

***LHF STUDY GUIDE* PASS THE HiSET® MATH TEST!**

PROPORTION

Lesson 4 Proportion Word Problems Test *Answers – p. 6*

1. A salesman has driven 150 miles in $3\frac{1}{2}$ hours. If he continues driving at the same rate, which expression shows how long it will take to drive the final 95 miles of his trip?

- A. $\frac{150}{95} \times 3.5$ B. $\frac{95}{150} + 3.5$ C. $\frac{95}{150} \times 3.5$ D. $\frac{95}{3.5} \times 150$ E. $\frac{3.5}{150} + 95$

2. A scientist tracks the flight of the birds he is studying and finds that they can fly 60 kilometers in $1\frac{1}{2}$ hours. At the same rate, how long will it take the birds to fly 200 kilometers?

- A. 90 hours B. 5 hours C. 40 hours D. 3.3 hours E. 50 hours

3. In a survey of 450 students at a large university, 343 said they are likely to rent textbooks instead of buying them. Based on this survey, how many of the 12,000 total students at the university would you predict are likely to buy textbooks instead of renting them?

- A. 9,147 B. 2,853 C. 3,743 D. 11,207 E. 2,538

4. The Farm Co-op recommends planting 56 fruit trees per $\frac{1}{2}$ acre. Which of the following will result in the same proportion of trees per acre?

- A. 150 trees & $1\frac{1}{2}$ acres B. 84 trees & $\frac{3}{4}$ acre C. 40 trees & $\frac{1}{4}$ acre
D. 300 trees & 3 acres E. 100 trees & $\frac{3}{4}$ acre

5. In a survey of 450 voters in Boone County, 65 said they would vote No on ballot question #1. How many of the 16,500 voters in Boone County do you predict will vote No on ballot question #1, based on these survey results?

- A. 2,383 B. 254 C. 385 D. 2,833 E. 238

6. The cost to outfit 12 students with band uniforms is \$425. How much will it cost to buy uniforms for all 40 students that are in the band?

- A. \$5,100 B. \$4,117 C. \$1,275 D. \$1,417 E. \$1,500

7. How many patterns can a machine cut in 15 minutes, if it is set to cut 32 patterns per hour?
- A. 2.13 B. 4.8 C. 16 D. 48 E. 8
8. Decorative ribbon trim costs \$1.99 for 16 inches. Sacha is trimming the front side of the 8 tables she will be using at her event. If each table is 4 feet across the front side, how much will the ribbon trim cost?
- A. \$5.97 B. \$63.68 C. \$3.98 D. \$95.52 E. \$47.76
9. 12 grams of flavor powder concentrate are used for every 65 liters of grape soda. Which expression shows how many grams of flavor powder concentrate will be needed to make 450 liters of grape soda?
- A. $\frac{450}{65} \div 12$ B. $\frac{12}{65} + 450$ C. $\frac{65}{12} \times 450$ D. $\frac{12}{65} \times 450$ E. $\frac{65}{450} \times 12$
10. A local road map has a scale of 6 miles per inch. If the actual distance between two towns is 57 miles, how many inches apart will they be on the map?
- A. 9 B. 51 C. 5.9 D. 9.5 E. 10.5
11. If a school system can purchase a bulk package of 500 workbooks for \$195, what is the cost per workbook?
- A. \$3.90 B. \$2.56 C. \$0.39 D. \$0.49 E. \$0.93
12. On the blueprints for a house, $\frac{1}{4}$ inch is equal to 1 foot. What are the dimensions on the blueprint of a room with actual measurements of 30 feet long and 20 feet wide?
- A. 8 inches by 4 inches B. 50 inches by 10 inches C. 15 inches by 10 inches
D. 7.5 inches by 5 inches E. 60 inches by 40 inches
13. At New You Yoga School, there are currently 353 students enrolled, which corresponds to 72% of maximum enrollment. How many more students would the school need to sign up to reach their goal of 95% enrollment?
- A. 466 B. 335 C. 113 D. 265 E. 268

14. Which expression below shows the cost of one ounce of Supersuds Laundry Powder if a 48 ounce box is on sale for \$3.29?

- A. $48 \div \$3.29$ B. $\$3.29 \div 48$ C. $48 - \$3.29$ D. $48 \times \$3.29$ E. $48 + \$3.29$

15. On the floor plan of a new restaurant, the cashier/waiting area measures 6 inches wide x 12 inches long, and each inch on the floor plan equals $2\frac{1}{2}$ feet of actual distance. What are the actual length and width of the cashier/waiting area?

