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Name:		School:	
Group Number:	Individual Number:	Score:	

2015 Minnesota Agricultural Mechanics Career Development Event
Metal Fabrication (Mig, Fuel Gas Welding and Cutting; Cold Metal)

MIG, Fuel Gas Welding and Cutting, Cold Metal Skill (20 minutes) Skill 25 points

Read Operational Procedures
Use Appropriate Safety Equipment

MIG Welding Exercise: (10 Points)

1. Select two precut pieces of 3/16th metal.
2. List the machine setting for this welder
3. Follow example of weld to be performed.
4. Complete the MIG weld exercise.
5. Cool the weld in the water furnished.
6. Label your weld with your name and school before turning it in.

MIG welder setting (5 points 1 points for each answer).

1. Look at the MIG welder to find the answers to the following questions.
2. What is the machine settings for this 3/16th piece of metal?

Voltage Range _____

Wire Mode _____

Wire Speed _____

Shielding Gas Flow _____ Cfh

3. What does the letters Cfh stand for? _____

Evaluation Score Sheet

	Safety and Work Habits	5 Points	_____
	Settings	5 Points	_____
	Weld Quality	5 Points	_____
MIG Exercise		10 Points	_____
	Total Possible 25	Total Points	_____

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2015 Minnesota Agricultural Mechanics Career Development Event
MIG, Fuel Gas Welding and Cutting, Cold Metal
Electric Motors, Controls and Sensing Devices

Helpful Items

Problem solving 20 points

Formulas:

$$\text{Low voltage } R(t) = \frac{1}{\frac{1}{R(1)} + \frac{1}{R(2)}}$$

$$\text{kWh} = \frac{W \times \text{hr}}{1000}$$

$$\text{Size} \times \text{rpm} = \text{size} \times \text{rpm}$$

$$E = I \times R$$

$$\text{High voltage } R(t) = R(1) = R(2)$$

$$\text{Overload hp} = \text{SF} \times \text{hp}$$

$$W = \text{Volts} \times \text{Amps}$$

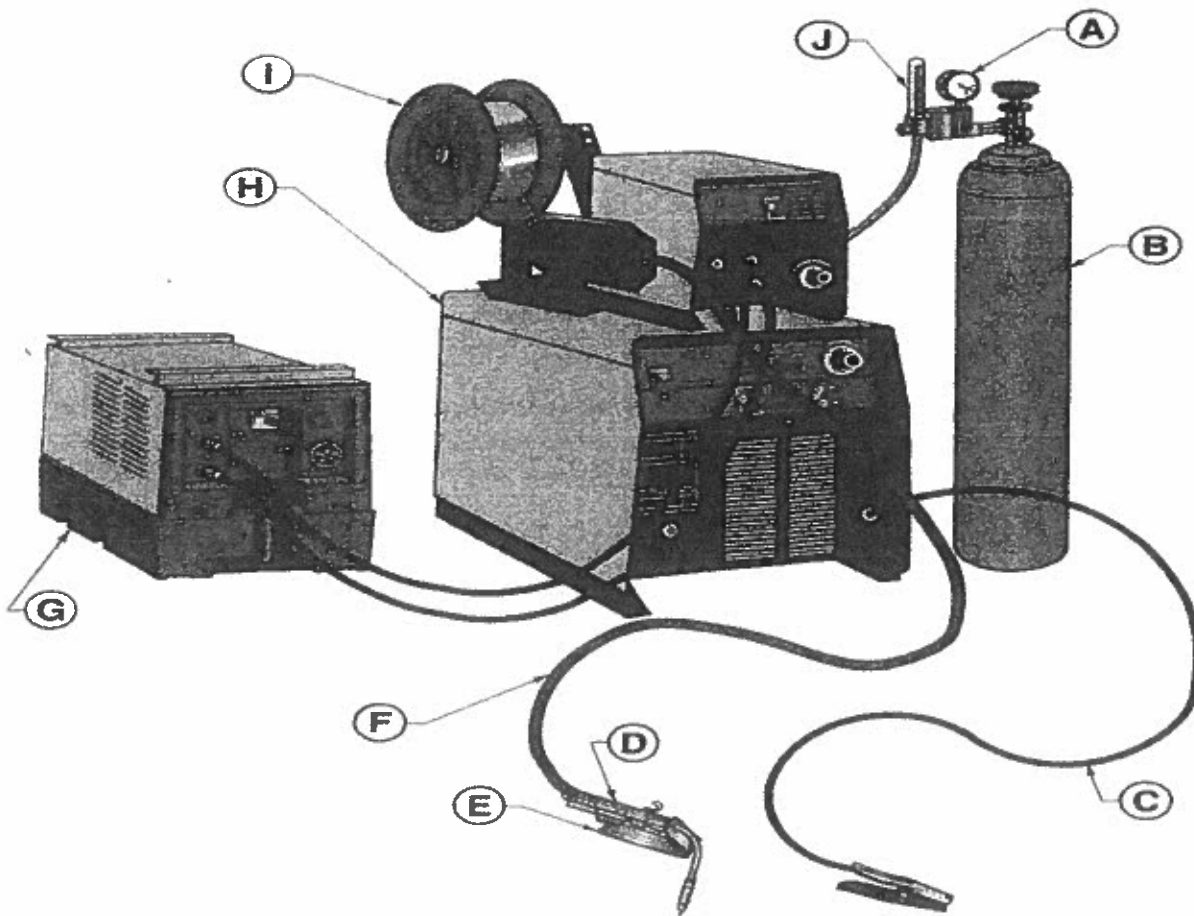
$$\text{Overload amps} = I \times \text{SF}$$

