Study Guide

Multiple Choice
Identify the choice that best completes the statement or answers the question.

Solve the proportion.

1. \( \frac{b}{10.5} = \frac{157.5}{52.5} \)
   a. 787.5  b. 320.5  c. 31.5  d. 3.5

2. A building 50 ft high casts a 75-ft shadow. Sarah casts a 6-ft shadow. The triangle formed by the building and its shadow is similar to the triangle formed by Sarah and her shadow. How tall is Sarah?
   a. 4 ft  b. 5 ft  c. 3 ft  d. not here

3. Gretchen is using an overhead projector to enlarge a drawing so she can make a poster. The original drawing measures 60 mm wide by 80 mm high. She moves the projector so that the width of the projected image is 300 mm. If the original drawing and the projected image are similar figures, what will be the height of the projected image?
   a. 440 mm  b. 225 mm  c. 180 mm  d. 400 mm

4. A map shows the distance between the corner of Cactus Road and 1st Street and the corner of 1st Street and Merle Road as 3 inches. If the scale is 1 in. : 3.7 mi, what is the actual distance?
   a. 1.3 mi  b. 11.1 mi  c. 111 mi  d. 22.2 mi

5. Martha paid $42.40 for her sister’s birthday present. This included 6% sales tax. What was the cost of the gift before tax?
   a. $40.00  b. $44.94  c. $25.44  d. $2.40

Write the percent as a fraction or mixed number in simplest form.

6. \( 35\% \)
   a. \( \frac{13}{20} \)  b. \( \frac{1}{6} \)  c. \( \frac{7}{20} \)  d. \( \frac{1}{3} \)

Write an equation and solve. Round to the nearest hundredth where necessary.

7. What percent of 24 is 30?
   a. \( n \cdot 24 = 30; 125\% \)  c. \( n = 30 \cdot 24; 720\% \)
   b. \( n \cdot 30 = 24; 80\% \)  d. \( n = 30 \cdot 0.24; 720\% \)

8. In a survey, 480 people, or 75%, said they attended a movie at least once a month. How many people were surveyed?
   a. 405 people  b. 360 people  c. 555 people  d. 640 people

9. Find the percent of increase from 320 to 380. Round to the nearest tenth of a percent if necessary.
   a. 18.8%  b. 84.2%  c. 15.8%  d. 0.2%

10. A toy store’s percent of markup is 35%. A model train costs the store $100. Find the markup.
    a. $135  b. $35  c. $285.71  d. $65
11. Soren placed $750 in a certificate of deposit (CD) with an interest rate of 3.5%. At the end of each year, the CD earns interest on the total amount including interest earned in previous years. How much money will there be after 5 interest payments?
   a. $131.25    b. $881.25    c. $1,312.50    d. $890.76

12. A construction company has a project that will take 1000 person-days to complete. How many days will it take to complete the project if the company has 50 workers?
   a. 20    b. 50    c. 80    d. 30

   a. $3.30    b. $6.60    c. $1.60    d. $25.20

14. \(2x - 26 = 10\)
   a. \(-8\)    b. \(5\)    c. \(2\)    d. \(18\)

15. \(-3x + 6 = -9\)
   a. \(-3\)    b. \(5\)    c. \(3\)    d. \(1\)

16. \(5m + 4m = 72\)
   a. \(-72\)    b. \(9\)    c. \(8\)    d. \(72\)

17. \(2s - 3s = 20\)
   a. \(4\)    b. \(-20\)    c. \(-1\)    d. \(-4\)

18. \(6d - 10d = 40\)
   a. \(-10\)    b. \(36\)    c. \(10\)    d. \(44\)

19. \(78 = -2(m + 3) + m\)
   a. \(-28\)    b. \(-42\)    c. \(-72\)    d. \(-84\)

20. \(\frac{1}{4}y + 9 = \frac{1}{2}\)
   a. \(-34\)    b. \(2\)    c. \(9\)    d. \(38\)

21. \(-\frac{3}{10} + a = \frac{2}{5}\)
   a. \(-\frac{10}{7}\)    b. \(\frac{7}{10}\)    c. \(\frac{9}{10}\)    d. \(\frac{2}{3}\)

