**2013 IOWA FFA AGRICULTURAL MECHANICS CAREER DEVELOPMENT EVENT**
WRITTEN EXAMINATION

Instructions: You have 50 minutes to complete this examination. Select the one best answer for each question. Mark your answers on the answer sheet provided. Do not write on this exam.

Machinery and Equipment Systems – Round Balers

Using the diagram provided below, please answer questions 1-4.
**Hint You may need to see the New Holland Baler hand-outs
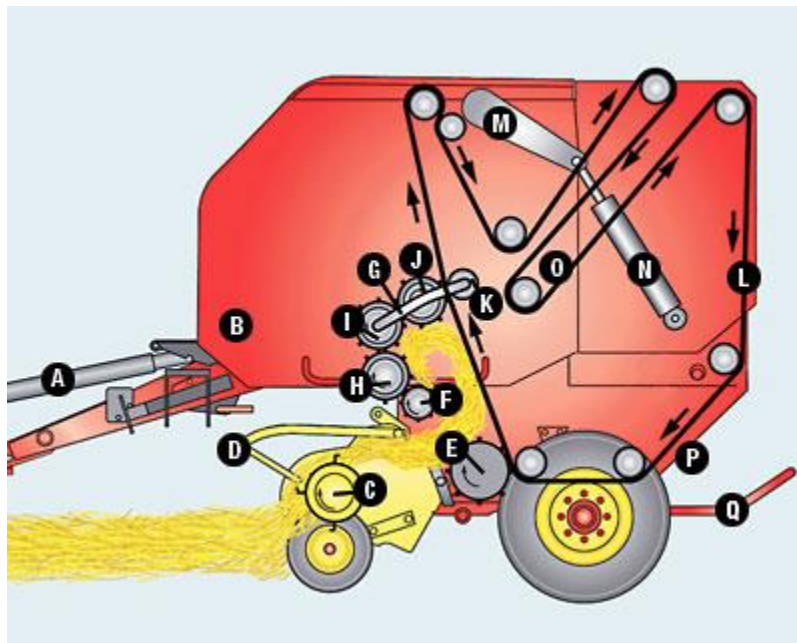
1. Which one of the following items is A pointing to in the diagram above?
      A. Driveshaft
      B. Tongue
      C. Jack Stand
      D. Gearbox

2. Which one of the following items is C pointing to in the diagram above?
      A. Driveshaft
      B. Tongue
      C. Windguard
      D. Pickup

3. Which one of the following items is M pointing to in the diagram above?
    A. Belt Tension Cylinder
    B. Belt Tension Arm
    C. Belt Tension Spring
    D. Belt

4. Which one of the following items is N pointing to in the diagram above?
    A. Belt Tension Cylinder
    B. Belt Tension Arm
    C. Belt Tension Spring
    D. Belt

<u>You will need to see the New Holland Baler hand-outs to answer 5-8</u>

5. Which of the following New Holland baler models has a series of balers specifically for Silage?
    A. BR7050
    B. BR 7060
    C. BR 7070
    D. BR 7090

6. The New Holland Balers come with an optional oiler kit that automatically oils all drive chains. How much oil can be stored in the reservoir?
    A. 1 Gallon
    B. 3 Gallons
    C. 1 Liter
    D. 3 Liters

7. Which of the following bale wrapping option is the fastest?
    A. Twine
    B. Net Wrap
    C. Plastic Wrap
    D. All the same

8. How many rolls of net wrap do the twine-net balers hold?
    A. 1
    B. 2
    C. 3
    D. 4

9. A round baler is traveling at a rate of 594 feet in 54 seconds, what is the baler's speed in miles per hour??
    A. 6.60
    B. 3.00
    C. 0.75
    D. 7.50

