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Name: <i>Key</i>	School: <i>Key</i>	
Group Number: <i>Key</i>	Individual Number: <i>Key</i>	Score:

2019 Minnesota Agricultural Mechanics Career Development Event

Power and Machinery

Planter

Skill 25 points / Problem solving. 25 points



1. How many Square feet are in an acer? 43,560
2 Points
2. How many square feet are in 1/1000th of an acer? 43.56
2 Points
3. Figure seed per lbs. For an 80,000 kernel bag of seed that weighs 45 lbs..? 1,800
2 Points
4. Figure initial planter vacuum level setting based on seeds per lbs. For a standard corn disk?
8.5 inches of water or inches of Vacuum *2 Points*
5. Figure initial planter vacuum level setting based on seeds per lbs. For a small corn disk?
11.5 inches of water or inches of Vacuum *2 Points*
6. Figure initial planter vacuum level setting based on seeds per lbs. For a large sweet corn disk?
13.5 inches of water or inches of Vacuum *2 Points*
7. Figure initial planter vacuum level setting based on seeds per lbs. For a sun flower / popcorn disk? NA *2 Points*
8. Which seed disk part # is recommended for uniform rounds based on seeds per lbs. figured in question 3? A432152 *Points*
9. Which seed disk part # is recommended for non-uniform (mixed shapes) based on seeds per lbs. figured in question 3? A52391 *2 Points*
10. Planter vacuum that is set to high will cause both Skips and Doubles. *2 Points*
11. How many feet of row would have to be measured off to check planter performance on 30" rows to equal 1/1000th of an acer? *2.5Points* 17.42
12. Figure the plant to plant spacing in corn planted at 35,000 population be? 5.97" OR 6"
2.5Points
 $30/12 = 2.5$ $43.56/2.5 = 17.42$ $17.42 \times 12 = 209.04$ $209.04/35 = 5.97"$ *OR 6"*

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-
- 1) The planter bar needs to be 20" to 22" from the ground when planting.
2 Points
 - 2) To remove a left opener disk which direction does the nut have to be turned?
Right / Left *1 Point*
 - 3) A properly adjusted double-disk opener will create a V bottom?
1 Point
 - 4) An improperly adjusted double-disk opener creates a W bottom?
1 Point
 - 5) Measure opener disk point of Contact? 2" Ok / Adjust
1 Points
 - 6) How is opener disk point of Contact increased? Remove shims from center
1 Point
 - 7) How is opener disk point of Contact decreased? Add shim to Center
1 Point
 - 8) Measure opener disk diameter 36.5 cm 14 3/8" Inch Replace / Keep in service
4 Points
 - 9) How is Gauge Wheel Arm and Equalizer ware compensated for to insure uniform depth across the planter? Index all row units with 2" boards
1 Point
 - 10) Gauge Wheel to opener Disk maximum allowable clearance is? 1.5 mm 1/16 inch
2 Points
 - 11) Inspect seed disk is this the right seed disk for this seed size? Yes / No
1 Point
 - 12) Seed Disk off Season Storage? Horizontal / Vertical
1 Point
 - 13) What annual pre-season maintenance needs to be done on seed disks?
2 Points Wash & Coat with slip plate or graphite spray
 - 14) Seed disk to meter housing clearance is about the thickness of a?
1 Point Business Card
 - 15) Meters equipped with a Double Eliminators are set initially by covering half of the seed cell. *1 Point*
 - 16) Check meter Double Eliminators for initial adjustment Ok / Adjust
adjustment Spec.? mm 3/32 inch *4 Points*

2.5MM 3/32"

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2019 Minnesota Agricultural Mechanics Career Development Event
Power and Machinery
Large Engine

