NIDA CORPORATION
COMPUTER ASSISTED INSTRUCTION

LESSON AND OBJECTIVE LISTING

HTML Lessons - Model 360S

2012-03-27

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OBJECTIVE LISTING - HTML Lessons - Model 360S

LESSON ID/TITLE CARDS/KITS

GENERAL

Prerequisites

1011-120-130 Safety Practices . . . . . ---

- Understand the nature of electric shock.
- Understand the effects of electric shock.
- Know how to prevent electrical hazards.
- Know how to provide treatment for electrical shock.
- Know how to work on an energized circuit.
- Know how to suppress fires.
- Recognize safety colors.
- Follow hand and power tool precautions.

1011-120-160 Electrostatic Sensitive Devices . . . . . ---

- Define an electrostatic sensitive device.
- Describe the sources of electrostatic discharge and list its hazards to electronic components.
- Identify the static-producing materials in the work area.
- Explain the principles of static control and methods employed in developing static control facilities.
- Describe the special handling, identification, packaging, and protection requirements for electrostatic sensitive devices.

SYSTEMS - BASIC (MODEL 3600)

Introduction to Systems

7211-112-130 Systems Familiarization ST101, ST102, ST103, ST104, ST105, ST106

- Define a system.
- Define structure, interconnectivity, and behavior.
- Define input, process, and output.
- Define feedback and system control.
- Identify types of feedback and system control.
- Define interface.
- Apply a systems thinking approach.
- Set up a system.
- Follow setup instructions.
- Initialize, align, and operate a system.
- Perform a system E-Stop.
- Perform a system restart.
- Perform a system shutdown.

7211-112-160 Systems Safety . . . . . ---

- Define a hazard.
- Identify a hazard as physical, chemical, ergonomic, radiation, psychological, or biological.
- Perform a safety risk assessment.
- Apply the hierarchy of risk controls.
- Select the correct fire extinguisher to put out a class A, B, C, D, and combination fires.
- Read emergency evacuation route diagrams.
- Practice standard safety rules while working around and with electricity.
- Correlate OSHA safety code colors used in manufacturing to situations and devices.
- Read material safety data sheets (MSDS).
- Implement the 5-point eye safety checklist.

LESSON ID/TITLE CARDS/KITS

SYSTEMS - BASIC (MODEL 3600) (cont.)

Introduction to Systems (cont.)

7211-112-160 Systems Safety (cont.)

- Recognize the hazards of confined spaces.

7211-112-190 Multimeter Familiarization ST101, ST102, ST103, ST104, ST105, ST106

- Define a digital multimeter's purpose.
- Identify quantities measured with a digital multimeter.
- Identify the sections of a digital multimeter.
- List the IEC Measurement Categories.
- List safe measurement techniques.
- Set up a DMM to measure DC and AC voltages.
- Measure and read DC and AC voltages.
- Apply safe voltage measurement techniques.
- Set up a DMM to measure DC current.
- Measure and read DC current.
- Apply safe current measurement techniques.
- Set up a DMM to measure resistance.
- Measure and read resistance.
- Set up a DMM to measure continuity.
- Measure and read continuity.
- Apply safe resistance and continuity measurement techniques.

7211-112-220 Oscilloscope Familiarization ST101, ST102, ST103, ST104, ST105, ST106

- Define the purpose of an oscilloscope.
- Identify quantities measured with an oscilloscope.
- Identify the sections of an oscilloscope.
- Set up an oscilloscope.
- Zero a trace.
- Perform probe compensation.
- Use an oscilloscope to measure waveforms for determining DC voltage,AC voltage (Vpk and Vpp), and period.
- Calculate frequency, Vrms, phase, and pulse width using an oscilloscope.
- Define and measure duty cycle.

System Structure and Behavior

7211-114-130 System Input and Output Devices ST101, ST102, ST103, ST104, ST105, ST106

- Define a system input.
- Identify system input devices.
- Define a system output.
- Identify system output devices.
- Trace input and output subsystem connections using a composite diagram.
- Perform an alignment procedure to adjust sensor sensitivity.
- Verify normal operation of speed, position, and direction sensors using displays, monitors, and a multimeter.

7211-114-160 System Control and Interface ST101, ST102, ST103, ST104, ST105, ST106

- Define process control
- Identify open loop control
- Identify closed loop control
- Read a control loop block diagram
- Recognize control station devices

LESSON ID/TITLE CARDS/KITS

SYSTEMS - BASIC (MODEL 3600) (cont.)

System Structure and Behavior (cont.)

7211-114-160 System Control and Interface (cont.)

- Define interface
- Identify hardware interface
- Identify software interface
- Identify user interface
- Examine various control signals.
- Control a system using GUI, HCI and HMI.
- Trace a control signal using a composite diagram.
- Analyze normal control signals using a multimeter and oscilloscope.

7211-114-190 System Indicator, Display, and Monitor Devices ST101, ST102, ST103, ST104, ST105, ST106

- Recognize the difference between data and information
- Define the parts of a data acquisition system
- Recognize the difference between passive and active data collection
- Define the purpose of system monitoring
- Identify monitoring devices
- Define the purpose of system displays
- Identify display devices
- Read a display
- Manually monitor system operation
- Recognize a system malfunction using the display

System Testing and Troubleshooting

7211-116-160 System Maintenance and Diagnostics ST101, ST102, ST103, ST104, ST105, ST106

- Recognize typical preventive, scheduled, and unscheduled maintenance routines.
- Describe general inspection techniques for systems maintenance.
- Recognize system unscheduled maintenance routines.
- Describe when unscheduled maintenance is necessary.
- Set up and initialize a system following a given procedure.
- Perform a system operational check.
- Show proper use of measurement devices.
- Examine basic systems fault isolation procedures.
- Demonstrate the ability to diagnose a defective subsystem using fault isolation procedures.