10. In ten minutes a round baler can harvest 2400 pounds of hay. How many pounds can be harvested in 1 hour?

    A. 2,400
    B.
    C. 14,400
    D. 24,000

11. Using the same information provided in question #10; how many tons of hay can be harvested in an eight hour day?
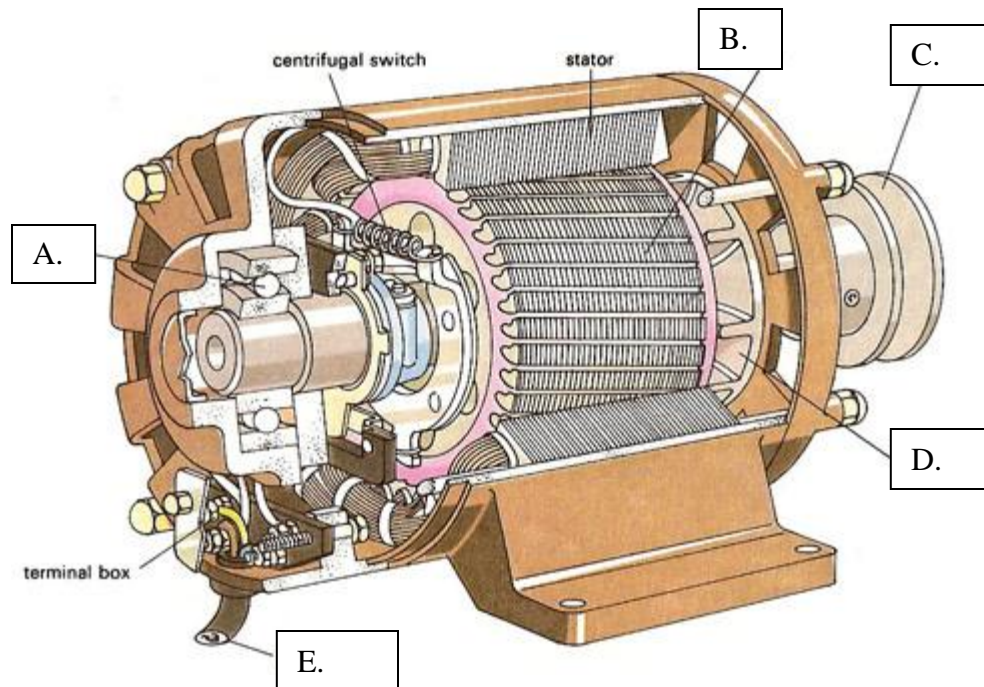
    A. 10.0
    B. 48.4
    C. 57.6
    D. 96.0

12. Using the same information provided in question #11. If each round bale weighs 1500 pounds, how many bales were made in the eight hour time period? You might have to round up to the nearest whole number.

    A. 76
    B. 77
    C. 127
    D. 128

Electrical Systems – Electrical Motors & Controls

Using the diagram provided below, please answer questions 13-16.

13. Which one of the following items is A pointing to in the diagram above?
    A. Rotor
    B. Cooling Fan
    C. Bearing
    D. Power Supply

14. Which one of the following items is B pointing to in the diagram above?
    A. Rotor
    B. Cooling Fan
    C. Bearing
    D. Power Supply
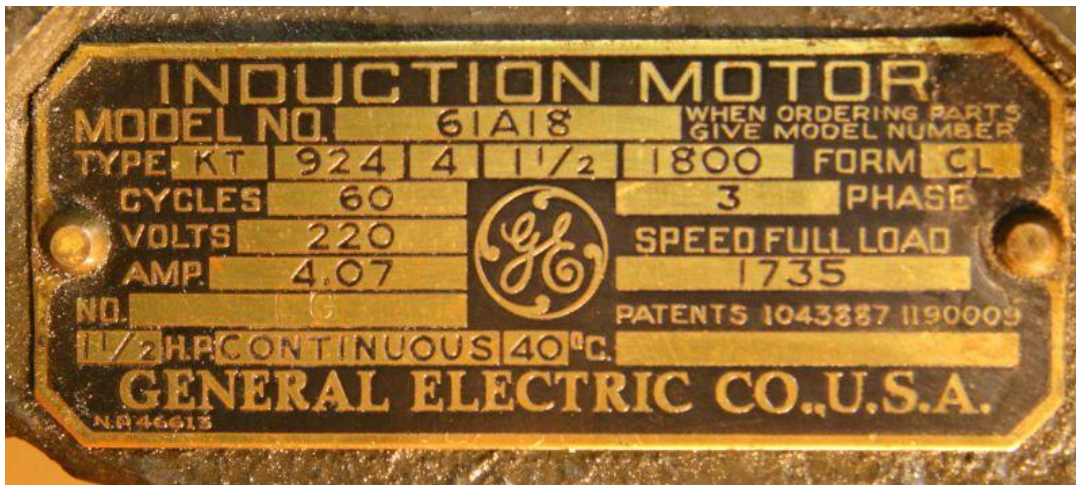
15. Which one of the following items is D pointing to in the diagram above?
    A. Rotor
    B. Cooling Fan
    C. Bearing
    D. Power Supply

