Week 3

08/22/2022

Trinity Robotics

Today we will learn an important concept within Robotics & Engineering. Next we will learn about a measuring device and have a class exercise to practice with them…

First we will start with a review of what we have already learned :

The 3 main parts of a Robot are:

1. The Controller - also known as the "brain" which is run by a computer program. Often, the program is very detailed as it give commands for the moving parts of the robot to

follow.

2. Mechanical parts - motors, pistons, grippers, wheels, and gears that make the robot move, grab, turn, and lift. These parts are usually powered by air, water, or electricity.

3. Sensors - to tell the robot about its surroundings.

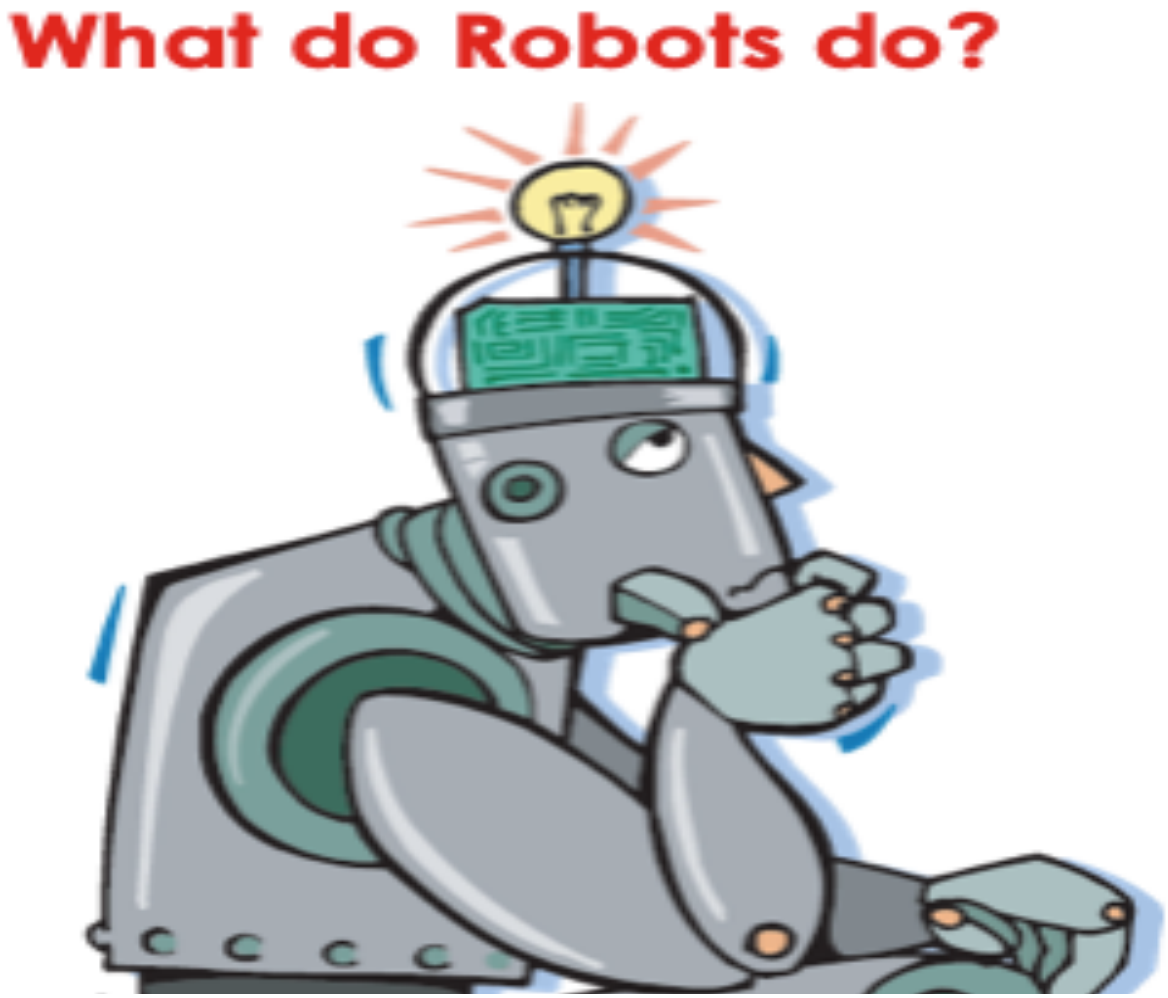
Review - from last week:

