



# COORDINATE GEOMETRY

Chapter 4

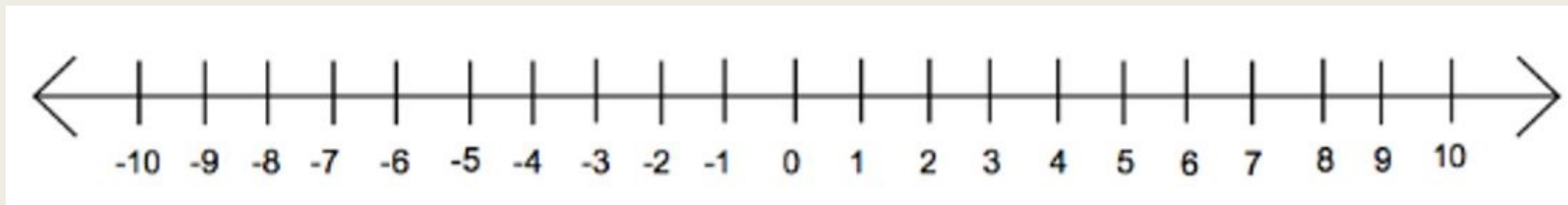


# Objective

- Have a working knowledge of coordinate system
- Understand quadrants of coordinate system
- Gain a working knowledge of machine geometry and axis orientation

# Real Number System

- Uses numbers 0 to 9
- Can be in any combinations
  - 2 or +2
  - -3
  - $1/8$ ,  $1-3/16$
  - $.185$ ,  $3.5$
- All real numbers can be placed on a number line

