

Table of Contents

Ratios and Proportions (Lineworker).....	3
Scenario.....	3
Problems.....	4
<i>Calculating Ratios.....</i>	<i>4</i>
<i>Calculating Direct Proportions.....</i>	<i>5</i>
<i>Calculating Inverse Proportions.....</i>	<i>6</i>
<i>Calculating Averages.....</i>	<i>7</i>
Ratios and Proportions (Pipefitter/Pipelayer/Welder)..	8
Scenario.....	8
Problems.....	9
<i>Calculating Ratios.....</i>	<i>9</i>
<i>Calculating Direct Proportions.....</i>	<i>10</i>
<i>Calculating Inverse Proportions.....</i>	<i>11</i>
<i>Calculating Averages.....</i>	<i>12</i>

Ratio and Proportions (Lineworker)

Scenario

“Hey, Gabriel, you want to check my numbers on this system upgrade plan?” René asks her supervisor.

“Sure, no problem,” Gabriel responds.

“Okay, so we have to install 840 feet of wire for the upgrade, and the pole at the substation is already set.”

If they must use 120 feet of wire between each pole, how many poles past the substation should René to bring to the job?

- A. 7 poles – Correct Answer
- B. 6 poles
- C. 9 poles
- D. 10 poles



Rene is preparing to install wires
near a substation

*Courtesy [ShadowedHills](#) via flickr,
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Problems

Calculating Ratios

Jack is pulling cable for an underground job in a city. The crew is using cable-pulling lubricant to assist in the pull and not damage the cable. Jack has used 5 gallons of lubricant for the first 100 feet of cable pulled. What is the ratio for feet of cable pulled to the gallons of lubricant used expressed in lowest terms?

- A. 50 ft of cable to 1 gallon of lubricant
- B. 100 ft of cable to 1 gallon of lubricant
- C. 20 ft of cable to 1 gallon of lubricant – Correct Answer
- D. 500 ft of cable to 1 gallon of lubricant

Faith is clearing brush around utility poles and has mixed 640 ounces of gas with 40 ounces of oil in a trimmer's 2-cycle motor. What is the ratio of gas to oil expressed in lowest terms?

- A. 16:1 oz – Correct Answer
- B. 1:16 oz
- C. 1:8 oz
- D. 8:1 oz

Ken's crew has just finished installations for a new subdivision. There were 39 new customers and the crew had to install 13 fuses. What is the ratio of customers to fuses expressed in lowest terms?

- A. 39 customers to 13 fuses
- B. 26 customers to 1 fuse
- C. 5 customers to 1 fuse
- D. 3 customers to 1 fuse – Correct Answer

Calculating Direct Proportions

Kim is determining how many discs an insulator must have for a given voltage. The engineering calculation estimate indicates that for every 10 kV of voltage, the insulator must have 1 insulating disc. If the voltage of the system Kim is working on is 120 kV, how many discs must the insulator have for this voltage?

- A. 11 discs
- B. 10 discs
- C. 12 discs – Correct Answer
- D. 20 discs

Alex is sloping a trench for a directed buried electrical line installation. For every 1 foot of depth, the slope of the trench side walls must be at least 1 1/2 feet back. If the trench is 10 feet deep, how far back does the crew need to slope the trench so they can work the installation safely?

- A. 12 ft of slope
- B. 10 ft of slope
- C. 15 ft of slope – Correct Answer
- D. 10 1/2 ft of slope

Calculating Inverse Proportions

Karen is planning an upgrade job to provide a new service to a factory. She knows it will take 10 linemen 7 days to do the job. How many days will it take if Karen assigns 15 linemen to do the same job?

- A. 4.7 days – Correct Answer
- B. 7.5 days
- C. 10.5 days
- D. 3 days

Joan has received a call from dispatch to respond to an accident involving a car and a utility pole. The dispatcher has asked Joan for an estimate of how long it will take her to get to the car accident. Joan knows that if she can do 45 mph, it will take her 55 minutes to get to the leak. If Joan gets on the highway, she can do 65 mph. How long will it take Joan to respond to the car accident if she uses the highway?

- A. 30 minutes
- B. 38 minutes – Correct Answer
- C. 53 minutes
- D. 79.4 minutes

Mike is in charge of the warehouse and he has to restock all the electric distribution trucks on Friday afternoon so they are ready to go on Monday morning. Two warehouse workers typically take 6 hours to restock the trucks. Mike has assigned 3 warehouse workers to the restocking effort. How long will it take the 3 warehouse workers to restock all the trucks?

- A. 2 hours
- B. 3 hours
- C. 9 hours
- D. 4 hours – Correct Answer

Calculating Averages

Len has 5 different meter reading crews. Using the automated meter reading system, the crews are reading meters at the following rates: crew 1 – 60 meters/day; crew 2 – 125 meters/day; crew 3 – 85 meters/day; and crew 4 – 90 meters/day. What is the average number of meters read by the crews in a single day?

- A. 90 meters/day – Correct Answer
- B. 72 meters/day
- C. 78 meters/day
- D. 80 meters/day

Harris is determining how many poles a line crew can set in a given day. The crews set poles at different rates based on the complexity of the job and soil conditions. The crews set the following number of poles: 5, 6, 3, 2, 6 and 8. What is the average number of poles a crew should be able to set in a day?

- A. 6 poles
- B. 5 poles – Correct Answer
- C. 4 poles
- D. 7 poles

Kim is reviewing a completed transmission job. Her task is to determine the average amount of wire the crew pulled per day. The crew numbers were: 1,000 feet, 1,500 feet, 850 feet, 1,250 feet, 1,500 feet, and 2,000 feet. What was the average number of wire pulled in one day?

