Trigonometry for Manufacturing

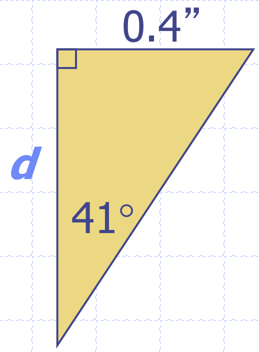
Introduction

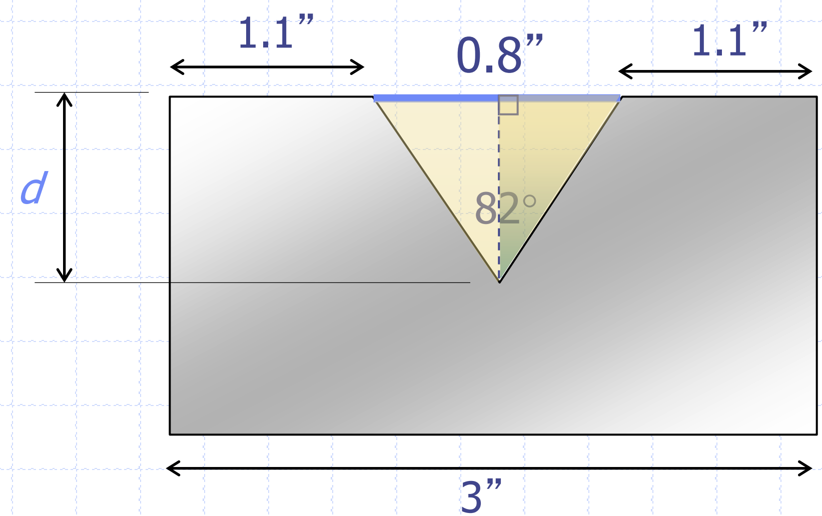
- Trigonometry is a branch of mathematics that means "measurement of, with and by means of triangles” to help you solve problems.
- Trigonometry is useful to Drafters, Design engineers (3-D), manufacturing technicians, and machinists (and others too.)
- Trigonometry is applied for making things by machinists to position holes, calculate height, length of angle cuts etc...

This presentation will give an brief overview of how a machinist uses trigonometry to make a part.

Machining application of Trig

- Determine the depth ***d*** of the groove machined in this aluminum block.

