DOCUMENT RESUME

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IDENTIFIERS	*Quinmester Program

ABSTRACT

The course outline has been prepared as a guide to help the trainee become proficient in the skills and knowledge necessary to become an aviation mechanic. The course is composed of four blocks subdivided into units, and requires a quinmester of 135 clock hours to complete: Block 1, Weight and Balance; Block 2, Mathematics; Block 3, Shop Drawing; Block 4, Posttest. The three-page course outline is followed by 10 pages of specific behavioral objectives, and 15 titles of instructional films are listed in the bibliography. Instruction sheets to be used in the course are not included, but a posttest is appended. (Author/AJ)

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AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

AVIATION MECHANICS I (Power and Frame)
(Aircraft Weight and Balance with Mathematics and Shop Drawing)

Department 48 - Course 9073.03

DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION • 1971

D A D E C O U N T Y P U B L I C S C H O O L S

1 4 1 0 N O R T H E A S T S E C O N D A V E N U E

M I A M I, F L O R I D A 33132

Course Outline

AVIATION MECHANICS I (Power and Frame)
(Aircraft Weight and Balance with Mathematics and Shop Drawing)

Department 48 - Course 9073.03

the division of

VOCATIONAL, TECHNICAL AND ADULT EDUCATION

Published by the Dade County School Board

Course Description

9073	48	9073.03	Aircraft Weight and Balance with Mathematics and Shop Drawing
State Category Number	County Dept. Number	County Course Number	Course Title

This is a basic course in the aircraft maintenance technicians program, providing a foundation in aircraft weight and balance control and computation. Basic shop drawing techniques including lettering, geometric construction, orthographic and pictorial sketching and drawing. Review of basic mathematics is emphasized in the course.

Indicators of success: The following regular requirements of entry and/or special recommendations of a student counselor, having first met the minimum probationary requirements.

Name of Test	Minimum Requirements	Probationary Requirements
1. Mental Ability		
a. Otis Quick-Scoring Mental Ability (Beta)	100 I.Q. or 50% ile	90 I.Q. or 21% ile
b. School or College Ability Test (form 3A, 3B)	50% ile (Total Score)	30% ile (Total Score)
2. Reading Skills		
California Intermediate Reading Test	50% ile (Total Score)	30% ile (Total Score)
3. Arithmetic Skills		
California Intermediate Arithmetic Test	50% ile (Total Score)	30% ile (Total Score)

PREFACE

The following course outline has been prepared as a guide to help the trainee become proficient in the skills and knowledge necessary to become an aviation mechanic.

This is a basic course composed of knowledge and skills necessary should one decide to follow either the airframe mechanics, the powerplant mechanic or the combined airframe and powerplant curriculum leading to a Federal Aviation Agency Mechanic's License. Prospective trainees must meet all entrance requirements as imposed on the in-school youth or the adult vocational program in Dade County.

This course is composed of four blocks which are subdivided into several units each, requiring one quinmester of 135 hours.

Great emphasis will be placed on the use of audio-visual aids and instruction sheets of various types. A list of the Behavioral Objectives which are to be met to earn satisfactory grades is included. Following each unit title will be found, in parentheses, several letters and numbers designating the time spent in terms of theory and shop work. EIT indicates estimated instructional time, T indicates time spent in theory or classroom work, and L/S indicates time spent in laboratory or shop work.

The level 1 following a unit indicates the student must have knowledge of general principles but no practical application, nor development of manipulative skills. Instruction is given by lecture, demonstration and discussion.

The level 2 following a unit indicates the student must have knowledge of general principles and limited practical application and sufficient manipulative skill to perform basic operations. Instruction is given by lecture, demonstration, discussion and limited practical application.

The level 3 following a unit indicates a student must have knowledge of general principles and performance of a high degree of practical application and sufficient manipulative skills to accomplish return-to-service. Instruction is given by lecture, demonstration, discussion and a high degree of practical application.

This outline was developed through the cooperative efforts of the instructional and supervisory personnel, the Quinmester Advisory Committee and the Vocational Teacher Education Service, and has been approved by the Dade County Curriculum Committee.