22. \(\frac{5}{4}(a - 8) = \frac{2}{3}\)
   a. \(\frac{14}{15}\)    b. \(\frac{1}{15}\)    c. \(\frac{8}{15}\)    d. \(\frac{2}{3}\)

23. Work-Out Corner has 5 more than 3 times as many exercise bicycles as The Gym. Together they have 21 bicycles. Solve the equation \(x + 3x + 5 = 21\) to find the number of bicycles at Work-Out Corner.
   a. 4 bicycles    b. 17 bicycles    c. 7 bicycles    d. 25 bicycles
24. The 9 officers of the Student Council are going on a trip to an amusement park. Each student must pay an entrance fee plus $5 for meals. The total cost of the trip is $225. Solve the equation $9e + 5 = 225$ to find the cost $e$ of the entrance fee for each student.

a. $20  
   b. $45  
   c. $25  
   d. $14

Solve and graph the inequality.

25. $2x - 10 > -14$
   a. $x > -7$
   b. $x > -2$
   c. $x > 2$
   d. $x < 2$

26. $14 - 2x > 18$
   a. $x > -9$
   b. $x < -9$
   c. $x > 2$
   d. $x < -2$

27. Melissa wants to spend no more than $300 on school clothes. She spends $75 on a coat and then wants to buy some sweaters that are on special for $10 each. Solve the inequality $75 + 10s \leq 300$ to find the greatest number of sweaters $s$ she can buy.

a. 23 sweaters  
   b. 22 sweaters  
   c. 30 sweaters  
   d. 21 sweaters

28. The width of a rectangle is 13 centimeters. Let $x$ represent the length. Find all possible values for $x$ if the perimeter is at least 228 centimeters.

a. $x \geq 44$ cm  
   b. $x \geq 101$ cm  
   c. $x \geq 18$ cm  
   d. $x \geq 215$ cm

29. Solve the volume formula $V = lwh$ for $h$.

a. $h = \frac{V}{lw}$  
   b. $h = \frac{V}{l + w}$  
   c. $h = \frac{l}{V}$  
   d. $h = \frac{V}{lw}$

30. The formula for converting degrees Fahrenheit ($F$) to degrees Celsius ($C$) is $C = \frac{5}{9}(F - 32)$. Find $C$ for $F = 50\degree$.

a. $-49\degree$  
   b. $-27\degree$  
   c. $3\degree$  
   d. $-15\degree$

31. The cost of renting a car is given by the formula $C = 50n + 0.15d$, where $C$ is the cost in dollars, $n$ is the number of days’ rental, and $d$ is the distance driven in miles. How much would it cost to rent a car for a 15-day trip, and drive 475 miles each day?

a. $1,225.00  
   b. $1,818.75  
   c. $821.25  
   d. $121.25

Short Answer
Tell whether the two ratios form a proportion. Explain.

32. \( \frac{1}{12} \) and \( \frac{8}{96} \)

33. \( \frac{9}{4} \) and \( \frac{11}{5} \)

34. The Student Council attended a convention. For lunch, 12 out of the 29 members chose milk to drink.  
   a. To the nearest tenth of a percent, what percent of the students chose milk?  
   b. To the nearest tenth of a percent, what percent of the students chose another beverage?

35. Amy has a garden covering 900 square feet.  
   a. If she wants to plant moss roses on 10% of the garden, how many square feet will moss roses cover? Write and solve a percent equation to solve this problem.  
   b. If the garden occupies 25% of Amy’s yard, what is the area of her yard in square feet? Write and solve a percent equation to solve this problem.

36. Ginnie bought a table cloth for $23.25. She embroidered a design on the table cloth and then sold it for $41.75.  
   a. What was the percent of increase in price of the tablecloth?  
   b. Suppose Ginnie wanted to make a profit of $24.50 on the sale of the tablecloth. What would be the percent of increase in the price for that amount of profit?

37. Danielle manages a clothing store. For a special promotion, she receives a shipment of coats that cost her $85 each.  
   a. Usually, the percent of markup for her store is 70%. Find the usual selling price of one of the coats.  
   b. The owner of the store suggests that she mark each coat with a price tag of $127.5. What is the percent of markup for each coat?

38. An engineer is drawing plans for a new water tower. The tower is 82 feet tall and the tank is circular with a diameter of 26 feet.  
   a. The engineer builds a model of the tower with a scale of 1 inch : 5 feet. What are the dimensions of the model?  
   b. Suppose the engineer decides to build a second model such that the height of model is 20 inches. What is the scale for the model?

