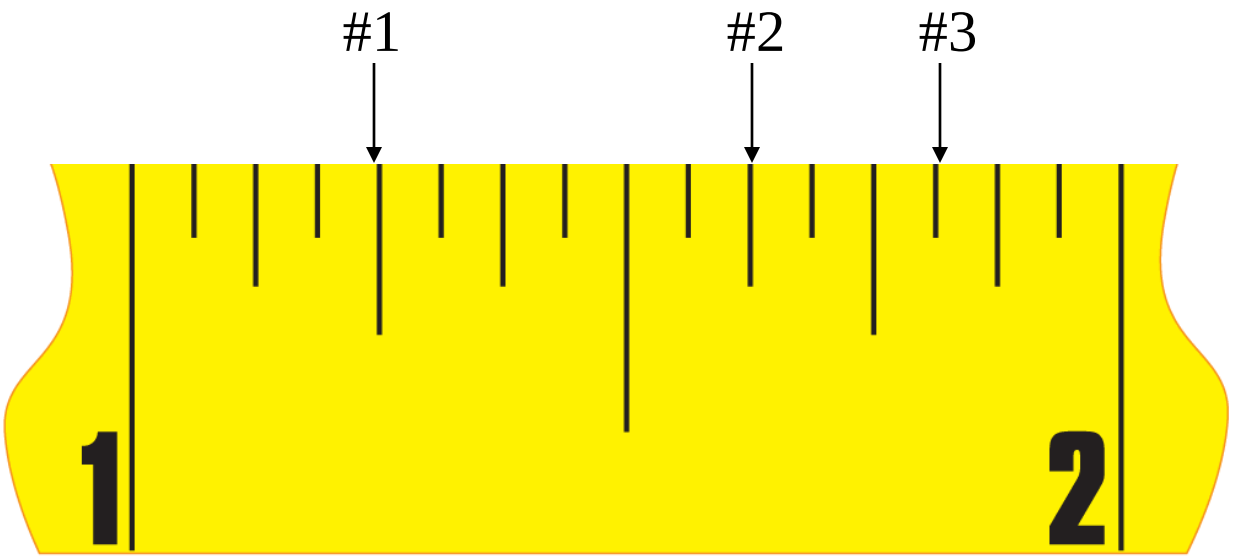
Iowa State FFA Agricultural Mechanics Career Development Event 2019

State of Iowa
Department of Education
Iowa State University
Department of Agricultural Education and Studies

DO NOT WRITE ON THIS DOCUMENT

Environmental and Natural Resource Systems
Soil and Water Management Problem-solving Exam

NOTE: Use the image below to answer questions one through four.



Standard Tape Measure Showing Inch Breakdown

1) What is the measurement of point #1 in the image above?

A) 1 1/4”
B) 1 1/2”
C) 1 1/16”
D) 1 1/8”

2) What is the measurement of point #2 in the image above?

A) 5/8”
B) 1 10/16”
C) 1 5/8”
D) 1 3/4”

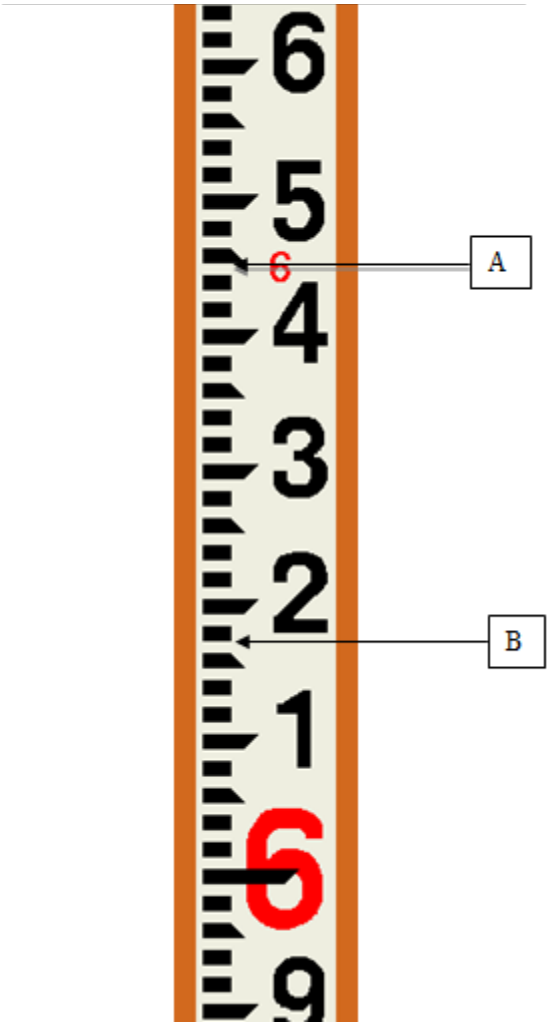
3) What is the measurement of point #3 in the image above?

A) 3/4”
B) 1 13/16”
C) 1 14/16”
D) 1 9/16”

4) What is the distance between points #1 and #3 on the tape measure?

A) 1/2”
B) 15/32”
C) 7/16”
D) 9/16”

Note: Use this image below to answer questions five and six.



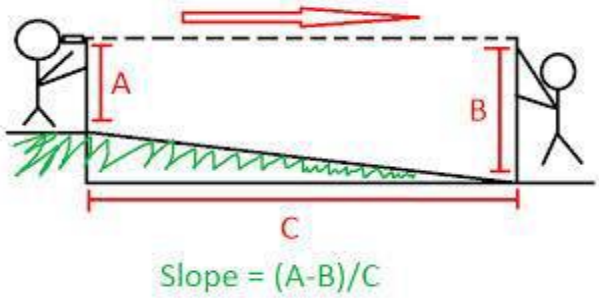
5) Using the surveying rod in the image on the previous page, what is the reading at point “A”?

A) 1.50
B) 6.50
C) 6.05
D) 6.45

6) Using the surveying rod in the image on the previous page, what is the reading at point “B”?