7211-116-190 System Malfunctions and Troubleshooting ST101, ST102, ST103, ST104, ST105, ST106

- Examine the systems troubleshooting process.
- Set up and initialize a system following a given procedure.
- Validate system operation using sensors, displays, and monitoring devices.
- Verify symptoms of subsystem malfunctions.
- Use a digital multimeter and oscilloscope to take measurements.
- Troubleshoot malfunctioning subsystems in a system.

LESSON ID/TITLE CARDS/KITS

SYSTEMS - RENEWABLE ENERGY - HOME (MODEL 3601)

Introduction

7231-112-130 Introduction to Renewable Energy Systems . . . . . ---

- Express the need for renewable energy.
- Explain the four interdependent elements of renewable energy systems.
- Understand renewable energy sources.
- Describe energy conversion technologies.

7231-112-160 Energy Sources and Site Surveys . . . . . ---

- Describe renewable energy resources (wind, solar, hydroelectric, ocean wave, ocean tidal, ocean current, ocean thermal conversion, geothermal).
- Illustrate energy resources (wind, solar).
- Explain the use of a site survey.
- Describe how to perform a site survey.

Home Energy Systems

7231-114-130 Home Solar Energy System Fundamentals . . . ES101, ES102, ES104, ES105, ES106, ES107

- Explain home solar energy operation.
- Describe solar resources and their uses for home energy.
- Recognize safe home solar energy maintenance methods.
- Recognize home solar energy common tools.
- Read a home solar energy block diagram to identify the major subsystems.
- Operate a home solar energy system using a block diagram.
- Verify the operation of the home solar energy system using sensors, monitors and display devices.
- Examine the operation of the home solar energy system.

7231-114-160 Home Wind Energy System Fundamentals . . . ES101, ES102, ES104, ES105, ES106, ES107, ES182

- Explain home wind energy operation.
- Describe the effects of wind speed and wind obstructions.
- Describe tilt-up tower operation.
- Recognize safe home wind energy maintenance methods.
- Recognize home wind energy common tools.
- Read a home wind energy block diagram to identify the major subsystems.
- Operate a home wind energy system using a block diagram.
- Verify the operation of the home wind energy system using sensors, monitors and display devices.
- Examine the operation of a home wind energy system.

7231-114-190 Home Hybrid Energy System Fundamentals ES101, ES102, ES104, ES105, ES106, ES107, ES182

- Explain home backup power generation.
- Explain home inverter and grid-tied interface operation.
- Describe hybrid home energy system integration.
- Recognize safe home hybrid energy maintenance methods.
- Recognize home hybrid energy common tools.
- Read a home hybrid energy block diagram to identify the major subsystems.
- Operate a home hybrid energy system using a block diagram.
- Verify the operation of the home hybrid energy system using sensors, monitors, and display devices.

LESSON ID/TITLE — CARDS/KITS

SYSTEMS - RENEWABLE ENERGY - HOME (MODEL 3601) (cont.)

Home Energy Systems (cont.)

7231-114-190 Home Hybrid Energy System Fundamentals (cont.)
- Examine the operation of each home hybrid energy subsystem.

7231-114-220 Home Energy System Maintenance and Diagnostics . . ES101, ES102, ES104, ES105, ES106, ES107, ES182
- Recognize typical home energy preventive, scheduled, and unscheduled maintenance routines.
- Describe general inspection techniques for home energy systems.
- Recognize unscheduled maintenance routines.
- Describe when unscheduled maintenance is necessary.
- Set up and initialize a home energy system following a given procedure.
- Perform a home energy operational check.
- Show proper use of measurement devices.
- Examine home energy system fault isolation procedures.
- Demonstrate the ability to diagnose a defective subsystem in a home energy system using fault isolation procedures.

7231-114-250 Home Energy System Malfunctions and Troubleshooting ES101, ES102, ES104, ES105, ES106, ES107
- Examine the troubleshooting process for home energy systems.
- Describe the basic tools used to troubleshoot home energy systems.
- Set up and initialize a home energy system following a given procedure.
- Validate system operation using sensors, displays, and monitoring devices.
- Verify symptoms of home energy subsystem malfunctions.
- Use a digital multimeter to take measurements.
- Troubleshoot malfunctioning subsystems in a home energy system.

7231-114-920 Home Energy Systems Post-Test (Theory) . . . . . ---

SYSTEMS - RENEWABLE ENERGY - COMMERCIAL WIND (MODEL 3602)

Introduction

7231-112-130 Introduction to Renewable Energy Systems . . . . . ---
- Express the need for renewable energy.
- Explain the four interdependent elements of renewable energy systems.
- Understand renewable energy sources.
- Describe energy conversion technologies.

7231-112-160 Energy Sources and Site Surveys . . . . . ---
- Describe renewable energy resources (wind, solar, hydroelectric, ocean wave, ocean tidal, ocean current, ocean thermal conversion, geothermal).
- Illustrate energy resources (wind, solar).
- Explain the use of a site survey.
- Describe how to perform a site survey.

Wind Energy Systems

7231-116-130 Wind Turbine System Fundamentals ES101, ES102, ES103, ES110, ES111, ES112, ES181
- Describe the types of wind turbines (HAWT and VAWT).
- Describe the differences between commercial and residential wind generation.
- Recognize safe wind turbine maintenance methods.

LESSON ID/TITLE — CARDS/KITS

SYSTEMS - RENEWABLE ENERGY - COMMERCIAL WIND (MODEL 3602) (cont.)

Wind Energy Systems (cont.)

7231-116-130 Wind Turbine System Fundamentals (cont.)

- Explain commercial wind power subsystem operation (generator, gearing, cooling, control, yaw, pitch, brake).
- Read a wind turbine block diagram to identify major subsystems.
- Set up and initialize a wind turbine system following a given procedure.
- Operate a wind turbine system using a block diagram.
- Verify the operation of a wind turbine system using sensors, monitors, and display devices.
- Examine the operation of each wind turbine subsystem.