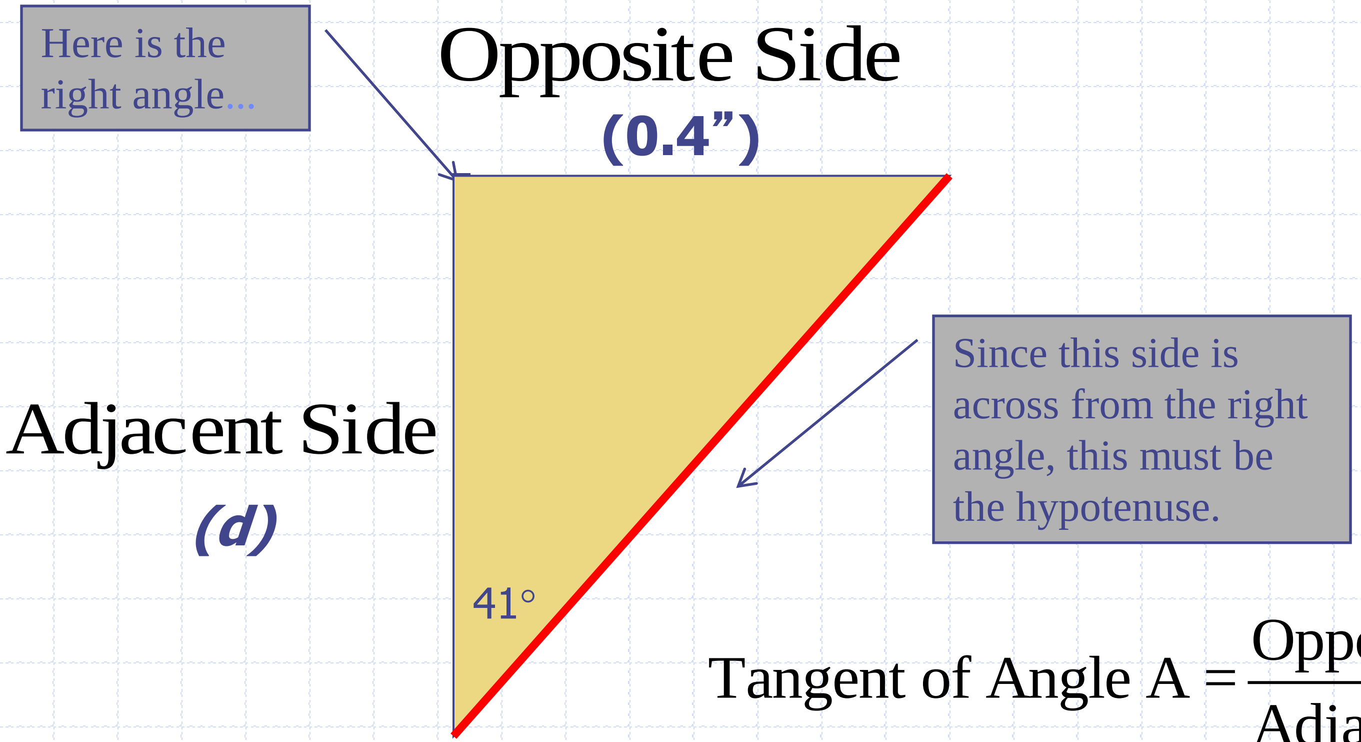




d = 0.46”

Labeling Right Triangles

- The hypotenuse is easy to locate because it is always found across from the right angle.

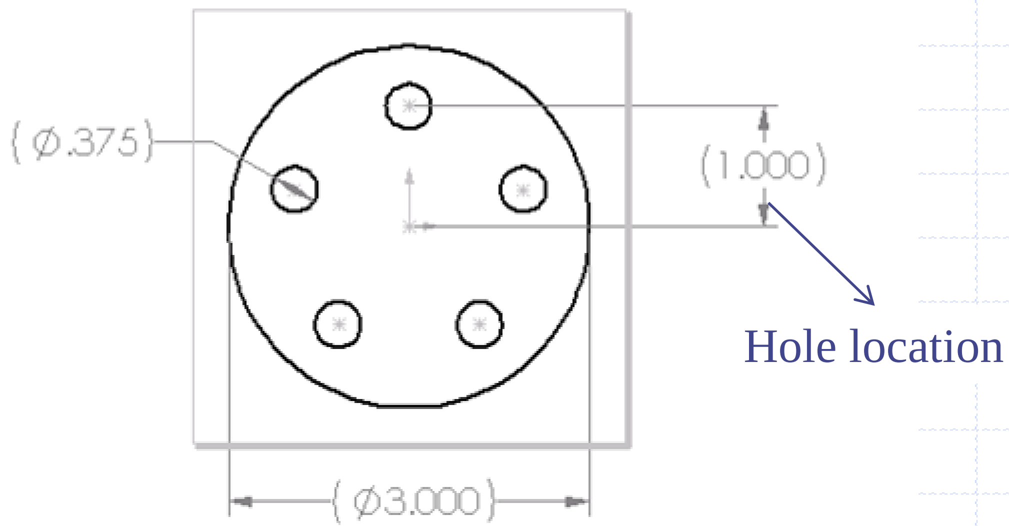


$$\text{Tangent of Angle A} = \frac{\text{Opposite}}{\text{Adjacent}}$$

d = 0.46”

Drilling Holes

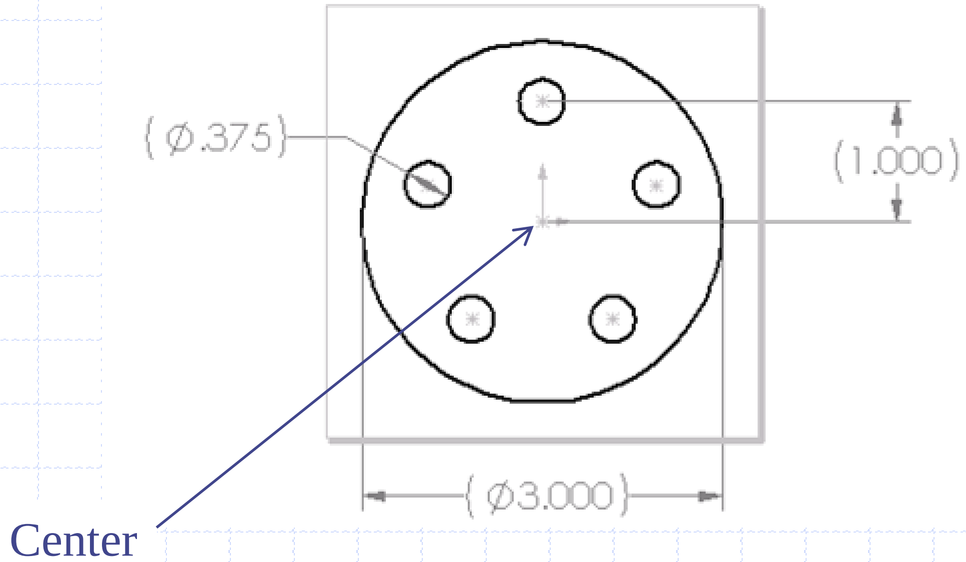
Here is a technical drawing of a flange containing five bolt holes. This is typically all the information that the engineer gives to the machinist to make a part. Notice that only one hole location is given, and all the others have to be calculated or inferred.