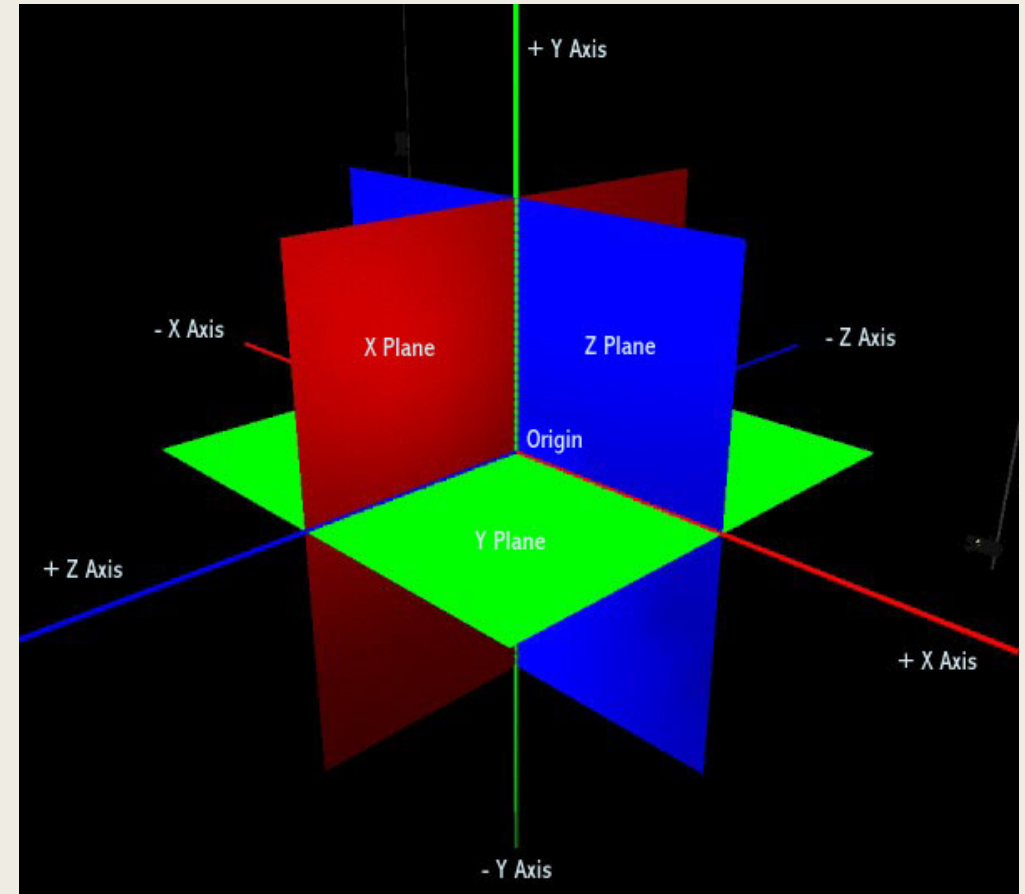


# Rectangular Coordinate System

- Cartesian Coordinate System
- A given point can be defined on a plane with two coordinate values
- A given point can be defined in space with three coordinate values
- When two number scales intersect at right angles it creates a rectangular coordinate system which makes three important terms
  1. *Axes and Planes*
  2. *Origin*
  3. *Quadrants*
  4. *Right hand coordinate system*

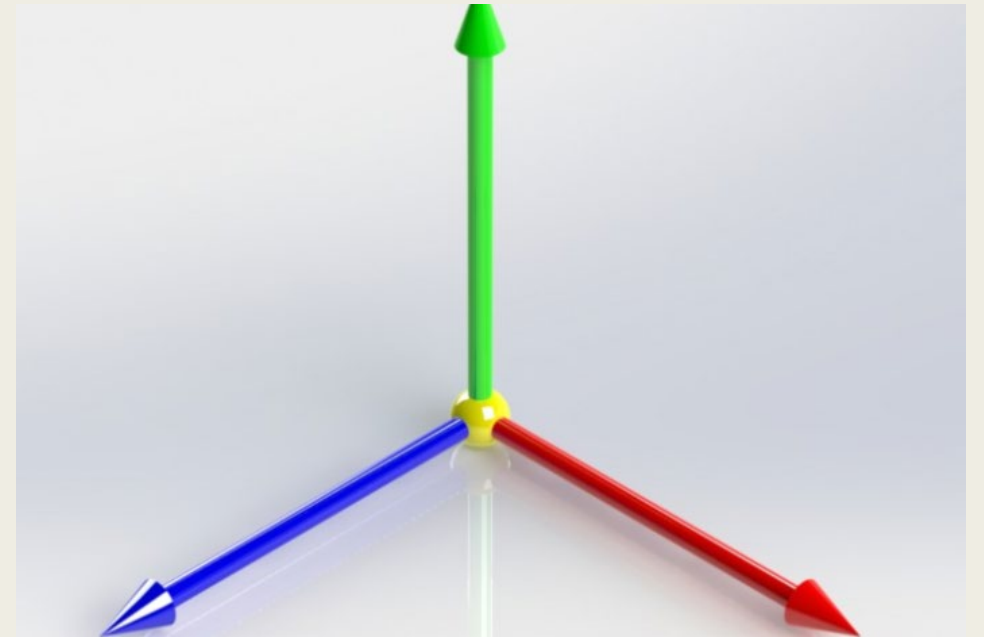
# 1. Axis and Planes

- Each major line of the number scale is an axis
- It could be in vertical or horizontal
- Axis is a reference for numbers in given direction
  
- Plane is a 2D entity
- It is the right angle view of two number scales
- It may vary between CAD/CAM and CNC programs