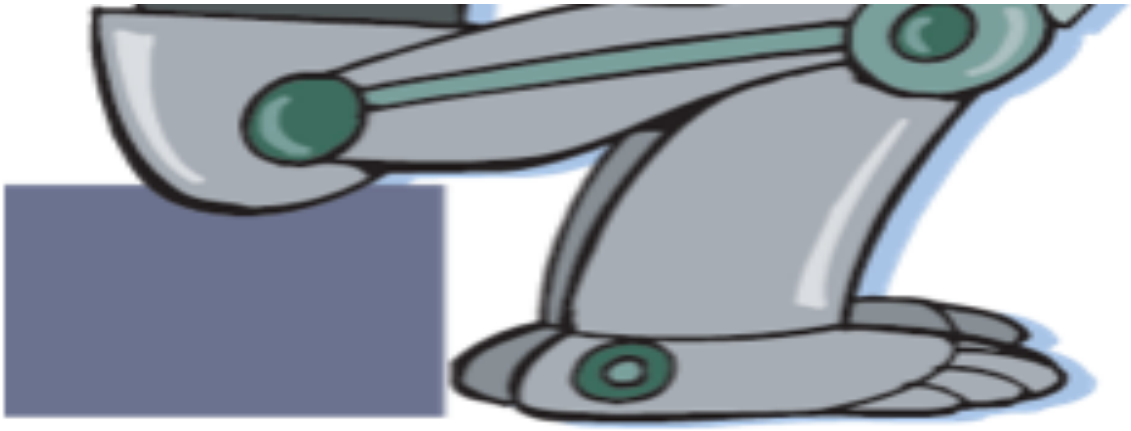
- What does the word ‘robotics’ mean? - The science or study of the technology associated with the design, fabrication, theory, and

with the design, fabrication, theory, and application of robots.

- What about ‘robot’? - Robots are any machine that does work on its own, automatically.

Robots





Imagine if your job was to tighten one screw on a toaster. And you did this over and over again on toaster after toaster, day after day, for weeks, months, or years. This kind of job is better done by robots than by humans. Most robots today are used to do repetitive actions or jobs considered too dangerous for humans. A robot is ideal for going into a building that has a possible bomb. Robots are also used in factories to build things like cars, candy bars, and electronics. Robots are now used in medicine, for military tactics, for finding objects underwater and to explore other planets. Robotic technology has helped people who have lost arms or legs. Robots are a great tool to help mankind.

So Why Use Robots?