- A. 30 feet x 15 feet B. 4.8 feet x 2.4 feet C. 30 inches x 15 inches
D. 4.8 inches x 2.4 inches E. 14.5 feet x 8.5 feet

16. The formula to make Ocean Blue paint calls for 6 gallons of blue paint and $\frac{1}{2}$ gallon of green paint. Which of the following combinations will correctly produce Ocean Blue paint?

- A. 12 gal. blue & $\frac{3}{4}$ gal. green B. 15 gal. blue & 2 gal. green
C. 4 gal. blue & $\frac{1}{4}$ gal. green D. 21 gal. blue & $1\frac{3}{4}$ gal. green
E. 8 gal. blue & 1 gal. green

17. A company has 150 clerks and 6 shift supervisors. If each clerk can produce 12 invoices in 3 hours, how many invoices can a clerk produce in an 8 hour shift?

- A. 32 B. 12.5 C. 37.5 D. 23 E. 50

18. Two tourist attractions are 9.4 centimeters (cm) apart on a map of France, and the scale on the map is 2.2 centimeters (cm) = 25 kilometers (km). Choose one of the expressions below that you would use to get the best estimate of the actual distance between the two locations.

- A. $\frac{25}{2} \times 10$ B. $\frac{25}{2} \times 9$ C. $\frac{9}{2} + 25$ D. $\frac{10}{3} \times 25$ E. $\frac{2}{9} \times 25$

19. Old Kings Trail is 24 cm long on a trail map of Shetland Downs. If the scale on the trail map is 2 cm = 1.5 km, how long is Old Kings Trail?

- A. 32 km B. 12 km C. 16 km D. 36 km E. 18 km

20. A company can manufacture 525 Fluid Analyzer Machines per week when it is working under normal conditions at 95% capacity. How many Fluid Analyzer Machines per week can the company make when it is undergoing renovations and working at only 65% capacity?

- A. 341 B. 11 C. 359 D. 395 E. 314

- 21.** How long will it take to polish a 120 piece silver service if it takes 30 minutes to polish 16 pieces of silver?
 A. 3 hours 75 minutes B. 64 minutes C. 3 hours 15 minutes
 D. 4 hours E. 3 hours 45 minutes
- 22.** Synthesis of Formula A is in direct proportion to the amount of carbon present. If $\frac{1}{2}$ ounce (oz) of Formula A can be synthesized from every 8 pounds (lb) of carbon, how many ounces of Formula A can be synthesized from 60 pounds of carbon?
 A. 4 B. $3\frac{3}{4}$ C. 30 D. 960 E. $3\frac{1}{4}$
- 23.** If a 24-pack of pens costs \$7.99, which expression shows the cost per pen?
 A. $\$7.99 \div 24$ B. $24 \div \$7.99$ C. $24 - \$7.99$ D. $24 \times \$7.99$ E. $24 + \$7.99$
- 24.** If a package of 75 cups costs \$12.99, which expression shows the cost of 35 cups?
 A. $\$12.99 \div 75$ B. $75 \div \$12.99$ C. $35 \times \$12.99 \div 75$
 D. $75 \times \$12.99 \div 35$ E. $35 \div \$12.99$
- 25.** If a lawyer bills her time at \$125 per hour, what is the charge for 2 hours and 45 minutes of legal time?
 A. \$306.25 B. \$250 C. \$433.75 D. \$343.75 E. \$360.25
- 26.** If a worker can process 12 forms each hour, which expression shows how many hours it will take to process 450 forms?
 A. $12 \div 450$ B. $12 + 450$ C. $450 - 12$ D. 12×450 E. $450 \div 12$
- 27.** There is $\frac{3}{4}$ ounce of salt in every 12 pounds of cake mix. How many ounces of salt will be needed to make 200 pounds of cake mix?
 A. $12\frac{1}{2}$ B. $12\frac{3}{4}$ C. 9 D. $16\frac{1}{2}$ E. $16\frac{3}{4}$
- 28.** To make 50 pounds of colored plaster it takes 7.5 ounces of tint. Which expression shows the best estimate of the number of pounds of colored plaster that can be made with 3.7 ounces of tint?
 A. $\frac{8}{50} \times 4$ B. $\frac{50}{8} + 4$ C. $\frac{50}{8} \times 3$ D. $\frac{4}{7} \times 50$ E. $\frac{4}{8} \times 50$

29. The number of elementary and secondary schools per 100,000 population for different states is shown in the chart below. If California has a population of about 40 million, which expression shows about how many elementary and secondary schools are in California?