You have an electric motor that can be wired for dual voltage (120) or (240) assuming that each set of running windings has a resistance of 30 ohms. Answer the following questions.

1. (2 pts.) What is the total resistance of the running windings when the motor is wired for high voltage?
2. (2 pts.) What is the total resistance of the running windings when the motor is wired for low voltage?
3. (2 pts.) How many amps of current does it draw when it is wired for low voltage?
4. (2 pts.) How many amps of current does it draw when wired for high voltage?
5. (1 pt.) You have an auger that needs to turn at 450 rpm. The auger has a 12 inch pulley what size pulley does the motor need if the motor turns at 1750 rpm?
6. (1 pt.) A three quarters hp electric motor with a service factor of 1.15 could be expected to deliver _____ hp output.

Identify the parts of the MIG welder

- | | |
|----------------------------------|-------------------------------|
| _____ 1. Wire electrode | _____ 6. Flowmeter |
| _____ 2. CV power source | _____ 7. Water coolant system |
| _____ 3. Heat Shield | _____ 8. Welding gun |
| _____ 4. Shielding gas | _____ 9. Ground |
| _____ 5. Shielding gas regulator | _____ 10. Welding Gun cable |



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2015 Minnesota Agricultural Mechanics Career Development Event

Concrete, Masonry, and Plumbing

20 Minutes

Skill 25 points

Concrete, Masonry, and Plumbing

PVC Exercise (9 points)

1. Cut two pieces of PVC. One should be 2 5/8" and one 3 3/8" long.
2. Select one coupling.
3. Prepare and connect all three parts together.

Copper Soldering Exercise (9 points)

1. Cut two pieces of copper tubing. One should be 3 1/4" and one 2 5/8" long.
2. Select one coupling.
3. Prepare tubing and coupling for soldering.
4. Place the 3 1/4" end vertically into a vice for soldering
5. Light the propane torch with a friction lighter and solder the joints.
6. Use a pliers and cool the soldered joint in the water provided.
7. Place masking tape on the tubing with your name and contestant number.
8. Turn in the completed project.