TABLE OF CONTENTS
with Suggested Hourly Breakdown

GOALS

The aviation maintenance technician must be able to demonstrate:

1. Knowledge of the basic sciences which provide the foundation of sound maintenance procedures.

2. Knowledge of the techniques of reading aircraft drawings.

3. Ability to solve mathematical computations.

4. Ability to solve weight and balance computations and to jack and weigh an aircraft.

5. The ability to refer to Federal Aviation Publications and interpret their meaning.

6. The ability to make acceptable sketches, showing repairs made to aircraft.

7. The ability to assume the responsibility inherent in the aviation maintenance technicians occupation.

Course Outline

AVIATION MECHANICS I (Power and Frame)
(Aircraft Weight and Balance with
Mathematics and Shop Drawing)

Department 48 - Course 9073.03

I. WEIGHT AND BALANCE (50 hours)

A. Weigh Aircraft
(Level - 3) (EIT-15 hrs) (T-6 hrs) (L/S-9 hrs)
1. Locate, Interpret, and Apply Weight and Balance Information
   a. Aircraft information
   b. Aircraft weight and balance records
   c. Moment arms
   d. Nomenclature and algebraic signs
2. Weighing Aircraft
   a. Weighing procedures
   b. Jacking and leveling aircraft
   c. Reading scales and recording weights

B. Perform Complete Weight and Balance Check and Record Data
(Level - 3) (EIT-35 hrs) (T-15 hrs) (L/S-20 hrs)
1. Solve Weight and Balance Problems
   a. Weights for computation
   b. Moment arms
   c. Center of gravity range
   d. Aircraft categories
2. Compute Forward and Aft Loaded Center of Gravity
   a. Minimum fuel for weight and balance computations
   b. Passenger and crew weights
   c. Baggage placards and ballast
   d. Weight and balance envelopes
3. Compute Effect of Equipment Changes and Loading Schedules
4. Compute Weight and Balance on a Helicopter
   a. Datum references
   b. Weighing points
   c. Weight and balance computations
5. Examine Weight and Balance Records

II. MATHEMATICS (30 hours)

A. Extract Roots and Raise Numbers to a Given Power
(Level - 1) (EIT-4.5 hrs) (T-4.5 hrs) (L/S-0 hrs)
1. Recognize and Apply Formulas Involving the Power of a Number, Squaring and Cubing
   a. Whole numbers
   b. Decimals
   c. Fractions
2. Extracting Square Root
   a. From a table
   b. By mathematics

B. Determine Areas and Volume of Various Geometrical Shapes
(Level - 2) (EIT-9 hrs) (T-6 hrs) (L/S-3 hrs)
1. Apply Formulas to Determine Areas and Volume
   a. Area formulas
   b. Volume formulas
2. Compute Wing Area
3. Calculate volume of
   a. Baggage compartments
   b. Fuel tanks
4. Compute Piston Displacement

C. Solve Ratio, Proportion and Percentage Problems
(Level - 3) (EIT-7.5 hrs) (T-4.5 hrs) (L/S-3 hrs)
1. Convert Fractional Numbers to Decimal Equivalents
2. Determine Ratio and Percentage of Numbers
3. Compute Compression Ratio

D. Perform Algebraic Operations Involving Addition, Subtraction, Multiplication, and Division of Positive and Negative Numbers
(Level - 3) (EIT-9 hrs) (T-4.5 hrs) (L/S-4.5 hrs)
1. Add, Subtract, Multiply and Divide Positive and Negative Numbers of Like Signs
2. Add, Subtract, Multiply and Divide Positive and Negative Numbers of Unlike Signs

III. SHOP DRAWING (55 hours)

A. Use of Drawings, Symbols, and Schematic Diagrams
(Level - 2) (EIT-18 hrs) (T-9 hrs) (L/S-9 hrs)

III. SHOP DRAWING (Contd.)

1. Identify Lines and Symbols
2. Interpret Dimensions
3. Interpret Electrical System Drawings
4. Use Installation Diagrams and Schematics