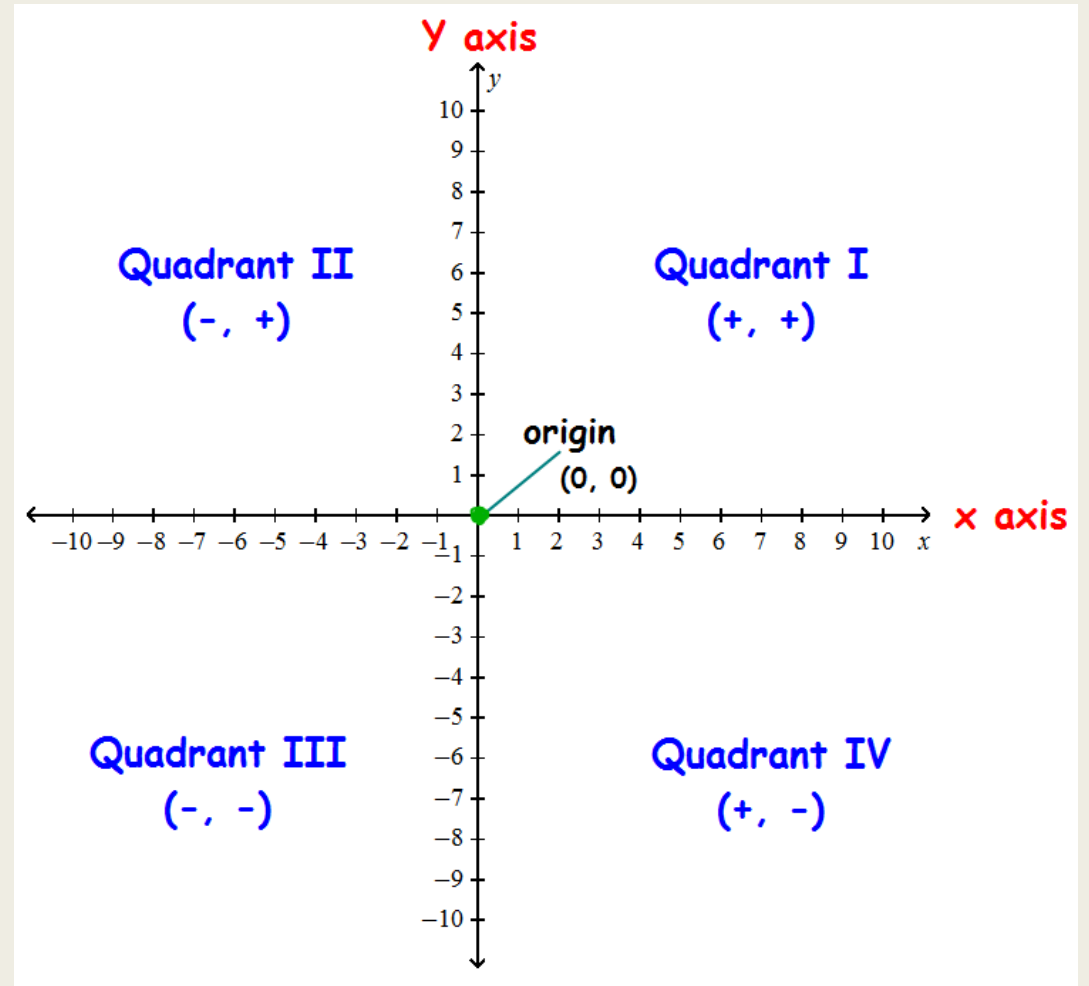
## 2. Origin

- An origin is the point where zero coordinates in each axis intersect
- XOYO on a plane - XOYOZO in space
- NOTE: in CNC programming the origin is called the program reference point  
This may also differ from the CAD origin