A. $\frac{100,000}{40,000,000} \times 26$

B. $40,000,000 \div 100,000$

C. $\frac{40,000,000}{100,000} \times 26$

D. $\frac{4,000,000}{100,000} \times 26$

E. $\frac{40,000,000}{26} \times 100,000$

State	El. & Sec. Schools per 100,000 Population
Vermont	63
West Virginia	44
Kentucky	35
Tennessee	28
California	26

30. A flavor formula calls for 1 ½ grams of coffee and 2 liters of water (H₂O). Which of the following combinations will produce the same concentration of these two ingredients?

A. ½ gram coffee & 3 liters water

B. 3 grams coffee & 6 liters water

C. 8 ¼ grams coffee & 11 liters water

D. 2 ½ grams coffee & 6 liters water

E. 10 ½ grams coffee & 5 liters water

ANSWER KEY Proportion Word Problems Test

1. A salesman has driven 150 miles in $3\frac{1}{2}$ hours. If he continues driving at the same rate, which expression shows how long it will take to drive the final 95 miles of his trip?

- A. $\frac{150}{95} \times 3.5$ B. $\frac{95}{150} + 3.5$ C. $\frac{95}{150} \times 3.5$ D. $\frac{95}{3.5} \times 150$ E. $\frac{3.5}{150} + 95$

$$\frac{\text{miles}}{\text{hours}} \quad \frac{150}{3.5} = \frac{95}{x} \quad \text{The cross multiplication expression is:}$$
$$3.5 \times 95 \div 150 \quad \text{or} \quad 95 \times 3.5 \div 150$$

All the answer choices are in fraction form, so you must figure out which of the answer choices is the same as one of your cross multiplication expressions. Use either the scan for correct fraction method or the calculation method.

Method One – Scan answer choices for the correct fraction.

The cross multiplication expressions are both $\div 150$, so the correct fraction will have 150 on the bottom and either 3.5×95 or 95×3.5 on top.

Think of answer C. as $\frac{95}{150} \times \frac{3.5}{1}$ and you can see 95×3.5 on top and 150 on the bottom.

Answer: C. $\frac{95}{150} \times 3.5$

Method Two – Calculation. Calculate the value of the cross multiplication expression, and then calculate the value of each multiple choice answer until you find a match.

Cross multiplication expression: $3.5 \times 95 \div 150 = 2.2$

Try A. $\frac{150}{95} \times 3.5 = 5.5$ **Does not** = 2.2, so **is not** correct.

(Reminder – to calculate the value of a fraction on the calculator, enter top number \div bottom number. $\frac{150}{95}$ is entered as $150 \div 95$.)

Try B. $\frac{95}{150} + 3.5 = 4.1$ **Does not** = 2.2, so **is not** correct.

Try C. $\frac{95}{150} \times 3.5 = 2.2$ **Does** = 2.2, so **is** correct.

Answer: C. $\frac{95}{150} \times 3.5$

2. A scientist tracks the flight of the birds he is studying and finds that they can fly 60 kilometers in $1\frac{1}{2}$ hours. At the same rate, how long will it take the birds to fly 200 kilometers?

- A. 90 hours **B. 5 hours** C. 40 hours D. 3.3 hours E. 50 hours

$$\frac{\text{km}}{\text{hours}} \quad \frac{60}{1\frac{1}{2}} = \frac{200}{x} \quad 1\frac{1}{2} \times 200 \div 60 = x = 5 \quad \text{Answer: B. 5 hours}$$

3. In a survey of 450 students at a large university, 343 said they are likely to rent textbooks instead of buying them. Based on this survey, how many of the 12,000 total students at the university would you predict are likely to buy textbooks instead of renting them?

- A. 9,147 **B. 2,853** C. 3,743 D. 11,207 E. 2,538

$$\frac{\text{all students}}{\text{students likely to rent}} = \frac{450}{343} = \frac{12,000}{x} \quad 343 \times 12,000 \div 450 = x = 9,146.67$$

rounds to 9,147

You have just calculated the number of students that are likely to rent, but the question asks how many students are likely to **buy**. Subtract from the total to get the number of students who are likely to buy. $12,000 - 9,147 = 2,853$

Answer: B. 2,853 students

NOTE – This is tricky not only because it requires an extra step at the end, but also because all three numbers that you are given are numbers of students. Remember to keep the related numbers together in the same ratio.

First ratio: 450 students is related to 343 students because both refer to just the students in the survey. These two numbers make up the first ratio.

Second ratio: 12,000 students is related to the unknown number because both refer to all the students at the university. These two values make up the second ratio.