A) 1.70
B) 6.17
C) 6.15
D) 6.50

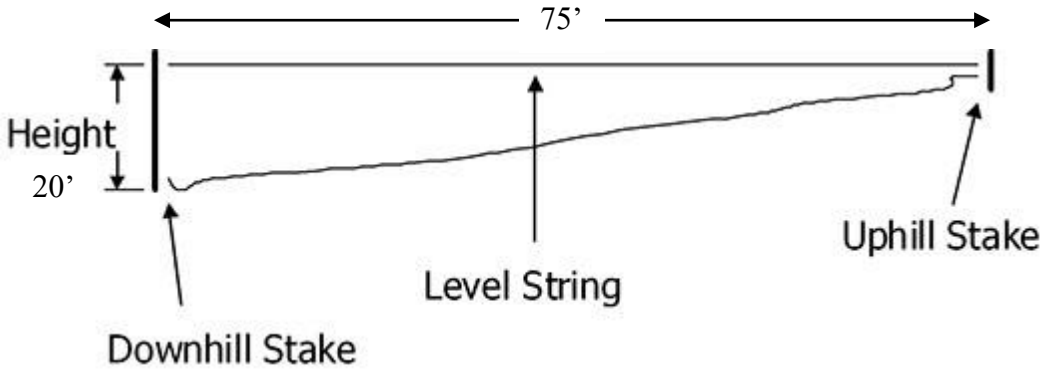
Note: Use this image below to answer question seven.



7) Assume that you are assisting on a job site and want to help prepare the site to lay a level pad of cement for a new feed silo. In order to minimize costs, you will need to determine if there is any slope over the 6’ site. If there is more than 3% slope, you will need to backfill the area that slopes off to ensure that costs remain low. Using the measurements taken at A and B in the image on the previous page, what is the percent slope?

A) 0.27%
B) 0.45%
C) 2.7%
D) 4.5%

Note: Use this image below to answer question eight.



8) Using the information in the figure at the bottom of the previous page, calculate the percent slope for the worksite of your concrete pad.

A) 20%
B) 26%
C) 75%
D) 95%

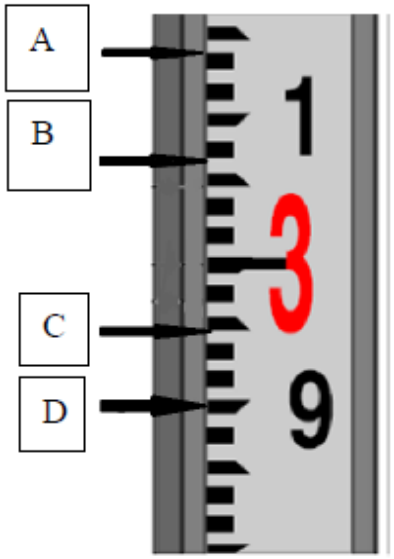
9) How many acres does one section of land contain?

A) 660 acres
B) 740 acres
C) 640 acres
D) None of the above

10) Approximately how many acres are in a rectangular field that measures 1000 by 375 yards?
Hints: Area of a rectangle is the length multiplied by the width.
1 yard = 3 feet; 1 acre = 43,560 ft^2

A) 8.61 acres
B) 17.55 acres
C) 77.48 acres
D) 16,355,000,000 acres

Note: Use the arrows pointing to the Philadelphia rod to answer questions eleven through fifteen.



11) What is the measurement scale on the rod shown?

A) Metric
B) Engineer's
C) Standard
D) None of the above

12) What is the measurement shown for point “A”?

A) 3 meters 14 cm
B) 3.14 meters
C) 3 feet 1.4 inches
D) 3.14 feet

13) What is the measurement shown for point “B”?

A) 3 feet 7 inches
B) 3 meters 7 cm
C) 3.07 feet
D) 3.07 meters

14) What is the measurement shown for point “C”?

A) 2 feet 9.5 inches
B) 2 meters 9.5 cm
C) 2.95 feet
D) 2.95 meters

15) What is the measurement shown for point “D”?

A) 9 feet
B) 2.90 feet
C) 2.90 meters
D) 2 feet 9 inches

Iowa State FFA Agricultural Mechanics Career Development Event 2019

State of Iowa
Department of Education
Iowa State University
Department of Agricultural Education and Studies

DO NOT WRITE ON THIS DOCUMENT

Electrical Systems
Electrical Problem-solving Exam

1) Identify this electrical tool.

A) Receptacle tester
B) Volt meter
C) Digital multimeter
D) Amperage determination tool

2) Identify this electrical tool.

A) Receptacle tester
B) Solenoid voltage tester
C) Outlet detector
D) Three-pronged switch

3) Regarding safety labels, a label box marked “Danger” is colored _____ and indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

A) Red
B) Yellow
C) Orange
D) Neon Green

4) What is the name of this tool?

A) Standard / flathead screwdriver
B) Chisel
C) Screw navigator
D) Pry bar

5) What is the most suitable purpose of the tool in question four?

A) Pry objects apart
B) Turn screws in a certain direction
C) Guide wire through conduit
D) Strip coating off wires

6) What does the 2 on a strip of 12-2 wire indicate?

A) Type of metal used in the wires
B) Wire gauge
C) Length of the wires inside
D) Number of wires inside

7) What does the 12 on a strip of 12-2 wire tell you?

A) Type of metal used in the wires
B) Wire gauge
C) Length of the wires inside
D) Number of wires inside

8) Which of the following wires is the largest in diameter?

A) 20-gauge
B) 14-gauge
C) 30-gauge
D) 12-gauge

9) If you were going to operate power tools off a fifteen-amp duplex outlet, which of the following tools could be used?

A) Two 10-amp band saws
B) Three 6-amp angle grinders
C) One 16-amp drill press
D) Two 5-amp jig saws

10) Resistance to the flow of electricity is measured in _____.

A) Amps
B) Ohms
C) Watts
D) Volts

11) In a typical strip of 12-3 wire, which color wire is regarded as the traveler wire?

A) Blue wire
B) White wire
C) Red wire
D) Black wire

12) In a typical strip of 14-2 wire, which color wire is regarded as the ground wire?

A) Bare copper wire
B) White wire
C) Red wire
D) Black wire

NOTE: For questions thirteen through fifteen, please refer to the Electrical Calculation Formulas chart below.