7231-116-160 3-Phase Power Fundamentals ES101, ES102, ES103, ES110, ES111, ES112, ES181

- Describe 3-phase power.
- Describe the operation of an AC generator.
- Describe the operation of inverters.
- Describe the difference between 50 Hz and 60 Hz power.
- Read a wind turbine block diagram.
- Operate a wind turbine system using a block diagram.
- Verify the presence of 3-phase power using an oscilloscope.

7231-116-190 Wind Turbine System Maintenance and Diagnostics . . ES101, ES102, ES103, ES110, ES111, ES112, ES181

- Recognize wind turbine preventive/scheduled and unscheduled maintenance routines.
- Describe physical inspection techniques for a wind turbine system.
- Recognize unscheduled maintenance routines.
- Describe when unscheduled maintenance is necessary.
- Set up and initialize a wind turbine system following a given procedure.
- Perform a wind turbine system operational check.
- Show proper use of measurement devices.
- Examine wind turbine system fault isolation procedures.
- Demonstrate the ability to diagnose a defective subsystem in a wind turbine system using fault isolation procedures.

7231-116-220 Wind Turbine System Malfunctions and Troubleshooting ES101, ES102, ES103, ES110, ES111, ES112, ES181

- Examine the troubleshooting process for wind turbine systems.
- Describe the basic tools used to troubleshoot commercial wind turbine systems.
- Initialize a wind turbine system.
- Validate a wind turbine system operation.
- Recognize symptoms of wind turbine subsystem malfunctions.
- Use a digital multimeter and oscilloscope to take measurements.
- Identify a malfunctioning subsystem in a wind turbine power system.

7231-116-920 Commercial Wind Energy Systems Post-Test (Theory) . . . . . ---

SYSTEMS - RENEWABLE ENERGY - COMMERCIAL SOLAR (MODEL 3603)

Introduction

7231-112-130 Introduction to Renewable Energy Systems . . . . . ---

- Express the need for renewable energy.

LESSON ID/TITLE — CARDS/KITS

SYSTEMS - RENEWABLE ENERGY - COMMERCIAL SOLAR (MODEL 3603) (cont.)

Introduction (cont.)

7231-112-130 Introduction to Renewable Energy Systems (cont.)

- Explain the four interdependent elements of renewable energy systems.
- Understand renewable energy sources.
- Describe energy conversion technologies.

7231-112-160 Energy Sources and Site Surveys . . . . . ---

- Describe renewable energy resources (wind, solar, hydroelectric, ocean wave, ocean tidal, ocean current, ocean thermal conversion, geothermal).
- Illustrate energy resources (wind, solar).
- Explain the use of a site survey.
- Describe how to perform a site survey.

Solar Energy Systems

7231-118-130 Solar Thermal System Fundamentals . . . . . ---

- Express the need for solar thermal power as a renewable energy.
- Differentiate non-concentrating and concentrating thermal collectors.
- Explain the three main classes of solar thermal collectors.
- Examine solar pool heating systems.
- Examine solar water heating systems.
- Examine solar space heating systems.
- Examine parabolic trough systems.
- Examine solar dish (Stirling engine) systems.
- Examine solar power tower systems.

7231-118-160 Solar Photovoltaic System Fundamentals ES101, ES102, ES104, ES107, ES108, ES109

- Express the need for solar photovoltaic power as a renewable energy.
- Explain the photovoltaic (PV) effect and construction.
- Describe solar resources.
- Describe general solar photovoltaic personal protective equipment.
- Explain proper installation procedures.
- Recognize safe installation and maintenance methods.
- Recognize solar PV system common tools.
- Read a solar photovoltaic system block diagram to identify the major subsystems.
- Set up and initialize a solar PV system following a given procedure.
- Operate a solar photovoltaic system using a block diagram.
- Verify the operation of a solar photovoltaic system using sensors, monitors, and display devices.
- Examine the operation of each solar photovoltaic subsystem.

7231-118-190 Solar Photovoltaic System Maintenance and Diagnostics ES101, ES102, ES104, ES107, ES108, ES109

- Recognize solar photovoltaic preventive/scheduled and unscheduled maintenance routines.
- Describe physical inspection techniques for solar photovoltaic systems.
- Recognize unscheduled maintenance routines.
- Describe when unscheduled maintenance is necessary.
- Set up and initialize a solar PV system following a given procedure.
- Perform a solar photovoltaic system operational check.
- Show proper use of measurement devices.
- Examine solar photovoltaic system fault isolation procedures.

LESSON ID/TITLE CARDS/KITS

SYSTEMS - RENEWABLE ENERGY - COMMERCIAL SOLAR (MODEL 3603) (cont.)

Solar Energy Systems (cont.)

7231-118-190 Solar Photovoltaic System Maintenance and Diagnostics (cont.)

- Demonstrate the ability to diagnose a defective subsystem in a solar photovoltaic system using fault isolation procedures.

7231-118-220 Solar Photovoltaic System Malfunctions and Troubleshooting . ES101, ES102, ES104, ES107, ES108, ES109

- Examine the troubleshooting process for solar photovoltaic systems.
- Describe the basic tools used to troubleshoot solar photovoltaic systems.
- Set up and initialize a solar PV system following a given procedure.
- Validate system operation using sensors, displays, and monitoring devices.
- Verify symptoms of solar photovoltaic subsystem malfunctions.
- Use a digital multimeter and oscilloscope to take measurements.
- Troubleshoot malfunctioning subsystems in a solar photovoltaic system.