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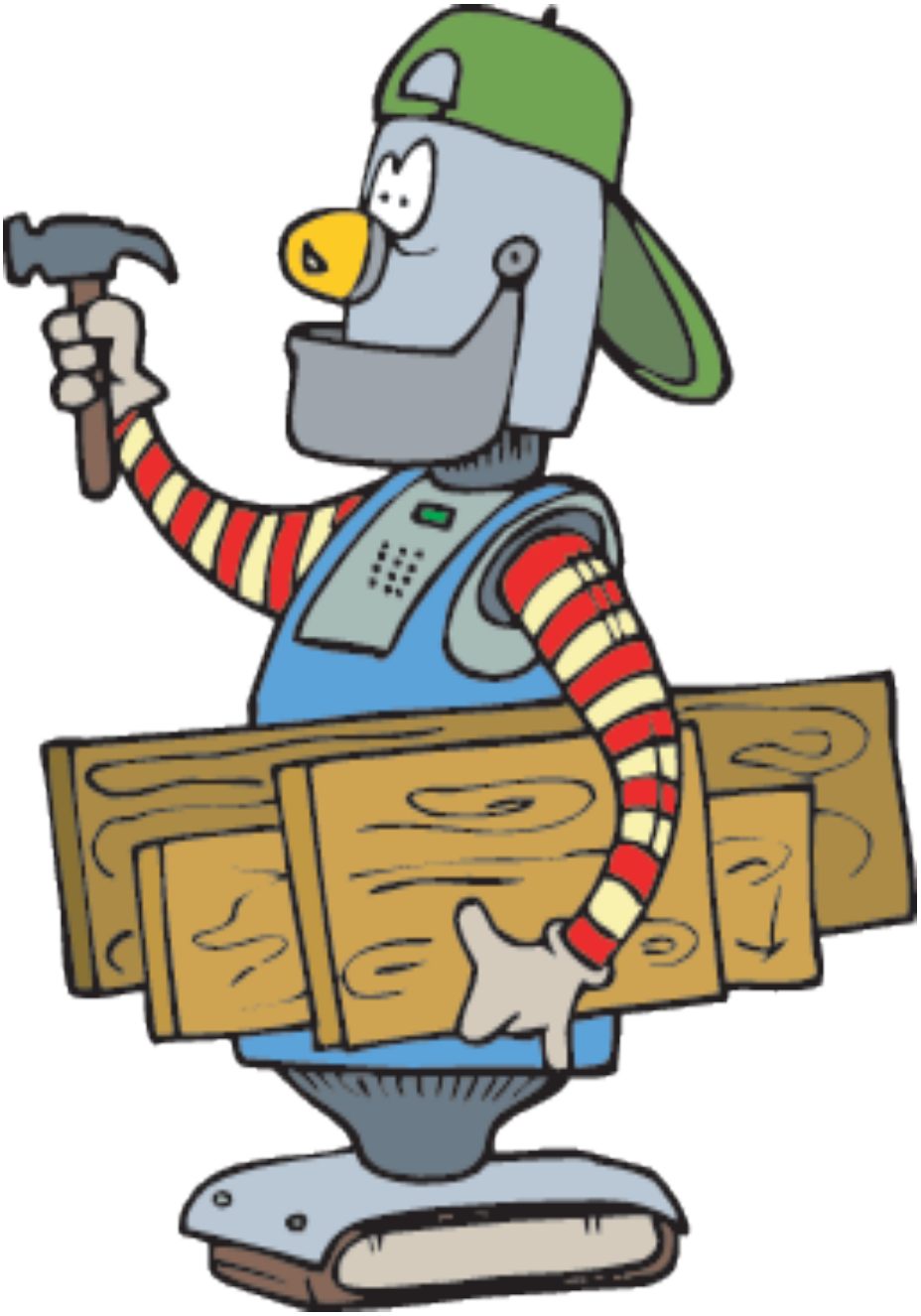
The reason robots are used is that it is often cheaper to use them over humans, easier for robots to do some jobs and sometimes the only possible way to accomplish some tasks! Robots can explore inside gas tanks, inside volcanoes, travel the surface of Mars or other places too dangerous for humans to go where extreme temperatures or contaminated environments exist.

Robots can also do the same thing over and over again without getting bored. They can drill, they can weld, they can paint, they can handle hazardous materials, and in some situations, robots are much more accurate than a human - which can cut back on production costs, mistakes or hazards. Robots never get sick, don't need sleep, don't need food, don't

need to take a day off, and best of all they don't ever complain! There are a lot of benefits to using robots.

Parts of a Robot



Robots can be made from a variety of

Robots can be made from a variety of materials including metals and plastics. Most robots are composed of 3 main parts:

1. The Controller - also known as the "brain" which is run by a computer program. Often, the program is very detailed as it give commands for the moving parts of the robot to follow.

