Please Print

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

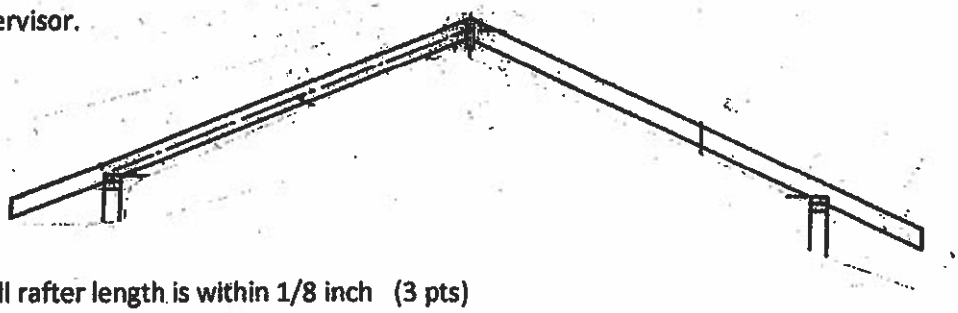
2016 Minnesota Agricultural Mechanics CDE

Metal and Wood Building Construction Carpentry Skills & Problem Solving

Skills & Problem Solving 25 points (30 minutes)

Skill 1: Rafter Layout

For this skill, you will be laying out a common rafter for a dog house. The dog house will have a **3 foot span. The rafter pitch will be 6/12.** The **overhang will be 2 inches** and a **1 inch bird's- mouth** will be required. You will be constructing the roof frame with a **1x4 ridge board.** The drawing provided is an example....it is **not a scale model.** Use a framing square and a pencil to **mark out the rafter on the material provided.** When completed, write your name, contestant number and school on your project and turn it in to the station supervisor.



Scoring: _____Overall rafter length is within 1/8 inch (3 pts)

_____Correct slope of plumb cut/within 1/8 inch (4 pts)

_____Correct slope of tail cut/within 1/8 inch (4 pts)

_____Correct position, size and angle of bird's-mouth (4 pts)

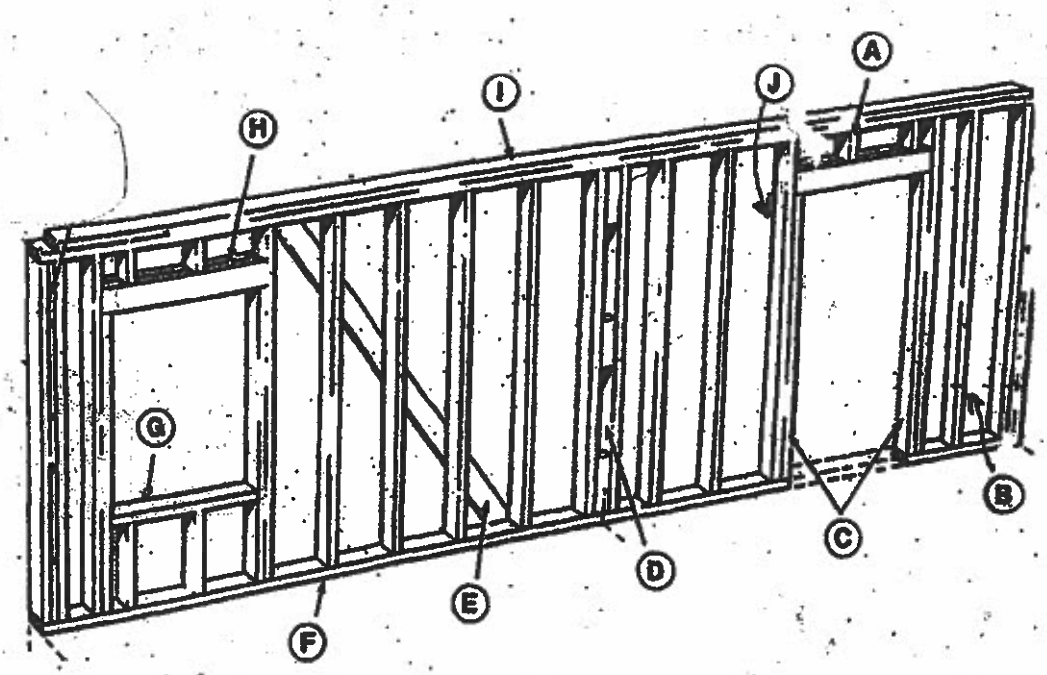
_____Total points for rafter layout skill

Skill 2: Building Framing Identification:

Identify the listed parts of the diagram by matching the letter to the term below. 1 point for each correct answer.

_____Header _____Trimmer _____Full Stud _____Cripple Stud

_____Sole Plate _____Cap Plate _____King Stud _____Rough Sill



Skill 3: Tools and fasteners Identification and Measurement:

Identify the following tools and fasteners by matching the letter to the term below. 1 point for each.