Electrical Calculation Formulas

$I=E/R$

$R=E.I$

$E = IR$

$P=IV$

$I = P/V$

$V= P/I$

13) A direct current (DC) electric motor transforms three kilowatts (kW) of electrical energy into mechanical form. If the electric motor's operating voltage is 1,500 volts, how much current does it "draw" when operating at full load (i.e., full power output)?

A) 2 amps
B) 500 amps
C) 2 ohms
D) 4,500 ohms

14) What is the resistance of a circuit that draws 0.02 amps with 24 volts applied?

A) 0.48 amps
B) 0.48 volts
C) 8.3 amps
D) 1,200 ohms

15) Find the current through a 10-ohm resistive circuit when 15 volts are applied.

A) 1.5 amps
B) 1.5 volts
C) 150 amps
D) 0.67 ohms

Iowa State FFA Agricultural Mechanics Career Development Event 2019

State of Iowa
Department of Education
Iowa State University
Department of Agricultural Education and Studies

DO NOT WRITE ON THIS DOCUMENT

Machinery and Equipment Systems
Small Engines Problem-solving Exam

1) A four-stroke engine gets its name from _____.

A) The number of cylinders it has
B) The number of piston movements during a combustion cycle
C) The number of valves used in its design
D) The number of engineers who designed it

2) A two-stroke engine gets its name from _____.

A) The number of cylinders it has
B) The number of piston movements during a combustion cycle
C) The number of valves used in its design
D) The number of engineers who designed it

3) Which stroke follows the exhaust stroke?

A) Compression
B) Intake
C) Power
D) Spark

4) To complete one operating cycle, the crankshaft of a four-stroke engine must make _____.

A) One-half of a revolution
B) Three revolutions
C) Four revolutions
D) Two revolutions

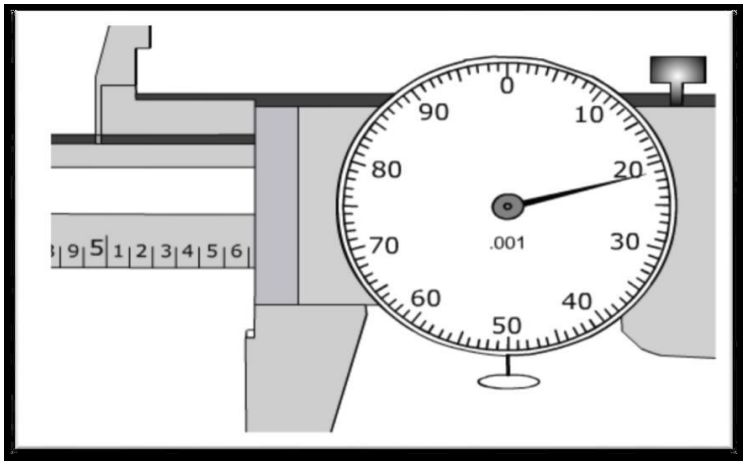
5) To complete one operating cycle, the crankshaft of a two-stroke engine must make _____.

A) One-half of a revolution
B) One revolution
C) Four revolutions
D) Two revolutions

6) What is the correct order of the strokes in a four-stroke engine?

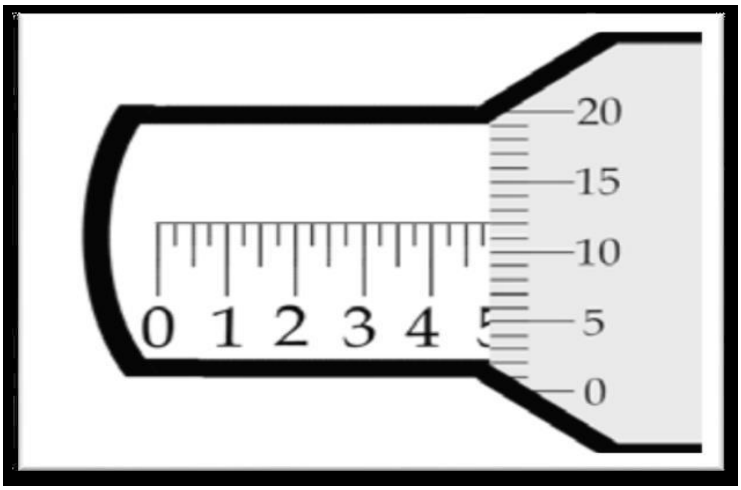
A) Intake, combustion, power, exhaust
B) Intake, compression, spark, exhaust
C) Intake, compression, power, exhaust
D) Exhaust, intake, power, compression

7) What measurement is indicated on the dial caliper below?



A) 5.623
B) 5.621
C) 6.520
D) 5.622

8) What measurement is indicated on the micrometer below?



A) .512
B) .500
C) .487
D) .475

9) Identify this part commonly found within small gas engines.

A) Piston
B) Cylinder
C) Connecting rod
D) Cylinder hone

10) Identify this part commonly found within small gas engines.

A) Valve
B) Glow plug
C) Spark plug
D) Fuel-air mixture igniter

11) Identify this part commonly found within small gas engines.

A) Camshaft
B) Crankshaft
C) Gear wheel
D) Engine pulley

12) Identify this part commonly found within small gas engines.

A) Camshaft
B) Crankshaft
C) Gear wheel
D) Engine pulley

13) Identify this tool commonly used in small gas engine repair.

A) Ring compressor
B) Cylinder cleaner
C) Valve spring retainer
D) Cylinder hone

14) Identify this tool commonly used in small gas engine troubleshooting.

A) Pressure tester
B) Spark plug cleaner
C) Spark tester
D) Sparkler

15) Identify this tool commonly used to make measurements on small gas engine parts.

A) Vernier caliper
B) Micrometer
C) Ring compressor
D) Valve clearance guide

Iowa State FFA Agricultural Mechanics Career Development Event 2019

State of Iowa
Department of Education
Iowa State University
Department of Agricultural Education and Studies

DO NOT WRITE ON THIS DOCUMENT

Metals and Welding
Shielded Metal Arc Welding / Arc Welding Problem-solving Exam

1) The minimum shade of lens that should be used during the SMAW process is a number ____ lens.