The machinist uses Trigonometry to calculate these hole locations.

Positioning Holes

Notice that all hole dimensions will be off the center of the bolt circle, or X 0, Y 0.



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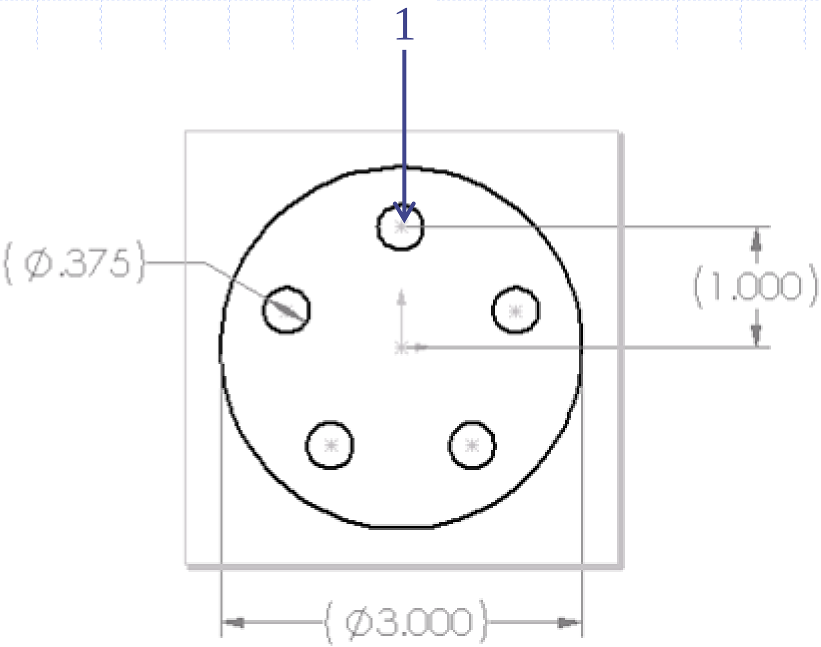
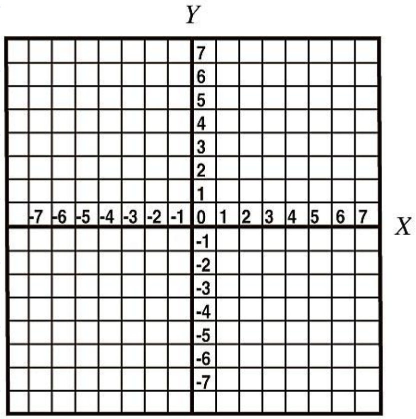


For the first hole, we see that the X value is zero and the Y value is the radius. They are both in a positive quadrant.

The first hole is at location:
X 0
Y 1.000



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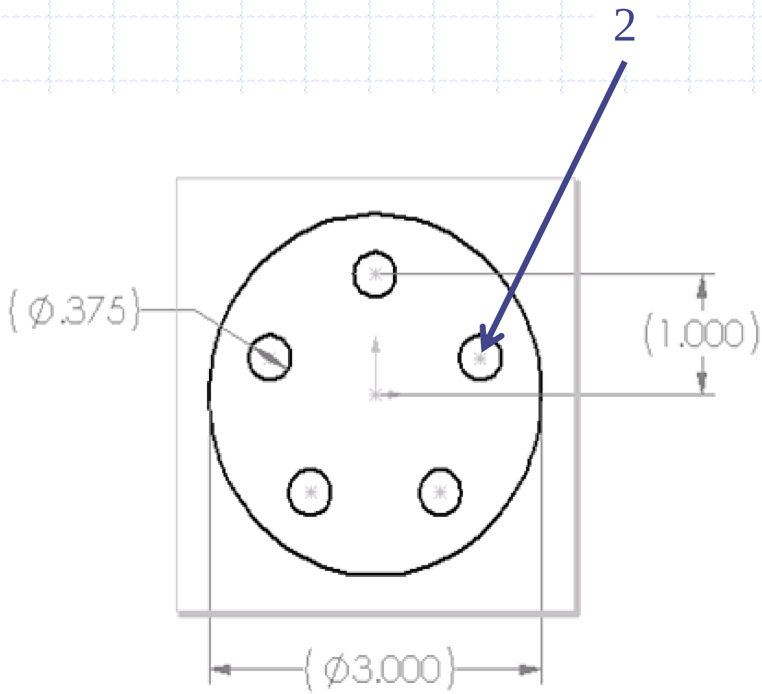