B. Draw Sketches of Repairs and Alterations
(Level - 2) (EIT-12 hrs) (T-5 hrs) (L/S-7 hrs)
1. Pictorial Sketches
2. Orthographic Projections

C. Use of Blueprint Information
(Level - 2) (EIT-15 hrs) (T-5 hrs) (L/S-10 hrs)
1. Read and Interpret Drawings
2. Interpret Installation Diagrams

D. Use of Graphs and Charts
(Level - 2) (EIT-10 hrs) (T-5 hrs) (L/S-5 hrs)
1. Kinds of Graphs
2. Interpreting Graphs and Charts

IV. QUINMESTER POST TEST

BEHAVIORAL OBJECTIVES

BLOCK I - WEIGHT AND BALANCE

A. Weigh Aircraft

1. Locate, Interpret and Apply Weight and Balance Information

   Given:

   Manufacturer's publications, weight and balance records for a specific airplane, and the necessary weighing equipment.

   Performance:

   The student will locate and interpret information necessary to the weighing of that airplane. He will describe the procedures and precautions to be observed in the weighing process, and will

   a. Position jacks, scale and level the aircraft
   b. Locate and identify all required items of equipment
   c. Make the necessary measurements to determine moment arms
   d. Read the scale weights and compute the empty center of gravity

   Standard:

   Interpretation of information, weighing of the aircraft, and computation of the empty center of gravity within + or - .1" of empty center of gravity.

2. Weighing Aircraft

   Given:

   Manufacturer's publications, weight and balance record for a specific airplane, and the necessary weighing equipment.

   Performance:

   The student will locate and interpret information necessary to the weighing of that airplane. He will describe the procedures and precautions to be observed in the weighing process, and will

a. Position Jacks, level the aircraft, and locate scales
b. Read the scale weights and compute the empty center of gravity

Standard:

Interpretation of information, weighing of the aircraft and computation of the empty center of gravity within + or - .1" of empty center of gravity.

B. Perform Complete Weight and Balance Check and Record Data

1. Solve Weight and Balance Problems

Given:

Manufacturer's Aircraft Specifications

Performance:

Provided with necessary weight and balance information, the student will solve five problems involving computation of the empty center of gravity of an airplane.

Standard:

Computation of empty center of gravity will be accurate to one-tenth of one inch (.1").

2. Compute Forward and Aft Loaded Center of Gravity

Given:

Necessary data to compute center of gravity on two different aircraft.

Performance:

The student will compute the forward and aft center of gravity condition on the specified aircraft. He will describe the hazards associated with exceeding the limits and will determine the necessary ballast, baggage reduction or loading schedule to preclude exceeding the approved limits.

Standard:

Problem will be solved to an accuracy of one-tenth of an inch.

3. Compute Effect of Equipment Changes and Loading Schedules

Given:

Sample loading schedules and equipment specifications for a specific model of airplane.

Performance:

The student will compute the effects of equipment changes on the empty center of gravity of an airplane. He will prepare a loading schedule after solving a problem involving maximum baggage, cargo load, or maximum gross loaded center of gravity conditions.

Standard:

The computed center of gravity will be accurate to 0.1". The loading schedule will meet FAA and manufacturer's requirements.

4. Compute Weight and Balance on a Helicopter

Given:

Weight, loads and balance information applicable to a helicopter.

Performance:

The student will solve one problem requiring computation of center of gravity on a helicopter.

Standard:

The computed center of gravity will be accurate to one-tenth of an inch.

5. Examine Weight and Balance Records

Given:

Sample files of weight and balance records for three different airplanes.

Performance:

The student will examine and judge which records are complete, accurate and current.

Standard:

The student will select the most complete, accurate and current record from the three sample files.

BLOCK II - MATHEMATICS

A. Extract Roots and Raise Numbers to a Given Power

1. Recognize and Apply Formulas Involving the Power of a Number, Squaring and Cubing

Given:

Ten mathematical formulas that involve numbers raised to powers (Area = R^2) etc. and an appropriate mathematic text or information sheet.