Concrete, Masonry, and Plumbing questions (one point each)

1. Which material on the table is PEX? _____
2. What is the name of this concrete tool? _____
3. What is the name of this galvanized steel fitting? _____
4. Which side of this concrete block is the top side? A or B Circle correct answer.
5. The tool on the bench is used to determine the wetness or dryness of a concrete mix. What is the name of the test? _____ Test.

(OVER)

6. What is the name for this concrete block? _____

7. What is the purpose of the straight piece of lumber on the bench?

Evaluation Score Sheet

PVC Exercise

Safety and work habits 3 Points _____

Material preparation 3 Points _____

Quality of PVC joint 3 Points _____

Copper Soldering Exercise

Safety and work habits 3 Points _____

Material preparation 3 Points _____

Quality of solder joint 3 Points _____

Concrete, Masonry, and Plumbing Questions

7 Points _____

Total Points 25

Total Points _____

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2015 Minnesota Agricultural Mechanics Career Development Event
Concrete, Masonry and Plumbing
Land Measurement, Leveling and GPS/GIS.

Helpful Items: Problem solving. 20 points

Concrete, Masonry, and Plumbing (two points each)

1. How much would it cost to pour concrete for a 30' x 42' shed? The floor will be 5" thick. Add 5% for waste and variation in forms. Round your answer up to the nearest ¼ yard. The cost of concrete is \$93.00 per cubic yard.

\$ _____

2. How many 8" x 12" x 16" concrete blocks are required to lay a foundation wall for a building 28' x 40' and specified to be courses high?

3. How much mortar will be needed for question #2? _____ Cubic feet round your answer up to the nearest ½ cubic yard.

Use the following information for your calculations.

Wall thickness	for 100 square feet of wall
Inches	Mortar (Cu. Ft.)
8	2.6
12	3.9

4. How many cubic yards of concrete would you need to pour a wall which has a total perimeter of 144' and is 8' tall and 10" thick? Round your answer up to the nearest cubic yard.

_____cubic yards

5. Assume you have decided to construct a 12' x 15' x 4" patio. You are using a 1:2.5:3.5 6 gallon mix. One batch would yield 4.2 cubic feet of concrete. How much of each ingredient would you need?

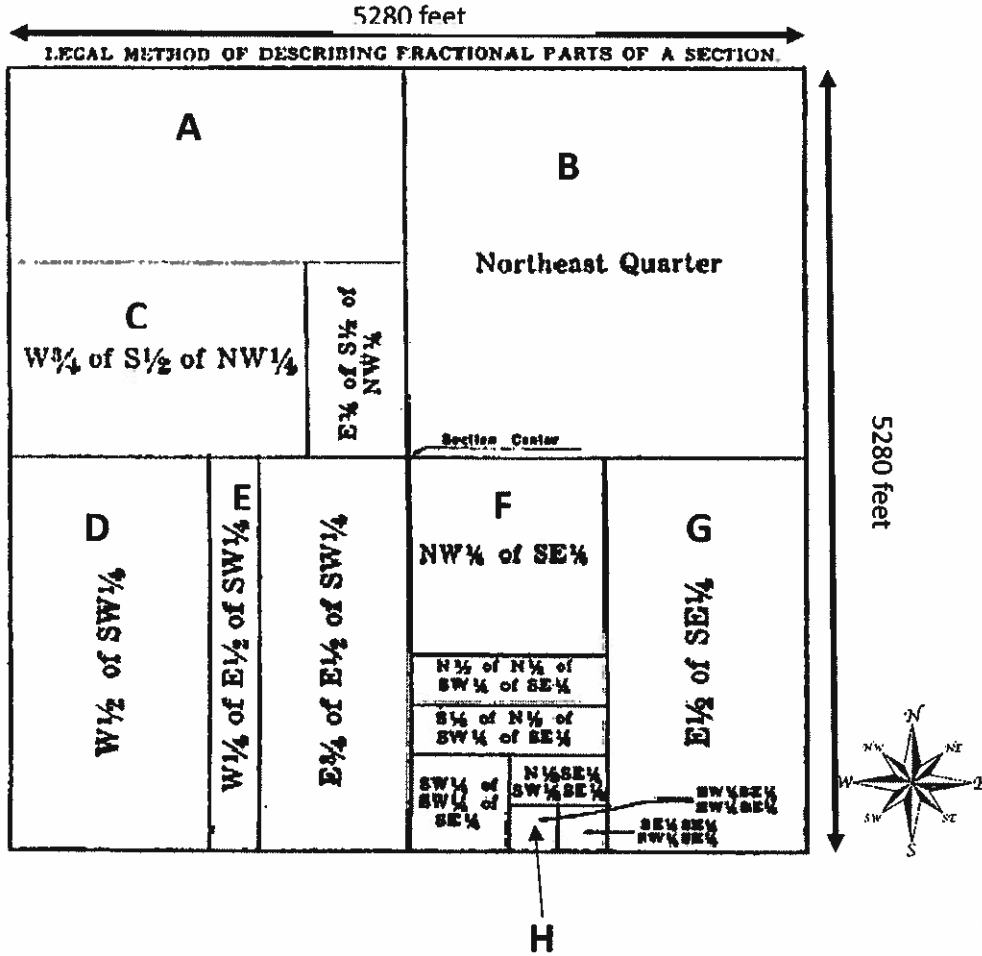
Cement _____ Bags.