2. Mechanical parts - motors, pistons, grippers, wheels, and gears that make the robot move, grab, turn, and lift. These parts are usually powered by air, water, or electricity.

3. Sensors - to tell the robot about its surroundings. Sensors allow the robot to determine sizes, shapes, space between objects, direction, and other relations and properties of substances. Many robots can even identify the amount of pressure necessary to apply to grab an item without crushing it.
   All of these parts work together to control how the robot operates.

A **fastener** is a hardware device that mechanically joins or affixes two or more objects together. In general, **fasteners** are used to create non-permanent joints; that is, joints that can be removed or dismantled without damaging the joining components.

Lets think of one of the mechanical components that goes into the parts of a robot; fasteners.

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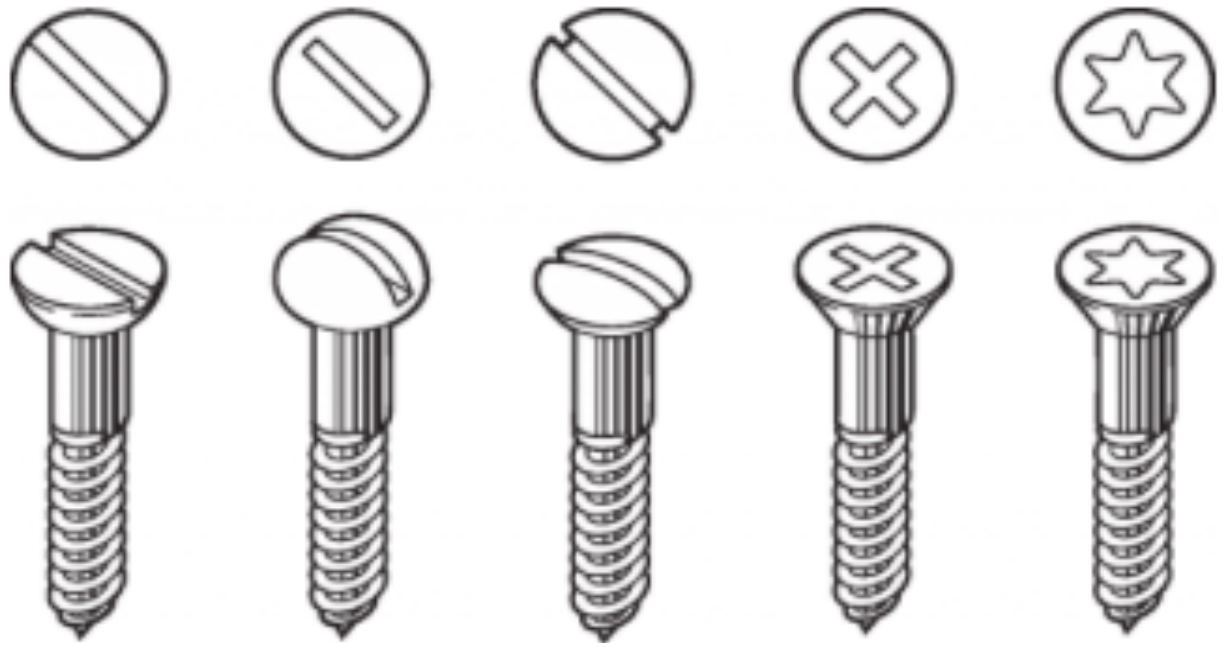
How do you think we will use fasteners in our Robotics Class?

Screws & Bolts

Screws are the type of fasteners which are used to hold things together. It consists of a head and threaded part which may or may not flush out with the surface while fastening according to the design. There are so many head types such as flat head, round head, raised head, truss head, Bugle head, pan head etc. and each of them were introduced for some purpose.

So let’s start the tale of screw heads.