39. When a new model of computers became available, Computer World reduces the price of the older computers by 25%. Jeremy has $1,457 saved. If the original price of the computer is $2,000, does Jeremy have enough money to buy the computer at the sale price?

40. Elise and Miguel both collect baseball cards. Miguel has 2 more than 2 times as many cards as Elise. Together they have 971 cards.  
   a. Write an equation to represent this situation.  
   b. How many cards does each person have?

41. Caitlin had $402 in her bank account. She withdrew $15 each week to pay for a swimming lesson. She now has $237.  
   a. Write an equation that can be used to find the number of swimming lessons that she paid
for.

b. How many swimming lessons did she pay for?
c. At the time she had $237, the cost of a lesson rose to $19. How many lessons can she pay for with her remaining $237?

42. Jeremy is building a large deck for a community center. The deck is shaped as a rectangle. The width of the deck is 29 feet. The perimeter of the deck is to be at least 134 feet.

a. Write an inequality that represents all possible values for the length of the deck.
b. Find all possible values for the length of the deck.

Essay

43. Dane designed two gardens for a museum. The gardens are shaped as similar trapezoids as shown. Find the perimeter of the smaller garden. Show your work.

![Trapezoid Diagram]

44. Allen makes a 3.4% commission selling vehicles at a car dealership.

a. How much commission does he make on the sale of a $17,000 car? Show your work.
b. During one busy month, Allen’s total commission was $9,860. If a salesperson sells more than $200,000 in one month, the person receives a bonus. Did Allen receive a bonus? Explain.

45. Susan drove to visit her cousin, driving a distance of 646 miles. The trip took 16 hours of driving time.

a. What was her average speed for the hours that she drove?
b. Susan wants to shorten her driving time by one half hour. What average speed should she drive to do this? Write and solve a proportion to find Susan’s new speed.

46. Dorothy is a scientist studying the rate of growth of a particular type of bacteria. For an experiment, she begins with 37 bacteria on a slide. She finds that the number of bacteria on the slide doubles every 30 minutes.

a. Make a table showing the total number of bacteria at the end of every 30-minute period for 4 hours.
b. What is the percent of increase in the population of the bacteria on the slide from the beginning of the experiment to the end of 4 hours? Show your work.

47. Michael is saving money to attend a ski camp in Canada. The total cost of the camp is $1,500. He has $785 in a savings account and plans to save $55 per week.

a. Explain how to write an equation to represent this situation.
b. Explain how to solve the equation to find the number of weeks that he will need to save to earn the total amount for the camp. Then find the number of weeks.
c. Michael has to pay the entire cost for the camp on June 1. Can he start saving on April
1 and still pay the entire cost? Explain your reasoning.

48. Wes owns a shop where he sells souvenirs. He ordered a shipment of boxes of huckleberry chocolates. Only \( \frac{3}{4} \) of his order arrived. At that time he had 5 boxes left. Added to the new boxes, he had a total of 128 boxes of the chocolates.
   a. Solve the equation \( \frac{3}{4} b + 5 = 128 \) to find the number of boxes \( b \) that were supposed to be in the shipment. Explain how you solved the equation.
   b. Check the solution to the equation from part a. Explain your method.

49. At Water World the admission fee is $17.00, and you can rent an inner tube for $0.75 per hour. You can use the formula \( P = 17.00 + 0.75h \) to find the total cost for admission plus renting an inner tube.
   a. Solve the formula \( P = 17.00 + 0.75h \) for \( h \). Explain your steps for solving the formula for \( h \).
   b. For how many hours can you rent an inner tube if you only have $20.75 to spend? Explain your method for finding the answer.