A) 10
B) 5
C) 8
D) 12

2) Identify this tool used during the SMAW process.

A) Slag hammer
B) Chipping hammer
C) Wire hammer
D) Angled hammer

3) Identify this tool used during the SMAW process.

A) Grill brush
B) Hair brush
C) Wire brush
D) Steel brush

NOTE: For questions four and five, please use the Miller Weld Settings Calculator provided at your station.

4) If you are using an E7018 electrode that measures 1/8" in diameter to weld mild steel, what is the suggested amperage range that should be used when setting up your welding machine?

A) 110 to 165
B) 200 to 275
C) 320 to 400
D) 65 to 100

5) If you are using an E6013 electrode that measures 3/32" in diameter to weld mild steel, what is the suggested amperage range that should be used when setting up your welding machine?

A) 105 to 180
B) 40 to 90
C) 150 to 230
D) 80 to 130

6) _____ is the amount of time in a 10-minute period that the welding machine can be operated at a specified current without overheating.

A) Duty cycle
B) Operating period
C) Duty period
D) Cycle of operation

7) What does the 60 on an E6013 welding electrode tell you?

A) Position
B) Tensile strength
C) Filler rod type
D) Current type

8) Breathing in zinc when welding galvanized metal can result in experiencing ____-like symptoms.

A) Cold
B) Sinus infection
C) Flu
D) Allergy

9) _____ is the process in which metal pieces are joined by heating them to a temperature high enough to cause them to melt and fuse into a single piece.

A) Brazing
B) Welding
C) Soldering
D) Arcing

10) You are using an E7018 welding electrode to weld a butt joint. Assuming the weld is performed correctly, how many pounds per square inch of pressure would it take to separate the joint?

A) 70
B) 70,000
C) 7,018
D) 18,000

11) You are using an E6011 welding electrode when welding mild steel. In which of the following positions could you use this electrode successfully?

A) Overhead
B) Vertical
C) Flat
D) All positions

12) You are using an E6013 welding electrode when welding mild steel plate, and your welding machine is set up to run either alternating (AC) or direct current (DC). Which of the following current types could you use to successfully weld with this electrode type?

A) AC-
B) DC+
C) DC-
D) Any current type can be used

13) Which of the following issues is the most likely to cause a thin, narrow, string-like welding bead?

A) Travel speed too fast
B) Travel speed too slow
C) Arc length too short
D) No electricity

14) Which of the following issues is the most likely to cause an overly wide and thick-looking welding bead?

A) Travel speed too fast
B) Travel speed too slow
C) Arc length too long
D) Too much electricity

15) Which of the following issues is the most likely to cause undercut in a welding bead?

A) Travel speed too fast
B) Correct electrode size and type
C) Arc length too short
D) Welding current too high

Iowa State FFA Agricultural Mechanics Career Development Event 2019

State of Iowa
Department of Education
Iowa State University
Department of Agricultural Education and Studies

DO NOT WRITE ON THIS DOCUMENT

Structural Systems
Plumbing Problem-solving Exam

1) Regarding pipe types, what do the letters "PVC" stand for?

A) Polyvinyl Chloride
B) Pipe Vent Cleaner
C) Plastic Varnished Compound
D) Primed Vapor Conduit

2) Identify this fitting commonly used in plumbing systems.

A) Tee
B) Elbow
C) Cap
D) Coupling

3) Identify this fitting commonly used in plumbing systems.

A) Tee
B) Elbow
C) Cap
D) Coupling

4) Identify this fitting commonly used in plumbing systems.

A) Tee
B) Elbow
C) Cap
D) Coupling

5) Identify this fitting commonly used in plumbing systems.

A) Tee
B) Elbow
C) Cap
D) Coupling

6) What is the purpose of the fitting shown in question five?

A) Cease the flow of water
B) Change the direction of water flow 90°
C) Change the direction of water flow 180°
D) Reverse the flow of water

7) Regarding pipe types, what do the letters “CPVC” stand for?

A) Certified Polyvinyl Chloride
B) Chlorinated Polyvinyl Chloride
C) Coated Polyvinyl Chloride
D) Constricted Polyvinyl Chloride

8) What is the purpose of using Teflon tape when fittings are threaded onto steel pipe?

A) To inconvenience the plumber
B) To make it easier to uncouple the pipes
C) To make the water more potable
D) To make a watertight seal

9) Regarding irrigation systems used in greenhouses, what is a primary purpose of using timers within these systems?

A) To increase water consumption
B) To water plants at certain time intervals
C) To regulate water quality
D) To cool the greenhouse

10) Regarding hydroponics systems, why should the plumbing system be constructed of PVC plastic pipe and fiberglass?

A) Because PVC pipe is the cheapest pipe type
B) Because nutrient solution flows easier within PVC pipe systems
C) Because PVC pipes have what plants crave
D) Because of the corrosive nutrient solution used in the hydroponics system

11) Regarding fluid dynamics in a plumbing system, _____ Principle states that as the diameter of a pipe containing a flowing fluid increases, the pressure at that point decreases; likewise, the speed of the fluid's flow increases at that point.

A) Boyle's
B) Bernouilli's
C) Hainline's
D) Pascal's

12) Regrading pipe sizing and identification, what do the letters "ID" stand for?

A) Inside diameter
B) Inner diameter
C) Inner-pipe diameter
D) Inter-dimensional diameter

13) Which of the following is considered a disadvantage of using copper pipe for plumbing systems?

A) Low initial cost
B) High degree of expansion
C) Bad water taste created if the water is basic
D) There are no disadvantages to using copper

14) Identify this tool that is commonly used for holding pipe and fittings.

A) Bench yoke vise
B) Machinist's vise
C) Chain vise
D) Chain wrench

15) While you are working to help finish assembling a plumbing system in a greenhouse, you encounter two PVC pipes of differing sizes that need to be joined together. Which of the following fitting types would you most likely use to connect these two pipes and complete the plumbing system?