16. Which one of the following items is E pointing to in the diagram above?
    A. Rotor
    B. Cooling Fan
    C. Bearing
    D. Power Supply

Using the diagram provided below, please answer questions 17-20.

17. What is the horsepower of the motor based on the information listed on the tag above?

     A. 1.0
     B. 1.5
     C. 3.0
     D. 4.0

18. What voltage is the motor wired for?

     A. 220
     B. 924
     C. 1735
     D. 1800

19. Our shop is wired for single phase 220 outlets; can we run this motor off of our current set up?

     A. Yes, it is ok as is
     B. Yes, after we change outlet boxes
     C. Yes, but we have to direct wire to the breaker box
     D. No, it's the wrong phase.

20. If the price of electricity is $0.12 per kilowatt-hour, how much does it cost to run this motor in the diagram above for 3 weeks? Assume the power factor of the motor is 84%.

     A. $45.49
     B. $379.08
     C. $45,489
     D. $379,076

	Useful formulas	
Wh=W x hours	Overload amps=I x SF	size x rpm=size x rpm
W=PF x I x V	Overload hp=SF x hp	E=IxR
W=Volts X amps	Watts AC= $\frac{V \times APF}{746 \text{ Watts/hp}}$	kWh=$\frac{W \times hr}{1000}$

21. A motor is run in the afternoon to circulate air 10 hours per day for 7 days a week. It is wired to a 230 volt power supply and uses 8 amps. The power factor for this motor is 85%. How many watt-hours are used in a week?
  A. 1564 watt-hours
  B. 1840 watt-hours
  C. 109480 watt-hours
  D. 128800 watt-hours

22. A motor with a full-load current of 25 amps must be run overloaded since you cannot purchase the correct size motor. If the service factor is 1.25, how many amps can this motor pull? (Assume the duty factor is continuous.)
  A. 1.25
  B. 20.00
  C. 25.00
  D. 31.25

23. A One-half Hp Electric Motor with a Service Factor of 1.40 Could Be Expected to Perform a _____ Hp Output.
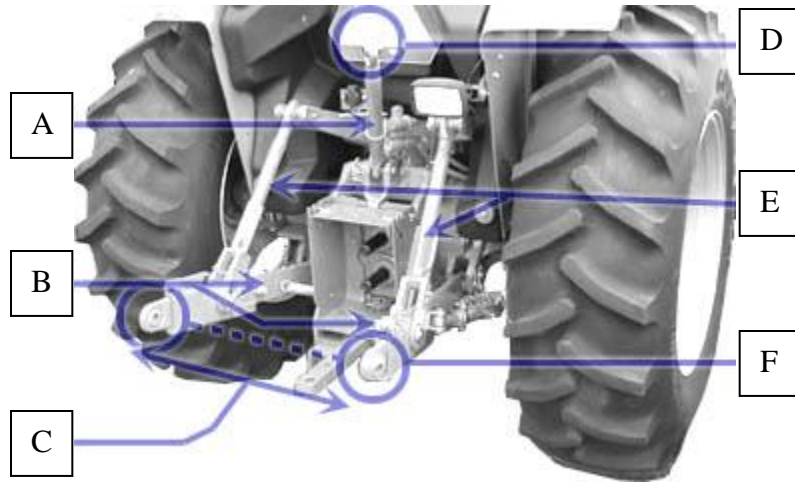 A. 0.5 hp
  B. 0.7 hp
  C. 1.0 hp
  D. 1.4 hp

24. You have an electric motor that turns 1750 RPM with a 3 inch pulley mounted on it that drives a shaft with 15inch pulley how fast does the shaft turn.
 A. 39 rpm
  B. 116 rpm
  C. 350 rpm
  D.78750 rpm

Energy Systems – Tractors
Using the diagram provided below, please answer questions 25-28.