Performance:

The student will recognize formulas that contain exponents. Using the reference information as a guide, he will solve five problems requiring the application of the formulas.

Standard:

The student will apply the correct formula. Solution of problems will demonstrate arithmetic accuracy to a two-place decimal.

2. Extracting Square Root

Given:

Ten mathematical problems that involve square root extraction and an appropriate math text or information sheet.

Performance:

The student will extract square root with the use of a table, slide rule or mathematical means. Using the reference information as a guide, he will solve five problems requiring the operation of extracting square root.

Standard:

Solution of problems will demonstrate arithmetic accuracy to a two-place decimal.

B. Determine Areas and Volumes of Various Geometrical Shapes

1. Apply Formulas to Determine Areas and Volume

Given:

Formulas and information sheets containing dimensioned drawings of rectangles, squares, triangles, trapezoids, circles, cylinders, cones, cubes, etc.

Performance:

The student will apply the correct formula and determine the area/volume of ten different geometrical shapes.

Standard:

The correct formula must be selected. The solution of the problem will be accurate to a two-decimal place.

2. Compute Wing Area

Given:

An information sheet illustrating the shapes and dimensions of two aircraft wings and the formulas for determining the area of geometrical shapes, as required.

Performance:

The student will apply the correct formula and compute the total wing area.

Standard:

The student will select and apply the correct formulas. Computation of total wing area will be accurate to the nearest square foot.

3. Calculate Volume

Given:

Formulas for determining the volume of various geometrical shapes and an information sheet containing dimensions and drawings for an aircraft baggage compartment and an aircraft fuel tank.

Performance:

The student will select and apply the correct formulas and compute the volume of the baggage and fuel tank.

Standard:

The student will select and apply the formulas without error. Computation of volumes will be accurate to the nearest cubic foot and/or U.S. gallon.

4. Compute Piston Displacement

Given:

The formula for computing volume of cylinders and information specifying the bore, stroke and number of cylinders on a typical aircraft engine.

Performance:

The student will compute the piston displacement of the engine.

Standard:

The computed displacement of the engine will be accurate to one cubic inch.

C. Solve Ratio, Proportion and Percentage Problems

1. Convert Fractional Numbers to Decimal Equivalents

Given:

An information sheet illustrating a scale of each 1/32 inch graduation from 1/32 inch to one inch.

Performance:

The student without reference to charts, will convert ten fraction scale graduations to a decimal equivalent.

Standard:

Each decimal equivalent will be accurate to three places, (thousandths of an inch).

2. Determine Ratio and Percentage of Numbers

Given:

An information sheet displaying three dimensioned diagrams or drawings of wing aspect ratio, fineness ratio of streamlined shapes, major and minor axes of an ellipse, etc.

Performance:

The student will determine the ratio of one number or dimension to the other. When expressed as a ratio, he will determine the percentage that one number is of the other.

Standard:

The student will determine the ratio and percentages of the dimension for two of the illustrations on the information sheet. They will be accurate to a three-place decimal on the percentages.

3. Compute Compression Ratio

Given:

A sketch or drawing of a cylinder and piston assembly with stated volumes of the cylinder at bottom and top center.

Performance:

The student will determine the compression ratio of the cylinder.

Standard:

The compression ratio will be computed to an accuracy of one decimal place.

D. Perform Algebraic Operations Involving Addition, Subtraction, Multiplication, and Division of Positive and Negative Numbers

1. Add, Subtract, Multiply and Divide Positive and Negative Numbers of Like Signs
   Given:
   Information sheet containing dimensioned weight and balance diagrams, illustrating datum, main wheel, nose or tail wheel, and center of gravity positions and moment arms.
   Performance:
   The student will label each of the dimensions with a plus or minus sign. He will solve 20 problems involving addition, subtraction, multiplication and division of these signed numbers.
   Standard:
   Labeling and computations will be without error.

2. Add, Subtract, Multiply and Divide Positive and Negative Numbers of Unlike Signs
   Given:
   Information sheet containing dimensioned weight and balance diagrams illustrating datum, main wheel, nose or tail wheel, center of gravity positions and moment arms.
   Performance:
   The student will label each of the dimensions with a plus or minus sign. He will solve 20 problems involving addition, subtraction, multiplication and division of these signed numbers.
   Standard:
   Labeling and computations will be without error.