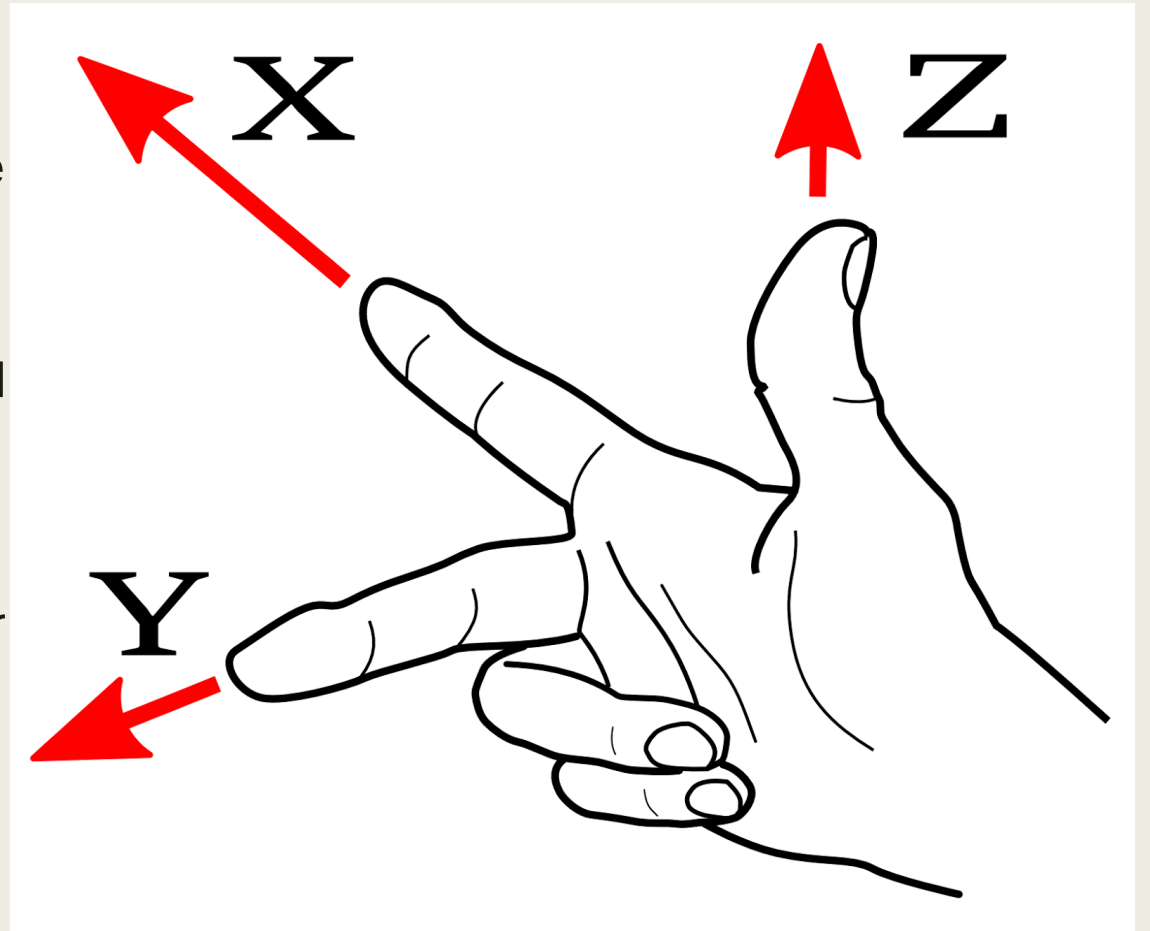
# 3. Quadrants

- Quadrants are the four parts of a plane formed by a system of rectangular coordinates
- Quadrants are defined by roman numerals



# 4. Right Hand Coordinate System

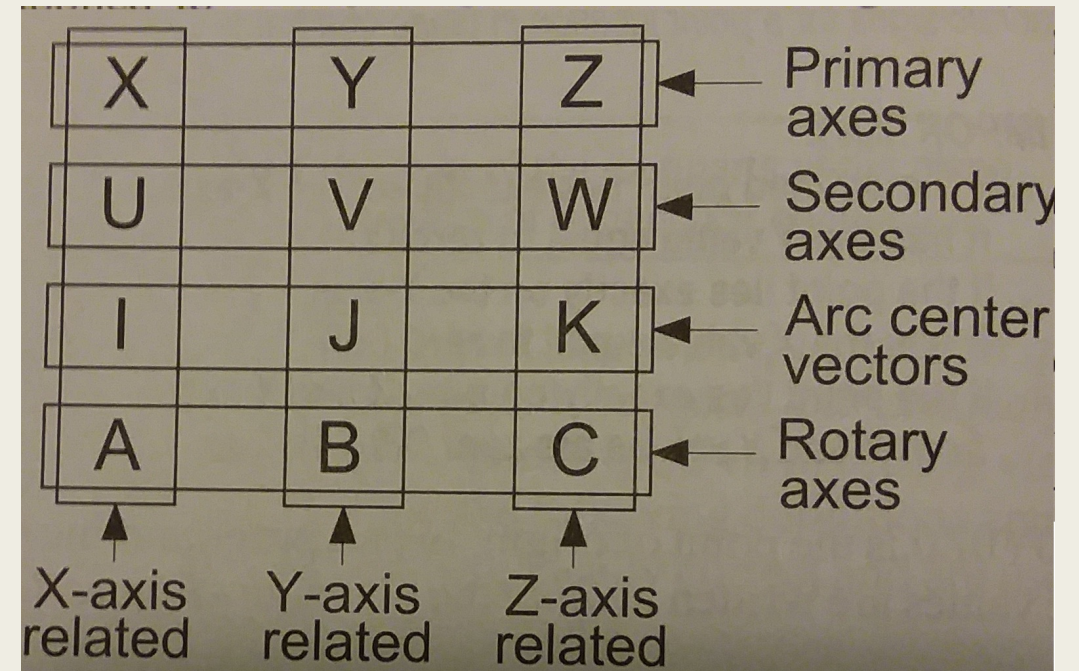
- Based on the fact that all numbers to the right and up are positive and the opposite direction are always negative
- CNC machines are normally programmed using absolute coordinate methods
- This follows that the origin in X0Y0Z0
- All movements will follow this rectangular coordinate systems