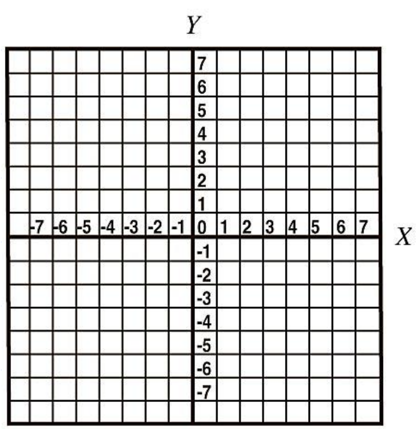
Trig is as follows:

360 / number of holes x (hole number -1)

360* / 5 holes = 72*
72* x (2nd hole - 1) = 72*

X = (SIN 72) x 1.000 radius
X = 0.951

Y = (COS 72) x 1.000 radius
Y = 0.309



The second hole is at location:
X 0.951
Y 0.309

Trig is as follows:

360 / number of holes x (hole nu

360* / 5 holes = 72*

72* x (3rd hole - 1) = 144*

X = (SIN 144) x 1.000 radius

X = 0.588

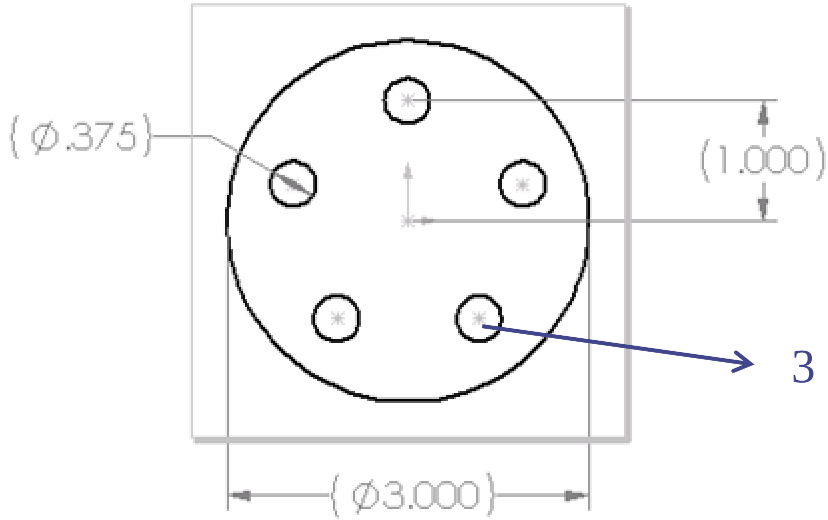
Y = (COS 144) x 1.000 radius

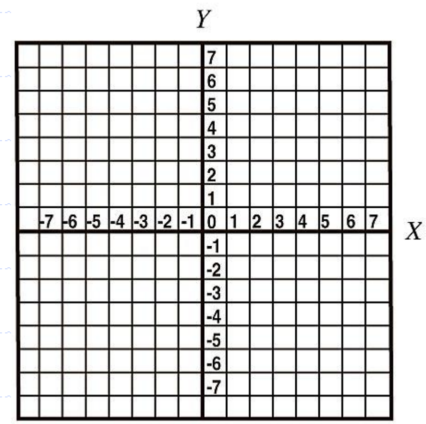
Y = - 0.809

The third hole is at location:

X 0.588

Y – 0.809





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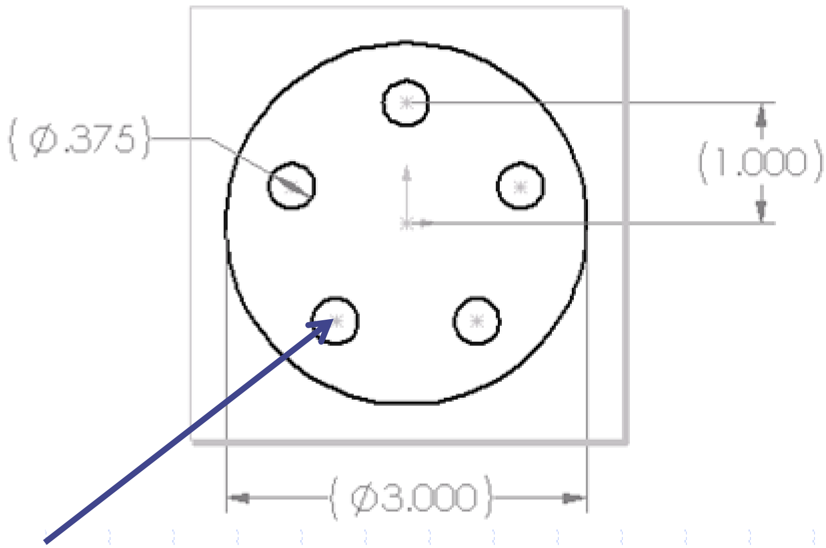

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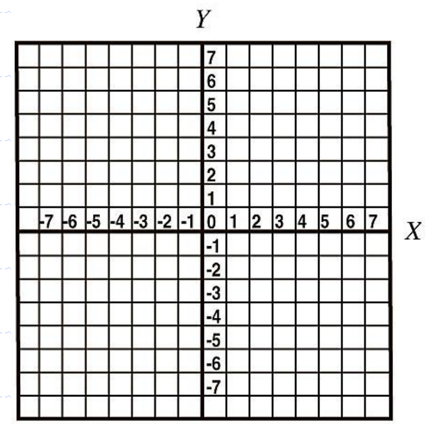
Trig is as follows:

360 / number of holes x (hole number -1)

360* / 5 holes = 72*
72* x (4th hole - 1) = 216*

X = (SIN 216) x 1.000 radius
X = - 0.588

Y = (COS 216) x 1.000 radius
Y = - 0.809



The fourth hole is at location:
X - 0.588
Y - 0.809

Cont…

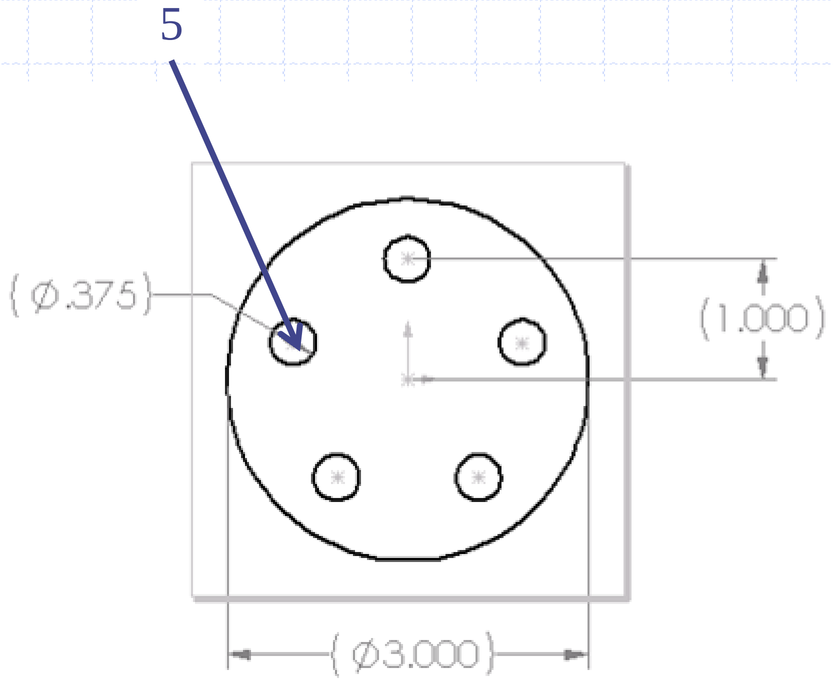
Trig is as follows:

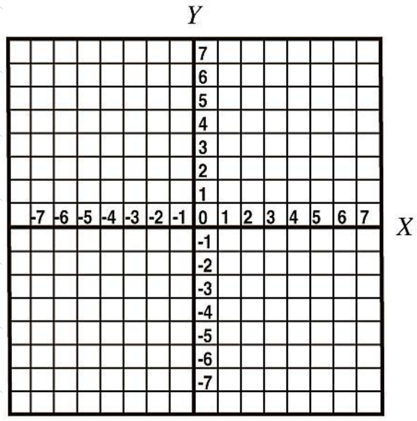
360 / number of holes x (hole number -1)

