**Guided Practice 1-6**

1. The line crew is using a block and a rope to lift a load up to the top of a pole. The block is rigged to the cross arm on the pole, and the cross arm is held on by bolts. Samyra, a lineman working on the ground, sees Barry, the head linesman, and asks, “Hey, Barry, we have the block and rope ready to make this lift up the pole, but we are not sure if that bolt in the cross arm is going to shear.” “Okay, well the shearing stress is equal to the load divided by the cross sectional area of the bolt. That gives us this formula,” Barry says as he writes down the information and shows it to Samyra. Samyra sees that Barry has written X pounds / 0.2485 square inches = 805 pounds per square inch. If X represents the maximum load, what is the maximum weight of the load the crew can pick up?

A. 400 lbs

B. 200 lbs

C. 3,239 lbs

D. 50 lbs

2. The line crew has reported to a manufacturing location to investigate a customer’s complaint about dimming lights. The crew determined that the apparent power (volt-amperes) being used by the customer is 22,000 volt-amperes. The crew must calculate the amps load by dividing 22,000 volt-amperes by the system voltage, which is 220 volts. Which calculation would the crew use?

A. 22,000 volt-amperes / 220 volts = X

B. 22,000 volt-amperes \* 220 volts = X

C. 220 volts / 22,000 volt-amperes = X

D. 22,000 volt-amperes = 0.220 volts \* X

3. Nicolette, an instrument and control technician, is checking a solenoid controlled valve. The valve is energized from 24 volts DC and the solenoid draws a current of 4 amps. Nicolette must calculate the solenoid resistance in ohms by dividing the system voltage by the system amperage. Which calculation would provide the solenoid resistance (X) in ohms?

A. 24 volts \* X ohms = 4 amps

B. 24 volts \* 4 amps = X ohms

C. X ohms = 24 volts / 4 amps

D. X ohms = 4 amps / 24 volts

4. A train with 50 cars delivers 1,650 tons of coal to a coal power plant. If Sara is trying to determine the average amount of coal delivered per train car, she can use the following formula: 50 \* X = 1,650. What is the average amount of coal in tons per train car?

A. 30 tons

B. 33 tons

C. 35 tons

D. 32 tons

5. The line crew just received an emergency call that a car has hit a pole and people are trapped in the car. The crew is 20.85 miles from the event and they have 30 minutes to get to it. To determine the speed the crew has to drive the formula is: 0.5 hours \* X = 20.85 miles, where X is the speed. What is the minimum speed that the crew could travel and still reach the accident site within 30 minutes? (Round to the nearest whole number.)

A. 45 mph

B. 42 mph

C. 60 mph

D. 21 mph

6. The line crew has determined that the watts loss due to resistance in the line going to a business is 950 watts. The amps in the line equal 12 amps. What is the ohms of resistance in the line using the following calculation: 950 watts = 12^2 amps \* X, where “X” is the ohms of resistance? Round to the nearest tenth.

A. 6.6 ohms

B. 66 ohms

C. 39.6 ohms

D. 0.66 ohms

**Independent Practice 7-12**

7. Lionel, an instrument and control technician, needs to add a relay to control a remote load. The relay has a coil resistance of 100 ohms. Lionel measures the DC voltage across the energized relay coil and finds it measures 22 volts. Lionel needs to calculate the solenoid power dissipation in watts by dividing the voltage squared (22 x 22 = 484) by the resistance. Which calculation would provide the solenoid coil power dissipation (X) in watts?

A. 484 volts / 100 ohms = X watts

B. X watts = 100 ohms / 484 volts

C. 484 volts \* 100 ohms = X watts

D. 44 volts / 100 ohms = X watts

8. Sara, who works at a nuclear plant which operates at a constant output, is trying to determine the power level, in Megawatts (MW), that the plant produces each hour. The total plant output for the day is 12,000 MW-h. She uses the following formula to calculate the power level of the plant: 24 hrs \* X = 12,000 MW-h. What is the power level?

A. 50 MW

B. 500 MW

C. 1,500 MW

D. 120 MW

9. A coal plant uses 15 tons of coal per hour to fuel the furnaces. If a coal silo contained 500 tons of coal, how much coal is left after 15 hours of operation? Mark used the following equation to determine the remaining coal: 15 tons/hour \* 15 hour + X = 500 tons.

A. 530 tons

B. 470 tons

C. 225 tons

D. 275 tons

10. The gas crew just received an emergency call that a car has hit the side of a house, snapping off a gas meter and causing a gas leak. The crew is 11.5 miles from the event and they have 15 minutes, or 0.25 hours, to get to it. To determine the speed the crew has to drive, the formula is: 0.25 hours \* X = 11.5 miles, where X is the speed. What is the minimum speed the crew could travel and still reach the accident site within 15 minutes?

A. 33 mph

B. 46 mph

C. 37 mph

D. 66 mph

11. The gas crew is using a small crane and a rope sling to lift a 1,500-pound load of pipes off a flatbed truck. The two rope slings are at a 45° angle coming off the single crane hook. The crew needs to know the total pounds of lift the two slings must provide. The calculation is 1,500 pounds = X / 1.414, where X is the weight to be lifted. How many pounds of lift must the two ropes provide?

A. 3,000 lbs

B. 2,121 lbs

C. 1,500 lbs

D. 1,750 lbs

12. Charlotte, an electrician, has determined the power loss in an energized solenoid controlled valve is 40 watts at a DC voltage across the solenoid of 22 volts. What is the resistance of the solenoid using the following calculation: 40 watts = 222 / X, where X is the resistance in ohms?

