Quality Control

Addition and Subtraction

Objectives:

- Define the following terms: whole number, numeral, digit, decimal, place value, addend, sum, minuend, subtrahend, and difference
- Properly place commas in large numbers
- Explain the significance of the digit zero in a number
- Differentiate between concrete and abstract numbers
- Properly prepare numbers for addition and subtraction
- Perform addition and subtraction on numbers
- Check your answers to both addition and subtraction problems
- Use a calculator to add and subtract numbers

Multiplication and Division

Objectives:

- Define the following terms: factor, multiplicand, multiplier, partial product, product, dividend, divisor, quotient, and remainder
- Recognize the various signs used for multiplication and division
- Properly prepare numbers for multiplication and division
- Perform multiplication and division on whole numbers, decimal numbers, and mixed decimal numbers
- Check your answers to both multiplication and division problems
- Find the average of a group of numbers
- Use a calculator to multiply and divide numbers

Fractions, Percents, Proportions, and Angles

Objectives:

- Define the following terms: fraction, proper fraction, improper fraction, lowest common denominator, percent, ratio, and proportion
- Add, subtract, multiply, and divide fractions
- Change fractions to decimals and decimals to fractions
- Solve problems involving percent
- Work with ratios and equivalent ratios
- Solve proportion problems
- Use a protractor to measure angles
- Lay out templates for checking angles
- Use a calculator to solve percent problems, to convert fractions to decimals, and to calculate missing terms in proportions

Metric System

Objectives:

- Name the base units most commonly used in the metric system and identify what they're used to measure
- Identify metric prefixes and their values
- Apply conversion factors to create a unit that's larger or smaller than the base unit
- Estimate lengths in metric units
- Express temperature in degrees Celsius
- Define the terms mass, density, force, torque, and pressure, and identify the metric units used to measure each one
- Use a conversion table to convert metric units to English units and English units to metric units
- Use a calculator to perform metric conversions

Formulas

Objectives:

- Explain the use of variables in formulas
- Prepare and use formulas to solve problems
- Use formulas to calculate the perimeter of a triangle and a rectangle, and the area of a triangle, a rectangle, and a circle
- Use formulas to calculate distance, current in a circuit, and the volume of a pyramid and a sphere
- Use a calculator to find square roots and solve formulas
- Substitute given numerical values for letters in a formula and find the unknown quantity
- Transform and solve equations and formulas

Introduction to Algebra

Objectives:

- Explain the difference between positive and negative numbers and their uses
- Perform basic arithmetic operations with signed numbers
- Raise a number to any power
- Use the order of operations for solving problems involving multiple operations
- Define the following words: term, constant, coefficient, exponent, monomial, trinomial, and polynomial
- Identify and combine like terms in an expression
- Perform basic arithmetic operations with signed terms
- Multiply and divide terms containing exponents
- Remove parentheses from an expression and simplify the expression

Linear Distance and Measurement

Objectives:

- Measure using both English and metric (SI) units of length
- Calculate the perimeters of rectangles, squares, and triangles
- Calculate the areas of objects such as rooms or machine bases
- Calculate the circumference of circular objects such as pipes or tanks
- Measure distances using rigid and flexible rules, thickness gages, and screw pitch gages
- Make precise measurements using vernier calipers and micrometers

QUALITY CONTROL

Bulk Measurement

Objectives:

- Measure an angle by degrees
- Find the areas of rectangles, triangles, and circles
- Find the volumes of prisms, cylinders, and cones
- Find the mass of material stored in a container
- Determine the amount of material that can be stored or handled
- Discuss the types and uses of conveyors and weighing systems

Temperature Measurement

Objectives:

- Change temperature units from one system to another
- Discuss the use of the various types of thermometers
- Select the type of thermometer to be used at certain temperatures

Energy, Force, and Power

Objectives:

- Distinguish among the concepts of energy, force, and power
- Explain what the term work means and how it's measured
- Know by sight the basic machines: lever, inclined plane, wedge, wheel and axle, and screw
- Solve simple problems that involve levers, mechanical advantage, and machine efficiency
- List the forms of energy that have important industrial applications and the instruments used for measuring energy

Fluid Measurement

Objectives:

- Understand the properties of fluids
- Determine the density, specific gravity, and viscosity of fluids
- Express pressure in three different units
- Measure the pressure of fluids using manometers and Bourdon tube pressure gages
- Measure the flow rate of fluids using different types of flowmeters

Elements of Print Reading, Part 1

Objectives:

- Given a drawing, interpret the dimensions and notes
- Differentiate between perspective, isometric, orthographic, and working drawings
- Identify the classifications of fits and the use of tolerances and their method of application
- Shown a scale for a drawing, be able to convert the sizes
- Identify the symbols used to indicate surface finishes

Elements of Print Reading, Part 2

Objectives:

- Distinguish between simplified and section drawings
- Interpret the symbols used in section drawings
- Given a drawing, identify the different components and interpret dimensions and notes
- Calculate the taper on a given workpiece
- Point out the differences between the types of rivet symbols used on a working drawing
- Choose the proper information on a drawing to calculate a dimension that isn't indicated

Introduction to Print Reading

Objectives:

- Identify the various kinds of lines used on drawings
- Compare and contrast the various types of drawings
- Relate the information given in the title block and bill of material to the drawing
- Define different types of scales used on drawings
- Identify the different views used on drawings