4. The Farm Co-op recommends planting 56 fruit trees per $\frac{1}{2}$ acre. Which of the following will result in the same proportion of trees per acre?

- A. 150 trees & $1\frac{1}{2}$ acres **B. 84 trees & $\frac{3}{4}$ acre** C. 40 trees & $\frac{1}{4}$ acre
D. 300 trees & 3 acres E. 100 trees & $\frac{3}{4}$ acre

In this type of problem, the question provides the first ratio of a proportion, and the answer choices provide five possibilities for the second ratio of the proportion. Remember that both ratios in a proportion are equal so both will simplify to the same number.

Step 1 – Simplify the first ratio of the proportion that is given in the problem.

You are given $\frac{\text{trees}}{\text{acres}} \frac{56}{\frac{1}{2}}$ Divide to simplify: $56 \div 0.5 = 112$

Step 2 – Find one of the answer choices that also simplifies to 112 and you will have found the other half of your proportion.

Try A. $\frac{\text{trees}}{\text{acres}} \frac{150}{1\frac{1}{2}}$ $150 \div 1.5 = 100$ **Does not** simplify to 112, so **is not** correct.

Try B. $\frac{\text{trees}}{\text{acres}} \frac{84}{\frac{3}{4}}$ $84 \div 0.75 = 112$ **Does** simplify to 112, so **is** correct.

Answer: B. 84 trees & $\frac{3}{4}$ acre

5. In a survey of 450 voters in Boone County, 65 said they would vote No on ballot question #1. How many of the 16,500 voters in Boone County do you predict will vote No on ballot question #1, based on these survey results?

- A. **2,383** B. 254 C. 385 D. 2,833 E. 238

$$\frac{\text{voters}}{\# \text{ of No votes}} = \frac{450}{65} = \frac{16,500}{x} \quad 65 \times 16,500 \div 450 = x = 2,383.3$$

Answer: A. 2,383 voters

6. The cost to outfit 12 students with band uniforms is \$425. How much will it cost to buy uniforms for all 40 students that are in the band?

- A. \$5,100 B. \$4,117 C. \$1,275 **D. \$1,417** E. \$1,500

$$\frac{\text{cost}}{\text{students}} = \frac{425}{12} = \frac{x}{40} \quad \$425 \times 40 \div 12 = x = \$1,416.67 \quad \text{Answer: D. \$1,417}$$

7. How many patterns can a machine cut in 15 minutes, if it is set to cut 32 patterns per hour?

- A. 2.13 B. 4.8 C. 16 D. 48 **E. 8**

$$\frac{\text{minutes}}{\text{patterns}} = \frac{60}{32} = \frac{15}{x} \quad 15 \times 32 \div 60 = x = 8 \quad \text{Answer: E. 8 patterns}$$

OR

$$\frac{\text{hours}}{\text{patterns}} = \frac{1}{32} = \frac{0.25}{x} \quad 0.25 \times 32 \div 1 = x = 8 \quad \text{Answer: E. 8 patterns}$$

SHORTCUT – If you see that there are four 15 minute periods in 1 hour, divide the 32 patterns in 1 hour by 4. $32 \div 4 = 8$ **Answer: E. 8 patterns**

8. Decorative ribbon trim costs \$1.99 for 16 inches. Sacha is trimming the front side of the 8 tables she will be using at her event. If each table is 4 feet across the front side, how much will the ribbon trim cost?

- A. \$5.97 B. \$63.68 C. \$3.98 D. \$95.52 **E. \$47.76**

$$\frac{\$}{\text{inches}} = \frac{1.99}{16} = \frac{x}{384} \quad 384 \times \$1.99 \div 16 = x = \$47.76 \quad \text{Answer: E. \$47.76}$$

Extra steps are needed before you form the proportion. You must calculate the number of inches needed to get the number to use in the second ratio.

Each table is 4 feet. Multiply x 12 inches per foot to get 48 inches per table.

8 tables are used. Multiply 48 inches x 8 tables to get 384 total inches needed.

9. 12 grams of flavor powder concentrate are used for every 65 liters of grape soda. Which expression shows how many grams of flavor powder concentrate will be needed to make 450 liters of grape soda?

- A. $\frac{450}{65} \div 12$ B. $\frac{12}{65} + 450$ C. $\frac{65}{12} \times 450$ **D. $\frac{12}{65} \times 450$** E. $\frac{65}{450} \times 12$

$$\frac{\text{grams of powder}}{\text{liters of soda}} \frac{12}{65} = \frac{x}{450}$$

The cross multiplication expression is:

$$12 \times 450 \div 65 \quad \text{or} \quad 450 \times 12 \div 65$$

All the answer choices are in fraction form, so you must figure out which of the answer choices is the same as one of your cross multiplication expressions. Use either the scan for correct fraction method or the calculation method.