Sand _____ Cubic Feet

Gravel. _____ Cubic Feet

Below is a list of legal land descriptions for a typical section of land. A section of land measures 1 mile x 1 mile and contains 640 acres.

Please answer the following questions regarding the image below.



6. Parcel **B** makes up an area of _____ acres. **2pt**
7. The proper legal description for parcel **A** is?
_____ **2pt**
8. If a farmer were to purchase parcels **D** and **E** how many acres would he buy?
_____ **2pt**
9. In feet, what is the length and width measurements of parcel **F**? _____ **2pt**
10. Parcel **H** makes up an area of _____ acres. **2pt**

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2015 Minnesota Agricultural Mechanics Career Development Event
Power and Machinery
Sprayer

20 minutes

Skill 25 points

1. This is used for what purpose? (Two point) _____
2. What is the purpose of this? (One point) _____
3. The number which correctly identifies the suction hose is _____. (One point)
4. The number which correctly identifies the pressure line is _____. (One point)
5. What are the two liquid pumps that this sprayer can be purchased with? (Two points)

6. What are the three ways in which these pumps can be powered or driven? (Three points)

7. How is the pump on this sprayer driven? (One point) _____
8. What type of pump is on this sprayer? (One point) _____

Use the diagram and technical information provided to answer questions 9-13

9. Which of the letters above identifies nozzle type? (One point) _____
10. Which of the letters above identifies nozzle flow rate? (One point) _____
11. Which of the letters above identifies spray angle? (One point) _____
12. Which of the letters above identifies nozzle material type? (One point) _____
13. Which of the letters above identifies nozzle brand name? (One point) _____

14. What brush is used to clean sprayer nozzles? Circle correct answer. (One point)

A.

B.

15. The following XR TeeJet extended range flat spray tips are available in 80°. Which one does not apply? (One point)

A. Stainless steel

B. Brass

C. Polymer

D. Ceramic

Using the XR Teejet nozzle selection guide and technical information sheets answer questions 16-18

16. Choose the best nozzle for the following scenario; (Two points)

Nozzle spacing: 20 inches

Speed: 5 mph

Application rate: 10 gpa

Pressure: 30 psi

Boom height: 30 inches from target _____

17. I have a set of XR11004 teejet nozzles on my sprayer I want to drive 12 mph and apply 10 GPA. What approximate pressure must I run, and what is the suggested minimum boom height range for these nozzles? (Two points)