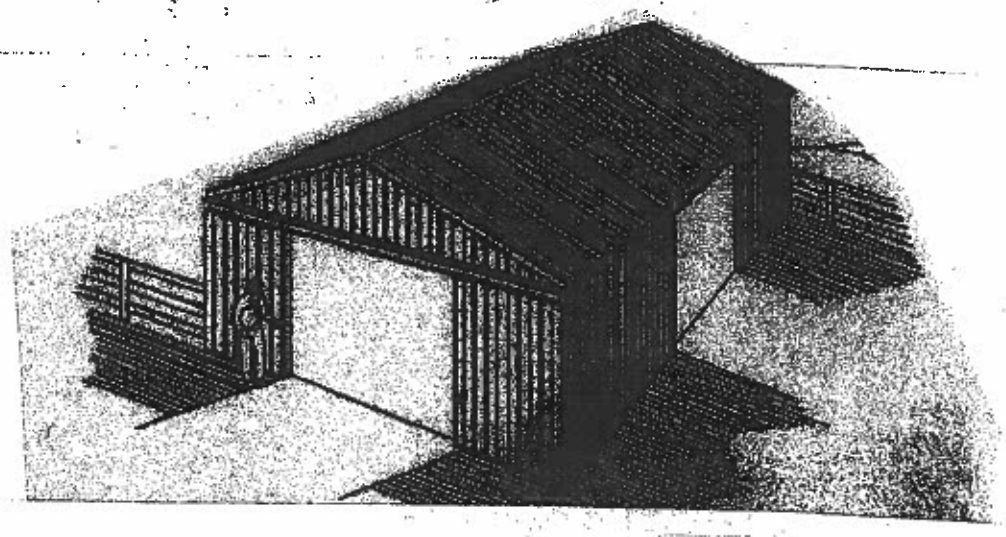
____16d common nail _____16d box nail _____16d casing nail _____16d finishing nail

_____Speed Square _____Try Square ____Carpenters Square ____Combination Square

_____T Bevel _____Torpedo Level

Metal & Wood Building Construction Carpentry Problem Solving:

The structure shown below is 60' x 120' and has a 30' door on one gable end and a 24' roll up garage door positioned 20' from the gable end on the North side wall. The side walls are 16' high. The posts and rafters are positioned at 8' on center. Rafters have a 4/12 pitch and a 1' overhang.



1. Use the information provided to calculate the number of poles for the shed: (3 points)

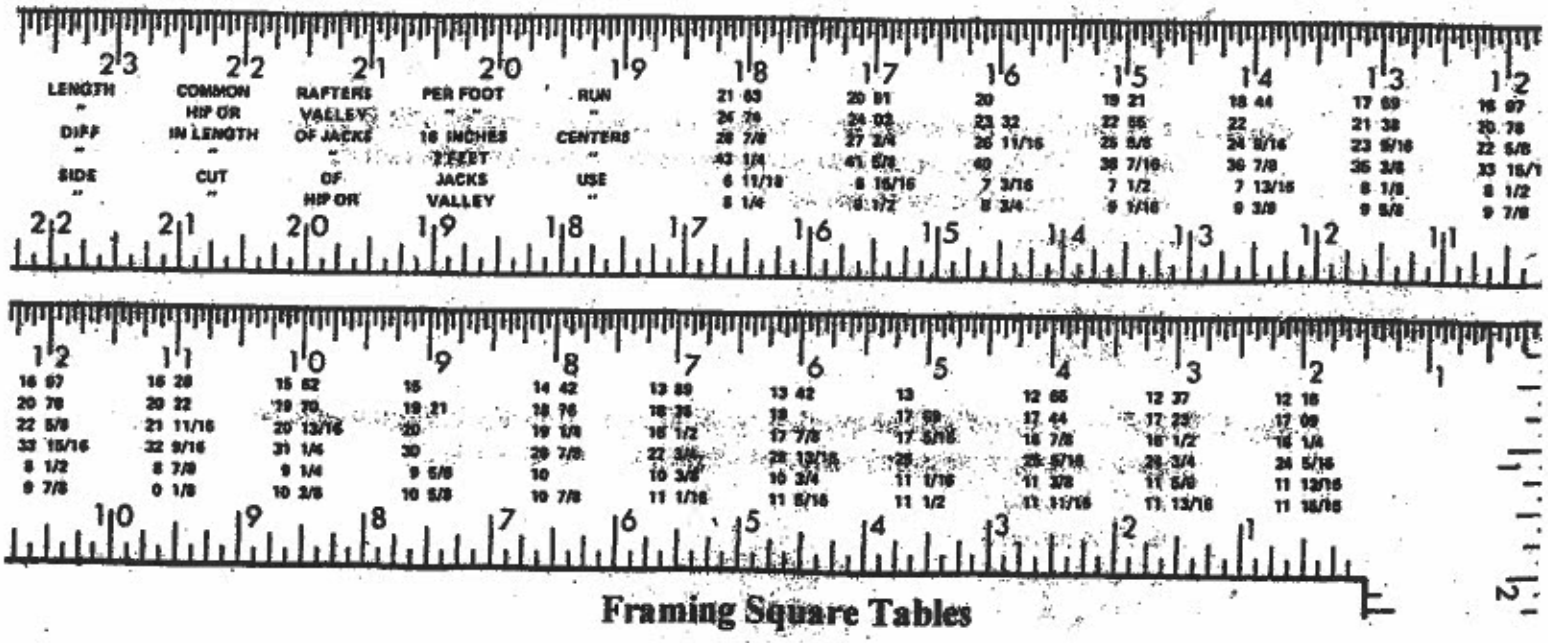
2. Use the information provided to calculate the number of square feet of roof that needs to covered. (3 points)

3. Calculate the number of squares of roofing material that are needed to be ordered. (3 points)

4. Use the information provided to calculate the number of roof truss rafters that need to be ordered. (3 points)

5. What is the rise per foot of run for your roof system? (2 points)

6. If each sheet of steel covers a 36" width, how many sheets will you need to cover the two long side walls? Exclude the garage door opening in your calculation. (3 Points)



Framing Square Tables

Scoring Rafter layout skill points _____ (15 points)

Framing ID points _____ (8 points)

Tool ID points _____ (10 points)

Problem Solving points _____ (17 points)

Total Score _____ (50 points possible)

Please Print

Name:		School:
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2016 Minnesota Agricultural Mechanics Career Development Event

Forage Harvester

Helpful Items: Skill 25 points

Use the New Holland FP 240 operators manual provided to complete this test. Use the index to find your information.