A. 121 ohms

B. 12.1 ohms

C. 1.21 ohms

D. 1.82 ohms

**Answer Key: Guided Practice 1-6**

1. The line crew is using a block and a rope to lift a load up to the top of a pole. The block is rigged to the cross arm on the pole, and the cross arm is held on by bolts. Samyra, a lineman working on the ground, sees Barry, the head linesman, and asks, “Hey, Barry, we have the block and rope ready to make this lift up the pole, but we are not sure if that bolt in the cross arm is going to shear.” “Okay, well the shearing stress is equal to the load divided by the cross sectional area of the bolt. That gives us this formula,” Barry says as he writes down the information and shows it to Samyra. Samyra sees that Barry has written X pounds / 0.2485 square inches = 805 pounds per square inch. If X represents the maximum load, what is the maximum weight of the load the crew can pick up?

A. 400 lbs

**B. 200 lbs – Correct Answer**

C. 3,239 lbs

D. 50 lbs

\_x = 805

.2485

Multiply by .2485 on both sides.

x=200.0425

2. The line crew has reported to a manufacturing location to investigate a customer’s complaint about dimming lights. The crew determined that the apparent power (voltamperes) being used by the customer is 22,000 volt-amperes. The crew must calculate the amps load by dividing 22,000 volt-amperes by the system voltage, which is 220 volts. Which calculation would the crew use?

**A. 22,000 volt-amperes / 220 volts = X – Correct Answer**

B. 22,000 volt-amperes \* 220 volts = X

C. 220 volts / 22,000 volt-amperes = X

D. 22,000 volt-amperes = 0.220 volts \* X

3. Nicolette, an instrument and control technician, is checking a solenoid controlled valve. The valve is energized from 24 volts DC and the solenoid draws a current of 4 amps. Nicolette must calculate the solenoid resistance in ohms by dividing the system voltage by the system amperage. Which calculation would provide the solenoid resistance (X) in ohms?

A. 24 volts \* X ohms = 4 amps

B. 24 volts \* 4 amps = X ohms

**C. X ohms = 24 volts / 4 amps – Correct Answer**

D. X ohms = 4 amps / 24 volts

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A. 30 tons

**B. 33 tons – Correct Answer**

C. 35 tons

D. 32 tons

50x=1650 Divide both sides by 50.

33=x

5. The line crew just received an emergency call that a car has hit a pole and people are trapped in the car. The crew is 20.85 miles from the event and they have 30 minutes to get to it. To determine the speed the crew has to drive the formula is: 0.5 hours \* X = 20.85 miles, where X is the speed. What is the minimum speed that the crew could travel and still reach the accident site within 30 minutes? (Round to the nearest whole number.)

A. 45 mph

**B. 42 mph – Correct Answer**

C. 60 mph

D. 21 mph

.5 \* x=20.85

Divide both sides by .5.

x=41.7 To round to the nearest whole number, look at the number in the tenth’s place and round up since it’s a 7.

x=42

6. The line crew has determined that the watts loss due to resistance in the line going to a business is 950 watts. The amps in the line equal 12 amps. What is the ohms of resistance in the line using the following calculation: 950 watts = 12^2 amps \* X, where “X” is the ohms of resistance?

**A. 6.6 ohms – Correct Answer**

B. 66 ohms

C. 39.6 ohms

D. 0.66 ohms

950=(12^2)x

950=144x

Divide both sides by 144.

6.59=x or 6.6 ohms

**Independent Practice 7-13**

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**A. 484 volts / 100 ohms = X watts – Correct Answer**

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D. 44 volts / 100 ohms = X watts

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A. 50 MW

**B. 500 MW – Correct Answer**

C. 1,500 MW

D. 120 MW

24x=12000 Divide both sides by 24.

x=500

9. A coal plant uses 15 tons of coal per hour to fuel the furnaces. If a coal silo contained 500 tons of coal, how much coal is left after 15 hours of operation? Mark used the following equation to determine the remaining coal: 15 tons/hour \* 15 hour + X = 500 tons.

A. 530 tons

B. 470 tons

C. 225 tons

**D. 275 tons – Correct Answer**

15\*15+x=500 Remind students to use order of operations, so they should multiply first.

225+x=500 Subtract 225 from both sides.

x=275

10. The gas crew just received an emergency call that a car has hit the side of a house, snapping off a gas meter and causing a gas leak. The crew is 11.5 miles from the event and they have 15 minutes, or 0.25 hours, to get to it. To determine the speed the crew has to drive, the formula is: 0.25 hours \* X = 11.5 miles, where X is the speed. What is the minimum speed the crew could travel and still reach the accident site within 15 minutes?

A. 33 mph

**B. 46 mph – Correct Answer**

C. 37 mph

D. 66 mph

.25x=11.5 Divide both sides by .25.

x=46

11. The gas crew is using a small crane and a rope sling to lift a 1,500-pound load of pipes off a flatbed truck. The two rope slings are at a 45° angle coming off the single crane hook. The crew needs to know the total pounds of lift the two slings must provide. The calculation is 1,500 pounds = X / 1.414, where X is the weight to be lifted. How many pounds of lift must the two ropes provide?

A. 3,000 lbs

**B. 2,121 lbs – Correct Answer**

C. 1,500 lbs

D. 1,750 lbs

1500=x/1.414 Multiply both sides by 1.414.

2,121=x

12. Charlotte, an electrician, has determined the power loss in an energized solenoid controlled valve is 40 watts at a DC voltage across the solenoid of 22 volts. What is the resistance of the solenoid using the following calculation: 40 watts = 22^2/ X, where X is the resistance in ohms?

A. 121 ohms

**B. 12.1 ohms – Correct Answer**

C. 1.21 ohms

D. 1.82 ohms

40=22^2/x

40=484/x Mutliply by x on both sides.

40x=484 Divide by 40 on both sides.

x=12.1 ohms