25. Which one of the following items is A pointing to in the diagram above?
   A. Upper Link Arm
   B. Lower Link Arm
   C. Lower Span Point
   D. Upper Hitch Point

26. Which one of the following items is B pointing to in the diagram above?
   A. Upper Link Arm
   B. Lower Link Arm
   C. Lower Span Point
   D. Upper Hitch Point

27. Which one of the following items is E pointing to in the diagram above?
   A. Upper Hitch Point
   B. Lift Arms
   C. Lower Hitch Points
   D. Lower Link Arms

28. Which one of the following items is F pointing to in the diagram above?
   A. Upper Hitch Point
   B. Lift Arms
   C. Lower Hitch Points
   D. Lower Link Arms

Using the diagram provided below, please answer questions 29-33.
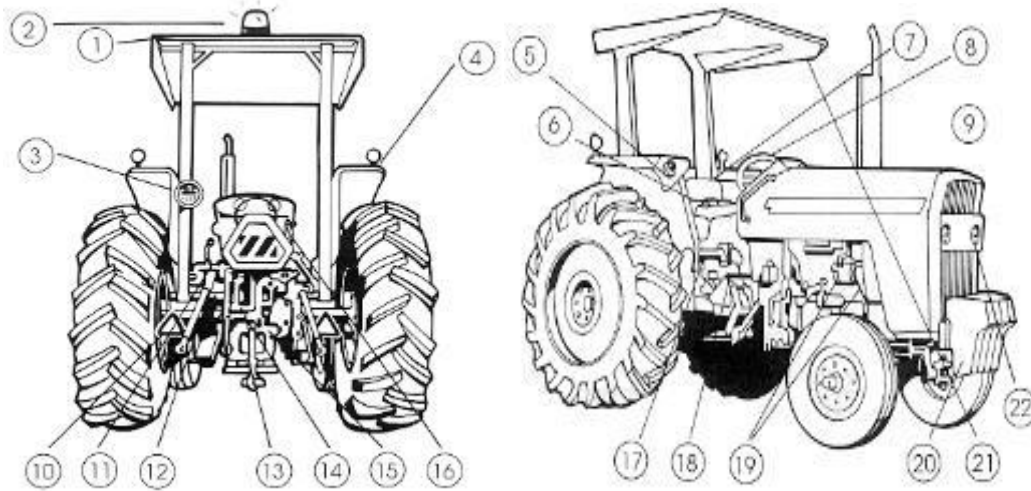
29. Which one of the following items is 1 pointing to in the diagram above?
   A. Sun Shield
   B. Rollover Protective Structure
   C. Roof
   D. Tractor Cab

30. Which one of the following items is 21 pointing to in the diagram above?
   A Sun Shield
   B. Rollover Protective Structure
   C. Roof
   D. Tractor Cab

31. Which one of the following items is 4 pointing to in the diagram above?
   A. Tire Guards
   B. Mud guards
   C. Buddy seat
   D. All the above

32. Which one of the following items is 20 pointing to in the diagram above?
   A. Front End Hitch
   B. Hydraulic Oil Reservoir
   C. Counter Weights
   D. Rock Box

33. A four-stroke cycle diesel engine is operating at 2200 RPM. How many times does the exhaust valve open and close in one hour?
   A. 2200
   B. 8800
   C. 66,000
   D. 132,000

34. The bore of an engine is 4.00 inches and the stroke is 3.5 inches. The engine has 8 cylinders. What is the engines displacement in cubic inches? Select the closest value.
- A. 16
- B. 49
- C. 352
- D. 400