A) Coupling / Union
B) Elbow
C) Cap
D) Reducer / Bushing

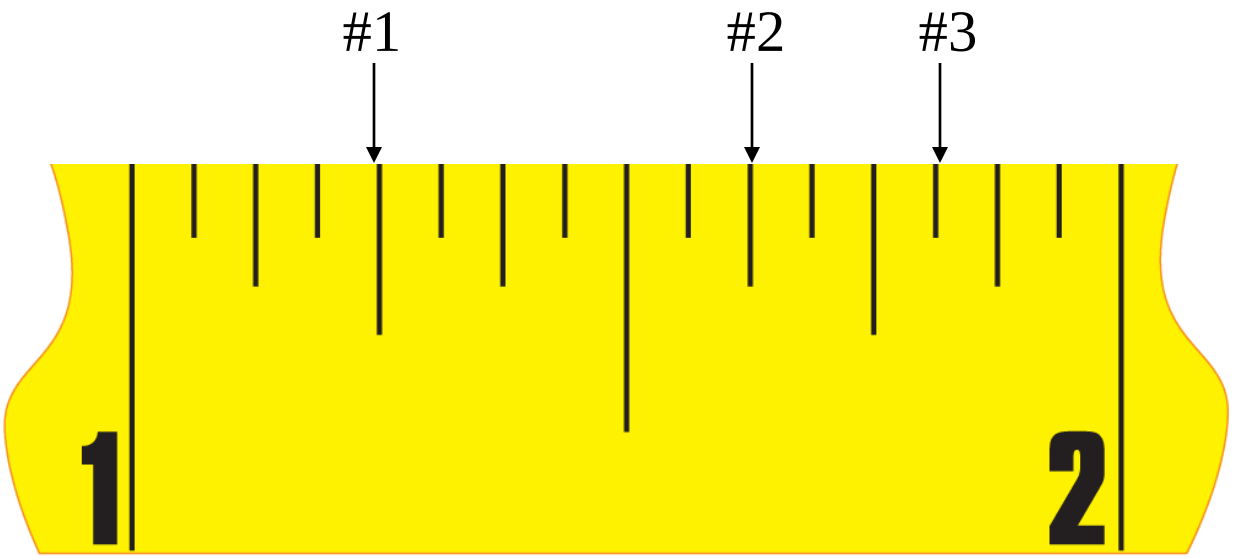
Iowa State FFA Agricultural Mechanics Career Development Event 2019

State of Iowa
Department of Education
Iowa State University
Department of Agricultural Education and Studies

DO NOT WRITE ON THIS DOCUMENT

Environmental and Natural Resource Systems
Soil and Water Management Problem-solving Exam

NOTE: Use the image below to answer questions one through four.



Standard Tape Measure Showing Inch Breakdown

1) What is the measurement of point #1 in the image above?

A) 1 1/4”
B) 1 1/2”
C) 1 1/16”
D) 1 1/8”

2) What is the measurement of point #2 in the image above?

A) 5/8”
B) 1 10/16”
C) 1 5/8”
D) 1 3/4”

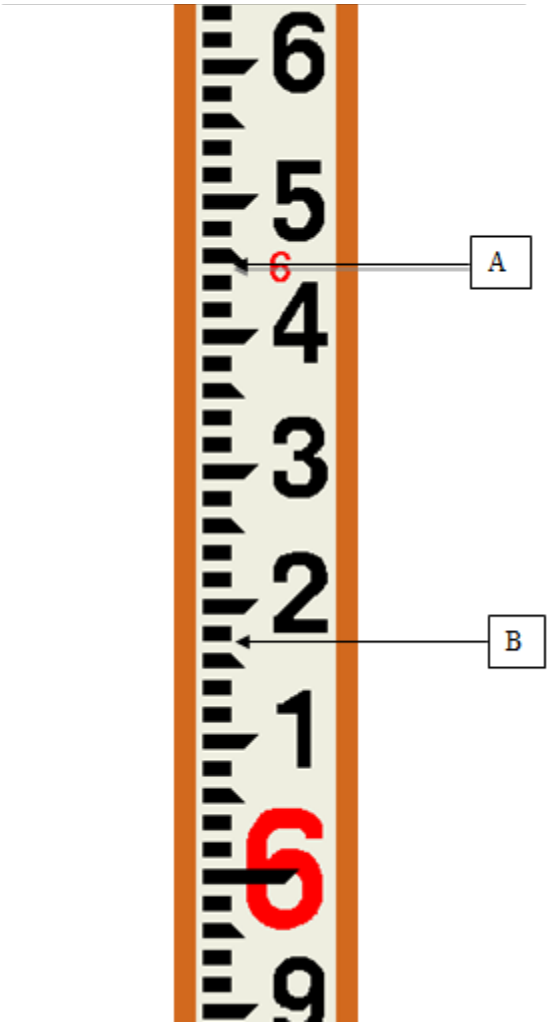
3) What is the measurement of point #3 in the image above?

A) 3/4”
B) 1 13/16”
C) 1 14/16”
D) 1 9/16”

4) What is the distance between points #1 and #3 on the tape measure?

A) 1/2”
B) 15/32”
C) 7/16”
D) 9/16”

Note: Use this image below to answer questions five and six.



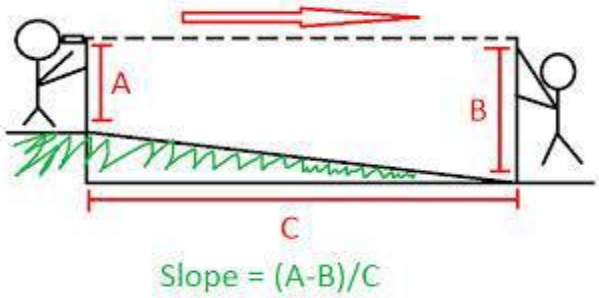
5) Using the surveying rod in the image on the previous page, what is the reading at point “A”?

A) 1.50
B) 6.50
C) 6.05
D) 6.45

6) Using the surveying rod in the image on the previous page, what is the reading at point “B”?