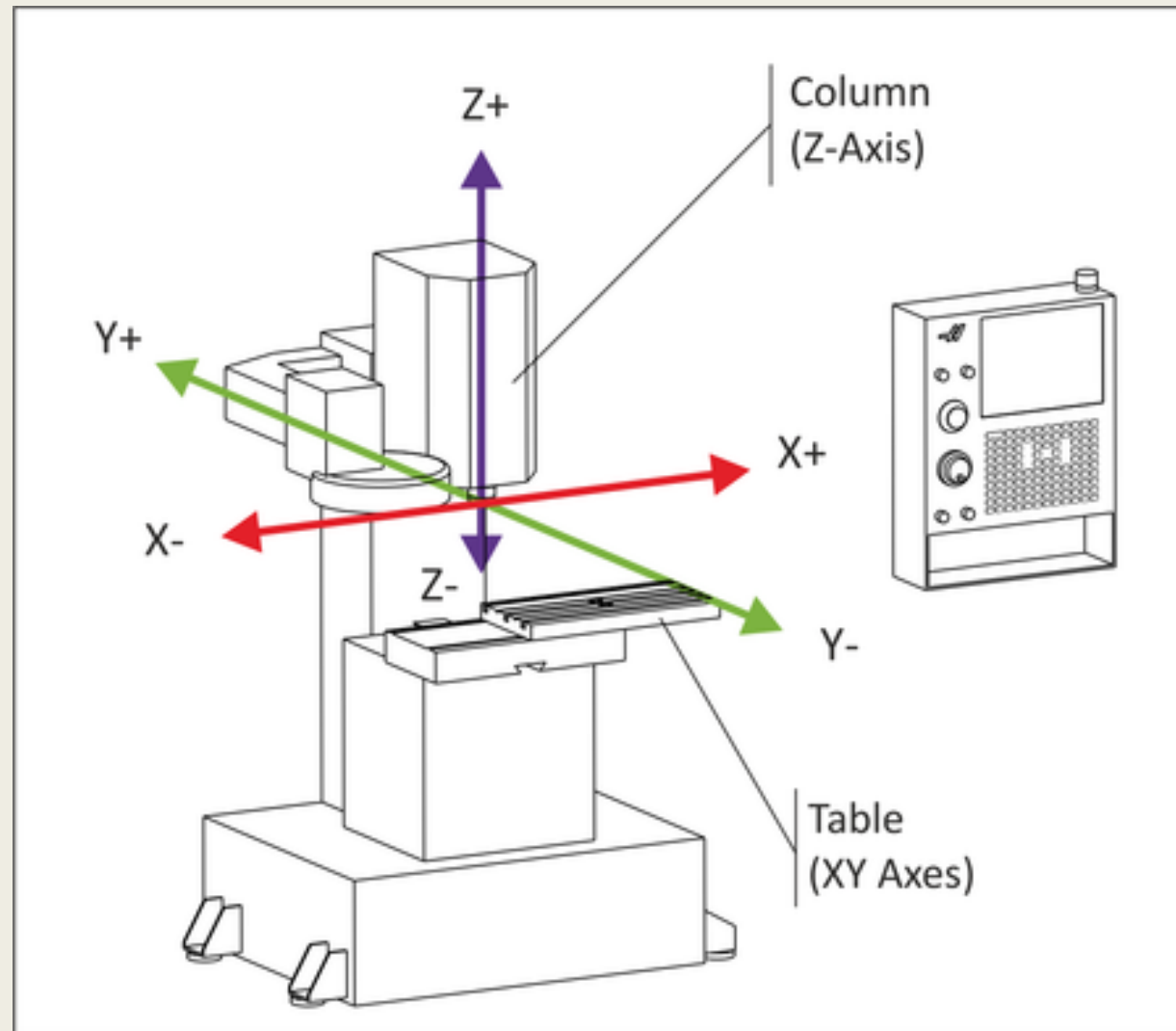


# Machine Geometry

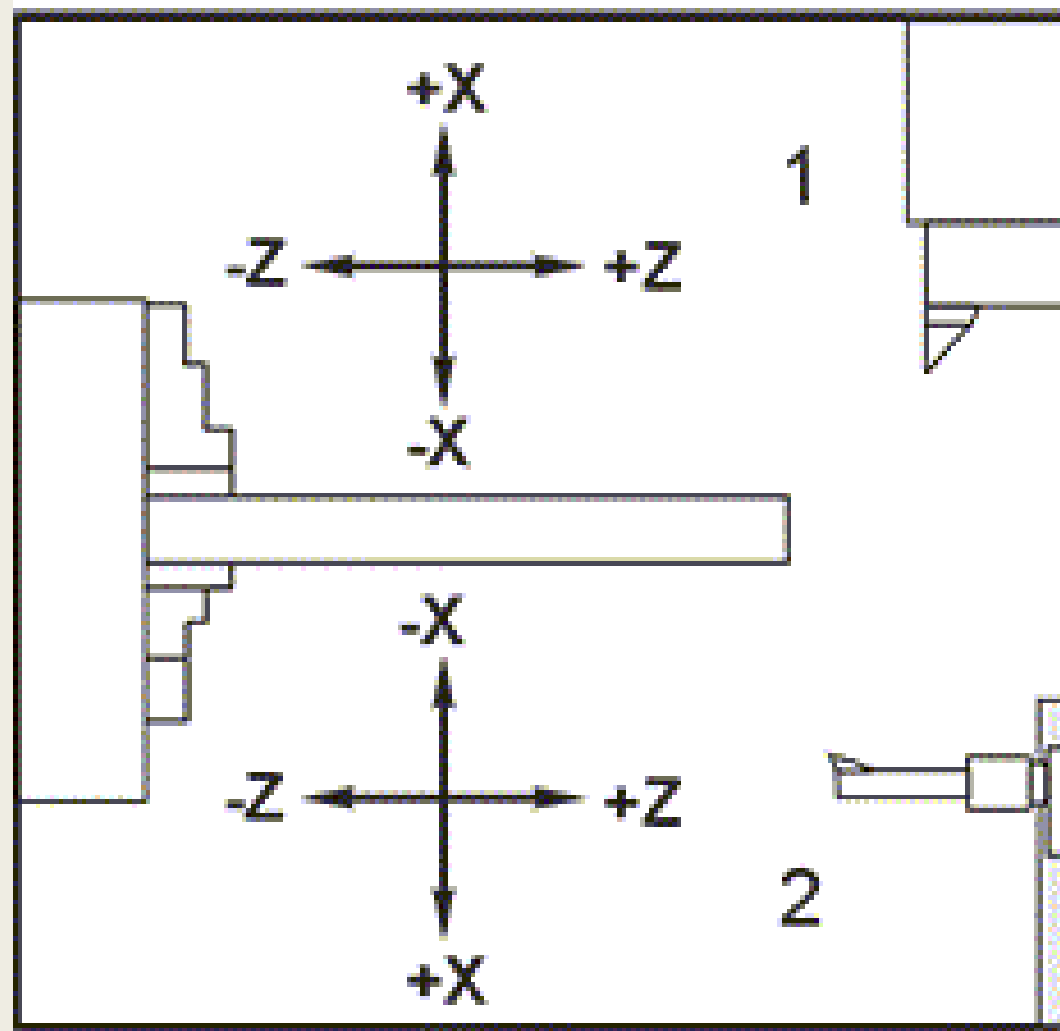
- Machines use the coordinate system
- The basic axis for machines are X, Y, and Z
- More complex machines can use U, V, W, I, J, K, A, B, C
- Typically the Z axis is the axis that could make a hole with a simple point tool



# Mill Axes



# Lathe Axes



# Homework

# Alpena Community College TAACCCT Grant

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