35. A cylinder of an engine contains 68 cubic inches of air at the bottom dead center and 4 cubic inches of air at top dead center. What is the compression ratio?
- A. 15:1
- B. 16:1
- C. 17:1
- D. Need more information

36. Your engine is burning fuel that has 124,000 BTU per gallon and the engine is 75% efficient. What horsepower does the engine develop per gallon? Select closest value.
- A. 15
- B. 25
- C. 37
- D. 45

Formulas to use

C.I.D. = $\dfrac{3.14 \times D \times S}{4}$

Work= Force x Distance

HP= $\dfrac{F \times D}{T \times 33,000}$

2545 BTU- 1 HP

Circumference= 3.14 x D

Structural Systems – Carpentry

Using the diagram provided below, please answer questions 37-40.

Building A:
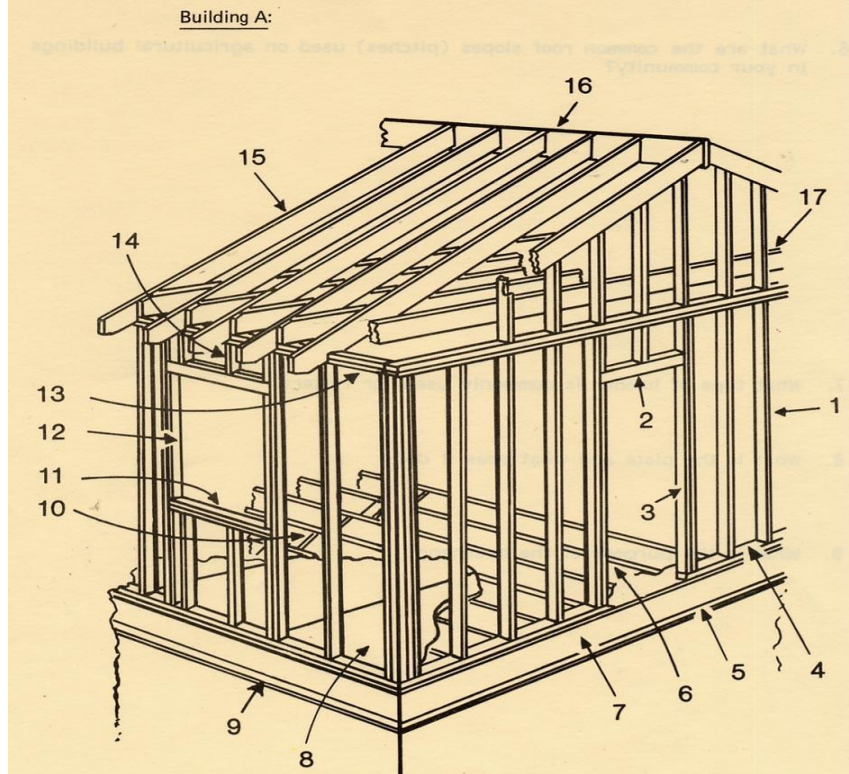
37. Which one of the following items is 15 pointing to in the diagram above?
   A. Ridge Board
   B. Common Rafter
   C. Rafter Tail
   D. Head Joist

38. Which one of the following items is 16 pointing to in the diagram above?
   A. Ridge Board
   B. Common Rafter
   C. Rafter Tail
   D. Head Joist

39. Which one of the following items is 1 pointing to in the diagram above?
   A. Bottom Plate
   B. Sill Plate
   C. Floor Joist
   D. Stud

40. Which one of the following items is 4 pointing to in the diagram above?
   A. Bottom Plate
   B. Sill Plate
   C. Floor Joist
   D. Stud