Types of Screws Heads



Fastener Type Chart

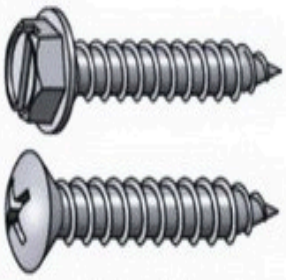
BoltDepot.com
fastener shopping made easy

www.boltdepot.com/tools

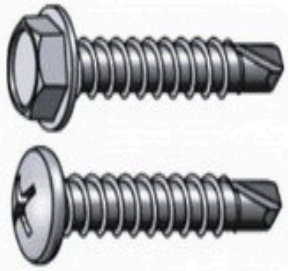
Wood Screws
Screws with a smooth shank and tapered point for use in wood. Abbreviated WS

Machine Screws
Screws with threads for use with a nut or tapped hole. Abbreviated MS

Thread Cutting Machine Screws
Machine screws with a thread cutting (self tapping) point.



Sheet Metal Screws
Fully threaded screws with a point for use in sheet metal. Abbreviated SMS



Self Drilling SMS
A sheet metal screw with a self drilling point.

Hex Bolts
Bolts with a hexagonal head with threads for use with a nut or tapped hole. Abbreviated HHMB or HXBT.

Carriage Bolts
Bolts with a smooth rounded head that has a small square section underneath.

Lag Bolts
Bolts with a wood thread and pointed tip. Abbreviated Lag.

Hex
A six sided nut. Also referred to as a Finished Hex Nut.

Heavy Hex
A heavier pattern version of a standard hex nut.

Nylon Insert Lock
A nut with a nylon insert to prevent backing off. Also referred to as a Nylock.

Jam
A hex nut with a reduced height.

Important Question:

How does a bolt & nut fastener work?

How do you tighten a bolt?