7231-118-920 Commercial Solar Energy Systems Post-Test (Theory) . . . . . ---

SYSTEMS - POWER DISTRIBUTION (MODEL 3604)

Transmission and Distribution

7231-714-130 3-Phase Fundamentals ES151, ES152, ES153, ES154, ES155, ES156

- Express the use of 3-phase power.
- Describe the operation of an AC generator.
- Describe the differences between 3-phase, single phase, and split phase services.
- Describe the difference between 50 Hz and 60 Hz power.
- Describe the operation of inverters.
- Read a 3-phase power transmission block diagram.
- Operate a 3-phase power transmission and distribution system.
- Verify the presence of 3-phase power using an oscilloscope.

7231-714-160 Power Transmission and Distribution Fundamentals . . ES151, ES152, ES153, ES154, ES155, ES156

- Express the need for power transmission and distribution.
- Describe the use of a power transmission system.
- Give a brief description of power distribution.
- Discuss power stabilization techniques.
- Describe the operation of grid-tie interfacing
- Recognize tools used on power transmission and distribution systems.
- Recognize safe maintenance methods.
- Initialize a power transmission and distribution system using default settings.
- Validate system operation using sensors, monitors, and display devices.
- Power down the power transmission and distribution system.

7231-714-190 3-Phase and Single-Phase Service Feeds ES151, ES152, ES153, ES154, ES155, ES156

- Analyze the use of 3-phase service feeds.
- Describe 3-phase service feeds.
- Analyze the use of single-phase service feeds.
- Describe single-phase service feeds.
- Initialize a power distribution system using default settings.
- Analyze 3-phase service feeds.

LESSON ID/TITLE — CARDS/KITS

SYSTEMS - POWER DISTRIBUTION (MODEL 3604) (cont.)

Transmission and Distribution (cont.)

7231-714-190 3-Phase and Single-Phase Service Feeds (cont.)

- Analyze single-phase service feeds.
- Power down the power transmission and distribution system.

7231-714-220 Power Transmission and Distribution Maintenance . . . ES151, ES152, ES153, ES154, ES155, ES156

- Recognize power transmission and distribution preventive/scheduled maintenance routines.
- Describe physical inspection techniques for power transmission and distribution systems (visual and sound).
- Recognize power transmission and distribution unscheduled maintenance routines.
- Describe when unscheduled maintenance is necessary.
- Initialize a power transmission and distribution system using default settings.
- Perform a power transmission and distribution system operational check.
- Show proper use of measurement devices.
- Examine power transmission and distribution system fault isolation procedures.
- Demonstrate the ability to diagnose a defective subsystem in a power transmission and distribution system using fault isolation procedures.

7231-714-250 Power Grid Troubleshooting ES151, ES152, ES153, ES154, ES155, ES156

- Examine the troubleshooting process for power transmission and distribution systems.
- Set up a power transmission and distribution system hardware following a given procedure.
- Initialize a power transmission and distribution system with default settings.
- Perform a power transmission and distribution system operational check.
- Show proper use of measurement devices.
- Demonstrate the ability to maintain a power transmission and distribution system.
- Power down a power transmission and distribution system.

7231-714-920 Power Distribution Post-Test (Theory) . . . . . ---

SONAR (MODEL 3650)

7811-614-130 Introduction to Sonar . . . . . ---

- Describe acoustic waves.
- Describe frequency and wavelength.
- Describe the Doppler effect.
- Define sonar.
- Describe acoustic wave propagation speed and sound pressure level.
- Define sound intensity.
- Describe decibel and signal-to-noise ratio.
- Define ambient noise as related to sonar performance.

7811-614-160 Principles of Sonar . . . . . Headset, MS101, MS102, MS103, MS104, MS105, MS106, MS113

- State the different roles of sonar, including: search, attack, noisemaking, navigation, bottom search, communication, oceanographic, active intercept, torpedo warning, classification, self noise monitoring, and laser depth.
- State and describe the principles of sound transmission, including: transmission speed, discrimination, and penetration.
- Describe the different methods of submarine detection including: magnetic anomaly detection, electromagnetic action, sniffing, infrared buoys, seabed hydrophones, towed array, and sonar.

LESSON ID/TITLE — CARDS/KITS

SONAR (MODEL 3650) (cont.)

7811-614-160 Principles of Sonar (cont.)

- Define the terms active and passive, and relate to the detection methods.
- Read an active sonar block diagram to identify major subsystems.
- Operate and observe an active sonar system.
- Observe distance measuring on an active sonar system.

7811-614-190 Oceanography . . . . . Headset, MS107, MS108, MS109, MS110, MS111, MS112, MS114(2)

- State and define the three main factors of temperature, depth, and salinity that affect the speed of sound through water.
- State and describe the following terms: refraction, velocity gradients (positive, negative, and zero), surface layers, thermocline (seasonal and permanent), isothermal.
- Describe the purpose of variable depth sonar.
- Explain the operation of a typical shipborne bathythermograph (XBT) installation.
- State and define the following propagation losses: spreading, absorption, scattering, Doppler distortion, reverberation, target size, target inclination, and noise (ambient and ship).
- List and explain the methods employed to minimize ship noise including: radiated noise, self noise (masker), propeller noise (agouti), crew noise, ship quiet states (cruising, quiet state, ultra quiet state, noise reduction organization), and noise ranging.
- Observe the display outputs of a passive sonar system operation.

7811-614-220 Basic Sonar Transmitter, Receiver, and Processing . . . . . Headset, MS101, MS102, MS103, MS104, MS105, MS106, MS107, MS108, MS109, MS110, MS111, MS112, MS113, MS114(2)

- List and state the function of each block in a typical sonar transmitter: Timing, oscillator, PFN, BFN, TX power amplifier, T/R switch, transducer (line, planar, spherical, cylindrical, and conformal arrays), RX amplifier, system interface, own Doppler nullifier, control/display, and headset.
- State the principles of beam-forming.
- List and explain typical sonar active (sector, ripple, omni) and passive operating modes.
- State the advantages/disadvantages of active and passive modes, of hull mounted and towed arrays, and of multistatic and bistatic sonars.
- Using a block diagram as a reference, observe signal flow and measure input and output signals between modules of an active sonar system.
- Given an active sonar system, align the system for maximum performance, perform subsystem operational checks, and detect a malfunctioning subsystem.
- Using a block diagram as a reference, observe signal flow and measure input and output signals between modules of a passive sonar system.
- Given a passive sonar system, align the system for maximum performance, perform subsystem operational checks, and detect a malfunctioning subsystem.