1. (3 points) What is the recutter size of screen used for dry ear corn?
2. (2 points) What oil is needed for the gear box?
3. (2 points) The chains use what oil?
4. (3 points) Main bevel gear box oil should be changed every _____ hours.
5. (3 points) The PTO shaft speed is _____.
6. (2 points) The constant horse needed for a FP 240 is _____.
7. (3 points) When replacing the cutting knife the bolts are torqued to _____ Ft lbs.
8. (3 points) Slip clutch setting for the blower clutch is adjusted to how many foot pounds?

   a. 500 to 600
   b. 650 to 700
   c. 550 to 650
   d. 1733

9. (4 points) What color is the wire used on the tractor trailer hookup center pin?

   ~~a. Red~~ ~~b. Brown~~ c. Violet d. Blue

Please Print

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

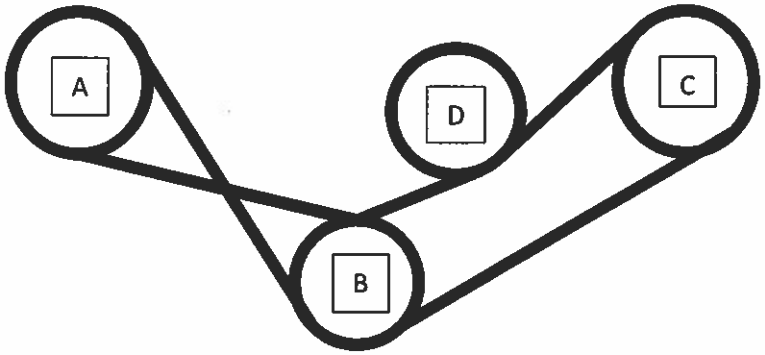
2016 Minnesota Agricultural Mechanics Career Development Event

Forage Harvester

Helpful Items: Problems 25 points

Width(feet)X Speed(MPH)/8.25=Acres per Hour

Drive/Driven X Drive Rpm= Driven Rpm

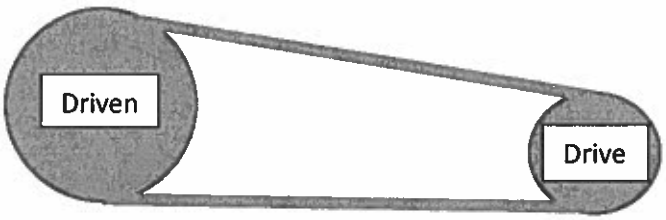


1. (3 points) Identify the direction the pulleys are turning if pulley A is turning counter clock wise.

B. _____

C. _____

D. _____



2. (3 points) If the drive pulley is running at 1250 RPM what is the speed of the driven Pulley? Drive gear is 4 inch diameter, driven gear is 7 inches diameter.

_____

3. (3 points) If you have 181 acres of silage to chop that you assume will yield 28 tons per acre using wagons that will hold 12 tons answer the following questions?

4. (3 points) How many wagon loads to complete the field? _____

5. (3points) If you put 39 hours on the chopper how many tons per hour did you harvest? _____

6. (4 points) Your chopper has a 4 row 30 inch spacing corn head. If you drive 4 miles per hour how many minutes does it take to fill a wagon? _____ minutes

7. (3 points) If you chop the field and discover it yields 31 tons per acre instead of 28 how many acres do you need to get the same amount of silage?

   _____

8. (3 points) How much torque in foot pounds is applied to a head bolt by applying 120 pounds of force on the end of a wrench 16 inches in length? Note Torque in ft-lbs. = (force in pounds) x (3length of arm in feet) 1ft = 12 inches

   a. 160
   b. 720
   c. 1540
   d. 1950

Please Print

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

2016 Minnesota Agricultural Mechanics Career Development Event
Power and Machinery
Small Engine

Skill 25 points

****

1. (Two point) List the serial number of this small engine. (Black) _____

2. (Three points) Using the serial number from #1 above and the attached information answer the following questions.

   What type of Carburetor is on this engine?
   a. Vacu-Jet
   b. Walbor Carburetor
   c. Flow-Jet Carburetor
   d. Pulsa-Jet

   What is the cubic inch displacement of this engine?
   a. 9
   b. 17
   c. 13
   d. 12

   What type of bearings does this engine have?
   a. Plain bearing auxiliary drive (PTO).
   b. Plain bearing auxiliary drive parallel to crankshaft.
   c. Plain bearing flange mounting.
   d. Ball bearing Gear Reduction.

3. (Two point) Measure shim using a caliper. _____

4. (One point) Using the head provided. Identify the valve which is marked. This valve is set at recession or protrusion?

   a. Protrusion:
   b. Recession:

5. (Two Points) identify the intake valve clearance.

   A. .04 B .005
   C. .004 D .003

6. (One Point) Refer to question 6. This valve is adjusted by:
   a. Grind the lifter.
   b. Adjust the rocker arm.
   c. Grind the valve tip end.
   d. Grind the push rod.

7. (Three points) find the model number of my Horizontal Briggs and Stratton engine using the information in Repair Manual identify the following:

   a. Initial Adjustment of idle mixture screw is backed out. _____ to _____ turns

   b. Found on page? _____

   c. At what speed should engine be run at_____ and how long before making final adjustment. _____

8. (Two points) Using the micrometers provided what is the cam lobe lift? Measure the intake lobe. (Without the decompression)
   _____

9. (One point) Identify this tool. _____

10. (Three points) Using the carburetor provided identify the marked parts.

    a. Adjusting screw adjusts what? _____

    b. Adjusting screw adjusts what? _____

    c. Adjusting screw adjusts what? _____

11. (One point) Identify this part. _____

12. (Two points) identify the information I need to order this bolt.

    a. Length _____.
    b. Thread pitch _____.
    c. Diameter _____.
    d. Hardness _____.