Using the diagram provided below, please answer questions 41-44.
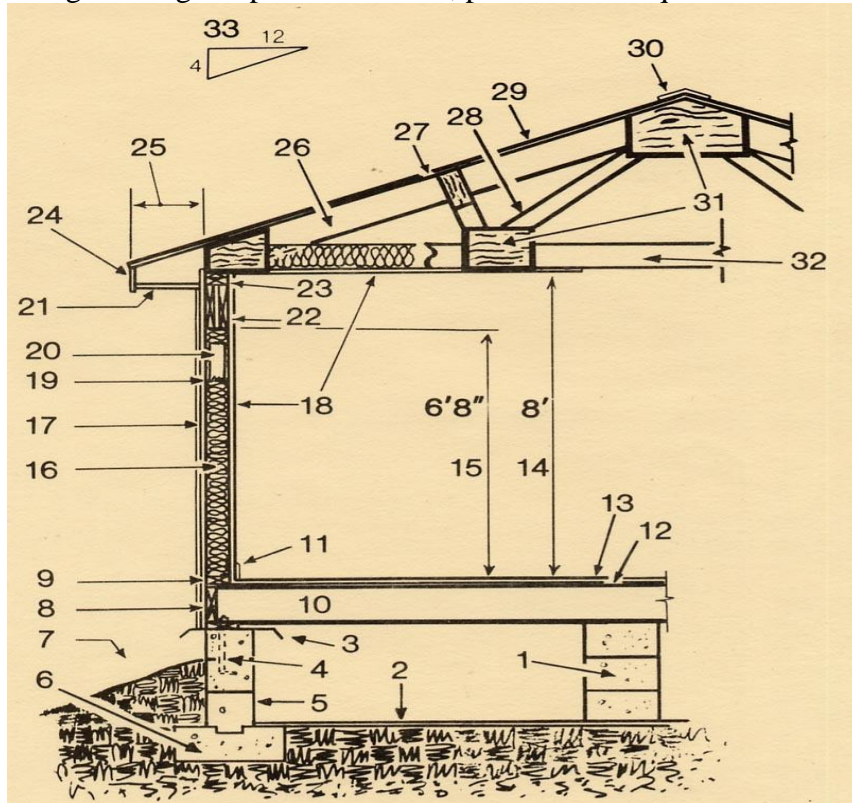
41. Which one of the following items is 31 pointing to in the diagram above?
    A. Rafter
    B. Tension Web (Brace)
    C. Gusset
    D. Bottom Chord

42. Which one of the following items is 32 pointing to in the diagram above?
    A. Rafter
    B. Tension Web (Brace)
    C. Gusset
    D. Bottom Chord

43. Which one of the following items is 21 pointing to in the diagram above?
    A. Soffit
    B. Fascia
    C. Roof Overhang
    D. Upper Plate

44. Which one of the following items is 24 pointing to in the diagram above?
    A. Soffit
    B. Fascia
    C. Roof Overhang
    D. Upper Plate

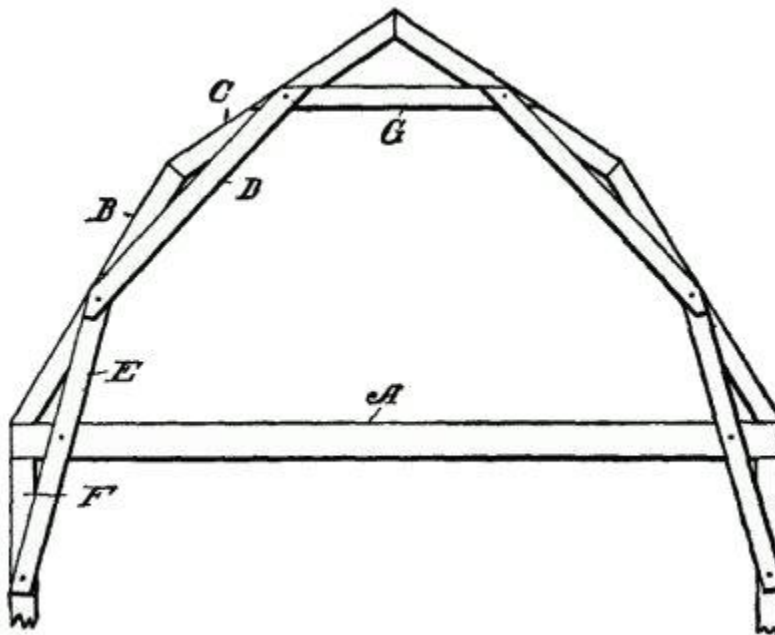Using the diagram provided below, please answer questions 45-46.
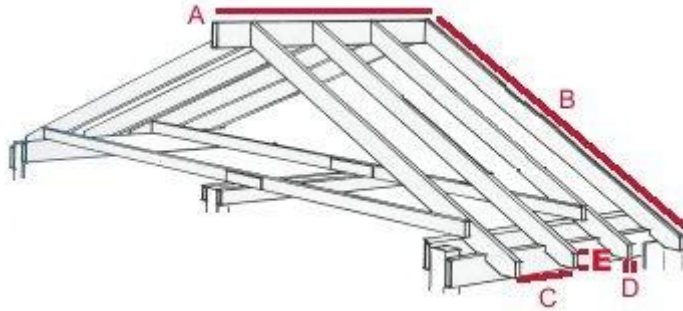
45. Roof pitch is the measurement of a roof's slope or incline. A roof with 4/12 pitch would have _____ inches of rise for each foot of horizontal distance from the edge of the roof towards the center.
    A. 4
    B. 12
    C. 1
    D. 2