7811-614-250 Active Sonar System Troubleshooting . . . . Headset, MS101, MS102, MS103, MS104, MS105, MS106, MS113

- Examine the troubleshooting process for active sonar systems.
- Set up and initialize an active sonar system following a given procedure.
- Validate system operation using sensors, displays, and monitoring devices.
- Verify symptoms of active sonar subsystem malfunctions.
- Use a digital oscilloscope to take measurements.

LESSON ID/TITLE — CARDS/KITS

SONAR (MODEL 3650) (cont.)

7811-614-250 Active Sonar System Troubleshooting (cont.)
- Troubleshoot malfunctioning subsystems in an active sonar system.

7811-614-280 Passive Sonar System Experiments . . . . . Headset, MS107, MS108, MS109, MS110, MS111, MS112, MS114(2)
- Set up and initialize a passive sonar system following a given procedure.
- Validate system operation using sensors, displays, and monitoring devices.
- Verify symptoms of passive sonar subsystem malfunctions.
- Use a digital oscilloscope to take measurements.
- Troubleshoot malfunctioning subsystems in a passive sonar system.

7811-614-310 Ships Fitted Sonar Equipment - Royal Australian Navy Vessels . . . . . ---
- Identify FFG (Adelaide class) sonar equipment.
- Identify FFH (Anzac class) sonar equipment.
- Identify SSG (Collins class) sonar equipment.
- Describe sonar equipment used on FFG, FFH, and SSG vessels.
- Identify MHC sonar equipment.
- Identify AGS sonar equipment
- Identify SMB sonar equipment.
- Identify AGSC sonar equipment.
- Describe MHC, HS, SMB, and SML sonar equipment.

7811-614-940 Sonar Post-Test (Theory) . . . . . ---

7811-614-940AU Sonar Post-Test (Theory) . . . . . ---

MATHEMATICS

Basic Math

2011-112-130 Adding and Subtracting . . . . . ---
- Describe the decimal number system.
- Describe the whole number line.
- Describe addition.
- Add whole numbers.
- Describe subtraction.
- Subtract whole numbers.

2011-112-160 Multiplying and Dividing . . . . . ---
- Describe multiplication.
- Multiply whole numbers.
- Describe division.
- Divide whole numbers.

2011-112-190 Fractions . . . . . ---
- Describe fractions.
- Describe proper and improper fractions.
- Change improper fractions to whole numbers or mixed numbers.
- Change mixed numbers to improper fractions.
- Reduce fractions to the lowest terms.

2011-112-220 Fraction Operations . . . . . ---
- Add fractions.
- Subtract fractions.
- Multiply fractions.

LESSON ID/TITLE CARDS/KITS

MATHEMATICS (cont.)

Basic Math (cont.)

2011-112-220 Fraction Operations (cont.)
- Divide fractions.

2011-112-250 Decimal Fractions . . . . . ---
- Describe decimal fractions.
- Recognize positional values in decimal fractions.
- Convert decimal fractions to standard fractions.
- Convert standard fractions to decimal.
- Add decimal fractions.
- Subtract decimal fractions.
- Multiply decimal fractions.
- Divide decimal fractions.

2011-112-280 Signed Numbers . . . . . ---
- Describe signed numbers.
- Describe the signed number line.
- Determine the relationship between two signed numbers.
- Add signed numbers.
- Subtract signed numbers.
- Multiply signed numbers.
- Divide signed numbers.

2011-112-310 Percents . . . . . ---
- Describe percents.
- Change percents to decimal numbers.
- Change decimal numbers to percents.
- Calculate the percentage part.
- Calculate the percentage rate.
- Calculate the percentage base.

2011-112-340 Exponents and Square Roots . . . . . ---
- Describe exponents.
- Calculate the result of numbers that use exponents.
- Describe square roots.
- Calculate square roots.

2011-112-370 Metric Notation . . . . . ---
- Convert decimal numbers to powers of ten and vice versa.
- Convert decimal numbers to metric prefixes and vice versa.
- Add, subtract, multiply, and divide powers of ten.
- Add, subtract, multiply, and divide metric prefixes.

Algebra

2011-212-130 Fundamentals of Algebra . . . . . ---
- Describe real numbers.
- Describe the four fundamental operations of real numbers.
- Describe real number variables.
- Describe the order of operations.
- Combine variables.
- Describe real number properties - closure, commutative, associative, identity, inverse, distributive.

LESSON ID/TITLE CARDS/KITS

MATHEMATICS (cont.)

Algebra (cont.)

2011-212-160 Linear Equations . . . . . ---
- Describe addition and subtraction laws.
- Solve X + A = B type of equations.
- Solve X - A = B type of equations.
- Describe multiplication and division laws.
- Solve X x A = B type of equations.
- Solve X ÷ A = B type of equations.
- Describe a formula.
- Place a word problem in an equation.
- Solve for the unknown quantity.

2011-212-190 Solving Linear Equations . . . . . ---
- Use the basic laws of equations to solve linear equations.
- Solve problems in the format of ax + b = c and ax - b = c.
- Solve problems in the format of x/a + b = c.
- Use the four-step process to solve word problems.
- Solve word problems in the format of linear equations.

