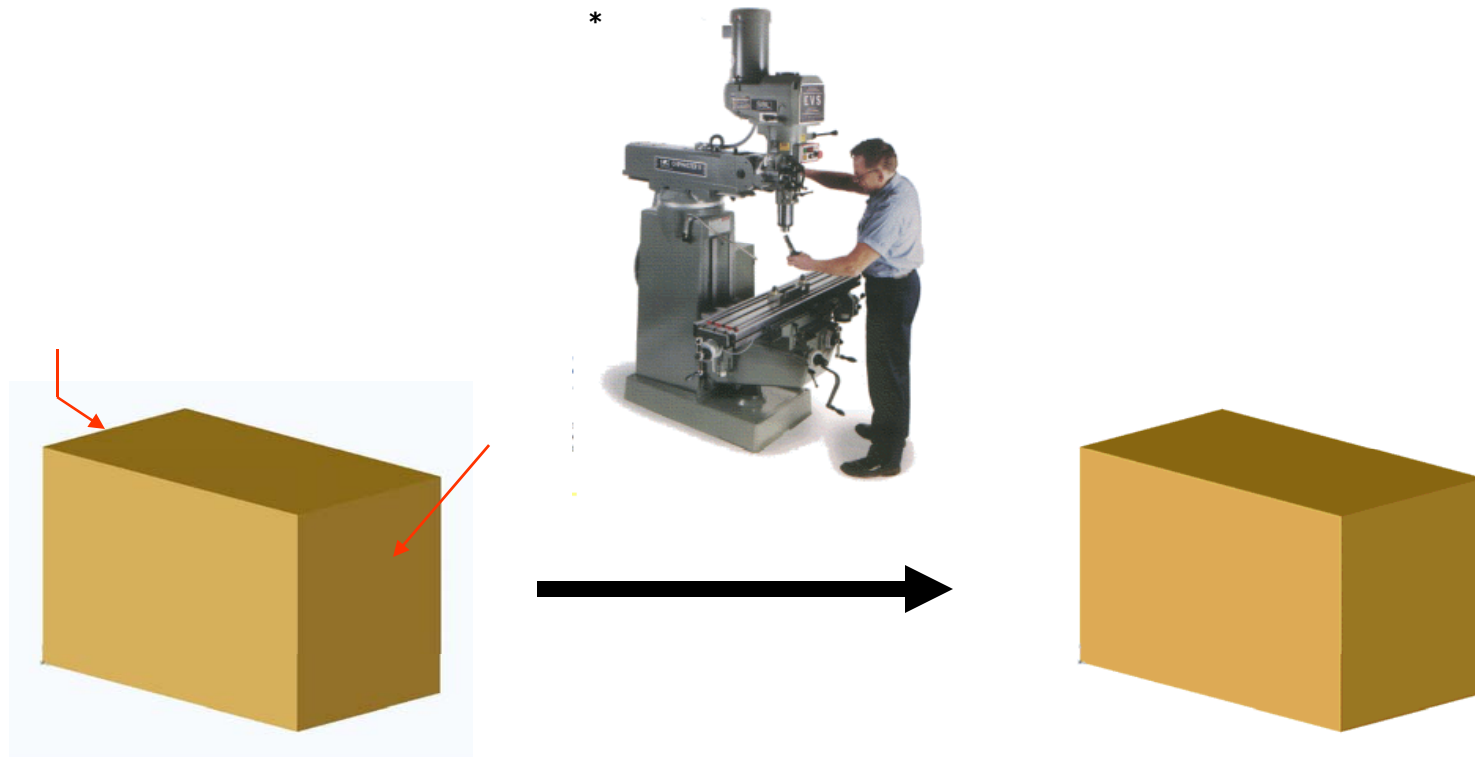
- A bandsaw to roughly cut the stock to size
- A manual vertical mill to create the planar features and the holes
- A belt sander to sand the radii ( assuming the tolerance is not very high)

Machine	Operation
Horizontal band saw	Saw stock to ~4.125"
Manual vertical mill	Mill two ends to length 4"
	Mill width to 2"
	Mill out 2"x1.5"x4"
	Drill hole 1" diameter
	Bore 1" radius
Belt sander	Sand 0.5 radii



