-- Inching Along in Industry --

Preface

Back in the late 1970's I could see it coming. I'm not really sure if our parents were the cause of it or if the educational trends changed, but none the less it was happening. America was losing its skilled craftsman. For some reason young people had acquired the mindset that working with your hands was a less than honorable profession. I believe it is very fulfilling to make great American products, but to that you must know how to measure!

Maybe they just didn't have the right tools or knowledge that would help them be good craftsmen. The biggest bit of knowledge that I see missing today is the skill of measurement; the inch and fraction decimal conversion. This workbook is dedicated to

- The Inch -

Sincerely,

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You must know how to measure!!

The Inch

The inch is a unit of measure. Easy right? 12 inches equals one foot, three feet equal one yard. But let's focus on the inch.

Figure A is the inch shown divided in six different ways.

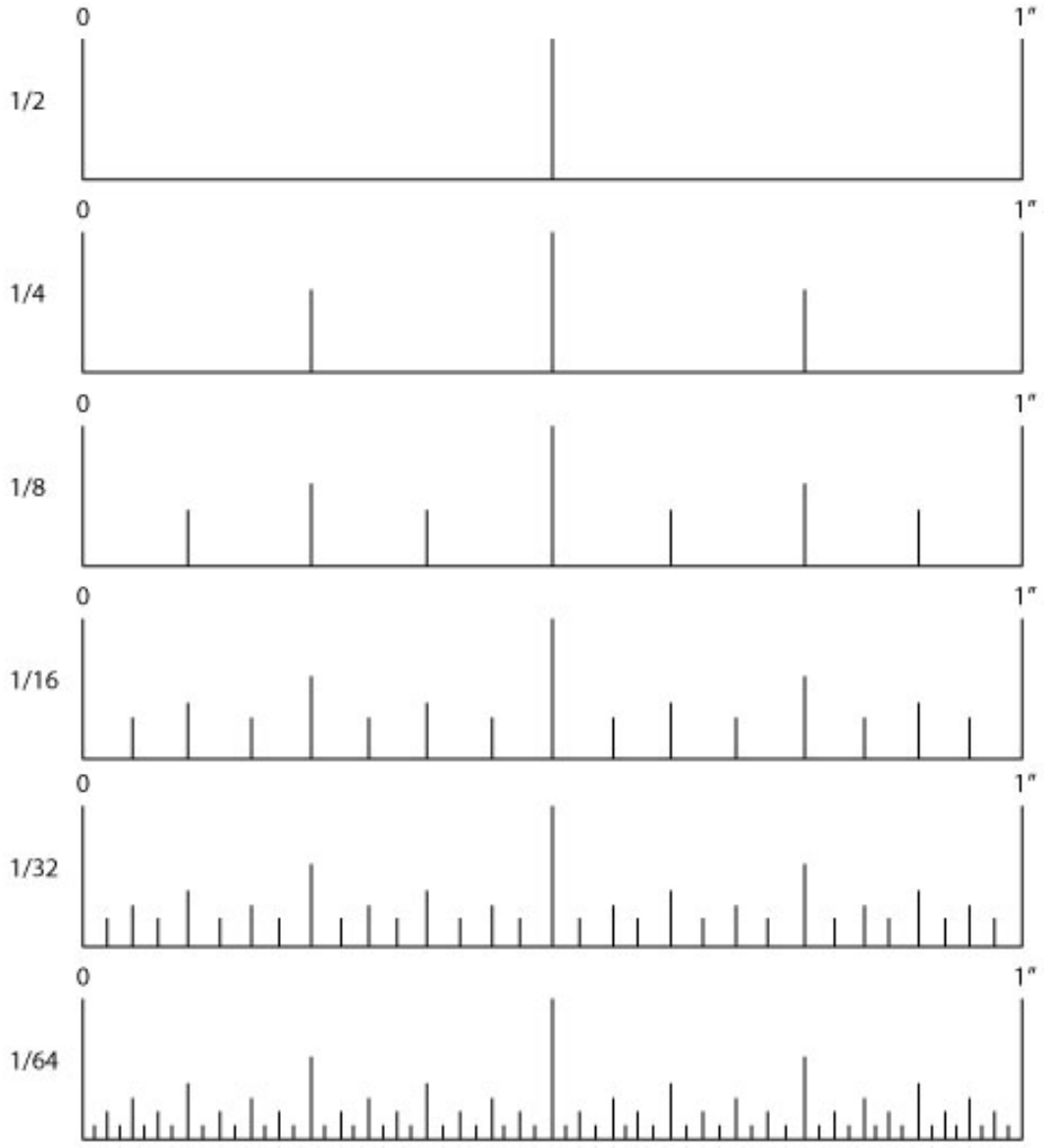


Figure A

Figure B shows the inch in just one way – one inch divided into 16 pieces. See how you could peel away each 1/16 of an inch.

Figure B

Now keep in mind that these diagrams of the inch are not to the correct scale. We all know the inch is only this long _____ , we made these diagrams larger for easier learning.

Now you're thinking to yourself, this isn't so bad. We can take the inch and divide it up or split it into many different pieces. But remember, each piece of the inch is a unit of length or measurement.

Figure C is a nice example of the inch broken into equal, fractional segments. You must understand this diagram.

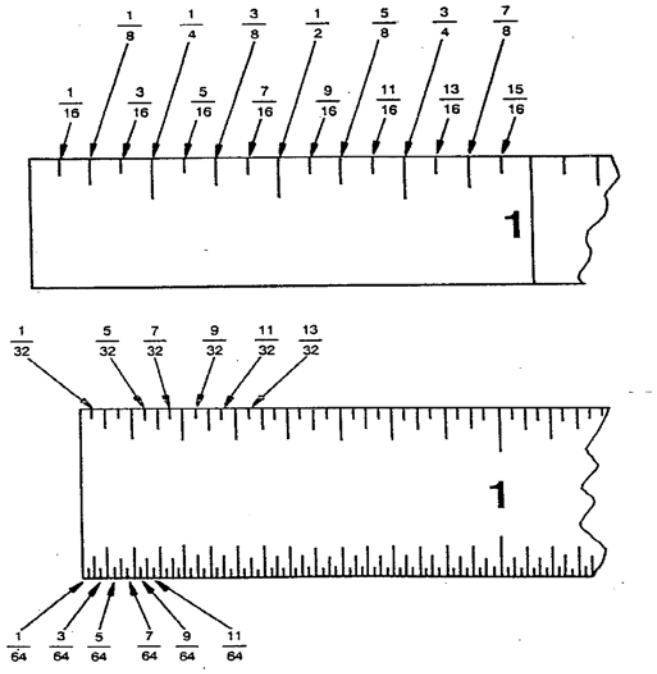
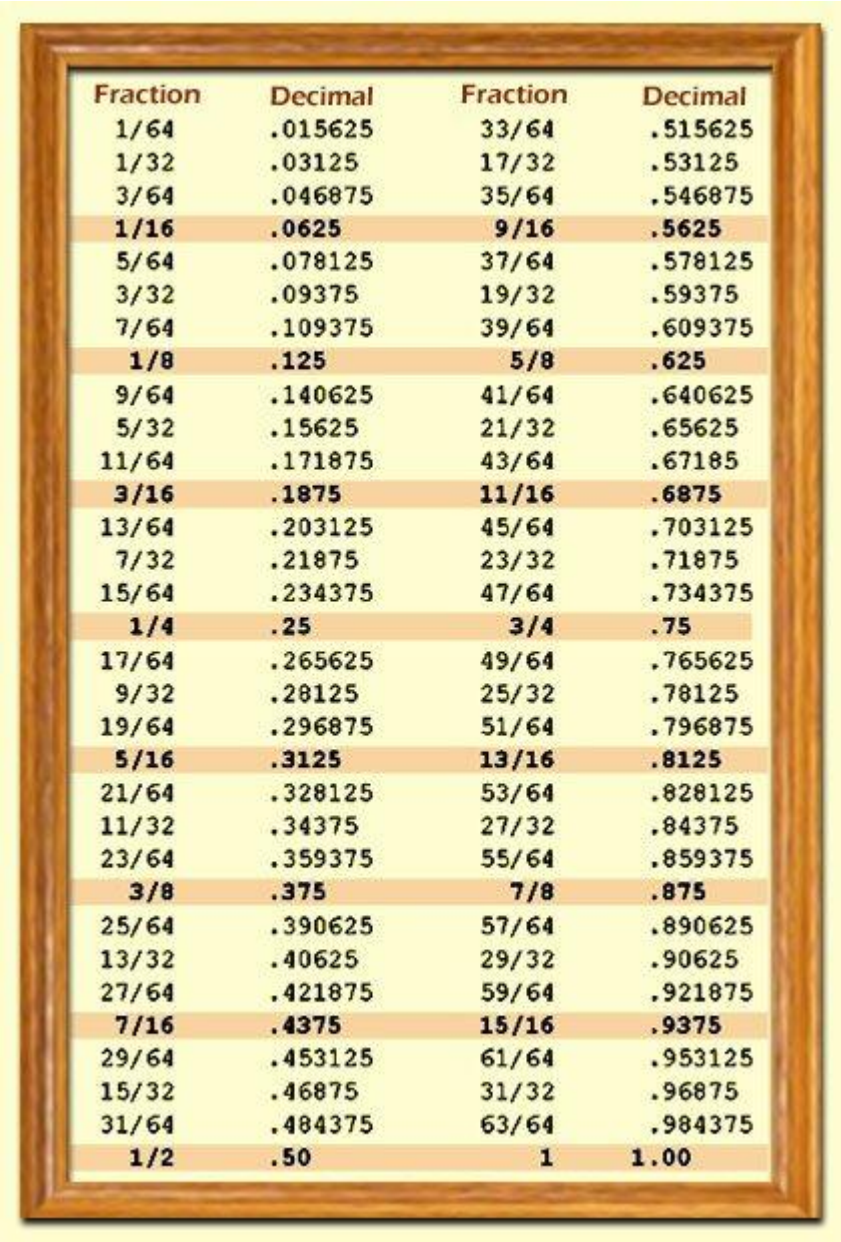