2011-212-220 Exponents and Monomials . . . . . ---
- Define exponents.
- Multiply and divide powers with the same base.
- Raise a power to a power.
- Raise a product or quotient to a power.
- Describe monomials.
- Add and subtract monomials.
- Multiply and divide monomials.
- Use the 4 steps to solve word problems.
- Solve word problems that use monomials.

2011-212-250 Polynomials . . . . . ---
- Define polynomials.
- Add polynomials.
- Subtract polynomials.
- Multiply a monomial and a polynomial.
- Multiply polynomials.
- Describe special binomial products.
- Divide polynomials by monomials.

2011-212-280 Factoring Polynomials . . . . . ---
- Factor by finding the greatest common factor.
- Factor by grouping.
- Factor trinomials.
- Factor by recognizing special binomial factors.
- Solve equations by factoring.
- Define quadratic equations and quadratic formula.
- Solve equations using the quadratic formula.
- Solve word problems.

2011-212-310 Roots and Radicals . . . . . ---
- Factor radicand terms.
- Simplify using the Product Property of Roots.

LESSON ID/TITLE CARDS/KITS

MATHEMATICS (cont.)

Algebra (cont.)

2011-212-310 Roots and Radicals (cont.)

- Simplify using the Product Quotient Property of Roots.
- Rationalize denominators.
- Multiply radicals.
- Divide radicals.
- Add radicals.
- Subtract radicals.
- Rationalize denominators.
- Use the Squaring Property of Equations to solve for the unknown.
- Solve equations containing one radical expression.
- Solve equations containing two radical expressions.

2011-212-340 Graphs . . . . . ---

- Describe the rectangular coordinate system.
- Locate points on a rectangular coordinate system.
- Find the coordinates of a point in a rectangular coordinate system.
- Graph linear equations.
- Find the slope of a line.
- Find the equation of a line.

2011-212-370 Systems of Linear Equations . . . . . ---

- Define a system of equations.
- Solve systems of equations by graphing.
- Identify consistent, inconsistent, and dependent systems by their graphs.
- Solve systems of equations by substitution.
- Identify consistent, inconsistent, and dependent systems by the results of substitution.
- Solve systems of equations by addition.
- Identify consistent, inconsistent, and dependent systems by the results of addition.

2011-212-400 Introduction to Statistics . . . . . ---

- Understand the role of statistics in industry.
- Understand the concepts of mean, median, mode, standard deviation, percentiles, and quartiles.
- Understand the analysis of statistical data.
- Understand the various statistical diagrams.
- Understand the statistical histogram.

Trigonometry

2011-214-130 Fundamentals of Trigonometry . . . . . ---

- Define the term angle.
- Identify positive angles and negative angles.
- Identify acute, obtuse, complementary, and supplementary angles.
- Identify angle measurements using degrees, minutes, and seconds.
- Add and subtract angle measurements.
- Understand the relationship between degrees and radians.
- Convert degrees into radians.
- Convert radians into degrees.

2011-214-160 Trigonometric Functions . . . . . ---

- Find the measurement of an unknown angle in a right triangle.
- Find the unknown side of a right triangle using the Pythagorean Theorem.

LESSON ID/TITLE CARDS/KITS

MATHEMATICS (cont.)

Trigonometry (cont.)

2011-214-160 Trigonometric Functions (cont.)

- Identify the properties of the 45-45-90 and 30-60-90 right triangles.
- Identify the six trigonometric functions.
- Find the sine, cosine, tangent, cosecant, secant, and cotangent of a given angle.
- Identify the relationships between the unit circle and the trigonometric functions.

2011-214-190 Graphing Trigonometric Functions . . . . . ---

- Identify the basic graphs for the six trigonometric functions.
- Define period and amplitude.
- Define the period and amplitude for the six trigonometric functions.
- Determine the amplitude of the sine and cosine functions.
- Find the change in the period of a trigonometric function.
- Determine the phase shift of a trigonometric function.

2011-214-220 Trigonometric Identities . . . . . ---

- Understand the origins of the reciprocal and ratio identities.
- Find the trigonometric function of an angle using either a reciprocal or ratio identity.
- Find the trigonometric function of an angle using combinations of reciprocal and ratio identities.
- Understand the origins of the Pythagorean and related identities.
- Find the trigonometric function of an angle using the Pythagorean and related identities.

2011-214-250 Angle Formulas . . . . . ---

- Know the sum and difference formulas for sine, cosine, and tangent.
- Find the exact trigonometric function value of a given angle using the sum and difference formulas.
- Know the double angle formulas for sine, cosine, and tangent.
- Know the power reducing formulas for sine, cosine, and tangent.
- Know the half-angle formulas for sine, cosine and tangent.
- Use the proper formula to find the exact trigonometric value of a given angle.

2011-214-280 Inverse Trigonometric Functions . . . . . ---

- Understand the methods for finding the inverse trigonometric functions.
- Know the domains, ranges, and graphs of arcsine, arccosine, and arctangent.
- Solve problems involving arcsine, arccosine, and arctangent.
- Know the domains, ranges, and graphs of arccosecant, arcsecant, and arccotangent.
- Solve problems involving arccosecant, arcsecant, and arccotangent.

2011-214-310 Applications of Trigonometry . . . . . ---

- Identify an oblique triangle.
- Use the law of sines to find the missing parts of oblique triangles.
- Understand the four possibilities resulting from the ambiguous case.
- Use the law of cosines to solve oblique triangles when given two sides and the included angle.
- Use the law of cosines to solve oblique triangles when given three sides.

2011-214-340 Graphing Polar Equations . . . . . ---

- Define the polar coordinate pair.
- Graph polar coordinates.
- Understand the techniques for graphing polar equations.
- Recognize and graph basic polar equations.

LESSON ID/TITLE CARDS/KITS

MATHEMATICS (cont.)

Trigonometry (cont.)