30 minutes

Skill & Problem 50 points

- (Two point) identify this tool. Piston ring compressor
- (Four point) Identify the intake valve - Circle one A or B
- (Two point) identify this bolt Carriage Bolt
- (Four point) what is the torque of a 9/16 - 12 grade 8 dry bolt? (List in foot pounds.) 150
- (Four point) Using the sheet provided. What size drill bit is used to tap a 7/16 coarse thread bolt. u
- (Two points) this tool is used for:
A. measure preload
B. measure sleeve height
C. measure shaft movement
D. measure backlash
- (Four points) identify this bolt.
A. Length 60.
B. Diameter of this bolt 12.
C. Identify the threads of this bolt 1.75.
- (Two points) identify the two sleeves. Circle the correct answer.
A. wet or dry
B. wet or dry
- (Four points) measure the valve recession. .115

+/- : 004 ↗

10. (Two point) identify this part. Starter
11. (Four points) Measure the cam lift of the this camshaft .255
12. (Four points) identify this bolt.
- 2 a. Length 4
- 1 b. Diameter of this bolt 1/2
- 1 c. Identify the threads of this bolt 13.

For the following questions identify the components on engine

13. (Two points) - .004 x 1 - .001
14. (Two points) - 115 h/p 1800 Rpm
15. (Two points) - Alternator 12 volts 55 Amps
16. (Two points) - Water Pump
17. (Two points) - oil cooler
18. (Two points) - Rocker arm

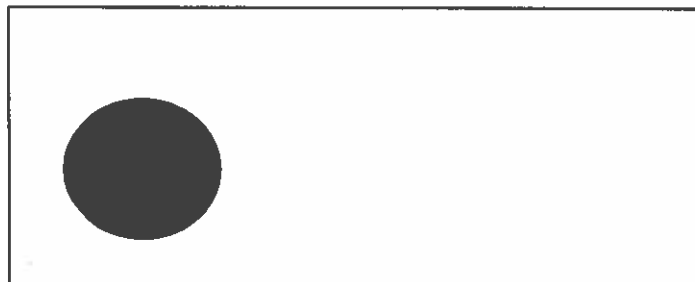
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2019 Minnesota Agricultural Mechanics Career Development Event
Metal Fabrication (Welding skill)



INSTRUCTIONS

1. Select a base plate and a piece of pipe for your welding skill.
2. You may run practice welds on one side of the base plate to set your welder.
3. After you have set your welder, flip the base plate over to weld the pipe as shown above.

WELDING EXERCISE

1. Position the pipe 1/2 inch from each edge on the corner of the plate.
 2. Tack the pipe to be welded in the proper position.
 3. Run a 2 inch bead on middle the remaining space of the base plate.
 4. Cool the weld in the water furnished.
 5. Label your weld with your name and school.
 6. Turn in to your group leader.
-
1. What is the thickness of the base plate you are welding? _____ (1 pt.)
 2. What is the diameter of the pipe that you are welding? _____ (1 pt.)

Evaluation Score Sheet

- | | |
|-----------------------------------|------------------------|
| Safety and Work Habits | _____ (4 pts.) |
| Proper position of the pipe | _____ (4 pts.) |
| Pipe to base plate weld quality | _____ (10 pts.) |
| Weld quality of the two inch bead | _____ (5 pts.) |
| TOTAL POINTS: | _____ (25 pts.) |