A) 1.70
B) 6.17
C) 6.15
D) 6.50

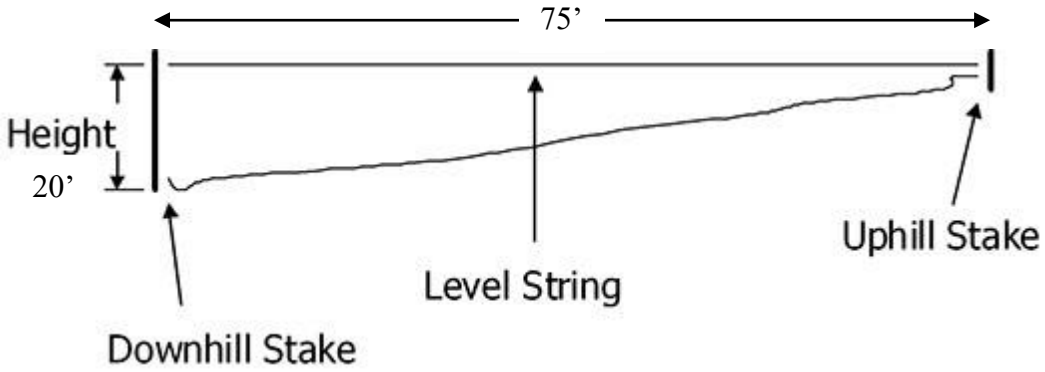
Note: Use this image below to answer question seven.



7) Assume that you are assisting on a job site and want to help prepare the site to lay a level pad of cement for a new feed silo. In order to minimize costs, you will need to determine if there is any slope over the 6’ site. If there is more than 3% slope, you will need to backfill the area that slopes off to ensure that costs remain low. Using the measurements taken at A and B in the image on the previous page, what is the percent slope?

A) 0.27%
B) 0.45%
C) 2.7%
D) 4.5%

Note: Use this image below to answer question eight.



8) Using the information in the figure at the bottom of the previous page, calculate the percent slope for the worksite of your concrete pad.

A) 20%
B) 26%
C) 75%
D) 95%

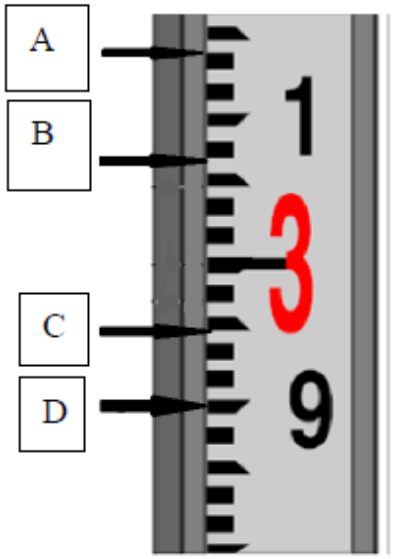
9) How many acres does one section of land contain?

A) 660 acres
B) 740 acres
C) 640 acres
D) None of the above

10) Approximately how many acres are in a rectangular field that measures 1000 by 375 yards?
Hints: Area of a rectangle is the length multiplied by the width.
1 yard = 3 feet; 1 acre = 43,560 ft^2

A) 8.61 acres
B) 17.55 acres
C) 77.48 acres
D) 16,355,000,000 acres

Note: Use the arrows pointing to the Philadelphia rod to answer questions eleven through fifteen.



11) What is the measurement scale on the rod shown?

A) Metric
B) Engineer's
C) Standard
D) None of the above

12) What is the measurement shown for point “A”?

A) 3 meters 14 cm
B) 3.14 meters
C) 3 feet 1.4 inches
D) 3.14 feet

13) What is the measurement shown for point “B”?

A) 3 feet 7 inches
B) 3 meters 7 cm
C) 3.07 feet
D) 3.07 meters

14) What is the measurement shown for point “C”?

A) 2 feet 9.5 inches
B) 2 meters 9.5 cm
C) 2.95 feet
D) 2.95 meters

15) What is the measurement shown for point “D”?

A) 9 feet
B) 2.90 feet
C) 2.90 meters
D) 2 feet 9 inches

Iowa State FFA Agricultural Mechanics Career Development Event 2019

State of Iowa
Department of Education
Iowa State University
Department of Agricultural Education and Studies

DO NOT WRITE ON THIS DOCUMENT

Electrical Systems
Electrical Problem-solving Exam

1) Identify this electrical tool.

A) Receptacle tester
B) Volt meter
C) Digital multimeter
D) Amperage determination tool

2) Identify this electrical tool.

A) Receptacle tester
B) Solenoid voltage tester
C) Outlet detector
D) Three-pronged switch

3) Regarding safety labels, a label box marked "Danger" is colored _____ and indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

A) Red
B) Yellow
C) Orange
D) Neon Green

4) What is the name of this tool?

A) Standard / flathead screwdriver
B) Chisel
C) Screw navigator
D) Pry bar

5) What is the most suitable purpose of the tool in question four?

A) Pry objects apart
B) Turn screws in a certain direction
C) Guide wire through conduit
D) Strip coating off wires

6) What does the 2 on a strip of 12-2 wire indicate?

A) Type of metal used in the wires
B) Wire gauge
C) Length of the wires inside
D) Number of wires inside

7) What does the 12 on a strip of 12-2 wire tell you?

A) Type of metal used in the wires
B) Wire gauge
C) Length of the wires inside
D) Number of wires inside

8) Which of the following wires is the largest in diameter?

A) 20-gauge
B) 14-gauge
C) 30-gauge
D) 12-gauge

9) If you were going to operate power tools off a fifteen-amp duplex outlet, which of the following tools could be used?

A) Two 10-amp band saws
B) Three 6-amp angle grinders
C) One 16-amp drill press
D) Two 5-amp jig saws

10) Resistance to the flow of electricity is measured in _____.

A) Amps
B) Ohms
C) Watts
D) Volts

11) In a typical strip of 12-3 wire, which color wire is regarded as the traveler wire?

A) Blue wire
B) White wire
C) Red wire
D) Black wire

12) In a typical strip of 14-2 wire, which color wire is regarded as the ground wire?

A) Bare copper wire
B) White wire
C) Red wire
D) Black wire

NOTE: For questions thirteen through fifteen, please refer to the Electrical Calculation Formulas chart below.