Method One – Scan answers choices for the correct fraction.

The cross multiplication expressions are both $\div 65$, so the correct fraction will have 65 on the bottom and either 12×450 or 450×12 on top.

Think of answer D. as $\frac{12}{65} \times \frac{450}{1}$ and you can see 12×450 on top and 65 on the bottom.

Answer: D. $\frac{12}{65} \times 450$

Method Two – Calculation. Calculate the value of the cross multiplication expression, and then calculate the value of each multiple choice answer until you find a match.

Cross multiplication expression: $12 \times 450 \div 65 = 83.08$

Try A. $\frac{450}{65} \div 12 = 0.58$ **Does not** = 83.08, so **is not** correct.

Try B. $\frac{12}{65} + 450 = 450.18$ **Does not** = 83.08, so **is not** correct.

Try C. $\frac{65}{12} \times 450 = 2437.5$ **Does not** = 83.08, so **is not** correct.

Try D. $\frac{12}{65} \times 450 = 83.08$ **Does** = 83.08, so **is** correct.

Answer: D. $\frac{12}{65} \times 450$

10. A local road map has a scale of 6 miles per inch. If the actual distance between two towns is 57 miles, how many inches apart will they be on the map?

- A. 9 B. 51 C. 5.9 **D. 9.5** E. 10.5

$$\frac{\text{actual miles}}{\text{inches on map}} \frac{6}{1} = \frac{57}{x} \quad 1 \times 57 \div 6 = x = 9.5 \quad \text{Answer: D. 9.5 inches}$$

11. If a school system can purchase a bulk package of 500 workbooks for \$195, what is the cost per workbook?

- A. \$3.90 B. \$2.56 C. **\$0.39** D. \$0.49 E. \$0.93

$$\frac{\text{workbooks}}{\text{cost}} = \frac{500}{195} = \frac{1}{x} \quad \$195 \times 1 \div 500 = x = \$0.39 \quad \text{Answer: C. \$0.39}$$

SHORTCUT – You may see right off that you need to divide the total price by the number of workbooks to get the price per workbook. $\$195 \div 500 = \0.39

Answer: C. \$0.39

If you don't see that, or are unsure what to do, set up a proportion as shown above.

TIP – You could also solve this using trial and error with the answers provided.

Test A. \$3.90 If each workbook is \$3.90, then 500 workbooks are
 $500 \times \$3.90 = \$1,950$. But the problem tells you that 500 workbooks
cost \$195, so \$3.90 can't be the correct cost per workbook.

Test B. \$2.56 $500 \times \$2.56 = \$1,280$ Not the correct total for 500 workbooks,
so \$2.56 is not the correct cost per workbook.

Test C. \$0.39 $500 \times 0.39 = \$195$ \$195 is the correct total for 500 workbooks,
so \$0.39 is the correct cost per workbook.

12. On the blueprints for a house, $\frac{1}{4}$ inch is equal to 1 foot. What are the dimensions on the blueprint of a room with actual measurements of 30 feet long and 20 feet wide?

- A. 8 inches by 4 inches B. 50 inches by 10 inches C. 15 inches by 10 inches
D. **7.5 inches by 5 inches** E. 60 inches by 40 inches

$$\text{LENGTH: } \frac{\text{actual feet}}{\text{inches on blueprint}} = \frac{1}{\frac{1}{4}} = \frac{30}{x} \quad 30 \times \frac{1}{4} \div 1 = x = 7.5$$

Length = 7.5 inches

$$\text{WIDTH: } \frac{\text{actual feet}}{\text{inches on blueprint}} = \frac{1}{\frac{1}{4}} = \frac{20}{x} \quad 20 \times \frac{1}{4} \div 1 = x = 5$$

Width = 5 inches

Answer: D. 7.5 inches long by 5 inches wide

SHORTCUT – You may recognize this problem as a pair of multiplication problems:

Length is $\frac{1}{4}$ inch for each foot, so $\frac{1}{4} \times 30 = 7.5$ inches.

Width is $\frac{1}{4}$ inch for each foot, so $\frac{1}{4} \times 20 = 5$ inches.

Answer: D. 7.5 inches long by 5 inches wide

13. At New You Yoga School, there are currently 353 students enrolled, which corresponds to 72% of maximum enrollment. How many more students would the school need to sign up to reach their goal of 95% enrollment?