Figure C

The precision of the product being made will determine the level of accuracy that needs to be used.

For example:
The length of a piece of firewood could be plus or minus an inch; but a door lock for your house will be plus or minus 1/64 of an inch so it fits and works properly.

Just so you don't become overconfident, here is how I see the inch in my brain.



Fraction	Decimal	Fraction	Decimal
1/64	.015625	33/64	.515625
1/32	.03125	17/32	.53125
3/64	.046875	35/64	.546875
1/16	**.0625**	**9/16**	**.5625**
5/64	.078125	37/64	.578125
3/32	.09375	19/32	.59375
7/64	.109375	39/64	.609375
1/8	**.125**	**5/8**	**.625**
9/64	.140625	41/64	.640625
5/32	.15625	21/32	.65625
11/64	.171875	43/64	.67185
3/16	**.1875**	**11/16**	**.6875**
13/64	.203125	45/64	.703125
7/32	.21875	23/32	.71875
15/64	.234375	47/64	.734375
1/4	**.25**	**3/4**	**.75**
17/64	.265625	49/64	.765625
9/32	.28125	25/32	.78125
19/64	.296875	51/64	.796875
5/16	**.3125**	**13/16**	**.8125**
21/64	.328125	53/64	.828125
11/32	.34375	27/32	.84375
23/64	.359375	55/64	.859375
3/8	**.375**	**7/8**	**.875**
25/64	.390625	57/64	.890625
13/32	.40625	29/32	.90625
27/64	.421875	59/64	.921875
7/16	**.4375**	**15/16**	**.9375**
29/64	.453125	61/64	.953125
15/32	.46875	31/32	.96875
31/64	.484375	63/64	.984375
1/2	**.50**	**1**	**1.00**

Figure D

Boy, where did all these decimal numbers and fractions come from?