360* / 5 holes = 72*
72* x (5th hole - 1) = 288*

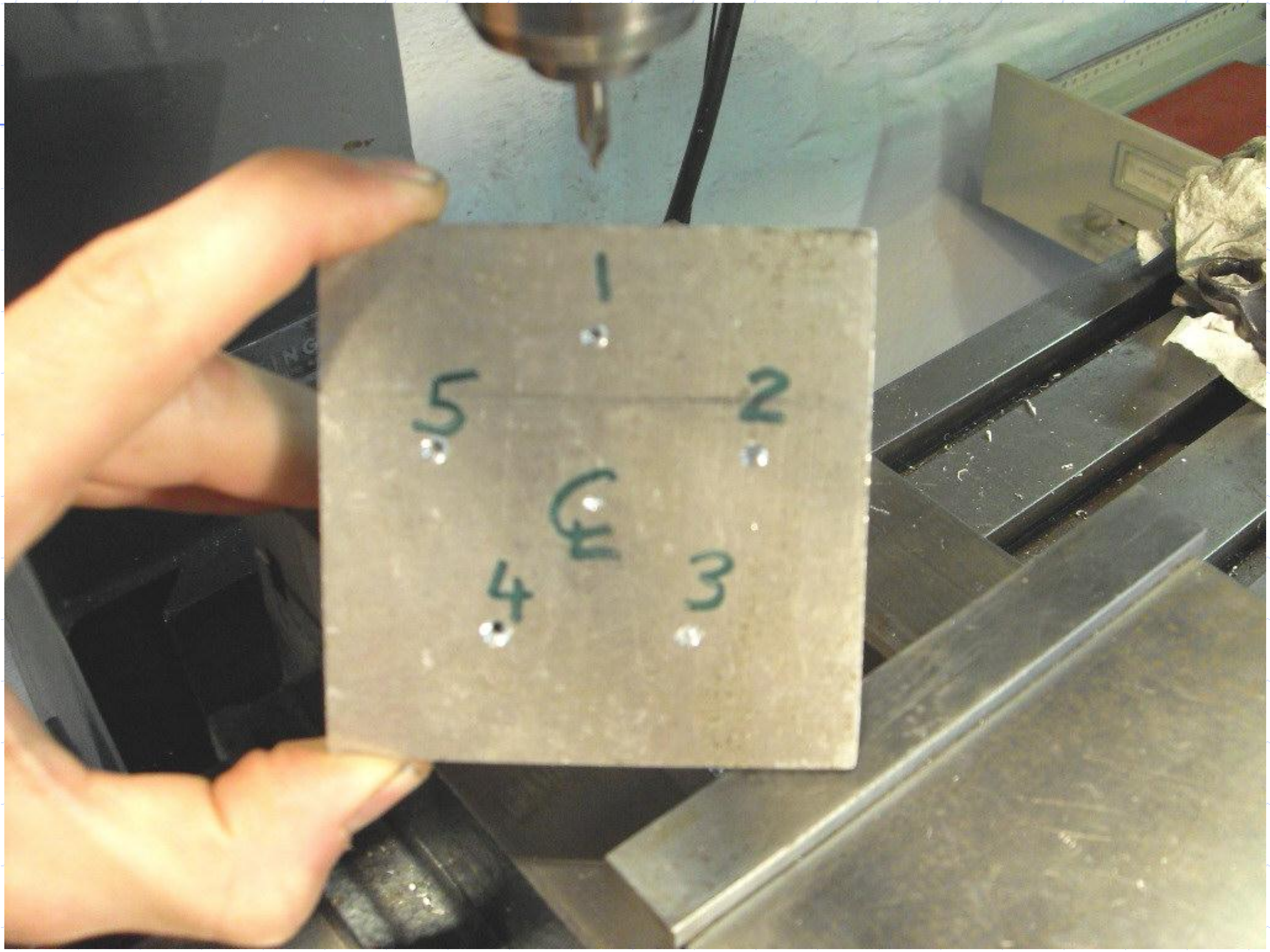
X = (SIN 288) x 1.000 radius
X = - 0.951

Y = (COS 288) x 1.000 radius
Y = 0.309





The fifth hole is at location:
X - 0.951
Y 0.309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