BLOCK III - SHOP DRAWINGS

A. Use of Drawings, Symbols and Schematic Diagrams

1. Identify Lines and Symbols
   Given:
   Reference information that illustrates and describes outline, hidden, phantom, section, center and dimension lines as well as copies

of typical aircraft detail and assembly drawings.

Performance:

The student will recognize and identify each kind of line as it appears in the drawings. He will interpret the meaning of the lines as they relate to surfaces and details of the part represented by the drawing.

Standard:

The student will point to one example of each type of line on the drawing and describe the detail of the part that is represented by that line. He will observe normal precautions and care for the drawings.

2. Interpret Dimensions

Given:

Typical aircraft detail drawings dimensioned in accordance with standard industry practice.

Performance:

The student will locate and interpret any dimension appearing on the drawing, including the application of any limits or tolerance to the dimension.

Standard:

Dimensions will be promptly located and interpreted without error.

3. Interpret Electrical System Drawings

Given:

A diagram or drawing of an electrical system that contains at least five circuits.

Performance:

The student will locate, isolate, and extract specific circuits from the diagram. He will trace specifically identified circuits.

Standard:

The student will correctly extract three individual circuits from the system diagram.

4. Use Installation Diagrams and Schematics

Given:

Installation drawings or schematic diagrams of three specific systems (fuel, oil, hydraulic, pressurization, etc.) and the maintenance manual for the airplane.

Performance:

The student will recognize the symbols and interpret information pertaining to identification and location of components within the system.

Standard:

The student will describe the location and name of all of the components in two of the three system drawings.

B. Draw Sketches of Repairs and Alterations

1. Pictorial Sketches

Given:

Appropriate drafting equipment and three written reports describing major repairs or alterations to the structure of the airplane.

Performance:

The student will make three sketches or drawings illustrating major repairs or alterations.

Standard:

The sketches or drawings must conform to standard drafting procedures, including correct position of views, adequate dimensions, and specifications of material. The sketches or drawings will be of such quality that they could be used as part of the maintenance records of an aircraft.

2. Orthographic Projections

Given:

Appropriate drafting equipment and three written reports describing major repairs or alterations to the structure of the airplane.

Performance:

The student will make three, three-view orthographic drawings of major repairs or alterations.

Standard:

The sketches or drawings must conform to standard drafting procedures, including correct position of views, adequate dimensions, and specifications of material. The sketches or drawings will be of such quality that they could be used as part of the maintenance records for an airplane.

C. Use of Blueprint Information

1. Read and Interpret Drawings

Given:

Random copies of aircraft drawings that were drawn to various scales and incorporate different title blocks and changes from the original drawing.

Performance:

The student will read and interpret information.

Standard:

When provided with a list of ten questions pertaining to scale, title block information, and changes incorporated on the drawings, the student will correctly answer seven of the questions.

2. Interpret Installation Diagrams

Given:

Installation diagrams or drawings of the type usually associated with service bulletins, modifications, or airworthiness directives.

Performance:

The student will interpret the necessary information to comply with the modification and will describe the procedure required to comply with the publication.

Standard:

The student will use correct nomenclature when describing procedure and will interpret all drawings relating to location of equipment, etc. without error.

D. Use of Graphs and Charts

1. Kind of Graphs

Given:

Charts and graphs of the type that appear in manufacturer's service and operating manuals.

Performance:

The student will make a graph and apply data obtained from three reports on engine power output.

Standard:

Plotting of information contained in a chart will be accurate within a ten percent tolerance.

2. Interpreting Graphs and Charts

Given:

Charts and graphs of the type that appear in manufacturer's service and operating manuals.

Performance:

The student will read and interpret data applied from engine power or performance charts.

Standard:

The charts or graphs will be interpreted without error.