- A. 466 B. 335 C. **113** D. 265 E. 268

$$\frac{\% \text{ enrollment}}{\text{students}} \quad \frac{72}{353} = \frac{95}{x} \quad 353 \times 95 \div 72 = x = 465.76$$

rounds up to 466

466 is the number of students the school will have at 95% enrollment.

The question asks how many **more** students are needed to reach this goal.

Subtract: goal – current students = new students needed $466 - 353 = 113$

Answer: C. 113 more students

14. Which expression below shows the cost of one ounce of Supersuds Laundry Powder if a 48 ounce box is on sale for \$3.29?

- A. $48 \div \$3.29$ B. **$\$3.29 \div 48$** C. $48 - \$3.29$ D. $48 \times \$3.29$ E. $48 + \$3.29$

$$\frac{\text{ounces}}{\$} \quad \frac{48}{3.29} = \frac{1}{x}$$

The cross multiplication expression is:

$$\$3.29 \times 1 \div 48 \quad \text{or} \quad 1 \times \$3.29 \div 48$$

It can be shortened to $\$3.29 \div 48$ because $\$3.29 \times 1$ is the same as $\$3.29$.

Answer: B. $\$3.29 \div 48$

15. On the floor plan of a new restaurant, the cashier/waiting area measures 6 inches wide x 12 inches long, and each inch on the floor plan equals 2 ½ feet of actual distance. What are the actual length and width of the cashier/waiting area?

- A. **30 feet x 15 feet** B. 4.8 feet x 2.4 feet C. 30 inches x 15 inches
D. 4.8 inches x 2.4 inches E. 14.5 feet x 8.5 feet

LENGTH: $\frac{\text{actual feet}}{\text{inches on floor plan}} \quad \frac{2 \frac{1}{2}}{1} = \frac{x}{12} \quad 12 \times 2 \frac{1}{2} \div 1 = x = 30$

Length = 30 feet

WIDTH: $\frac{\text{actual feet}}{\text{inches on floor plan}} \quad \frac{2 \frac{1}{2}}{1} = \frac{x}{6} \quad 6 \times 2 \frac{1}{2} \div 1 = x = 15$

Width = 15 feet

Answer: A. 30 feet long x 15 feet wide

SHORTCUT – If every inch represents 2 ½ feet, 6 inches x 2 ½ = 15 feet for the width, and 12 inches x 2 ½ = 30 feet for the length. If you can see it this way from reading the problem, you can skip setting up the proportions and save a little time.

16. The formula to make Ocean Blue paint calls for 6 gallons of blue paint and $\frac{1}{2}$ gallon of green paint. Which of the following combinations will correctly produce Ocean Blue paint?

- A. 12 gal. blue & $\frac{3}{4}$ gal. green B. 15 gal. blue & 2 gal. green
C. 4 gal. blue & $\frac{1}{4}$ gal. green **D. 21 gal. blue & $1\frac{3}{4}$ gal. green**
E. 8 gal. blue & 1 gal. green

In this type of problem, the question provides the first ratio of a proportion, and the answer choices provide five possibilities for the second ratio of the proportion. Remember that both ratios in a proportion are equal so both will simplify to the same number.

Step 1 – Simplify the first ratio of the proportion that is given in the problem.

$$\text{You are given: } \frac{\text{blue}}{\text{green}} \quad \frac{6}{\frac{1}{2}} \quad \text{Divide to simplify: } 6 \div 0.5 = 12$$

Step 2 – Find one of the answer choices that also simplifies to 12 and you will have found the other half of your proportion.

Try A. $\frac{\text{blue}}{\text{green}} \quad \frac{12}{\frac{3}{4}} \quad 12 \div 0.75 = 16$ **Does not** simplify to 12, so **is not** correct.

Try B. $\frac{\text{blue}}{\text{green}} \quad \frac{15}{2} \quad 15 \div 2 = 7.5$ **Does not** simplify to 12, so **is not** correct.

Try C. $\frac{\text{blue}}{\text{green}} \quad \frac{4}{\frac{1}{4}} \quad 4 \div 0.25 = 16$ **Does not** simplify to 12, so **is not** correct.

Try D. $\frac{\text{blue}}{\text{green}} \quad \frac{21}{1\frac{3}{4}} \quad 21 \div 1.75 = 12$ **Does** = 12, so **is** correct.

Answer: D. 21 gal. blue & $1\frac{3}{4}$ gal. green

17. A company has 150 clerks and 6 shift supervisors. If each clerk can produce 12 invoices in 3 hours, how many invoices can a clerk produce in an 8 hour shift?