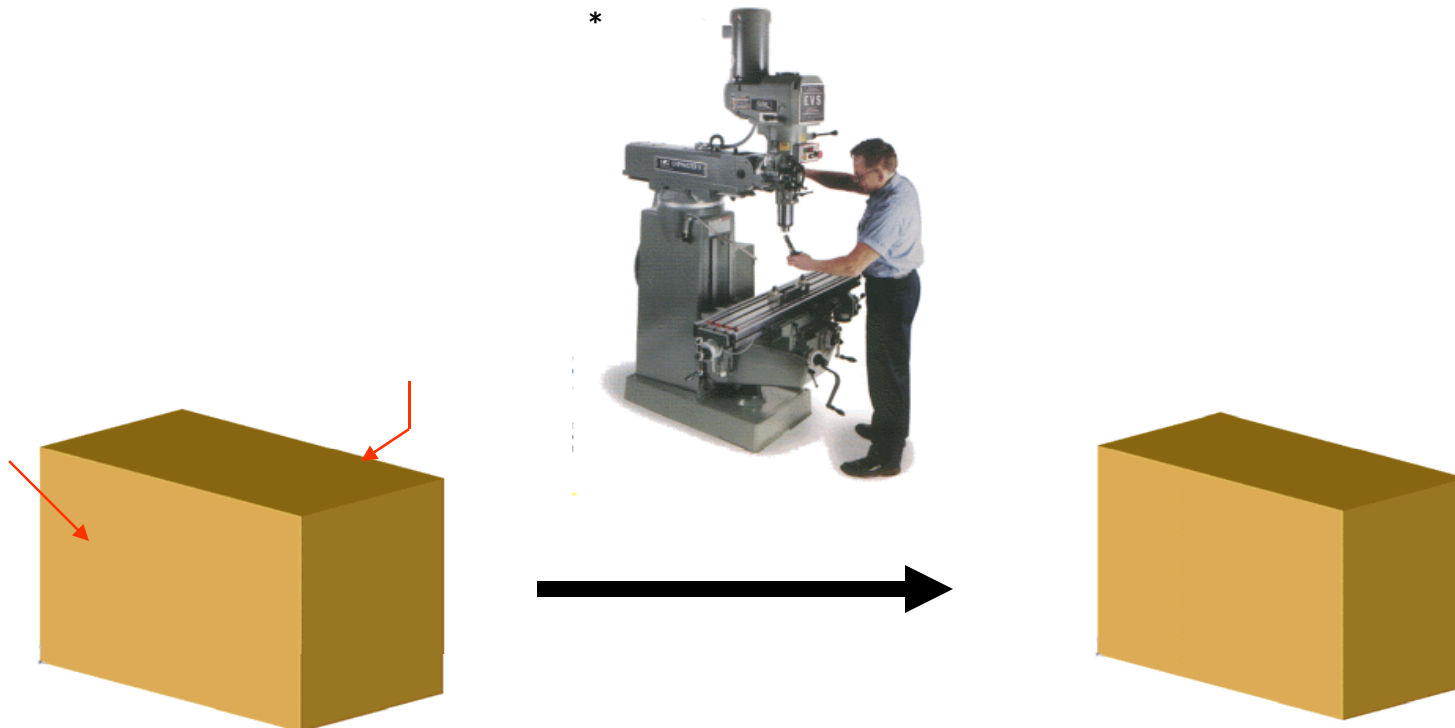
\* Source: <http://www.jettools.com/Catalog/Metalworking/CatalogPages/HVBS56M.html>

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Manual vertical mill	Mill two ends to length 4"
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	Mill out 2"X1.5"X4"
	Drill hole 1" diameter
	Bore 1" radius
Belt sander	Sand 0.5 radii