BIBLIOGRAPHY
(Aircraft Weight and Balance with
Mathematics and Shop Drawing)

Basic References:

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2. French, Thomas E., and Svenson, Carl L. Mechanical Drawing. New York: McGraw-Hill Book Company, Inc., 1949. Pp. 300.

3. Giachino, J. W., and Beukema, H. L. Drafting Technology. Chicago: American Technical Society, 1964. Pp. 442.

4. U.S. Department of Air Force. Ground Safety; Accident Prevention Handbook. AFM 32-3. Washington, D.C.: U.S. Government Printing Office, 1962. Pp. 348.

Supplementary References:

1. Pawelek, Stanley J. An Introduction to Drafting. Boston: D. C. Heath and Company, 1947.

2. Stein, Edwin I. Refresher Mathematics. Boston: Allyn and Bacon, Inc., 1967. Pp. 566.

3. Walton, Harry. How and Why of Mechanical Movements. New York: Popular Science Publishing Company. E. P. Dutton and Company, Inc.

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1. Federal Aviation Administration. Acceptable Methods, Techniques and Practices - Aircraft Alterations, Advisory Circular 43.13-2. Washington, D.C.: U.S. Government Printing Office, 1965. Pp. 74.

2. Federal Aviation Administration. Acceptable Methods, Techniques and Practices - Aircraft Inspection and Repair, Advisory Circular 43.13-1. Washington, D.C.: U.S. Government Printing Office, 1965. Pp. 232.

3. Federal Aviation Administration. Airframe and Powerplant Mechanics Examination Guide, Advisory Circular 65-2A. Washington, D.C.: U.S. Government Printing Office, 1969. Pp. 63.

4. Federal Aviation Administration. Federal Aviation Regulations Parts: 1, 23, 25, 27, 29, 33, 37, 39, 45, 47, 65, 91 and 145. Washington, D.C.: U.S. Government Printing Office, 1969.

Films:

1. Adding and Subtracting Signed Numbers. 16mm. 30 min. Black and White. Sound. MLA.

2. Angles and Arcs in Circles. 16mm. 12 min. Black and White. Sound. Knowledge Builder.

3. Areas. 16mm. 12 min. Black and White. Sound. Knowledge Builder.

4. Auxiliary Views. 16mm. 10 min. Black and White. Sound. Jam Handy.

5. Balancing Forces. 16mm. 13.5 min. Color. Sound. FAC.

6. Behind the Shop Drawing. 16mm. 19 min. Black and White. Sound. Jam Handy.

7. Design. 16mm. 11 min. Color. Sound. Bailey.

8. Draftsman, The. 16mm. 11 min. Black and White. Sound. Mahnke.

9. Drawing With Pencil. 16mm. 11 min. Black and White. Sound. EBEC.

10. Language of Drawing. 16mm. 10 min. Black and White. Sound. McGraw-Hill Book Company, Inc.

11. Parallel Lines. 16mm. 11 min. Black and White. Sound. Johnson Hunt.

12. Perspective Drawing. 16mm. 8 min. Black and White. Sound. University of California.

13. Shape Description. 16mm. 11 min. Black and White. Sound. McGraw-Hill Book Company, Inc.

14. Size Description. 16mm. 16 min. Black and White. Sound. McGraw-Hill Book Company, Inc.

15. Space, 16mm. 10 min. Color. Sound. Bailey.

A P P E N D I X

Quinmester Post Test Sample

Quinmester Post Test

Name_____ Date_____ Score_____

Multiple Choice Test Items

Each statement needs a figure or a phrase to make it correct. Only one of the choices listed is correct. Place the number of the choice you make in the space provided on a separate answer sheet.

