X, Y & Z
Makes the World Go Around

And sometimes A, B or C
Students to comprehend.

Mathematical values with no concrete connection.

The image of charts and grids offer a visualization.

Illustrate comparisons or changes.

These values are then utilized on charts or grids to establish values, solve problems and get answers.

In science and math, calculations are performed to...

Data & Coordinates
Plotting a Slope

Working with Coordinates
CLUE

Precipitation (mm)

Plotting Data Points
Machines can achieve axial position increments of 0.1000" within a cubic measurement. Machine tools and manufacturing processes, motion basis for all System (3D) is the entire The Cartesian Coordinate System

Cartesian Coordinate System
coordinates

coordinates comprised of thousands of coordinates

Every object no matter what the shape is

manufacturing equipment

This applies to manual or computerized

shape

locates a precise position or machine a specific

coordinates enable a skilled employee to

coordinates
(How deep and aggressive of a bite)
The materials used in the manufacturing process dictate allowable feeds.
Controls product cost, quality, and tool life

Distance over time

and subsequently cost and pricing

The materials used in the manufacturing process dictate all speeds.
Controls product costs and quality

RPM to Surface Feet per minute.

in Manufacturing

Mathematical Calculations
Geometry

- Material costs by volume
- Surface area for speed control
- Material removal rates in volume & weight
- Area-Perimeter-Cubic-Circumference

Distance per Revolution x per tooth

in Manufacturing

Mathematical Calculations
within dual Cartesian coordinate systems

Manufecturing is GLOBAL. America works every day within a dual measurement

Inch & Metric

Cost of labor over time
Cost of manufacturing over time

Cost x Time

Salary increases
Time and cost savings
Incremental changes in cutting rates

Percentages

in Manufacturing
Mathematical Calculations
Combined

Positional in 6 Axis Locations

Rotation in a cube

X Y Z Locations

Axial Positions

Rotational -- A B C Axial Positions

Ratios

Weights

Chemical Solutions

Production Rates

Calculations in Manufacturing

Angular

Conversion to Decimal I, E. Degrees, Minutes & Seconds to Decimal

54 degrees, 15 minutes, 40 seconds = 54.2611 degrees

How many seconds are in 360 degrees?
Overhead, overtime, labor

Production rates of machining vs. labor hours

Chemical solutions in machining coolants, adhesives, paints

Ratios

Removal weight and recycling savings

Volume calculations per cubic inch to determine materials cost, materials

Weights

Calculations in Manufacturing
Trigonometry for X Y Z Coordinates
Machine Motion
Fifty Millionth of an Inch
0.0005"
Can Measure a Component to

The Coordinate Measuring Machine
The Coordinate Measuring Machine

The Science of Metrology
should be the precision manufactured component.

The final result of an executed CNC program

information on the engineering drawings.

The coordinates are determined by dimensional

machine to execute.

which is a list of motion commands for the

The program contains codes and coordinates

that automates a machining process.

CNC Machines operate from a computer program.
which will result in the intended design. A background in precision machining, writing a list of robotic commands and interpreting the design must be able to interpret the design and with...
N240 G6 X.500 Y.300 R.250
N230 G6 T.750 Y.2.750 R.250
N220 G6 X.750 Y.2.250 R.250
N210 G6 X.500 Y.2.0
N200 G6 X.0 Y.0
N190 G6 T.0

(diameter +.010")

N180 G6 G41 D1 X.0 Y.0 F.10.0

CO0001 Sub Program Finish Pass

N170 M30

N160 G2 Z.2 F.15.0 (basic end to a program)

N150 G90 Z.2 F.15.0 (basic end to a program)

N140 G90 Z.2 F.15.0 (basic end to a program)

N130 G90 Z.2 F.15.0 (basic end to a program)

N120 W.98 P.1001

N110 M98 P.1001

N100 G6 Z.2 F.15.0 (basic end to a program)

N90 G6 X.0 Y.0 Z.0 F.15.0 (incremental move, .625 / 6)

N80 G6 X.0 Y.0 Z.0 F.15.0 (incremental move, .625 / 6)

N70 G6 X.0 Y.0 Z.0 F.15.0 (incremental move, .625 / 6)

N60 G6 X.0 Y.0 Z.0 F.15.0 (incremental move, .625 / 6)

N50 G6 X.0 Y.0 Z.0 F.15.0 (incremental move, .625 / 6)

N40 G6 X.0 Y.0 Z.0 F.15.0 (incremental move, .625 / 6)

N30 G6 X.0 Y.0 Z.0 F.15.0 (incremental move, .625 / 6)

N20 G6 X.0 Y.0 Z.0 F.15.0 (incremental move, .625 / 6)

N10 G6 X.0 Y.0 Z.0 F.15.0 (incremental move, .625 / 6)

N00 G6 X.0 Y.0 Z.0 F.15.0 (incremental move, .625 / 6)

%