Electrical Calculation Formulas

$I=E/R$

$R=E.I$

$E = IR$

$P=IV$

$I = P/V$

$V= P/I$

13) A direct current (DC) electric motor transforms three kilowatts (kW) of electrical energy into mechanical form. If the electric motor's operating voltage is 1,500 volts, how much current does it "draw" when operating at full load (i.e., full power output)?

A) 2 amps
B) 500 amps
C) 2 ohms
D) 4,500 ohms

14) What is the resistance of a circuit that draws 0.02 amps with 24 volts applied?

A) 0.48 amps
B) 0.48 volts
C) 8.3 amps
D) 1,200 ohms

15) Find the current through a 10-ohm resistive circuit when 15 volts are applied.

A) 1.5 amps
B) 1.5 volts
C) 150 amps
D) 0.67 ohms

Iowa State FFA Agricultural Mechanics Career Development Event 2019

State of Iowa
Department of Education
Iowa State University
Department of Agricultural Education and Studies

DO NOT WRITE ON THIS DOCUMENT

Machinery and Equipment Systems
Small Engines Problem-solving Exam

1) A four-stroke engine gets its name from _____.

A) The number of cylinders it has
B) The number of piston movements during a combustion cycle
C) The number of valves used in its design
D) The number of engineers who designed it

2) A two-stroke engine gets its name from _____.

A) The number of cylinders it has
B) The number of piston movements during a combustion cycle
C) The number of valves used in its design
D) The number of engineers who designed it

3) Which stroke follows the exhaust stroke?

A) Compression
B) Intake
C) Power
D) Spark

4) To complete one operating cycle, the crankshaft of a four-stroke engine must make _____.

A) One-half of a revolution
B) Three revolutions
C) Four revolutions
D) Two revolutions

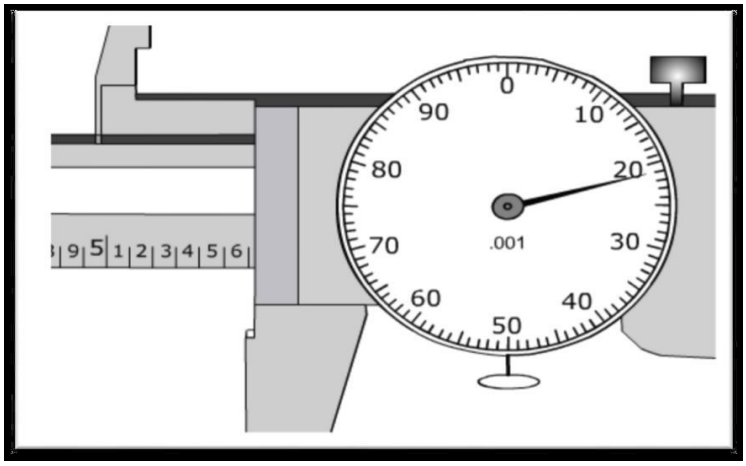
5) To complete one operating cycle, the crankshaft of a two-stroke engine must make _____.

A) One-half of a revolution
B) One revolution
C) Four revolutions
D) Two revolutions

6) What is the correct order of the strokes in a four-stroke engine?

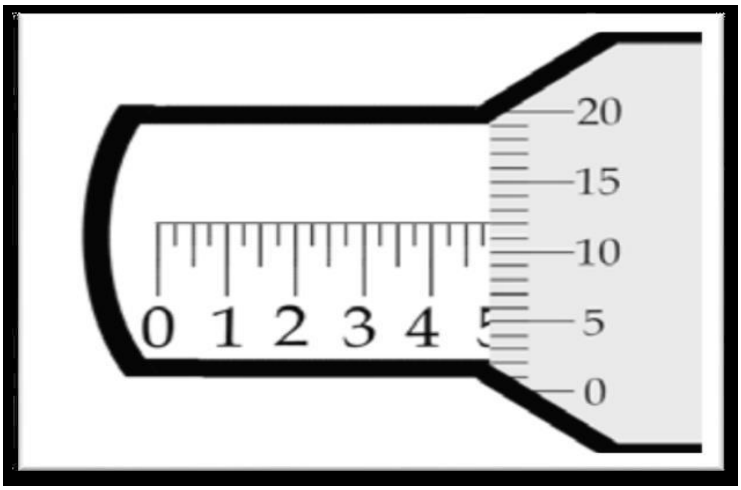
A) Intake, combustion, power, exhaust
B) Intake, compression, spark, exhaust
C) Intake, compression, power, exhaust
D) Exhaust, intake, power, compression

7) What measurement is indicated on the dial caliper below?



A) 5.623
B) 5.621
C) 6.520
D) 5.622

8) What measurement is indicated on the micrometer below?



A) .512
B) .500
C) .487
D) .475

9) Identify this part commonly found within small gas engines.

A) Piston
C) Connecting rod
B) Cylinder
D) Cylinder hone

10) Identify this part commonly found within small gas engines.

A) Valve
C) Spark plug
B) Glow plug
D) Fuel-air mixture igniter

11) Identify this part commonly found within small gas engines.

A) Camshaft
C) Gear wheel
B) Crankshaft
D) Engine pulley

12) Identify this part commonly found within small gas engines.

A) Camshaft
B) Crankshaft
C) Gear wheel
D) Engine pulley

13) Identify this tool commonly used in small gas engine repair.

A) Ring compressor
B) Cylinder cleaner
C) Valve spring retainer
D) Cylinder hone

14) Identify this tool commonly used in small gas engine troubleshooting.

A) Pressure tester
B) Spark plug cleaner
C) Spark tester
D) Sparkler

15) Identify this tool commonly used to make measurements on small gas engine parts.

A) Vernier caliper
B) Micrometer
C) Ring compressor
D) Valve clearance guide

Iowa State FFA Agricultural Mechanics Career Development Event 2019

State of Iowa
Department of Education
Iowa State University
Department of Agricultural Education and Studies

DO NOT WRITE ON THIS DOCUMENT

Metals and Welding
Shielded Metal Arc Welding / Arc Welding Problem-solving Exam

1) The minimum shade of lens that should be used during the SMAW process is a number ____ lens.