13. (Two points) identify the information I need to order this bolt.
    A. Length _____
    B. TPI _____
    C. Diameter _____
    D. Hardness _____

Please Print

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

2016 Minnesota Agricultural Mechanics Career Development Event

Small Engines

Helpful Items: Problem solving. 25 points

πr^2 = circumference of a circle

Torque = F X D

Area of a circle = diameter squared X .7854

area of a circle = 3.14 x radius squared

1 cc = 16.39 square inch

psi = Pounds per square inch

Speed of shaft = speed X driver diameter / Driven diameter

****

1. (Three points.) Determine the following, Cubic inch displacement _____ of this engine with the following information:

Number of cylinders 1
Bore 2.7812
Stroke 1.940
RPM's 1750

Cubic inch displacement _____

2. (3 points) I have a hydraulic cylinder lifting an implement. The cylinder diameter is 3.5 inches with the rod diameter of 1.125 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. 1,924.

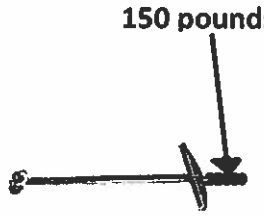
b. 9,621.

c. 21,647

d. 2,164

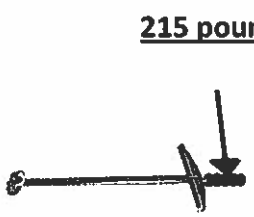
3. (Three points) Calculate the amount of torque in the following three examples. Circle the letter which represents the greatest amount of torque?

A. B. C.



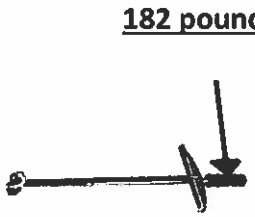
2 foot torque wrench

A



1.5 foot torque wrench

B



1.750 foot torque wrench

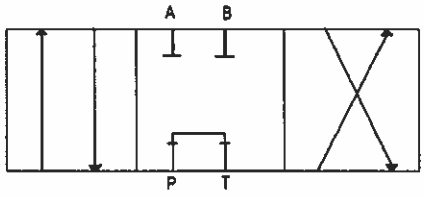
C

4. (Two Points) One bar is equal to _____ one PSI.

A. 12.5
B. 21.2
C. 14.5
D. 16.5

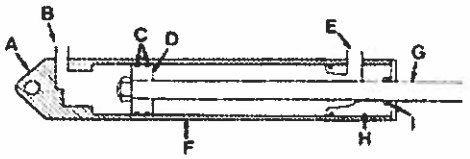
5. Three points. This hydraulic symbol identifies the system as a:

A. Closed hydraulic center system.
B. Open center hydraulic system.



6. Three points. Identify this hydraulic cylinder as a:

A. Single acting hydraulic cylinder.
B. Double acting hydraulic cylinder.



7. Three point. Question number 6 to produce the highest lifting capacity the inlet of this hydraulic cylinder would be:

A. B.
B. E.

8. Two point. Firing order of a six cylinder engine:

    A. 153246.
    B. 156243.
    C. 153624.
    B. 164253.

9. One point. When a 4 cycle engine has both intake and exhaust valves open the stroke is:

    A. Intake stroke.
    B. Top of compression stroke.
    C. Bottom of power stroke.
    D. Top of exhaust stroke.

10. Two points. Two batteries hooked in series: May be more than one answer.

    A. Doubles the voltage.
    B. Voltage stays the same.
    C. Doubles the CCA's
    D. CCA's stays the same.

Please Print

Name:		School:
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2016 Minnesota Agricultural Mechanics Career Development Event

Electrical Circuits

Helpful Items: Problem solving. 25 points

****

Carefully study the attached wiring diagram of a negative pressure vent control and answer the following questions. Each answer is worth 2.5 points.

1. Power enters the controller at T1 when you are wiring the power supply what color wire will you attach to the GND terminal _____and L2_____.

2 From the power supply L1 feeds power to where?

_____ _____

2. K1 preforms what function at the vents in units one and two? _____

3. Item 5 on the parts list is a three position switch what are the three positions the switch can be in?

_____ _____ _____

4. When the switch is placed in automatic power is supplied to where? _____

5. When the switch is placed in manual power is supplied to where? _____

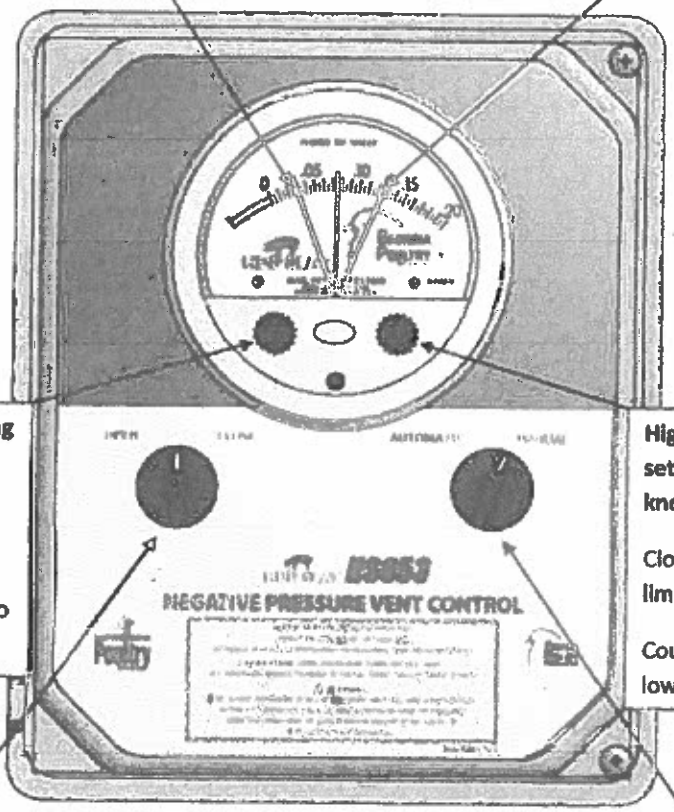
Operation:

The High and Low limit pointers are used to visibly create the desired operating range. When actual pressure drops below the Low limit or exceeds the High limit, onboard relays are activated to either open or close vents.

Pressure reading drops below this limit, the vent machine **CLOSES** vents to raise the pressure inside.

Area between limit pointers, no adjustments are made

Pressure reading exceeds this limit, the vent machine **OPENS** vents to lower the pressure inside.



Low Pressure setting adjustment knob.

Clockwise to raise limit,

Counter clockwise to lower limit

High Pressure setting adjustment knob.

Clockwise to raise limit,

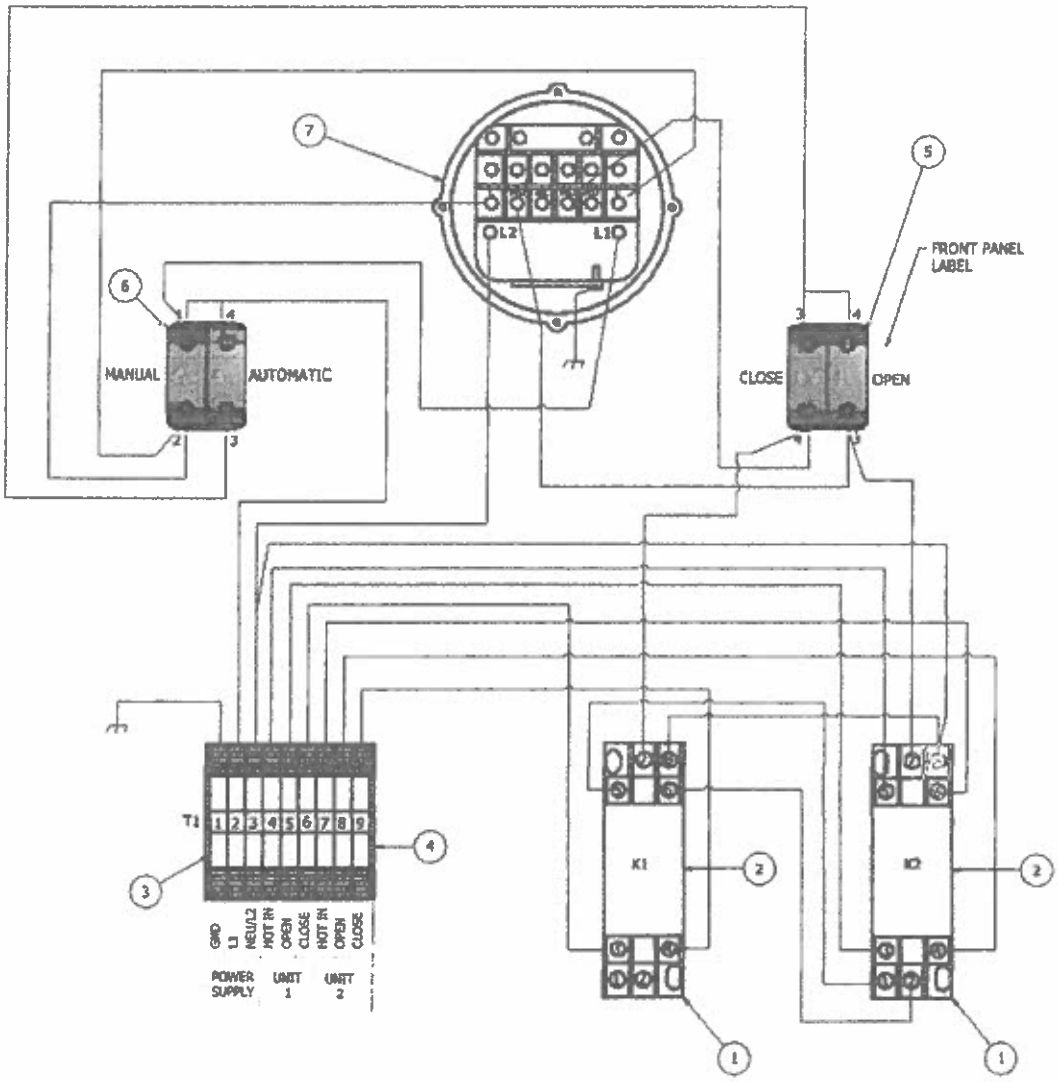
Counter clockwise to lower limit

Manual OPEN /CLOSE

AUTO/MANUAL

Selection

Internal Wiring Diagram / Parts List:



PARTS LIST			
ITEM	QTY	PART NUMBER	DESCRIPTION
1	1	ADSQL08D	RELAY SOCKET FOR QL2 SERIES
2	2	EL1015	RELAY PLUG IN DPDT ,120VAC COIL
3	9	ADKN-T12GRY	DIN MOUNT TERMINAL BLOCK
4	1	ADKN-ECT6GRY	TERMINAL BLOCK END CAP
5	1	ADGCX3300	3 POSITION, 22MM SWITCH,N/0+N/C
6	1	ADGCX3320-22	2 POSITIOIN, 22MM SWITCH, 2X N/0
7	1	HS650	GAGE PHOTOHELIC, 120V RELAY OUTPUT

Please Print

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

2016 Minnesota Agricultural Mechanics Career Development Event
Metal Fabrication

Arc Welding Exercise: SKILLS 25 points

****

1. Select two precut pieces of metal, one 3/32" E6013, and one 1/8" E6013 electrode.
2. Take one piece of metal and run a bead using the 3/32" electrode.
3. When you have completed cleaning to your satisfaction, cool the weld in the water furnished.
4. Take your first piece of metal with your bead and now complete a Tee weld on the second piece of metal welding only one side.
5. When you have completed cleaning to your satisfaction, cool the weld.
6. Label your project with your name and school before turning into judge.

Evaluation score sheet:

1. Safety and work habits	5 points _____
2. 3/32" bead quality	5 points _____
3. 3/32" bead penetration	5 points _____
4. 1/8" Tee weld quality	5 points _____
5. 1/8" Tee weld penetration	5 points _____
	Total points _____
	(25 possible)

Please Print

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

2016 Minnesota Agricultural Mechanics Career Development Event

Metal Fabrication

Helpful Items: Problem solving. 25 points

****

Match the characteristics with the electrode. 7 points

_____1.	E7018	A. Fast-freeze
_____2.	E6012	B. Fill-freeze
_____3.	E6010	C. Fast-fill
_____4.	E7024	D. Low hydrogen

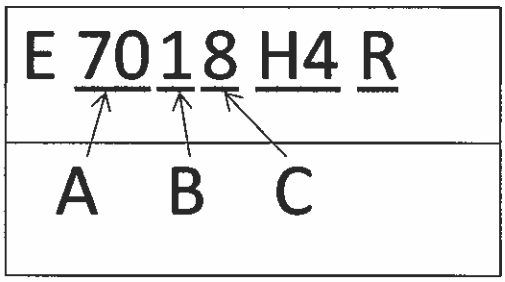
_____5.	The _____ electrode produces a snappy arc with little slag.	A. Fast-freeze
_____6.	The _____ electrode includes iron powder electrodes.	B. Fill-freeze
_____7.	The _____ electrode is a general purpose electrode.	C. Fast-fill

Identify the parts of the AWS electrode classification 3 points

_____ 8. Welding Position

_____ 9. Type of coating and current

_____ 10. Tensile strength



Joint and Weld Classification

Type of <u>Joints</u> 15 points 1.5 points per question

1. 

A. Square Groove
B. Single Vee Groove
C. Double J Groove
D. Double U Groove
E. Double V Groove

2. 

A. Square Groove
B. Single Vee Groove
C. Double J Groove
D. Double U Groove
E. Double V Groove

3. 

A. Square Groove
B. Single Vee Groove
C. Double J Groove
D. Double U Groove
E. Double V Groove

4. 

A. Square Groove
B. Single Vee Groove
C. Double J Groove
D. Double U Groove
E. Double V Groove

5. 

A. Square Groove
B. Single Vee Groove
C. Double J Groove
D. Double U Groove
E. Double V Groove

6. 

A. Single U Groove
B. Single Bevel
C. Double Fillet
D. Single J Groove
E. Double Bevel Groove

7. 

A. Single U Groove
B. Single Bevel
C. Double Fillet
D. Single J Groove
E. Double Bevel Groove

8. 

A. Single U Groove
B. Single Bevel
C. Double Fillet
D. Single J Groove
E. Double Bevel Groove

9. 

A. Single U Groove
B. Single Bevel
C. Double Fillet
D. Single J Groove
E. Double Bevel Groove

10. 

A. Single U Groove
B. Single Bevel
C. Double Fillet
D. Single J Groove
E. Double Bevel Groove

Key

Please Print

Name:		School:
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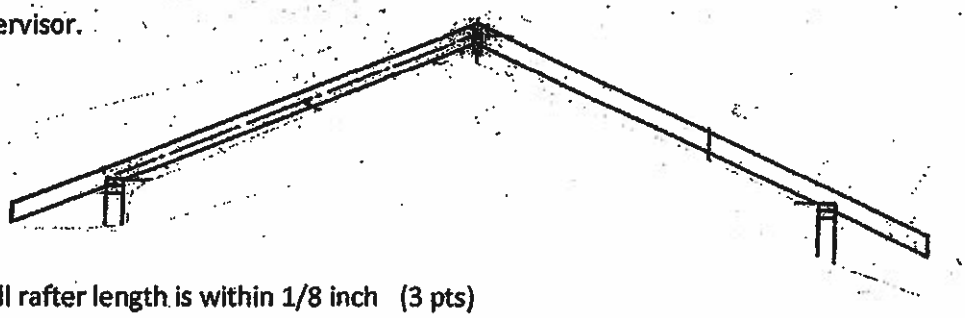
2016 Minnesota Agricultural Mechanics CDE

Metal and Wood Building Construction Carpentry Skills & Problem Solving

Skills & Problem Solving 25 points (30 minutes)

Skill 1: Rafter Layout

For this skill, you will be laying out a common rafter for a dog house. The dog house will have a **3 foot span. The rafter pitch will be 6/12.** The **overhang will be 2 inches** and a **1 inch bird's- mouth** will be required. You will be constructing the roof frame with a **1x4 ridge board.** The drawing provided is an example....it is **not a scale model.** Use a framing square and a pencil to **mark out the rafter on the material provided.** When completed, write your name, contestant number and school on your project and turn it in to the station supervisor.