46. If the pitch of the roof is 4/12, the span is 24 feet, and you are using 2x6 lumber to build the rafters with no overhang. What size of board would you purchase at the lumber yard for B?
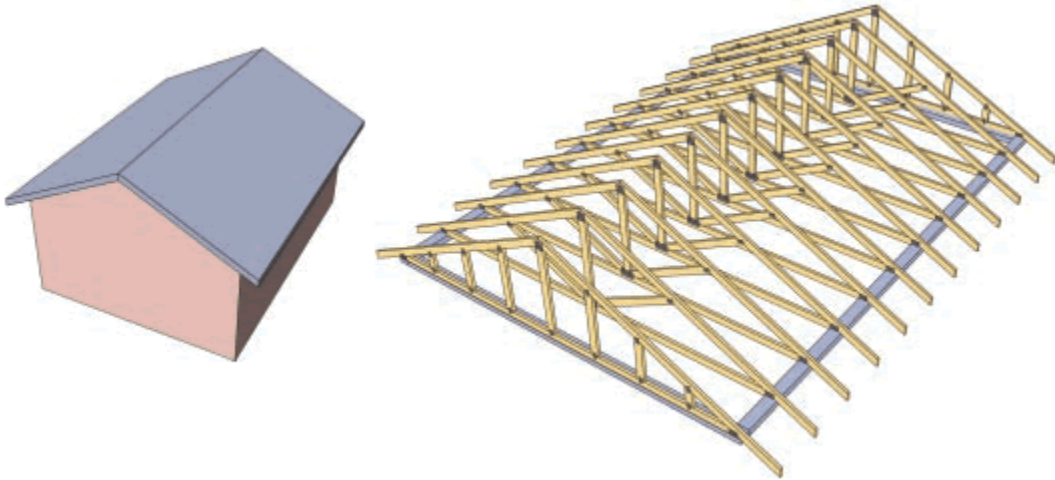   A. 2"x4"x12'
    B. 2"x6"x12'
    C. 2"x6"x13'
    D. 2"x6"x14'

Using the diagram provided below, please answer question 47.

47. What type of roof is shown in the image above?
- A. Princess Truss
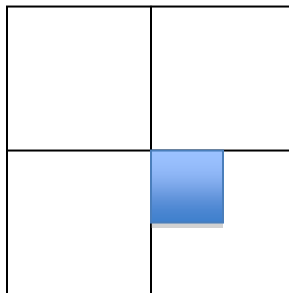- B. Double Cantilever
- C. Vaulted Parallel Chord
- D. Gambrel

Using the diagram provided below, please answer question 48.

48. What type of roof is shown in the image above?
- A. Gable
- B. Double Cantilever
- C. Vaulted Parallel Chord
- D. Gambrel

Environmental & Natural Resources Systems – Survey & Land Measurement
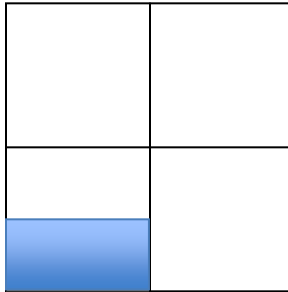Using the diagram provided below, please answer question 49-51.