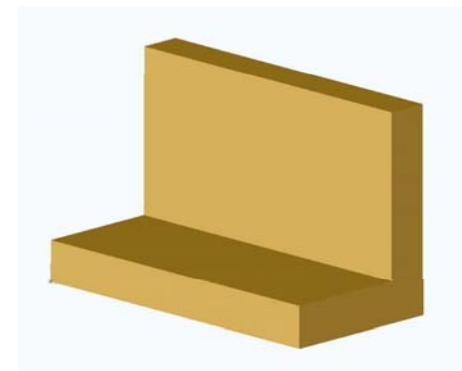
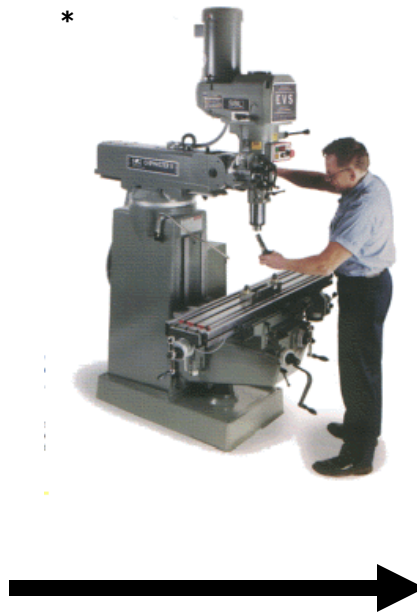
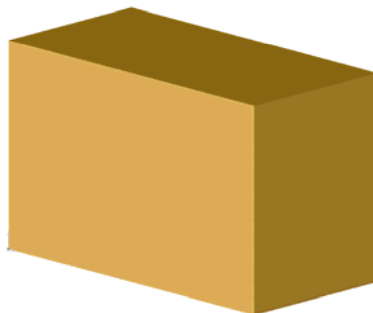
\* Source: <http://www.hemsaw.com/Videolinkpages/x-vVideopg.htm>

Machine	Operation
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Manual vertical mill	Mill two ends to length 4"
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	Mill out 2"x1.5"x4"
	Drill hole 1" diameter
	Bore 1" radius
Belt sander	Sand 0.5 radii



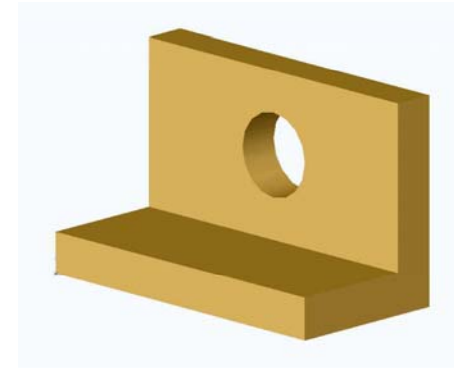
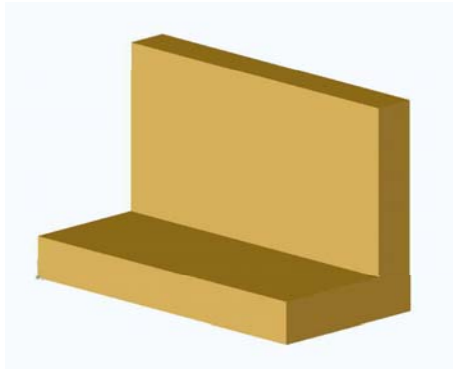
\* Source: <http://www.hemsaw.com/Videolinkpages/x-vVideopg.htm>

Machine	Operation
Horizontal band saw	Saw stock to ~4.125"
Manual vertical mill	Mill two ends to length 4"
	Mill width to 2"
	<b>Mill out 2"X1.5"X4"</b>
	Drill hole 1" diameter
	Bore 1" radius
Belt sander	Sand 0.5 radii