- A. **32** B. 12.5 C. 37.5 D. 23 E. 50

$$\frac{\text{invoices}}{\text{hours}} \quad \frac{12}{3} = \frac{x}{8} \quad 8 \times 12 \div 3 = x = 32 \quad \text{Answer: A. 32 invoices}$$

Watch out for extra numbers included in the problem that are not needed to calculate the answer to the question being asked. The numbers of clerks and supervisors do not enter into the calculation for the number of invoices 1 clerk can produce.

18. Two tourist attractions are 9.4 centimeters (cm) apart on a map of France, and the scale on the map is 2.2 centimeters (cm) = 25 kilometers (km). Choose one of the expressions below that you would use to get the best estimate of the actual distance between the two locations.

- A. $\frac{25}{2} \times 10$ B. $\frac{25}{2} \times 9$ C. $\frac{9}{2} + 25$ D. $\frac{10}{3} \times 25$ E. $\frac{2}{9} \times 25$

The problem asks for the best estimate, so numbers will be rounded.

2.2 cm rounds down to 2 cm.

9.4 cm rounds down to 9 cm.

$$\frac{\text{cm on map}}{\text{actual km}} \quad \frac{2.2}{25} = \frac{9.4}{x} \quad \rightarrow \quad \frac{2}{25} = \frac{9}{x} \quad \text{The cross multiplication expression is:}$$

$$25 \times 9 \div 2 \quad \text{or} \quad 9 \times 25 \div 2$$

All the answer choices are in fraction form, so you must figure out which of the answer choices is the same as one of your cross multiplication expressions. Use either the scan for correct fraction method or the calculation method.

Method One – Scan answers choices for the correct fraction.

The cross multiplication expressions are both $\div 2$, so the correct fraction will have 2 on the bottom and either 25×9 or 9×25 on top.

Think of answer B. as $\frac{25}{2} \times \frac{9}{1}$ and you can see 25×9 on top and 2 on the bottom.

Answer: B. $\frac{25}{2} \times 9$

Method Two – Calculation. Calculate the value of the cross multiplication expression, and then calculate the value of each multiple choice answer until you find a match.

Cross multiplication expression: $25 \times 9 \div 2 = 112.5$

Try A. $\frac{25}{2} \times 10 = 125$ **Does not** = 112.5, so **is not** correct.

Try B. $\frac{25}{2} \times 9 = 112.5$ **Does** = 112.5, so **is** correct.

Answer: B. $\frac{25}{2} \times 9$

19. Old Kings Trail is 24 cm long on a trail map of Shetland Downs. If the scale on the trail map is 2 cm = 1.5 km, how long is Old Kings Trail?

- A. 32 km B. 12 km C. 16 km D. 36 km E. **18 km**

$$\frac{\text{cm on map}}{\text{actual km}} \quad \frac{2}{1.5} = \frac{24}{x} \quad 1.5 \times 24 \div 2 = x = 18 \quad \text{Answer: E. 18 km}$$

20. A company can manufacture 525 Fluid Analyzer Machines per week when it is working under normal conditions at 95% capacity. How many Fluid Analyzer Machines per week can the company make when it is undergoing renovations and working at only 65% capacity?

- A. 341 B. 11 C. **359** D. 395 E. 314

$$\frac{\% \text{ capacity}}{\text{machines}} \quad \frac{95}{525} = \frac{65}{x}$$

$$525 \times 65 \div 95 = x = 359.2$$

Answer: C. 359 machines

21. How long will it take to polish a 120 piece silver service if it takes 30 minutes to polish 16 pieces of silver?

- A. 3 hours 75 minutes B. 64 minutes C. 3 hours 15 minutes
D. 4 hours E. **3 hours 45 minutes**

$$\frac{\text{hours}}{\text{pieces of silver}} \quad \frac{0.5}{16} = \frac{x}{120}$$

$$120 \times 0.5 \div 16 = x = 3.75$$

Answer: E. 3 hours 45 minutes

22. Synthesis of Formula A is in direct proportion to the amount of carbon present. If ½ ounce (oz) of Formula A can be synthesized from every 8 pounds (lb) of carbon, how many ounces of Formula A can be synthesized from 60 pounds of carbon?