Nozzle spacing: 20 inches

Speed: 12 mph

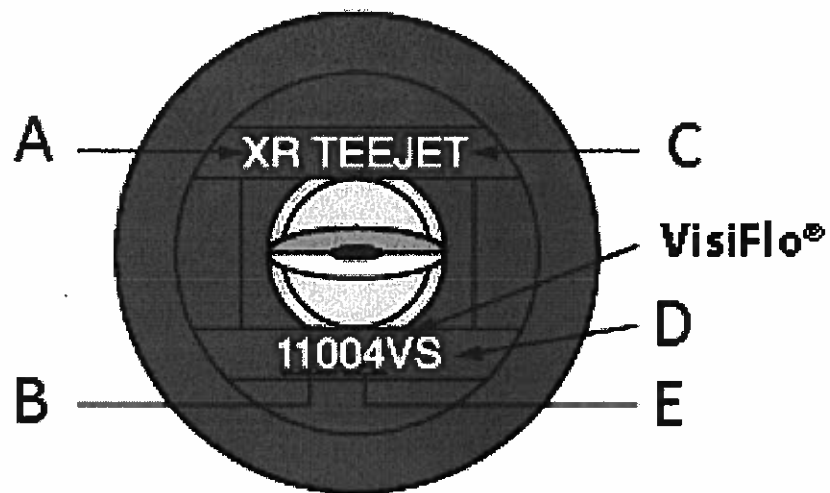
Application rate: 10 gpa

Pressure: _____

Boom height: _____

18. If I am banding an herbicide using a 65 Degree spray angle nozzle, and the nozzle is 12 inches above the ground, what is my band width going to be? (Two point)

Use this diagram to answer questions 9-13



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2015 Minnesota Agricultural Mechanics Career Development Event
Tractor Power
Agricultural Machinery and Equipment -- Sprayer

Problem solving.

20 points

Helpful Items:

πr^2 = circumference of a circle

Torque = F X D

Area of a circle = diameter squared X .7854
squared

area of a circle = 3.14 x radius

1 cc = 16.39 square inch

psi = Pounds per square inch

1 liter = 61.02 cubic inches

Sprayer Calibration Worksheet

1. By using the ounces-to-gallons calibration method, with the spray nozzle spacing of 20 inches how many feet should you drive to determine calibration time?

_____ feet (one point)

- A. 102 ft.
- B. 113 ft.
- C. 204 ft.
- D. 255 ft.

2. You drive the distance you just determined 3 times, with the average time of 27 seconds (5.2 mph). With the sprayer parked, you collect output from each of the 8 nozzles (at 30 psi line pressure), and the results are recorded here.

Nozzle number-	1	2	3	4	5	6	7	8
	^	^	^	^	^	^	^	^
Output in oz.	20	19	19	21	20	15	20	21

What is the application rate of the sprayer? _____ GPA (one point)

- A. 25
- B. 155
- C. 151
- D. 19

You have 150 acres of soybeans that you want to spray. Your sprayer has 8 nozzles set on a 20-inch spacing_ the sprayer has a 500-gallon capacity tank. We are applying 20 gallons per acre.

You plan to use a Pursuit-Select tank mix, using Pursuit 70DG and Select 2EC. The labeled rate is 1 pint of Select and 1.44 ounces of Pursuit per acre. Pursuit is packaged in soluble packets that each treat 5 acres

3. How many acres will one tank cover? _____ (2points)
 - A.20
 - B.25
 - C.50
 - D.35

4. How many times will you fill the sprayer? _____(2points)
 - A. 6
 - B. 5
 - C. 8
 - D. 3

5. How many packets of pursuit will you use per fill? _____ (2points)
 - A. 4
 - B. 5
 - C. 10
 - D. 7

6. How many pints of select will you use per fill? _____ (2points)
 - A. 25
 - B. 20
 - C. 35
 - D. 50

7. (Two Point) what is the cubic inch displacement of this diesel engine with the following information. Six cylinders with bore 4.25, and the stroke of 4.50 inches.
 - A. 383
 - B. 18
 - C. 14.18
 - D. 63.8