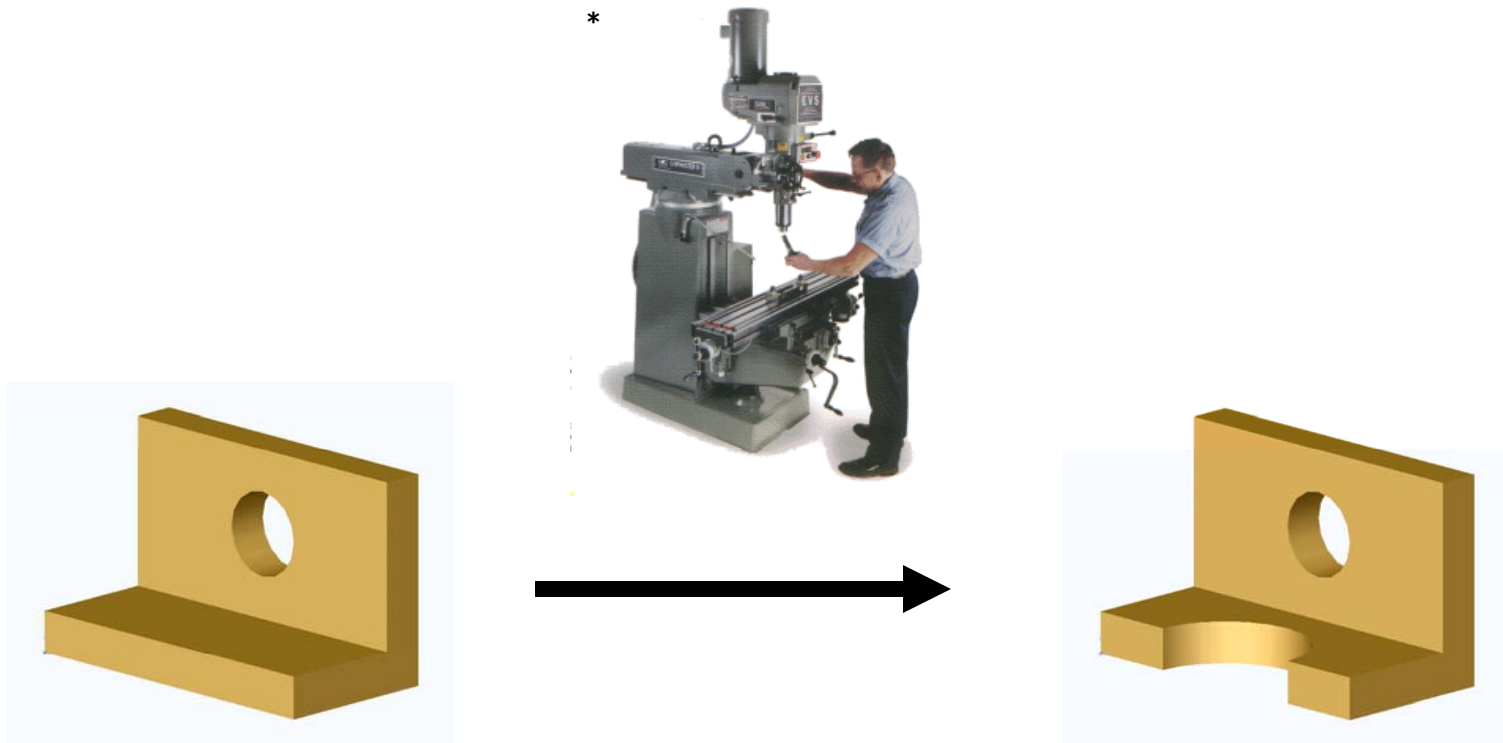
\* Source: <http://www.hemsaw.com/Videolinkpages/x-vVideopg.htm>

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	Bore 1" radius
Belt sander	Sand 0.5 radii



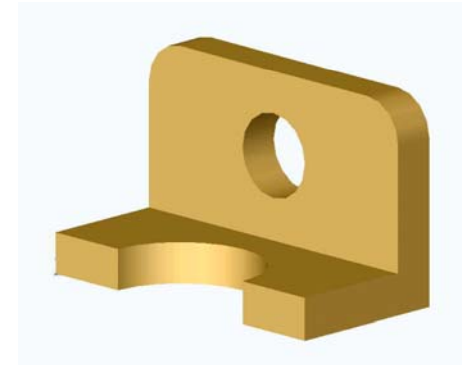
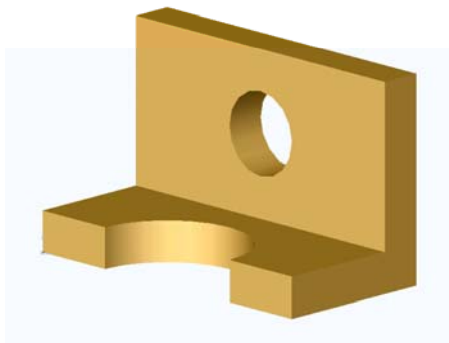
\* Source: <http://www.hemsaw.com/Videolinkpages/x-vVideopg.htm>