2011-214-370 Conic Sections: Circles and Parabolas . . . . . ---

- Recognize the general equation for a circle.
- Find the center and radius of a circle from a given equation.
- Find the equation for a circle given the center and radius.
- Recognize the general equations for parabolas.
- Find the focus, vertex, and directrix of a parabola from a given equation.
- Find the equation for a parabola given the focus, vertex, and/or directrix.

2011-214-400 Conic Sections: Ellipses and Hyperbolas . . . . . ---

- Recognize the general equations for ellipses.
- Find the center, vertices, and foci of an ellipse from a given equation.
- Find the equation for an ellipse given the center, vertices, and foci.
- Recognize the general equations for hyperbolas.
- Find the center, vertices, foci, and asymptotes of a hyperbola from a given equation.
- Find the equation for a hyperbola given the center, vertices, and foci.

Calculus

2011-216-130 Fundamentals of Calculus . . . . . ---

- Apply the slope formula to particles moving along straight paths.
- Recognize functions and identify the domain and range.
- Find the composite of two given functions.
- Find the average rate of change of a function.
- Understand the transition as a secant line becomes a tangent line when ΔX goes to 0.
- Find the slope at a given point on a curve.

2011-216-160 Limits . . . . . ---

- Understand the concept of a limit.
- Recognize right-hand limits and left-hand limits.
- Find limit values.
- Understand the sandwich property.
- Understand how the sandwich property is used to find the limits of trigonometric functions.
- Find limits involving trigonometric functions.

2011-216-190 Limits: Continuity and Infinity . . . . . ---

- Identify continuous functions.
- Determine continuity at a point.
- Determine continuity over an interval.
- Understand how infinity is used as a limit.
- Identify the limit form as the variable approaches infinity.
- Find limits involving infinity.

2011-216-220 Derivatives . . . . . ---

- Understand the definition of a derivative.
- Find derivatives using the definition.
- Find derivatives using the constant rule, power rule, and sum rule.
- Find the derivative of the product of two functions.
- Find the derivative of the quotient of two functions.

2011-216-250 The Chain Rule . . . . . ---

- Identify the chain rule.
- Find derivatives using the chain rule.
- Identify the derivatives of the six trigonometric functions.

LESSON ID/TITLE CARDS/KITS

MATHEMATICS (cont.)

Calculus (cont.)

2011-216-250 The Chain Rule (cont.)
- Find derivatives of functions using trigonometric expressions.

2011-216-280 Additional Differentiation Methods . . . . . ---
- Identify implicit functions.
- Find derivatives using implicit differentiation.
- Identify higher order derivatives.
- Find second and third derivatives of functions.
- Find the velocity and acceleration functions given the position function.

2011-216-310 Applications of Derivatives . . . . . ---
- Sketch curves using the first and second derivatives.
- Identify intervals where the function is increasing or decreasing.
- Locate local maximum or minimum points.
- Determine concavity.
- Find inflection points.
- Develop strategy for solving maxima-minima word problems.
- Solve max-min problems.

2011-216-340 Integration . . . . . ---
- Understand the relationship between integration and differentiation.
- Integrate simple algebraic indefinite integrals.
- Integrate simple trigonometric indefinite integrals.
- Identify integrals resulting from use of the chain rule.
- Integrate indefinite integrals using the u substitution method.

2011-216-370 Definite Integrals . . . . . ---
- Understand the relationship between the limits of integration and an interval of x values.
- Identify upper and lower limits of integration.
- Evaluate definite integrals.
- Use definite integrals to find the area involving only positive regions.
- Use definite integrals to find the area of both positive and negative regions.

2011-216-400 Applications of Definite Integrals . . . . . ---
- Find the area of a region bounded by two curves.
- Find the area of a region bounded by two curves and the x-axis.
- Understand the theory of rotation about the x-axis.
- Find the volume of an object formed by rotating y = f(x) about the x-axis.

Computer Math

2011-312-130 Fundamentals of Computer Math . . . . . ---
- Understand concept of number systems other than base 10.
- Add and subtract numbers of base N.
- Convert numbers of base N to base 10.
- Convert numbers of base 10 to base N.
- Construct a base N multiplication table.
- Multiply and divide base N numbers.

2011-312-160 The Binary System . . . . . ---
- Add and subtract binary numbers.
- Convert binary numbers to decimal numbers.
- Convert decimal numbers to binary numbers.
- Use BCD (8421) codes.

LESSON ID/TITLE CARDS/KITS

MATHEMATICS (cont.)

Computer Math (cont.)

2011-312-160 The Binary System (cont.)
- Use Gray codes.
- Use ASCII codes.
- Use EBCDIC codes.

2011-312-190 Octal and Hexadecimal Systems . . . . . ---
- Perform computations using octal numbers.
- Convert binary numbers to octal numbers.
- Convert octal numbers to binary numbers.
- Convert hexadecimal numbers to decimal numbers.
- Convert decimal numbers to hexadecimal numbers.
- Convert binary numbers to hexadecimal numbers.
- Convert hexadecimal numbers to binary numbers.

2011-312-220 Logic Expressions . . . . . ---
- Identify a valid logic statement.
- Describe a negated logic statement.
- Identify and use the "and" connector.
- Identify and use the "or" connector.
- Construct truth tables.
- Identify conditional logic statements.
- Identify and use the "If..., then..." connector.
- Identify and use the "...if and only if..." connector.
- Construct truth tables.
- Decipher complex compound logic statements.
- Understand logic arguments.
- Construct truth tables.

2011-312-250 Boolean Algebra . . . . . ---
- Describe basic Boolean operations.
- Describe basic properties of Boolean algebra.
- Describe electronic circuits that perform basic Boolean algebra.
- Describe sum of products equations.
- Describe product of sums equations.
- Describe complements.

2011-312-280 Gate Networks . . . . . ---
- Develop gate networks from sum of products equations.
- Develop gate networks from product of sums equations.
- Find the output of a gate network.
- Develop a truth table for a gate network.