50. Rudy invested $1,400.00 in a savings account earning simple interest. At the end of 3 years, he had a total of $1,568.00 in his account.
   a. How much simple interest did he earn in 3 years? Explain how you found the answer.
   b. How much simple interest did he earn per year? Explain how you found the answer.
   c. What was the rate of simple interest per year for his account? Explain how you found the answer.
MULTIPLE CHOICE

1. C
2. A
3. D
4. B
5. A
6. C
7. A
8. D
9. A
10. B
11. D
12. A
13. A
14. D
15. B
16. C
17. B
18. A
19. D
20. A
21. B
22. C
23. B
24. A
25. B
26. B
27. B
28. B
29. D
30. D
31. B

SHORT ANSWER

32. To find whether the two ratios form a proportion, write them as a proportion and then check the cross products.

\[
\frac{1}{12} \overset{2}{=} \frac{8}{96}
\]

Test by writing as a proportion.

\[
1 \cdot 96 \overset{2}{=} 8 \cdot 12
\]

Write cross products.
96 = 96 \quad \text{Simplify.}

The ratios form a proportion since the cross products are equal.

33. To find whether the two ratios form a proportion, write them as a proportion and then check the cross products.

\[
\frac{9}{4} \overset{?}{=} \frac{11}{5}
\]

Test by writing as a proportion.

\[
9 \cdot 5 \overset{?}{=} 11 \cdot 4
\]

Write cross products.

\[
45 \neq 44
\]

Simplify.

The ratios do not form a proportion since the cross products are not equal.

34. a. 41.4% 
   b. 58.6%

35. a. \( n = 0.10 \cdot 900 \)

\[ n = 90 \]

Moss roses will cover 90 square feet.

b. \( 900 = 0.25 \cdot n \)

\[ n = 3,600 \]

Amy’s yard is 3,600 square feet.

36. a. 79.6% 
   b. 105.4%

37. a. $144.50 
   b. 50%

38. a. To find the dimensions for the model, write and solve a proportion using the scale for each dimension.

\[
\frac{\text{model (in.)}}{\text{actual (ft)}} \rightarrow \frac{1}{5} = \frac{h}{82} \quad \text{← model (in.)} \\
1 \cdot 82 = 5 \cdot h
\]

\[
\frac{82}{5} = \frac{5h}{5}
\]

\[
16.4 = h
\]

The model is 16.4 inches tall and 5.2 inches in diameter.

b. You need to find the scale of the model as a ratio of 1 inch to some number of feet. Write and solve a proportion using the height of the new model and the height of the actual tower.
The scale is 1 inch : 4.1 feet.

39. The sale price of the computer is \(2,000 - (2,000 \cdot 0.25) = \$1,500\). Jeremy does not have enough money saved to buy the computer.

40.
   a. \(x + 2x + 2 = 971\)
   b. Elise, 323 cards; Miguel, 648 cards

41.
   a. \(237 + 15p = 402\), where \(p = \text{number of lessons paid for}\)
   b. 11 lessons
   c. 12 lessons

42.
   a. If \(L = \text{length of the deck, an inequality is } 2L + 58 \geq 134.\)
   b. \(L \geq 38 \text{ ft}\)

ESSAY

43.
   a. To find the perimeter of the smaller garden, you must add the lengths of the sides. The trapezoids are similar, so write and solve proportions to find the lengths of the missing sides.
   \[
   \frac{6}{10} = \frac{3}{a} \quad \frac{6}{4} = \frac{3}{b} \quad \frac{6}{4} = \frac{3}{c}
   \]
   \[
   6a = 30 \quad 6b = 12 \quad 6c = 12
   \]
   \[
   a = 5 \quad b = 2 \quad c = 2
   \]
   The perimeter of the smaller garden is \(3 \text{ m} + 5 \text{ m} + 2 \text{ m} + 2 \text{ m}\), or 12 meters.

44.
   a. \(c = 17,000 \cdot 0.034\)
   \[
   c = 578
   \]
   Allen earned a \$578 on the sale of the car.
   b. Write and solve a percent equation to find the total sales.
   \[
   \frac{9,860}{0.034} = \frac{9,860}{0.034} = \frac{9,860}{0.034} = \frac{9,860}{0.034}
   \]
   Allen sold \$290,000 worth of vehicles, which is greater than \$200,000. Allen received a bonus.
45.  
   \[ \frac{646 \text{ miles}}{16 \text{ hours}} = 40.4 \text{ mi/h} \]
   
   a. Her average speed was about 40.4 miles per hour.

   b. Methods may vary. Sample: Write and solve a proportion to find the speed needed to
   shorten the trip from 16 hours to 15.5 hours:

   \[ \frac{40.4}{16} = \frac{r}{15.5} \]
   
   \[ 16r = 40.4 \cdot 15.5 \]
   
   \[ r = \frac{40.4 \cdot 15.5}{16} \]
   
   \[ r = 41.6774 \]

   Susan should drive at an average speed of approximately 41.7 mi/h to reduce her trip time
   by one half hour.