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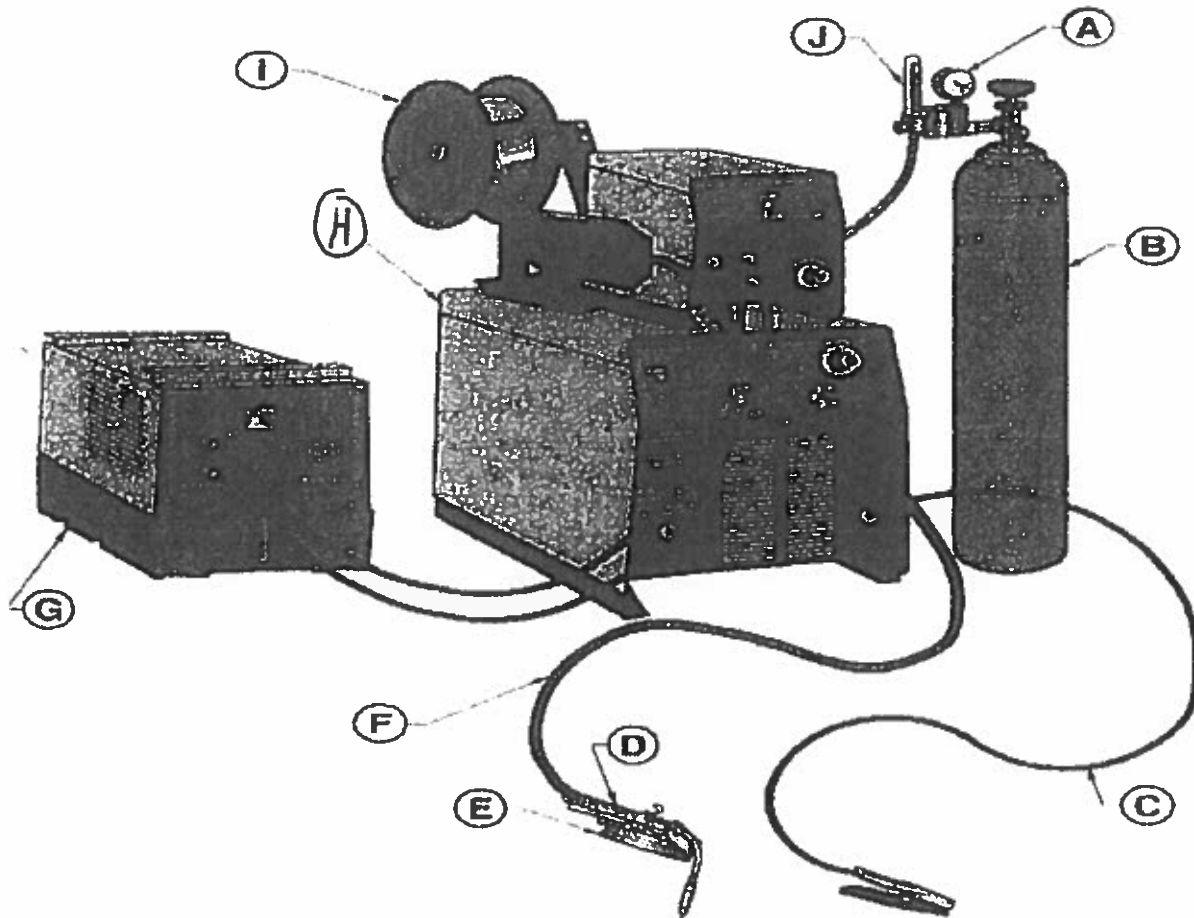
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2019 Minnesota Agricultural Mechanics Career Development Event
Metal Fabrication (Welding, Cold Metal)

30 minutes

Skill & Problem 50 points



A. Identify the parts of the MIG welder (1 point each) 10 points total

- I 1. Wire electrode
- G 2. CV power source
- E 3. Heat Shield
- B 4. Shielding gas
- A 5. Shielding gas regulator

- J 6. Flowmeter
- H 7. Water coolant system
- D 8. Welding gun
- C 9. Ground
- F 10. Welding gun cable

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2019 Minnesota Agricultural Mechanics Career Development Event
Concrete, Masonry, & Plumbing

30 minutes

Skill & Problem 50 points

Plumbing Skill 25 points

Read Operational Procedures and Study Illustration
Use Appropriate Safety Equipment

****1/2 of Contestants will solder while the other are flaring****

Single Flare Exercise:

1. Select a precut piece of copper tubing from the tubing stock or use the opposite end of the soldered tube.
2. Recut/prepare the end of the tubing prior to flaring
3. Install into flaring tool and tighten down, flare tubing
4. When you have achieved the desired flare remove from tool.
5. If you have completed both flaring and soldering turn your project and this sheet to the event judge otherwise prepare to move to the next area.
(label your project with your name and school before turning into judge)

Soldering Exercise:

1. Select a piece of copper tubing from the tubing stock or use the opposite end of the flared tube.
2. Obtain a coupler fitting from the event judge
3. Clean joint to be soldered
4. Apply flux to components
5. Light the torch and adjust the appropriate flame
6. Complete solder joint, cool in water container and clean
7. If you have completed both soldering and flaring turn your project and this sheet to the event judge otherwise prepare to move to the next area.
(label your project with your name and school before turning into judge)

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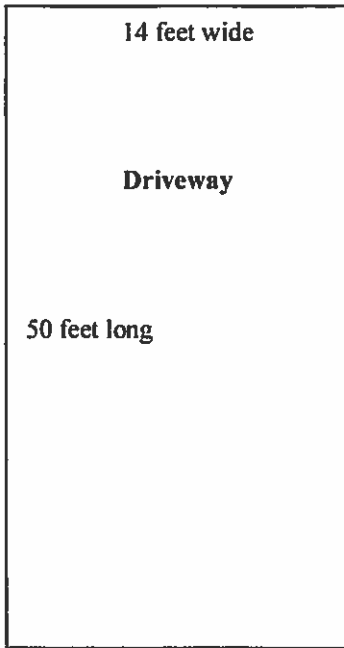
Plumbing Evaluation Score Sheet

Item	<u>Possible Score</u>	<u>Points earned</u>
1. Safety and Work Habits	2	_____
2. Flare-Correct taper	5	_____
3. Flare-Clean and smooth edge	5	_____
4. Solder joint-joint seated and bonded	5	_____
5. Solder joint-amount of Solder	5	_____
6. Neatness of Completed project	3	_____

Total Possible 25
(over)

Total points _____

1. You have decided that you want a concrete driveway in front of your machine shed. Because of the weight of some of the equipment the concrete slab needs to be 6 inches thick. All questions are worth 3 pts.



A. Calculate the amount of ready-mix that is needed? (Round up to half yards)

$$14 \times 50 \times .5 = 350 \text{ cu ft} / 27 = 12.96 = 13 \text{ yds}$$

B. The cost of ready-mix is \$162.00/yard. How much would it cost to do the job? 13 cu. Yards

$$\begin{array}{r} 162 \\ \times 13 \\ \hline \end{array}$$

$$\begin{array}{r} \$ \\ \$ 2106^{00} \\ \hline \end{array}$$

C. Steel reinforcing mesh is sold in 5 ft. X 75 ft. rolls. The entire slab will have wire mesh overlapped 6 inches. Run the mesh the long way. How many rolls will you need to do the job?

$$\begin{array}{l} 5 \text{ ft} \\ 4 \text{ ft} \\ 3 \text{ ft} \\ 4 \text{ ft} \\ 5 \text{ ft} \end{array} \quad \begin{array}{l} 2 \times 75 = 150 / 50 = 3 \text{ RYH} \\ 3 \times 50 = 150 / 75 = 2 \end{array}$$

D. If the wire mesh sells for \$ 68.50 a roll. How much will the wire mesh cost? 2 roll

$$\begin{array}{r} \$ \\ \$ 137^{00} \\ \hline \end{array}$$

E. The total job is expected to take 4 people 8 hours to form up and pour. If the workers receive \$ 23.00 per hour. What would the labor cost for the job?

$$4 \times 8 = 32 \quad 32 \times 23 =$$

$$\begin{array}{r} \$ \\ \$ 736^{00} \\ \hline \end{array}$$

2. Identify the following concrete, masonry, or plumbing items. (1 points each)

A. PEX Pipe

F. Rebar Wire Tyer or Twister

B. Brick Chisel

G. PEX Crimper

C. Union

H. Pointing Trowel

D. Rebar Stand

I. Brass PEX Fitting

E. Faucet Wrench

J. CPVC Pipe

Pointing Trowel

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2019 Minnesota Agricultural Mechanics Career Development Event

Electric Motors, Controls and Sensing Devices 30 minutes

Electric Motors, Controls and Sensing Devices Skills 25 points

Word Bank

Stator- Amps- Governor- Thermal protector- Volts- Bendix- Delta- Capacitor- End bell-