1. Oil in the aircraft oil tank, for weight and balance purposes, is considered
    1. part of the aircraft empty weight
    2. the same as fluid in the hydraulic system
    3. empty load
    4. useful load

2. If additional radio equipment is installed in the nose of an airplane, it will
    1. reduce the allowable maximum gross weight
    2. reduce the useful load
    3. cause the CG location to be out of limits
    4. reduce empty weight

3. Aircraft center of gravity (CG) means
    1. the point on the aircraft where gravity equals lift
    2. the jack point of an aircraft
    3. the point from which the aircraft, if suspended in air, would be perfectly balanced
    4. the point designated by the manufacturer, from which all measurements are taken

4. You have two weights balanced on a fulcrum. The true statement is
    1. the fulcrum must be centered
    2. the weights must be equal
    3. the moments must be the same
    4. the CG may vary

5. For weight and balance purposes, oil is considered to weigh
   1. 5 pounds per gallon
   2. 6 pounds per gallon
   3. 7.5 pounds per gallon
   4. 8 pounds per gallon

6. The empty weight of an airplane is generally considered to be
   1. everything out except the fuel
   2. fuel drained, all fixed equipment in place
   3. the plane including chocks and tiedowns
   4. full of fuel and pilot, but no baggage or passengers

7. On a blueprint, a line which divides a symetrical part equally is called a
   1. phantom line
   2. center line
   3. break line
   4. dashed line

8. The result of subtracting empty weight from maximum weight is
   1. gross weight
   2. net weight
   3. useful load
   4. payload

9. The result of adding empty weight and the useful load of an airplane, results in
   1. gross weight
   2. net weight
   3. payload
   4. maximum weight

10. Which of the following is equal to 7/8?
   1. .85%
   2. 85%
   3. 8.5%
   4. 87.5%

11. 1/2 + 7/8 - 1/3 =
   1. 11/16
   2. 1 3/8
   3. 1 1/24
   4. 9/13

12. Extract the square root of 7396.
    1. 73
    2. 96
    3. 86
    4. 68

13. The sum of +12, +13, and -31 =
    1. -6
    2. +6
    3. -25
    4. +56

14. Gear "A" has 30 teeth, Gear "B" has 20 teeth; Gear "A" is turning at 1200 RPM. Find speed of gear "B".
    1. 800
    2. 900
    3. 1800
    4. 1600

15. Find 110% of 55
    1. 65
    2. 60.5
    3. 60
    4. 45

16. Add the following signed numbers; -2751 plus 241.
    1. -2992
    2. 2992
    3. 2510
    4. -2510

17. Find the value of the exponent 5^{-3}
    1. 1500
    2. -125
    3. .005
    4. .0005

18. What is the area of a rectangle that is 8 feet by 16 feet?
    1. 48 feet
    2. 128 sq. ft.
    3. 24 sq. ft.
    4. 48 sq. ft.

19. Find the volume of a cylinder which is 12" in diameter and 20" long
    1. 1262 cu. in.
    2. 113.10 sq. in.
    3. 2262 cu. in.
    4. 2880 cu. in.

20. On a blueprint, the title block is usually located
    1. in the lower right hand corner
    2. in the upper right hand corner
    3. in the lower left hand corner
    4. on the back side for easy location

21. On an orthographic drawing, the front view is located
    1. on the top, left side of the paper
    2. on the lower right side of the paper
    3. on the lower left side of the paper
    4. on the upper right side of the paper

22. The purpose of making a graph is to
    1. save space on the paper
    2. show by comparison, the relation of numbers or values
    3. indicate all specifications for the part
    4. aid in making a drawing to scale

23. In sketching electrical systems, it is quite common to use
    1. color coding
    2. pictures of the components
    3. abbreviations for all notes and nomenclature
    4. symbols

24. Extension lines are
    1. lines from the center to the outer surface of an object
    2. used for the same purpose as phantom lines
    3. used so dimensions can be kept off the drawing
    4. heavier in weight than center lines

25. The revision block on a drawing is located
    1. on the back side, visible after the print is folded properly
    2. directly below the title block
    3. on the upper right corner of the print
    4. on the left side of the drawing directly below the bill of material

KEY TO QUINMESTER POST TEST
9073.03

1.	4	9.	1	17.	3
2.	2	10.	4	18.	2
3.	3	11.	3	19.	3
4.	3	12.	3	20.	1
5.	3	13.	1	21.	3
6.	2	14.	3	22.	2
7.	2	15.	2	23.	4
8.	3	16.	4	24.	3
				25.	3