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	Bore 1" radius
Belt sander	Sand 0.5 radii



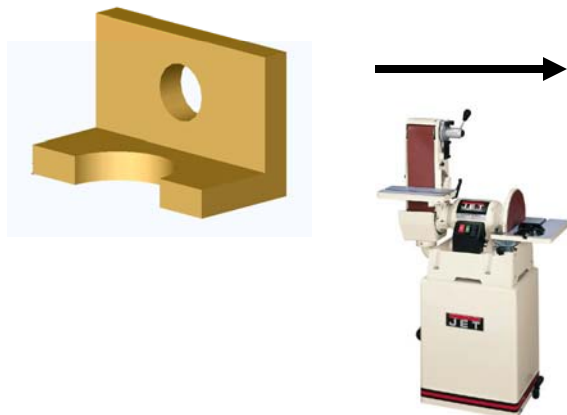
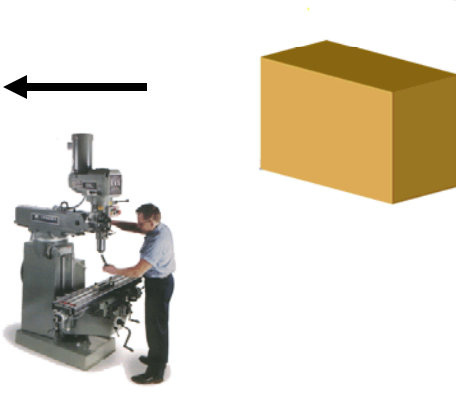
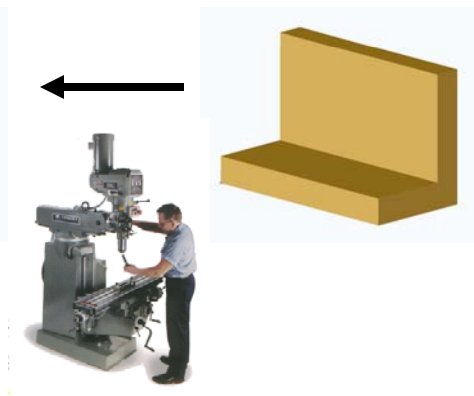
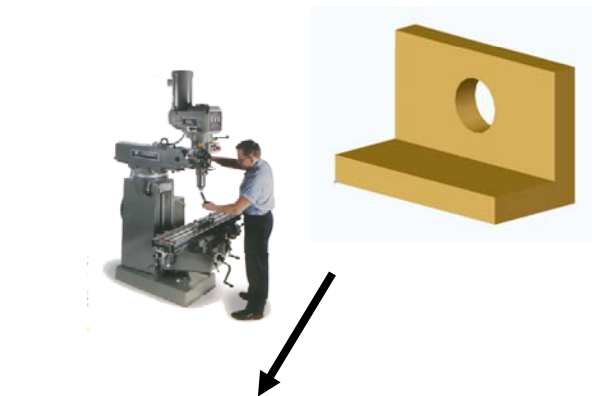
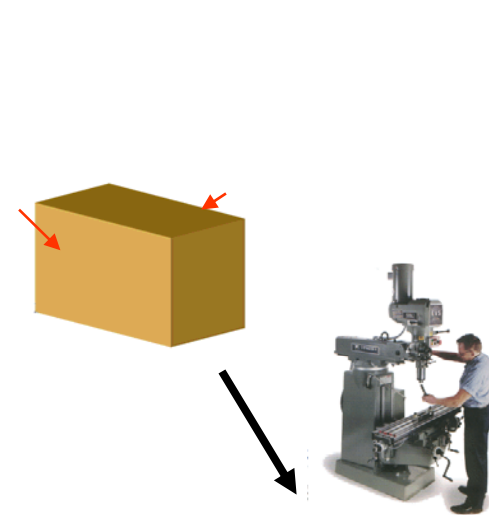
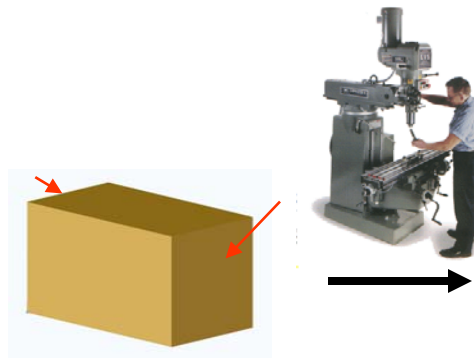
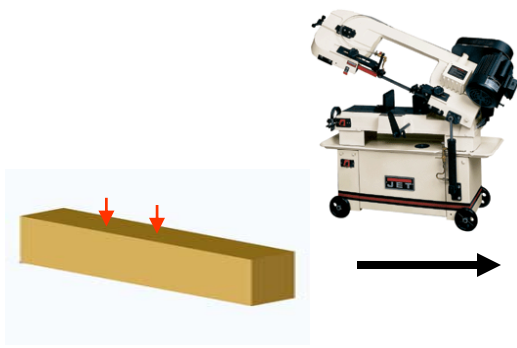
\* Source: <http://www.hemsaw.com/Videolinkpages/x-vVideopg.htm>