Magnetic contactor- Commutator- Thermistor- Split phase- Watt- Centrifugal switch-

Wound rotor- Wye- Torque- Squirrel cage rotor- Ohm- Brush phase convertor- Heater-

Voltage- Burner control- Resistance- Pressure switch- Rated temperature rise- Frame-

Time delay- Mercury switch- Photo electric switch- Potentiometer- Micro switch

- (4 points) Station 1 - Identify this device Pressure Switch
 What voltages can this device operate at 115 - 230 or 32 = -1
 Is this device adjustable YES
- (3 points) Station 2- Observe the nameplate on the motor and answer the questions What phase is this motor 3
 What voltage is this motor wired for 208 - 230
 What would you do to change the rotation of this motor change any two power wires
- (4 points) Station 3- What phase is this circuit breaker 3
 Poles 1-3 can operate on how many volts 415 or 250
 Poles 1-3 can carry how many amps 30 or 50
 What is the time delay on poles 1-3 0.3
- (3 points) Station 4- Observe the nameplate on the motor and answer the questions
 What is the phase of this motor Single
 What voltage is this motor wired for 115
 What is the rotation of the motor clockwise
- (2 points) - Station 5- Identify this motor controller mercury switch

Use the ohm meter provided and test the component circle your answer.

Pass

Fail

KEY

6. (2 points)- Station 6- This motor is a Capacitor start and Cap AC 1012 run type motor.

7. (1 point)- Station 7- Identify this motor controller. Time Delay

8. (1 point)- Station 8- Identify this motor protection device Heater

9. (1 point)- Station 9- Identify this component Double pole Double throw DPDT

10. (1 point)- Station 10- The frequency controller is driving the induction motor at 30 hertz, the motor has 9 to 1 reduction drive. Read what the rpm is on the photo tachometer and calculate the rpm of the motor _____ rpm

98 - 882

99 - 891

100 - 900

11. (1 point)- Station 11- Test this motor protection device with the ohm meter to determine if it is serviceable then circle the correct answer Pass Fail

12. (1 point)- Station 12- Identify this control device Micro Switch

13. (1 point)- Station 13- Identify this component Photo Electric Switch

Problem Solving 2 ½ points each Circle the correct letter

1. What is the resistance of an air compressor motor that operates on 120 volts of electricity and uses 0.95 amps of electricity? $E = IR$; E = volts, I = amperes, and R = resistance

A 79 ohms

B. 79 watts

C 126 ohms

D 126 watts

2. If an electric motor has a rated speed of 1750 rpm, which size pulley should be installed on the motor to drive a drill press with a four-inch pulley at 875 rpm? Formula: $S \times D = S' \times D'$, S = Speed of motor, D = Diameter of motor pulley, S' = Speed of equipment and D' = Diameter of equipment pulley.

- A. 2
- B. 3
- C. 4
- D. 5

3. If during a calibration time of 1 minute and 30 seconds a feed auger delivers 119.5 pounds of feed to a container weighing 9.5 pounds, how many pounds of feed does the auger deliver per minute of operation?

- A. 68.2
- B. 73.3
- C. 77.2
- D. 81.2

4. If a motor has a rated speed of 3000 rpm and has a 2" pulley, how many rpms will it drive a grain auger with a 10" pulley? $S \times D = S' \times D'$ (S = speed of motor, D = diameter of motor pulley, S' = speed of machine, and D' = diameter of machine pulley).

- A. 400
- B. 600
- C. 650
- D. 700

5. If a drill press uses 1032 watts and operates on 120 volts of electricity, how many amps of electricity does the motor pull?

- A. 5.2
- B. 8.6
- C. 9.7
- D. 10.1

6. You have a 240 volt motor running your aeration fan on your grain bin. You know from the nameplate that the 3 HP motor draws 15 amps and has a power factor of 0.8. You plan on running the fan 24 hours a day for 76 days. If your electricity cost is \$0.07 per kilowatt-hour what will your total cost be?