Let's discuss the decimal. Decimals come from fractions. For example:

1/4 = .25

Simple, right? But how do we do this? Let's review:

$$
\begin{array}{r}
.25 \\
4\overline{)1.00} \\
.8 \\
.20
\end{array}
$$

Voila! You just took a fraction and turned it into a decimal.

This can be done with any fraction you can make. Simply divide the denominator into the numerator. Example:

$$
33/64 = \begin{array}{r}
.515625 \\
64\overline{)33.00}
\end{array}
$$

Now you know that .75 is 3/4 and 3/4 is .75 -- both being a unit of measure, or a part of that inch.

Now if you look at the decimal chart in Figure D notice that the inch goes from 0 to 1.000, or in this decimal language, that means we divide the inch into 1000 different pieces. If we were to divide our inch into 1,000 pieces how many pieces would be in 1/4 inch?

1/4 inch = .250

I hope by now you have realized that if you start at the point of 0 and move from that point, creating distance. And distance needs to be measured.

The inch can be measured in fractions, 1/64, 1/32, 1/16/ 1/8, 1/4, 1/2. All of which can be converted into a decimal.

The inch could be measured in tenths, hundredths or thousandths, depending on how many pieces you split your inch into.

Now why do you think there are different ways to split up and measure the inch? The reason is different trades, like woodworking, carpentry, plumbing, nursing, electrical, steel fabricating, etc. do not have to be as accurate in measuring.

If you pursue a career working in a machine shop, tool and die work, or inspection, or science, the unit of measurement becomes much more accurate; down to the .0001 of an inch.

Let's review **Figure D** again. If I took the measurement of 6.3 inches, keeping in mind that the arrow is pointing to the dot between the 6 and the 3, you would pronounce the number as six and three tenths inches. If I changed it to 6.375 inches you would pronounce it as six and three hundred seventy five thousandths inches. 6.375 inches is also 6 3/8 inches. If you were a machinist you would say six and three hundred seventy five thousands, or a carpenter you would use the terminology six and three eighths.

We could use any number or combinations of numbers but they all would be a unit of measurement.

You may be asking yourself "Why do we need so many different forms of measurement?" Imagine buying a pair of pants or shoes and not having consistent methods of measurement. It would be terrible. Or how about the car you drive or the airplane you travel in? Imagine what would happen if it was manufactured without the high standards of measurement. It could be very unsafe, not work or not last. I can't think of any aspect of everyday life that wouldn't be affected if we didn't have accurate measurement.

When it comes to America's craftsmen; it could be steel fabricators, welders, plumbers, electricians, carpenters, machinists, etc; all these trades require the fine art of measurement.

Measuring is endless. Remember, you could divide an inch into a million pieces or just into two pieces. The level of accuracy and precision depends on the need and the cost.

We could talk about the inch forever, but once you know how to measure, you can measure anything.

We have covered a lot of information about measuring, but let's see how much you have learned. Attached is a short quiz that you should have no problem answering.

Now go forth and make good, properly measured American products!

The six-inch ruler shown on this page is divided into inches (at the numbers), half inches (every eight lines), quarter inches (every four lines), eighth inches (every other line), and sixteenth inches (from one line to the next).

Remember that rulers, like books, are read from left to right. The arrow at A is $\frac{1}{2}$ inch from the left end of the ruler. The arrow at B is $1\frac{3}{8}$ inches from the left end.

1. Tell in inches how far from the left end each of the following points is.

C_____	H_____
D_____	I_____
E_____	J_____
F_____	K_____
G_____	L_____

2. How much farther is point D from the left end of the ruler than point C?

3. How much farther is point H from the left end of the ruler than point F?

4. How much farther is point L from the left end of the ruler than point J?