A) 10
B) 5
C) 8
D) 12

2) Identify this tool used during the SMAW process.

A) Slag hammer
B) Chipping hammer
C) Wire hammer
D) Angled hammer

3) Identify this tool used during the SMAW process.

A) Grill brush
B) Hair brush
C) Wire brush
D) Steel brush

NOTE: For questions four and five, please use the Miller Weld Settings Calculator provided at your station.

4) If you are using an E7018 electrode that measures 1/8" in diameter to weld mild steel, what is the suggested amperage range that should be used when setting up your welding machine?

A) 110 to 165
B) 200 to 275
C) 320 to 400
D) 65 to 100

5) If you are using an E6013 electrode that measures 3/32" in diameter to weld mild steel, what is the suggested amperage range that should be used when setting up your welding machine?

A) 105 to 180
B) 40 to 90
C) 150 to 230
D) 80 to 130

6) _____ is the amount of time in a 10-minute period that the welding machine can be operated at a specified current without overheating.

A) Duty cycle
B) Operating period
C) Duty period
D) Cycle of operation

7) What does the 60 on an E6013 welding electrode tell you?

A) Position
B) Tensile strength
C) Filler rod type
D) Current type

8) Breathing in zinc when welding galvanized metal can result in experiencing ____-like symptoms.

A) Cold
B) Sinus infection
C) Flu
D) Allergy

9) _____ is the process in which metal pieces are joined by heating them to a temperature high enough to cause them to melt and fuse into a single piece.

A) Brazing
B) Welding
C) Soldering
D) Arcing

10) You are using an E7018 welding electrode to weld a butt joint. Assuming the weld is performed correctly, how many pounds per square inch of pressure would it take to separate the joint?

A) 70
B) 70,000
C) 7,018
D) 18,000

11) You are using an E6011 welding electrode when welding mild steel. In which of the following positions could you use this electrode successfully?

A) Overhead
B) Vertical
C) Flat
D) All positions

12) You are using an E6013 welding electrode when welding mild steel plate, and your welding machine is set up to run either alternating (AC) or direct current (DC). Which of the following current types could you use to successfully weld with this electrode type?

A) AC-
B) DC+
C) DC-
D) Any current type can be used

13) Which of the following issues is the most likely to cause a thin, narrow, string-like welding bead?

A) Travel speed too fast
B) Travel speed too slow
C) Arc length too short
D) No electricity

14) Which of the following issues is the most likely to cause an overly wide and thick-looking welding bead?

A) Travel speed too fast
B) Travel speed too slow
C) Arc length too long
D) Too much electricity

15) Which of the following issues is the most likely to cause undercut in a welding bead?

A) Travel speed too fast
B) Correct electrode size and type
C) Arc length too short
D) Welding current too high

Iowa State FFA Agricultural Mechanics Career Development Event 2019

State of Iowa
Department of Education
Iowa State University
Department of Agricultural Education and Studies

DO NOT WRITE ON THIS DOCUMENT

Structural Systems
Plumbing Problem-solving Exam

1) Regarding pipe types, what do the letters "PVC" stand for?

A) Polyvinyl Chloride
B) Pipe Vent Cleaner
C) Plastic Varnished Compound
D) Primed Vapor Conduit

2) Identify this fitting commonly used in plumbing systems.

A) Tee
B) Elbow
C) Cap
D) Coupling

3) Identify this fitting commonly used in plumbing systems.

A) Tee
B) Elbow
C) Cap
D) Coupling

4) Identify this fitting commonly used in plumbing systems.

A) Tee
B) Elbow
C) Cap
D) Coupling

5) Identify this fitting commonly used in plumbing systems.

A) Tee
B) Elbow
C) Cap
D) Coupling

6) What is the purpose of the fitting shown in question five?

A) Cease the flow of water
B) Change the direction of water flow 90°
C) Change the direction of water flow 180°
D) Reverse the flow of water

7) Regarding pipe types, what do the letters "CPVC" stand for?

A) Certified Polyvinyl Chloride
B) Chlorinated Polyvinyl Chloride
C) Coated Polyvinyl Chloride
D) Constricted Polyvinyl Chloride

8) What is the purpose of using Teflon tape when fittings are threaded onto steel pipe?

A) To inconvenience the plumber
B) To make it easier to uncouple the pipes
C) To make the water more potable
D) To make a watertight seal

9) Regarding irrigation systems used in greenhouses, what is a primary purpose of using timers within these systems?

A) To increase water consumption
B) To water plants at certain time intervals
C) To regulate water quality
D) To cool the greenhouse

10) Regarding hydroponics systems, why should the plumbing system be constructed of PVC plastic pipe and fiberglass?

A) Because PVC pipe is the cheapest pipe type
B) Because nutrient solution flows easier within PVC pipe systems
C) Because PVC pipes have what plants crave
D) Because of the corrosive nutrient solution used in the hydroponics system

11) Regarding fluid dynamics in a plumbing system, _____ Principle states that as the diameter of a pipe containing a flowing fluid increases, the pressure at that point decreases; likewise, the speed of the fluid's flow increases at that point.

A) Boyle's
B) Bernouilli's
C) Hainline's
D) Pascal's

12) Regrading pipe sizing and identification, what do the letters "ID" stand for?

A) Inside diameter
B) Inner diameter
C) Inner-pipe diameter
D) Inter-dimensional diameter

13) Which of the following is considered a disadvantage of using copper pipe for plumbing systems?

A) Low initial cost
B) High degree of expansion
C) Bad water taste created if the water is basic
D) There are no disadvantages to using copper

14) Identify this tool that is commonly used for holding pipe and fittings.

A) Bench yoke vise
B) Machinist's vise
C) Chain vise
D) Chain wrench

15) While you are working to help finish assembling a plumbing system in a greenhouse, you encounter two PVC pipes of differing sizes that need to be joined together. Which of the following fitting types would you most likely use to connect these two pipes and complete the plumbing system?

A) Coupling / Union
B) Elbow
C) Cap
D) Reducer / Bushing