Scoring: _____Overall rafter length is within 1/8 inch (3 pts)

_____Correct slope of plumb cut/within 1/8 inch (4 pts)

_____Correct slope of tail cut/within 1/8 inch (4 pts)

_____Correct position, size and angle of bird's-mouth (4 pts)

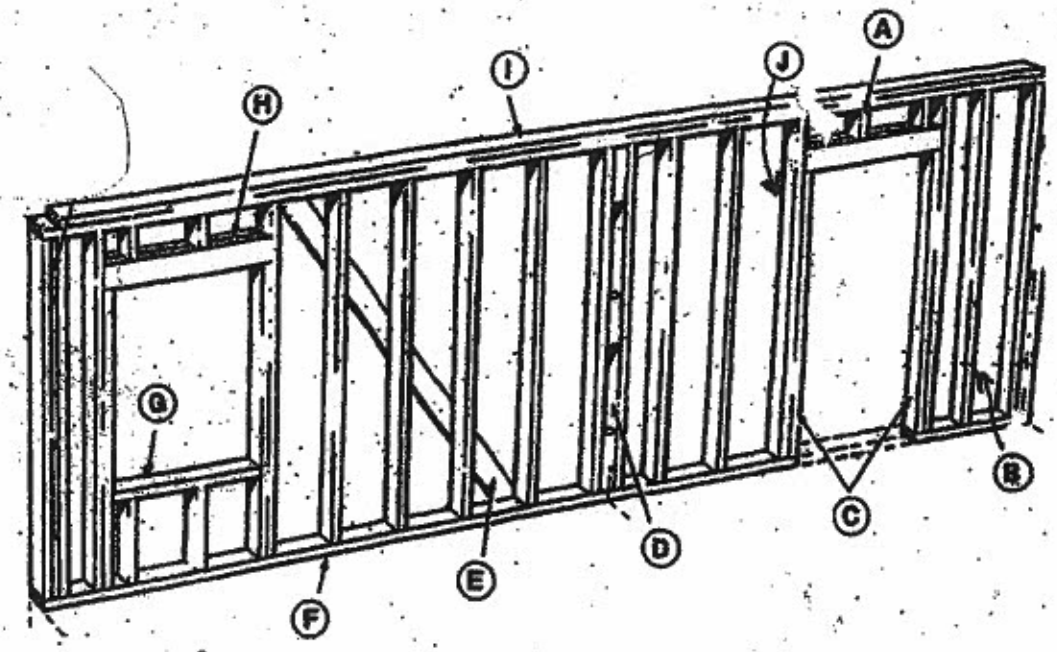
_____Total points for rafter layout skill

Skill 2: Building Framing Identification:

Identify the listed parts of the diagram by matching the letter to the term below. 1 point for each correct answer.

H Header C Trimmer B Full Stud A Cripple Stud

F Sole Plate I Cap Plate J King Stud G Rough Sill



Skill 3: Tools and fasteners Identification and Measurement:

Complete at site

Identify the following tools and fasteners by matching the letter to the term below. 1 point for each.

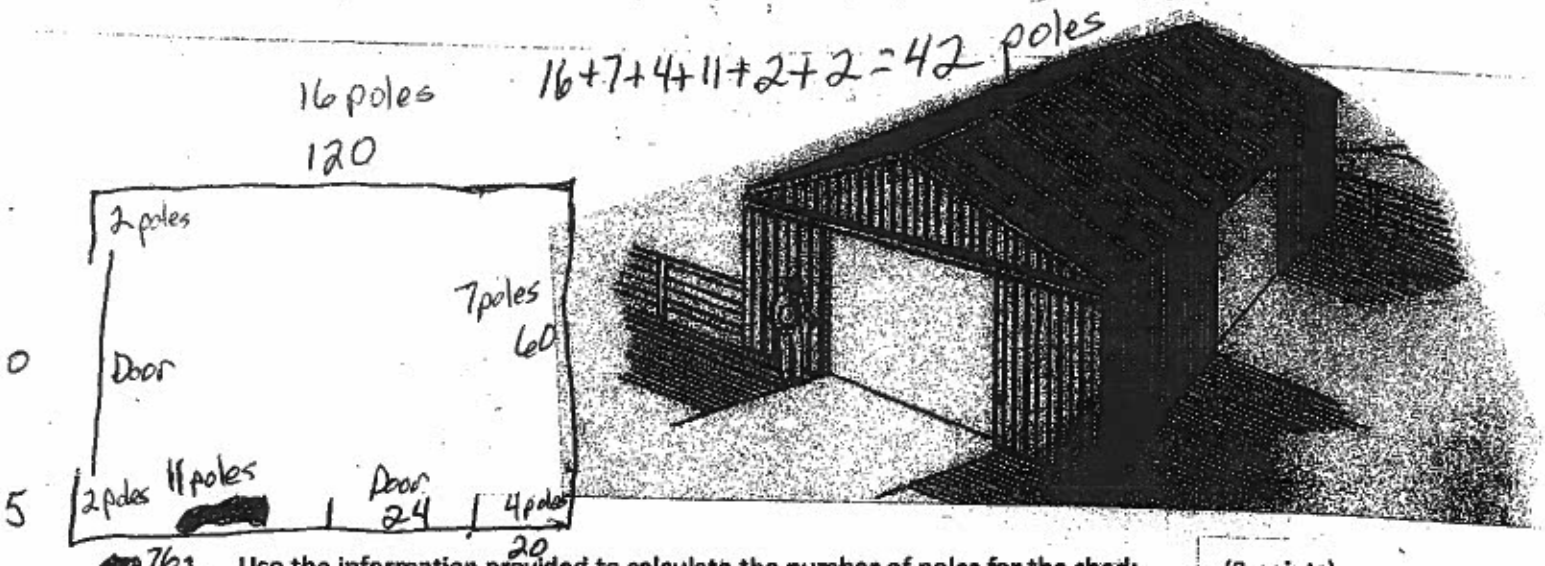
____16d common nail _____16d box nail _____16d casing nail _____16d finishing nail