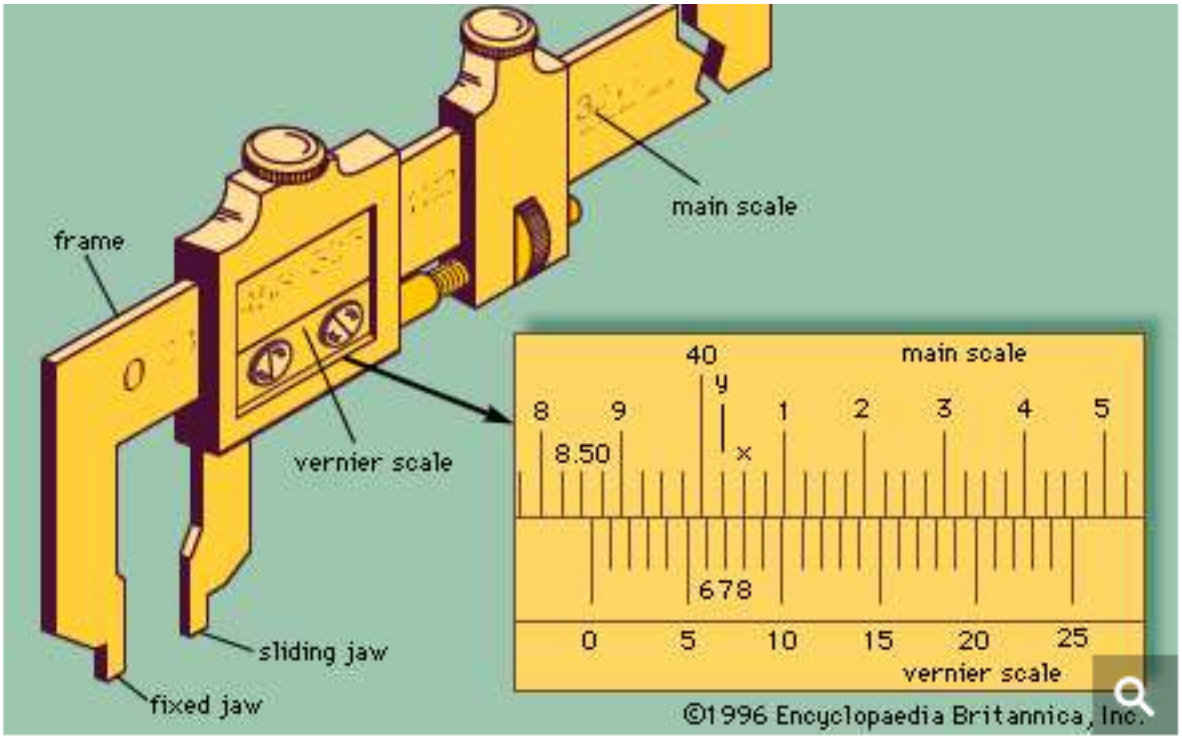
Vernier caliper

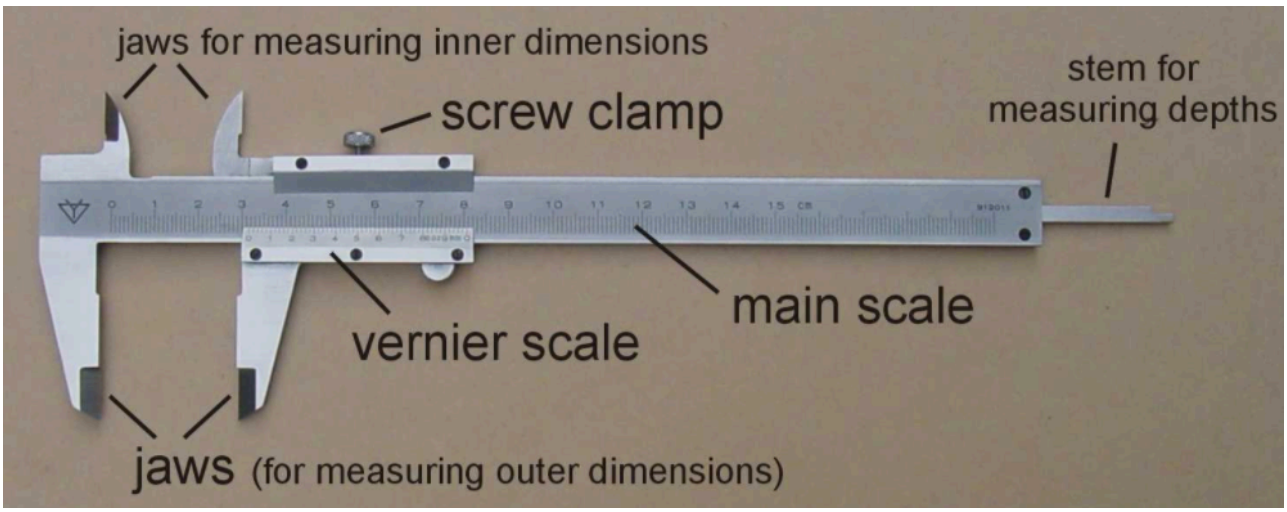
Vernier caliper

measurement instrument

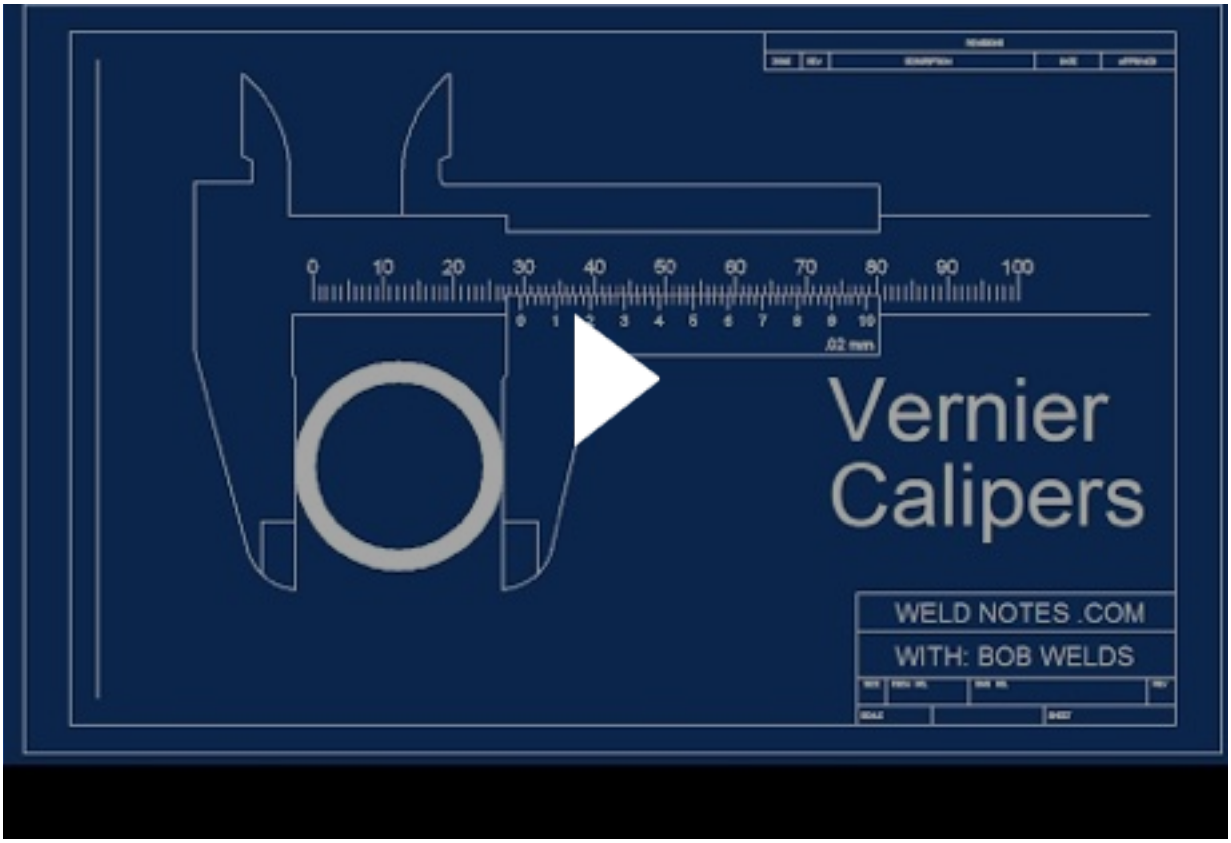
Vernier caliper, instrument for making very accurate linear measurements introduced in 1631 by Pierre Vernier of France. It utilizes two graduated scales: a main scale similar to that on a ruler and an especially graduated auxiliary scale, the vernier, that slides parallel to the main scale and enables readings to be made to a fraction of a division on the main scale. Vernier calipers are widely used in scientific laboratories and in manufacturing for quality control measurements.

In the figure, the vernier scale has 25 divisions, whereas the main scale has 24 divisions in the same length. This means that the divisions on the vernier scale are shorter than those on the main scale by $^{1}/_{25}$ of a division on the main scale. In the figure, line 8 on the vernier coincides with line *x* on the main scale. To align lines 7 and *y* the vernier would have to be moved to the left by $^{1}/_{25}$ of a main-scale division; to align lines 6 and 40, the movement would be $^{2}/_{25}$, and so on. By similar reasoning, the 0 line on the vernier would have to be moved a distance equal to $^{8}/_{25}$ of a main-scale division to align it with the 8.50 line on the main scale. This means that in the position shown in the figure the 0 line is $^{8}/_{25}$ of a main-scale division to the right of the 8.50 line. The reading of the vernier is therefore 30 + 8.50 + 0.08 = 38.58.





[How to Read a Metric Vernier Calipe]



1https://youtu.be/vkPlzmalvN4

Next we will have an in class Exercise…