2011-312-310 Simplifying Boolean Equations . . . . . ---
- Review the basic principles of Boolean algebra.
- Describe the rules of Boolean algebra.
- Describe DeMorgan's theorems.
- Use the basic principles, rules, and DeMorgan's theorems to simplify Boolean equations.

2011-312-340 Karnaugh Maps . . . . . ---
- Describe Karnaugh maps.
- Develop a Karnaugh map for two, three, and four variables.
- Simplify Boolean algebra equations using Karnaugh maps.

LESSON ID/TITLE CARDS/KITS

MATHEMATICS (cont.)

Computer Math (cont.)

2011-312-370 Algorithms and Flowcharts . . . . . ---
- Describe the three basic computer operations.
- Describe algorithms.
- Describe flowcharts.
- Recognize flowchart symbols.

2011-312-400 Sequences and Matrices . . . . . ---
- Define sequences.
- Solve sequence problems.
- Define matrices.
- Solve matrix problems.

Measurements

2011-412-130 Introduction to Linear Measurements . . . . . ---
- Become familiar with the two different standards of measurement.
- Define precision and determine which measurement applications require more or less precision.
- Identify the following measurement tools:a. Standard rulerb. Micrometerc. Vernier caliper
- Define linear measurement.
- Describe how the following measurement tools are used:a. Standard rulerb. Micrometerc. Vernier caliper

2011-412-160 Metric and Scientific Conversions . . . . . ---
- Become familiar with units of British and metric units and be able to convert from one to the other.
- Become familiar with the concepts of scientific notation and be able to add, subtract, multiply, and divide values in scientific notation.

2011-412-190 Angular and Circular Measurements . . . . . ---
- Become familiar with some basic concepts of angular and circular characteristics including: angle, diameter, and radius.
- Describe angular measurement using: try square, carpenter's square, protractor, sliding T-bevel, and combination square.
- Describe diameter and radius measurements using calipers, micrometers, and vernier calipers.

2011-412-220 Area Measurements . . . . . ---
- Define rectangles and squares.
- Determine the difference between the two.
- Use the area formula for squares and rectangles.
- Define parallelograms and triangles.
- Determine the relationship between the two.
- Use the area formula for parallelograms and triangles.
- Define a trapezoid.
- Differentiate trapezoids from parallelograms.
- Define the dimensions of a circle: radius, diameter, and circumference.
- Use the formulas for area and circumference.

2011-412-250 Volume Measurements . . . . . ---
- Define volume and describe how it relates to area.
- Differentiate between liter, centimeter, and meter.
- Solve problems of volume measurement in a solid rectangle.

LESSON ID/TITLE CARDS/KITS

MATHEMATICS (cont.)

Measurements (cont.)

2011-412-250 Volume Measurements (cont.)
- Define and be able to recognize a prism.
- Define and be able to recognize a pyramid.
- Using the formulas for each, solve problems of prism and pyramid volume.
- Define and be able to recognize a cylinder.
- Define and be able to recognize a cone.
- Define and be able to recognize a sphere.
- Using the formulas for each, solve problems of cylinder, cone, and sphere volume.

2011-412-280 Velocity and Acceleration Measurements . . . . . ---
- Define vector and scalar quantities and be able to differentiate between the two.
- Define and be able to solve problems of velocity.
- Define and be able to solve problems of acceleration.

2011-412-310 Force Measurements . . . . . ---
- Describe force as it relates to inertia and Newton's First Law of Motion.
- Describe force as it relates to acceleration and Newton's Second Law of Motion.
- Describe force as it relates to interaction and Newton's Third Law of Motion.

2011-412-340 Work and Power Measurements . . . . . ---
- Define work and be able to solve problems using the standard measure of work, the newton (N).
- Define power and be able to solve problems using the standard measure of power, the joule (J).

CHEMISTRY

3011-112-130 Introduction to Chemistry . . . . . ---
- Define chemistry.
- Describe the history of chemistry.
- Recognize chemistry's impact on everyday life.

3011-112-160 Matter and Energy . . . . . ---
- Define Matter and Energy.
- Name the three states of matter.
- Distinguish classes of matter.
- Differentiate between physical changes and chemical reactions.

3011-112-190 The Periodic Table . . . . . ---
- Recognize the periodic table.
- Understand the structure of the periodic table.
- Identify Groups and Periods.
- Relate various element names to their corresponding chemical symbol.
- Describe some properties that are common to elements located in the same groups on the periodic table.

3011-112-220 Solids, Liquids, and Gases . . . . . ---
- Identify the three physical states of matter.
- Define the properties of the three states of matter.
- Understand how matter changes from one state to another.

3011-112-250 Atomic Structure . . . . . ---
- Describe the structure of the atom.

LESSON ID/TITLE CARDS/KITS

CHEMISTRY (cont.)

3011-112-250 Atomic Structure (cont.)
- Understand how atomic structure gives rise to the chemical properties of the elements.

3011-112-280 Bonding . . . . . ---
- Understand the process of atomic bonding.
- Distinguish the types of chemical bonds.
- Use the electron dot structure to represent chemical compounds.

3011-112-310 Chemical Quantities . . . . . ---
- Identify the units of measure used in chemistry.
- Recognize the correct units to use in various chemical calculations.
- Use dimensional analysis for converting chemical quantities and verifying correctness of chemical calculations.

3011-112-340 Chemical Names . . . . . ---
- Understand and apply standard conventions for naming inorganic chemical compounds.

3011-112-370 Chemical Reactions . . . . . ---
- Identify different types and classes of chemical reactions.
- Understand the basic mechanisms of chemical reactions.
- Recognize the role of chemical reactions in our day-to-day lives.

3011-112-400 Applications of Chemistry . . . . . ---
- Identify the impact of some different fields of chemical science on the world today.