46.  
   \[ \begin{array}{|c|c|}
   \hline
   \text{Elapsed Time (hours)} & \text{Total Number of Bacteria} \\
   \hline
   0 & 37 \\
   0.5 & 74 \\
   1.0 & 148 \\
   1.5 & 296 \\
   2.0 & 592 \\
   2.5 & 1,184 \\
   3.0 & 2,368 \\
   3.5 & 4,736 \\
   4.0 & 9,472 \\
   \hline
   \end{array} \]

   a. amount of increase = 9,472 – 37 = 9,435

   \[ \text{percent increase} = \frac{\text{amount of increase}}{\text{original amount}} \]
   
   \[ = \frac{9,435}{37} \]
   
   \[ = 255 \]
   
   \[ = 25,500\% \]

   The percent of increase in population is 25,500%.

47.  
   a. Let \( w \) be the number of weeks that Michael will save $55. An equation for this
   situation is \( 1,500 = 785 + 55w \), since he must earn $1,500, he has $785, and he
   will save $55 per week.

   b. To solve the equation, subtract 785 from each side. Then divide each side by 55.
   
   \[ 1,500 = 785 + 55w \]
1,500 – 785 = 785 + 55w – 785 Subtract 785 from each side.
715 = 55w Simplify.
715
55 = w Divide each side by 55.

He needs to save for 13 weeks.

c. No, he can’t pay the entire amount on June 1. He needs to save for 13 weeks and there are fewer than 13 weeks between April 1 and June 1.

48.

a. To solve the equation \( \frac{3}{4} b + 5 = 128 \), you must subtract 5 from each side and then multiply each side by \( \frac{4}{3} \).

\[
\frac{3}{4} b + 5 = 128
\]

\[
\frac{3}{4} b + 5 - 5 = 128 - 5 \quad \text{Subtract 5 from each side.}
\]

\[
\frac{3}{4} b = 123 \quad \text{Simplify.}
\]

\[
\frac{4}{3} \cdot \frac{3}{4} b = \frac{4}{3} \cdot 123 \quad \text{Multiply each side by \( \frac{4}{3} \), the reciprocal of \( \frac{3}{4} \).}
\]

\[
b = 164 \quad \text{Simplify.}
\]

There were supposed to be 164 boxes in the shipment.

b. To check the solution, substitute 164 for \( b \) in the original equation.

\[
\frac{3}{4} b + 5 = 128
\]

\[
\frac{3}{4} (164) + 5 = 128 \quad \text{Substitute 200 for \( b \).}
\]

\[
123 + 5 = 128 \quad \text{Simplify.}
\]

\[
128 = 128 \quad \text{The solution checks.}
\]

49.

a. To solve the formula for \( h \), first subtract 17.00 from each side. Then divide each side by 0.75.

\[
P = 17.00 + 0.75h
\]

\[
P - 17.00 = 17.00 + 0.75h - 17.00 \quad \text{Subtract 17.00 from each side.}
\]

\[
\frac{P - 17.00}{0.75} = \frac{0.75h}{0.75} \quad \text{Divide each side by 0.75.}
\]
\[
\frac{P - 17.00}{0.75} = h \\
\text{Simplify.}
\]

b. To find the number of hours, substitute 20.75 for \( P \) in the equation.
\[
\frac{P - 17.00}{0.75} = h
\]
\[
\frac{20.75 - 17.00}{0.75} = h \quad \text{Substitute 20.75 for} \ P.
\]
\[
5 = h \quad \text{Simplify.}
\]
You can rent the inner tube for 5 hours.

50.

4. a. To find the simple interest, subtract 1,400.00 from 1,568.00 to get 168.00. So he earned $168.00 in 3 years.
   b. To find the simple interest per year, divide 168.00 by 3 to get 56.00. So he earned $56.00 per year.
   c. To find the rate of interest per year, divide 56.00 by 1,400.00 to get 0.04. So the simple interest rate was 4%.

[3] one incorrect computation or an error in reasoning
[2] two computational errors or poor explanation
[1] one or more answers missing and/or no explanation