8. (One Points) what is the cubic inch displacement of a 8.8 liter engine?
 - A. 536.9
 - B. 436
 - C. 636
 - D. 330

9. (One Points) I have a hydraulic cylinder lifting an implement. The cylinder diameter is 4.5 inches with the stroke of 12 inches. The tractor hydraulic operating system is 2250 psi. What is the maximum force exerted by the cylinder when the cylinder is extending? Mark the closest answer.

- A. 3,578.
- B. 35,784.
- C. 1590.
- D. 43,578.

10. (One Point) The top ring of a piston is called what:

- A. Oil ring
- B. Top groove spacer ring
- C. Compression ring
- D. Expandable ring

11. (One Point) What engine oil pump does not belong?

- A. Piston
- B. Gear
- C. Vane
- D. Balanced vane

12. (One points) the following is a list of functions of the lubrication system. Which one does **not** apply?

- a. lubricate
- b. seals
- c. cools
- d. advances the timing

13. True or False. (One Point) The diesel fuel is brought into the engine along with the intake air system.

14. True or False. (One Point) A diesel engine must have 400 pounds or over of compression for the engine to start.

15. True or False. (One Point) BTDC stands for before top dead center.

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2015 Minnesota Agricultural Mechanics Career Development Event
Power and Machinery
Engine

20 minutes

Skill 25 points

1. (One point) Identify part 1 one the engine.
2. (One point.) What is the recommended service interval for the fuel filter on this tractor?
3. (One point) Identify Part 3 on the engine.
4. (One point) List the slow idle speed for this tractor?
5. (One point) How many cylinders does the engine on this tractor have?
6. (One point) List the firing order for the engine on the Tractor?
7. (Two points.) Measure a crankshaft main bearing journal.
8. (Three points.) Identify this bolt.
 - A. Length _____
 - B. Diameter of this bolt _____.
 - C. Identify the threads of this bolt _____.
9. (Two point) Identify this part number 9
10. (One point) Using the sheet provided. What size drill bit is used to tap a 7/16 course thread bolt. _____
11. (Two points) Measure the valve recession of the identified valve. _____
12. (Two points). Camshaft measure the cam lift.

13. (Three points.) Identify this bolt.

A. Length _____.

B. Diameter of this bolt _____.

C. Identify the threads of this bolt _____.

14. (One point.) What is the torque of a 9/16 - 12 grade 8 dry bolt? (List in foot pounds.) _____

15. (One point.) Identify this bolt _____.

16. (Two points) identify the two sleeves. Circle the correct answer.