- A. \$ 73.54
- B. \$ 656.64
- C. \$1575.93
- D. \$ 367.72

KEY

7. You have two motors. The first is a .4 hp split phase motor that is rated at 4.5 amps. The time rating on the motor is CONT and the SF of the motor is 1.4. This motor costs \$35.49. The second motor is a .5 hp split phase motor that is rated at 5.5 amps. The time rating on this motor is CONT and the SF of this motor is 1. This motor costs \$39.95. The application for this motor requires ~ 1/2 hp.

Which is the best motor for the application? (Show your work for partial credit)

$.4 \times 1.4 = .56 \text{ HP} \leftarrow$
 $.5 \times 1 = .5 \text{ HP}$

VOLT	HORSE POWER	DUAL ELEMENT FUSE	CIRCUIT BREAKER	DISTANCE FROM SERVICE PANEL TO MOTOR (Including Vertical Distances)									
				COPPER WIRE						ALUMINUM WIRE			
				=12	=10	=8	=6	=4	=2	=8	=6	=4	=2
115V	1/3 HP	10 AMP	15 AMP	126 FT	201 FT	321 FT	509 FT	811 FT	1288 FT	195 FT	309 FT	492 FT	783 FT
	1/2 HP	15 AMP	20 AMP	92 FT	148 FT	236 FT	374 FT	596 FT	946 FT	143 FT	227 FT	361 FT	575 FT
	3/4 HP	20 AMP	25 AMP	65 FT	105 FT	167 FT	265 FT	423 FT	672 FT	101 FT	161 FT	256 FT	408 FT
	1 HP	25 AMP	30 AMP		90 FT	144 FT	229 FT	365 FT	579 FT	87 FT	139 FT	221 FT	352 FT
	1-1/2 HP	30 AMP	40 AMP		72 FT	115 FT	183 FT	292 FT	463 FT	70 FT	111 FT	177 FT	282 FT
	2 HP	30 AMP	50 AMP		60 FT	96 FT	152 FT	243 FT	386 FT	58 FT	92 FT	147 FT	235 FT
230V	1/3 HP	5.6 AMP	15 AMP	505 FT	806 FT	1285 FT	2036 FT	3246 FT	5154 FT	781 FT	1237 FT	1958 FT	3134 FT
	1/2 HP	7 AMP	15 AMP	371 FT	592 FT	944 FT	1496 FT	2385 FT	3787 FT	573 FT	909 FT	1446 FT	2303 FT
	3/4 HP	10 AMP	15 AMP	263 FT	420 FT	670 FT	1062 FT	1693 FT	2689 FT	407 FT	645 FT	1027 FT	1635 FT
	1 HP	12 AMP	15 AMP	227 FT	362 FT	578 FT	916 FT	1461 FT	2319 FT	351 FT	556 FT	885 FT	1410 FT
	1-1/2 HP	15 AMP	20 AMP	181 FT	290 FT	462 FT	733 FT	1168 FT	1855 FT	281 FT	445 FT	708 FT	1128 FT
	2 HP	20 AMP	25 AMP	151 FT	241 FT	385 FT	611 FT	974 FT	1546 FT	234 FT	371 FT	590 FT	940 FT
	3 HP	25 AMP	35 AMP		170 FT	272 FT	431 FT	687 FT	1091 FT	165 FT	262 FT	416 FT	663 FT
	5 HP	40 AMP	60 AMP			165 FT	261 FT	417 FT	662 FT		159 FT	253 FT	403 FT

8. Using the above table what size copper wire would you use to drive a 5 horsepower unloading auger on a grain bin that is 300 feet from the service panel?

#4

What size circuit breaker?

60 Amp

9. Using the above table what size wire would you need to run the aeration fan in question 6 if the service panel is 150 feet away?

.75 pt each

10 Copper

8 Alum.

What size circuit breaker is needed?

.75 pt each

35 Amp

35 Amp

10. What is the largest motor that can be used on 115 volts?

2 HP

What size of aluminum wire would you use on this motor if it is 150 feet from the service panel?

2