_____Speed Square _____Try Square ____Carpenters Square ____Combination Square

_____T Bevel _____Torpedo Level

Metal & Wood Building Construction Carpentry Problem Solving:

The structure shown below is 60' x 120' and has a 30' door on one gable end and a 24' roll up garage door positioned 20' from the gable end on the North side wall. The side walls are 16' high. The posts and rafters are positioned at 8' on center. Rafters have a 4/12 pitch and a 1' overhang.



16+7+4+11+2+2=42 poles

1. Use the information provided to calculate the number of poles for the shed: (3 points)

see above. 42 poles

2. Use the information provided to calculate the number of square feet of roof that needs to be covered. (3 points)

from square 4/12=12.65 $\frac{12.65 \times 31}{12} = 32.679 \times 120 = 3,921.48 \times 2 =$ 7842.96 ft.2

3. Calculate the number of squares of roofing material that are needed to be ordered. (3 points)

$\frac{7842.96}{100} =$ 78.43 squares

4. Use the information provided to calculate the number of roof truss rafters that need to be ordered. (3 points)

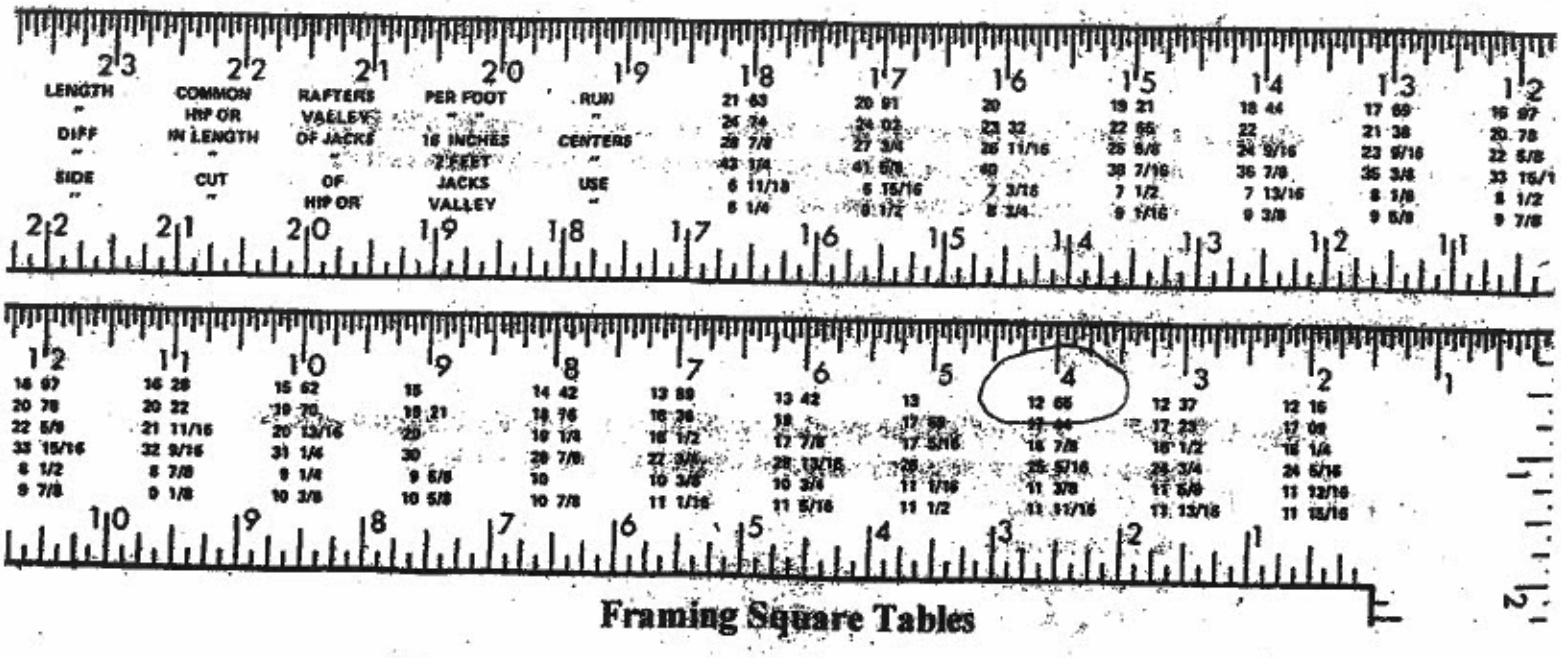
$\frac{120}{8} + 1 =$ 16 roof truss rafters

5. What is the rise per foot of run for your roof system? (2 points)

rafter pitch (4)/12 → 4"

6. If each sheet of steel covers a 36" width, how many sheets will you need to cover the two long side walls? Exclude the garage door opening in your calculation. (3 Points)

$\frac{120' + (120' - 24')}{3} = \frac{216}{3} =$ 72 sheets



Scoring Rafter layout skill points _____ (15 points)

Framing ID points _____ (8 points)

Tool ID points _____ (10 points)

Problem Solving points _____ (17 points)

Total Score _____ (50 points possible)