A. wet or dry

B. wet or dry

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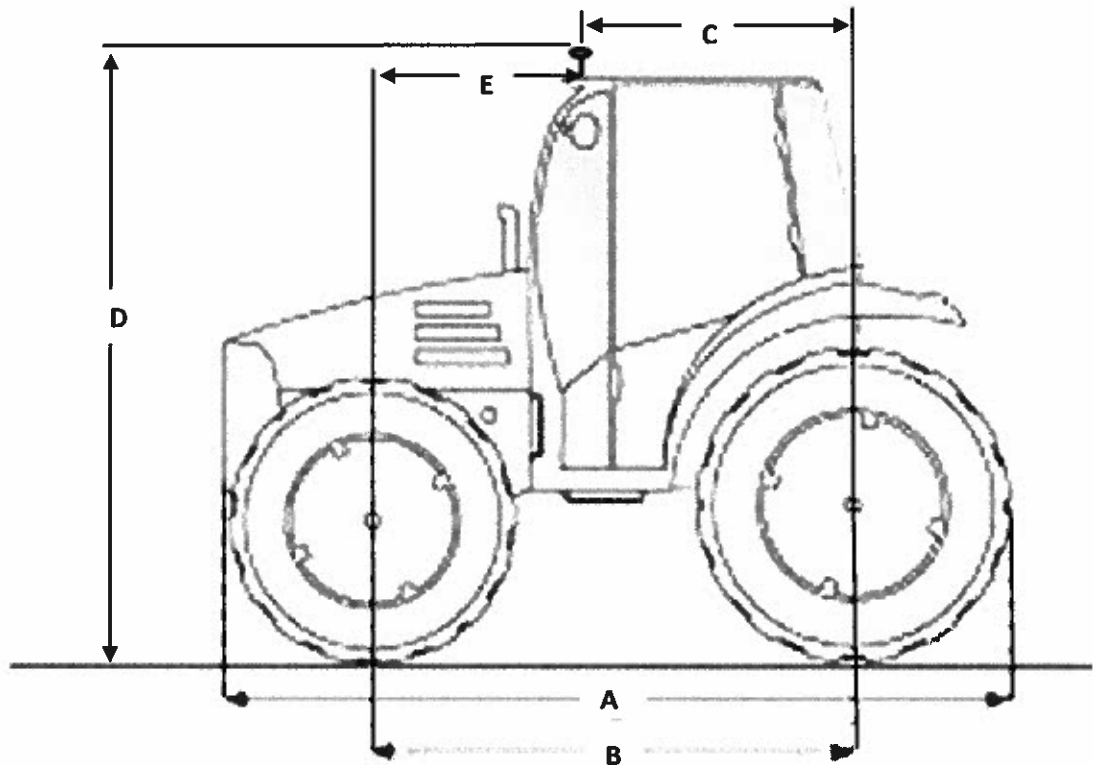
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2015 Minnesota Agricultural Mechanics Career Development Event

Land Measurement, Leveling, and GPS/GIS

SKILL

25 Points



Measurements:

A= 160"

B= 120"

C= 24"

D= 125"

E= 20"

Directions: You have been asked by the dealership manager to help a farmer set up and calibrate a new auto-steer unit that he just purchased. Use the above

diagram (which is the same type of tractor that this system will be installed on) and the supplied quick reference guide to answer the following questions.

Circle the correct answer

1. Vehicle type? 2pt
 - a. Two wheel drive
 - b. Mechanical front wheel drive
 - c. Articulating four wheel drive
 - d. Tracked tractor

2. Wheelbase? 2pt
 - a. 160"
 - b. 120"
 - c. 24"
 - d. 125"
 - e. 20"

3. Antenna height? 2pt
 - a. 160"
 - b. 120"
 - c. 24"
 - d. 125"
 - e. 20"

4. Antenna to Axle offset? 2pt
 - a. 160"
 - b. 120"
 - c. 24"
 - d. 125"
 - e. 20"

After entering the above numbers and performing the calibration as mentioned in the **quick reference guide**, you notice some issues with the system performance. Using the quick reference guide answer the next five questions regarding troubleshooting the system. Each response must have two answers (except question 5); which setting must be changed, and in which direction the adjustment should be made. (Increase or decrease) **Fill in the blank.**

5. While driving in the field, you hit a small bump and the auto steer disengages **4pt**
Setting to be changed _____ Direction of adjustment _____

6. You notice that the system does not pick up the next guidance line quick enough. You are too far down the swath before the system engages. **4pt**
Setting to be changed _____ Direction of adjustment _____

7. Once the system has engaged and is online, you notice very sharp and erratic corrections as the system tries to maintain the line. **4pt**

Setting to be changed _____ Direction of adjustment _____

8. While on the guidance line, you notice that the system is making "S" turns as it tries to maintain the line. **4pt**

Setting to be changed _____ Direction of adjustment _____

9. While going up a steep hill, you experience a great deal of slippage, and the system disengages. Which of the engage options probably needs to be adjusted? **1pt** _____