- A. 1,350 ft/day – Correct Answer
- B. 1,620 ft/day
- C. 1,320 ft/day
- D. 1,100 ft/day

Ratio and Proportions (Pipefitter/Pipelayer/Welder) Scenario

“Hi, Laura. How are we doing with the outage in the Thornbrook neighborhood?” Denise asks Laura, a gas dispatcher.

“I was just getting ready to call in the gas distribution mechanics,” responds Laura. “We expect the gas system to be repaired within the next 45 minutes.”

“Sounds good. I want all 150 customers relit within an hour of the gas system’s repair.”

Laura knows from experience that 1 mechanic can relight 10 houses in an hour. How many gas mechanics need to come in to restore all the customers within an hour after the system is repaired?

- A. 10 mechanics
- B. 15 mechanics – Correct Answer
- C. 5 mechanics
- D. 30 mechanics



Laura is calling in gas mechanics to restore service in a residential neighborhood
Courtesy Bureau of Labor Statistics, image is in the public domain

Problems

Calculating Ratios

Jane is placing cones for a work zone around a new gas pipe installation. The site requires 5 cones for every 75 feet of the work zone. What is the ratio of cones to the length of the work zone expressed in lowest terms?

- A. 1 cone to every 15 ft – Correct Answer
- B. 1 cone for every 10 ft
- C. 15 cones for every 75 ft
- D. 1 cone for every 7 1/2 ft

Hank needs to pump out a trench that has filled with rain water. The portable gas pump runs for 3 hours and uses 6 gallons of gas. What is the ratio of gas use to hours of pump operation expressed in lowest terms?

- A. 1 gallon of gas for 2 hours of pump operation
- B. 1 gallon of gas for 1/2 hour of pump operation – Correct Answer
- C. 1 gallon of gas for 3/4 hour of pump operation
- D. 3 gallons of gas for 6 hours of pump operation

Karen is heating up welding rods for a weld job to cover a road trench with a plate of steel. She needs 20 welding rods for every 5 feet of weld on the plate. What is the ratio of welding rod to the length of the weld expressed in lowest terms?

- A. 4 welding rods for every 5 ft of weld
- B. 5 welding rods every 5 ft of weld
- C. 2 welding rods for every 1 ft of weld
- D. 4 welding rods for every 1 ft of weld – Correct Answer

Calculating Direct Proportions

Darron is sloping a trench for a gas pipeline installation. For every 5 feet deep, the slope of the trench side walls must be at least $\frac{3}{4}$ feet back. If the trench is 15 feet deep, how far back does the crew need to slope the trench so they can work the installation safely?

- A. $1\frac{1}{2}$ ft of slope
- B. $3\frac{3}{4}$ ft of slope
- C. $2\frac{1}{4}$ ft of slope – Correct Answer
- D. $\frac{3}{4}$ ft of slope

Jane is calculating the loads of fill she needs to fill a trench where a new pipe was installed. For every 8 feet of trench, Jane needs 6 tons of fill. How many tons of fill does Jane need for a 24-foot trench?

- A. 12 tons of fill
- B. 6 tons of fill
- C. 18 tons of fill – Correct Answer
- D. 8 tons of fill

Calculating Inverse Proportions

Tom is designing a gas installation job. Tom knows that it will take 12 days to dig the trench with 3 backhoes. If Tom can get 6 backhoes, how many days will it take to dig the trench?

- A. 4 days
- B. 24 days
- C. 3 days
- D. 6 days – Correct Answer

Ned has received a call from dispatch to respond to a gas leak. The dispatcher has asked Ned for an estimate of how long it will take Ned to get to the gas leak. Ned knows that if he can do 30 mph, it will take him 45 minutes to get to the leak. If Ned can do 45 mph, how long will it take Ned to respond to the gas leak?

- A. 60 minutes
- B. 30 minutes – Correct Answer
- C. 45 minutes
- D. 15 minutes

Mike is in charge of the warehouse and he has to restock all the gas distribution trucks on Friday afternoon so they are ready to go on Monday morning. Two warehouse workers typically take 6 hours to restock the trucks. Mike has assigned 3 warehouse workers to the restocking effort. How long will it take the 3 warehouse workers to restock all the trucks?

- A. 2 hours
- B. 3 hours
- C. 6 hours
- D. 4 hours – Correct Answer

Calculating Averages

Wendy is the welder on a pipeline installation. Wendy completed 6 welds the first day, 10 welds the second day, and 8 welds the third day. What is the average number of welds Wendy is completing per day?

- A. 8 welds/day – Correct Answer
- B. 6 welds/day
- C. 10 welds/day
- D. 12 welds/day

Yolanda is responsible for several crews doing pipe fusions in a new residential subdivision. The 3 crews averaged 30 fusions the first day, 28 the second day, 26 the third day, and 20 the final day. What is the average number of fusions the 3 crews are completing per day?

- A. 34 fusions/day
- B. 26 fusions/day – Correct Answer
- C. 27 fusions/day
- D. 8 fusions/day

Five welders are working on a new gas pipeline installation. The welders work at different rates depending on the complexity and quality of their welding ability. The welders are welding 30 inches of bead/hour, 21 inches of bead/hour, 15 inches of bead/hour, 25 inches of bead/hour, and 29 inches of bead/hour. What is the average rate of welding for the 5 welders?

- A. 20 in of bead/hour
- B. 25 in of bead/hour
- C. 24 in of bead/hour – Correct Answer
- D. 26 in of bead/hour