49. The land description for the shaded parcel is best written as
- A. The SW1/2 of the S1/4
- B. The NW1/4 of the SE1/4
- C. The E1/2 of the N1/2 of the SE1/4
- D. None of the Above

13

50. Assume the image above is of a typical section; how many acres are in a section?
    A. 1,000 Acres
    B. 720 Acres
    C. 640 Acres
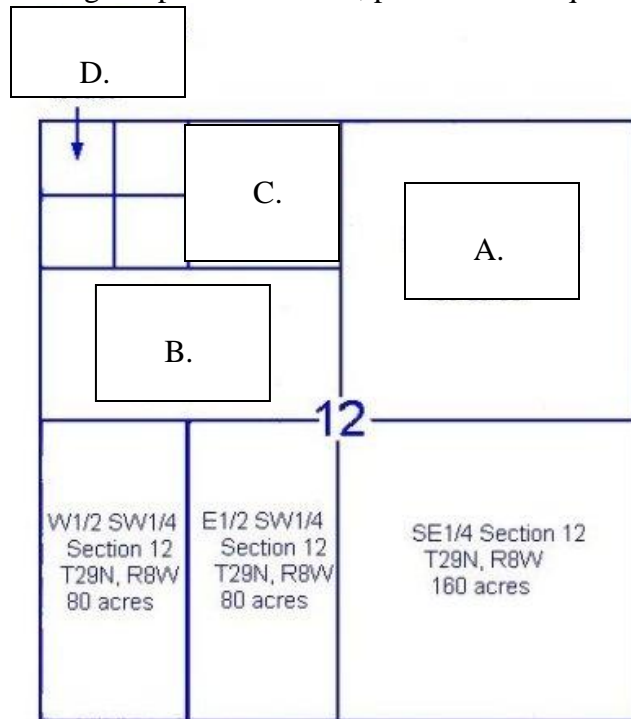   D. 100 Acres

51. Assume the image above is of a typical section; how many acres are in the shaded area?
    A. 1,000 Acres
    B. 640 Acres
    C. 160 Acres
    D. 40 Acres

Using the diagram provided below, please answer question 52-53.

52. The land description for the shaded parcel is best written as:
    A. The S1/2 of the SW1/4 of Sec 17
    B. The S1/4 of the S1/4 of Sec 17
    C. The S1/2 of the SW1/2 of Sec 17
    D. The E1/2 of the N1/2 of the SE1/4

53. Assume the image above is of a typical section; how many acres are in the shaded area?
    A. 1,000 Acres
    B. 640 Acres
    C. 160 Acres
    D. 80 Acres

Using the diagram provided below, please answer question 54-53.

54. Assume the image above is of a typical section; how many acres are in the area labeled A?

      A. 640 Acres
      B. 320 Acres
      C. 160 Acres
      D. 80 Acres

55. Assume the image above is of a typical section; how many acres are in the area labeled B?

      A. 640 Acres
      B. 320 Acres
      C. 160 Acres
      D. 80 Acres

56. Assume the image above is of a typical section; how many acres are in the area labeled C?

      A. 640 Acres
      B. 320 Acres
      C. 80 Acres
      D. 40 Acres

57. Assume the image above is of a typical section; how many acres are in the area labeled A?

        A. 10 Acres
        B. 20 Acres
        C. 60 Acres
        D. 80 Acres

58. The following description: NW ¼ of the NW ¼ of Section 12 identifies which of the parcels of land labeled above

        A.
        B.
        C.
        D.

59. A _____ _____ is a permanent point of known elevation.

        A. Back Sight (BS)
        B. Fore Sight (FS)
        C. Height of Instrument (HI)
        D. Benchmark (BM)

60. Elevation of an unknown point can be determined by subtracting the rod reading (FS) from the known:

        A. Front Sight
        B. Back Sight
        C. Height of Instrument
        D. Turning Point