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Horizontal band saw	Saw stock to ~4.125"
Manual vertical mill	Mill two ends to length 4"
	Mill width to 2"
	Mill out 2"X1.5"X4"
	Drill hole 1" diameter
	Bore 1" radius
Belt sender	Sand 0.5 radii

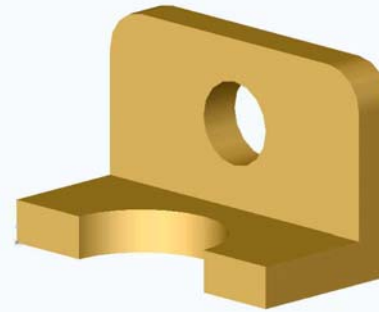


\* Source: <http://www.jettools.com/jet-index.html> (WMH Tool Group)





# Process |



Machine	Operation
Horizontal band saw	Saw stock to ~4.125"
Manual vertical mill	Mill two ends to length 4"
	Mill width to 2"
	Mill out 2"X1.5"X4"
	Drill hole 1" diameter
	Bore 1" radius
Belt sander	Sand 0.5 radii

# Time estimation (minutes)

Machine	Operation (V = Volume, A = Area, P = Perimeter)	Fixture	Tool Change	Run (R=Rough, F=Finish)	Deburr/Inspect/Measure
<b>Horizontal band saw</b>	Saw stock to ~4.125" A = 5.6525 in <sup>2</sup> , P = 9 in	0.23	-	2.02	0.30D, 0.05I
<b>Manual vertical mill</b>	Mill two ends to length 4" V = 0.703 in <sup>3</sup> A = 11.25 in <sup>2</sup> , P = 19in	0.20 0.20	2	0.13R 0.75F	0.63D, 0.05I, 0.13M
	Mill width to 2" V = 2.5 in <sup>3</sup> A = 10 in <sup>2</sup> , P = 13in	0.20	-	0.46R 0.67F	0.43D, 0.05I, 0.13M
	Mill out 2"X1.5"X4" V = 12 in <sup>3</sup> A = 14 in <sup>2</sup> , P = 15in	-	-	2.19R 0.93F	0.50D, 0.05I 0.13M, 0.13M
	Drill hole 1" diameter -Center drill -Pilot drill 1/2" -Pilot drill 63/64" -Ream	0.20	2 2 2 2	0.03 0.05 0.04 0.01	0.21D, 0.05I 0.17M
	Bore 1" radius V = 0.79 in <sup>3</sup> A = 1.57 in <sup>2</sup> , P = 7.28in	0.20	2	0.96R 0.01F	0.24D, 0.05I 0.06M
<b>Belt sender</b>	Sand 0.5 radii V = 0.05 in <sup>3</sup> A = 0.79 in <sup>2</sup> , P = 3.14in	0.08	-	0.20R 0.21F	0.10D, 0.05I 0.06M, 0.06M

# Summary Times (minutes)

Fixture	Tool Change	Run (R=Rough, F=Finish)	Deburr/Inspect/Measure
1.31	12	6.08	2.58
			3.63

**Total Time 25.6 minutes**