Reading Shop Prints, Part 1

Objectives:

- Properly interpret working drawings (including dimensions and tolerances)
- Interpret symbols, notes, and specification
- Identify material requirements
- Interpret drawings to determine the proper procedure to make the part

Reading Shop Prints, Part 2

Objectives:

- Read and properly interpret various shop prints
- Interpret and use cam prints
- Interpret and use gear prints
- Read and understand an assembly drawing and bill of materials
- Read simple sheet metal drawings

Dimensioning

Objectives:

- Identify the height, width, and length dimensions of a drawing
- Interpret dimensions on angles, arcs, fillets, rounds, holes, and chamfers
- Interpret the surface finish symbols for roughness, waviness, and lay

QUALITY CONTROL

Tolerancing and Symbols

Objectives:

- Tell the position method from the bracket method of dual dimensioning
- Identify the three general classes of fit
- Interpret unilateral and bilateral tolerances
- Interpret the various symbols and notations used on drawings

Sectional Views and Simplified Drafting

Objectives:

- Tell one type of section from another
- Interpret the various types of sections
- Interpret drawings using simplified drafting methods

Quality Concepts: Terminology

Objectives:

- Define quality and total quality management, using examples
- Describe how quality has evolved to where it is today
- Explain several motivations for quality improvement
- Describe how quality-conscious organizations have changed for the better
- Assess quality-consciousness in individuals and organizations
- Explain how some familiar business practices have led to TQM and how certain other common practices have gotten in the way of TQM
- Name some successful results of TQM programs

Precision Measuring Instruments, Part 1

Objectives:

- Explain the difference between accuracy and precision
- Define standard, the Rule of 10, and traceability
- Describe Abbe's error
- Describe how to use a number of tools for measuring dimensions
- Read a vernier scale
- Demonstrate the skill to work with both English and metric dimensions and with their abbreviations
- Convert between millimeters and inches

Precision Measuring Instruments, Part 2

Objectives:

- Properly read standard and metric micrometers
- Read a vernier micrometer
- Choose special micrometers appropriately for various measuring tasks
- Recognize five kinds of depth and height gages and demonstrate the ability to read a depth gage
- Read the scale on a vernier bevel protractor
- Explain the uses of many kinds of indicators and gages in shopwork
- Describe how to minimize cosine error when using dial test indicators

Precision Measuring Instruments, Part 3

Objectives:

- Explain the use of optical comparators and toolmaker's microscopes

- Recognize the setup and operation of an optical alignment system—including laser and alignment telescopes

- Understand the use of digital readout gauges, and the use of both absolute and incremental measuring

- Recognize the uses for in-process and post-process gauging, including video inspection and CNC tool presetters

- Understand the use of hardness testers and video material testing

- Recognize the uses for modern nondestructive material testing, including magnetic particle inspection and ultrasonic testing

Logarithms

Objectives:

- Explain the parts of a logarithm and understand how to find them

- Find the logarithm of a number not in the log table

- Define antilogarithm

- Calculate and perform mathematical processes with logarithms

Time Study, Part 1

Objectives:

- Define the term fair day's work, especially with reference to time study

- Explain the responsibilities of the following individuals in the time study procedure: supervisor, time study analyst, union steward, and operator

- Describe the various types of stopwatches and their advantages and disadvantages

- Explain how videotape equipment, motion-picture cameras, and electronic data collectors are used in time studies

- List the information to be included on a time study form

- Explain the differences between the snapback and continuous methods of timing

- Outline and explain the procedure to be followed in taking a time study, including selecting an operator, recording the important information, dividing the operation into elements, determining the number of cycles to study, recording the readings, and calculating the study

- Explain the various methods used to rate operator performance, including skill and effort rating, speed rating, and synthetic rating

- Describe how an individual is trained to rate operator performance

- Discuss the application of allowances

- Apply formulas for computing standards

- Explain the purpose of temporary standards, setup standards, and work-sampling studies

- Explain how time standards are used

Time Study, Part 2

Objectives:

- Describe how to develop standard time data

- Use simultaneous equations to establish standards for very brief elements

- Calculate times for various operations

- Explain how to use standard data in time study

- Describe the motions used in MTM

- Use the MTM tables to calculate times

- Explain how time formulas are used to set standard times

QUALITY CONTROL

Operation Analysis, Part 1

Objectives:

- Discuss what operation analysis can accomplish

- Describe the process chart

- Explain analysis of designs, specifications, quality control, materials, and manufacturing processes in work simplification

- Discuss the importance of developing the appropriate manufacturing process and tooling methods while reducing costs and improving production

Operation Analysis, Part 2

Objectives:

- Understand the industrial effects of lighting, temperature, humidity, ventilation, noise, dust and fumes, and safety

- Describe efficient use of handling equipment to reduce cost

- Discuss the use of efficient motion patterns to improve workstation layout

- Explain the relationship of memomotion and micromotion studies to operation analysis

Quality Control of Manufactured Products

Objectives:

- Discuss basic concepts of quality control

- Explain quality costs and their control

- Understand the relationship of quality policies to the marketplace

- Review measurement standards and sources of error

- Describe the inspection function, its purpose, and classification of defects

- Define the control function and the reports used in this function

- Recognize the scope of the vendor as part of the team

- Identify various statistical methods of summarizing data

- Discuss design review and planning for quality