- A. 4 B. **3 ¾** C. 30 D. 960 E. 3 ¼

$$\frac{\text{lb carbon}}{\text{oz Formula A}} \quad \frac{8}{\frac{1}{2}} = \frac{60}{x}$$

$$\frac{1}{2} \times 60 \div 8 = x = 3.75$$

Answer: B. 3 ¾ oz of Formula A

23. If a 24-pack of pens costs \$7.99, which expression shows the cost per pen?

- A. **\$7.99 ÷ 24** B. 24 ÷ \$7.99 C. 24 – \$7.99 D. 24 x \$7.99 E. 24 + \$7.99

$$\frac{\text{pens}}{\$} \quad \frac{24}{7.99} = \frac{1}{x}$$

The cross multiplication expression is:

$$\$7.99 \times 1 \div 24 \quad \text{or} \quad 1 \times \$7.99 \div 24$$

It can be shortened to \$7.99 ÷ 24 because \$7.99 x 1 is the same as \$7.99.

Answer: A. \$7.99 ÷ 24

24. If a package of 75 cups costs \$12.99, which expression shows the cost of 35 cups?

- A. $\$12.99 \div 75$ B. $75 \div \$12.99$ C. **$35 \times \$12.99 \div 75$**
D. $75 \times \$12.99 \div 35$ E. $35 \div \$12.99$

$$\frac{\text{cups}}{\$} \frac{75}{12.99} = \frac{35}{x}$$

The cross multiplication expression is:

$$\$12.99 \times 35 \div 75 \quad \text{or} \quad 35 \times \$12.99 \div 75$$

Answer: C. $35 \times \$12.99 \div 75$

25. If a lawyer bills her time at \$125 per hour, what is the charge for 2 hours and 45 minutes of legal time?

- A. \$306.25 B. \$250 C. \$433.75 D. **\$343.75** E. \$360.25

$$\frac{\text{hours}}{\$} \frac{1}{125} = \frac{2.75}{x}$$

$$\$125 \times 2.75 \div 1 = x = \$343.75 \quad \text{Answer: D. } \$343.75$$

SHORTCUT – 2.75 hours \times \$125 per hour = 2.75 \times \$125 = \$343.75. If you can see it this way from reading the problem, you can skip setting up the proportion and save a little time.

26. If a worker can process 12 forms each hour, which expression shows how many hours it will take to process 450 forms?

- A. $12 \div 450$ B. $12 + 450$ C. $450 - 12$ D. 12×450 E. **$450 \div 12$**

$$\frac{\text{forms}}{\text{hours}} \frac{12}{1} = \frac{450}{x}$$

The cross multiplication expression is:

$$450 \times 1 \div 12 \quad \text{or} \quad 1 \times 450 \div 12$$

It can be shortened to $450 \div 12$ because 450×1 is the same as 450.

Answer: E. $450 \div 12$

27. There is $\frac{3}{4}$ ounce of salt in every 12 pounds of cake mix. How many ounces of salt will be needed to make 200 pounds of cake mix?

- A. **$12 \frac{1}{2}$** B. $12 \frac{3}{4}$ C. 9 D. $16 \frac{1}{2}$ E. $16 \frac{3}{4}$

$$\frac{\text{oz salt}}{\text{lb cake mix}} \frac{3}{4} = \frac{x}{200}$$

$$\frac{3}{4} \times 200 \div 12 = x = 12.5 \quad \text{Answer: A. } 12 \frac{1}{2} \text{ oz}$$

28. To make 50 pounds of colored plaster it takes 7.5 ounces of tint. Which expression shows the best estimate of the number of pounds of colored plaster that can be made with 3.7 ounces of tint?

- A. $\frac{8}{50} \times 4$ B. $\frac{50}{8} + 4$ C. $\frac{50}{8} \times 3$ D. $\frac{4}{7} \times 50$ E. $\frac{4}{8} \times 50$

The problem asks for the best estimate, so numbers will be rounded.

7.5 rounds up to 8.

3.7 rounds up to 4.

$$\frac{\text{lb plaster}}{\text{oz tint}} \quad \frac{50}{7.5} = \frac{x}{3.7} \quad \rightarrow \quad \frac{50}{8} = \frac{x}{4} \quad \text{The cross multiplication expression is:}$$

$$50 \times 4 \div 8 \quad \text{or} \quad 4 \times 50 \div 8$$

All the answer choices are in fraction form, so you must figure out which of the answer choices is the same as one of your cross multiplication expressions. Use either the scan for correct fraction method or the calculation method.

Method One – Scan answers choices for the correct fraction.

The cross multiplication expressions are both $\div 8$, so the correct fraction will have 8 on the bottom and either 50×4 or 4×50 on top.

Think of answer E. as $\frac{4}{8} \times \frac{50}{1}$ and you can see 4×50 on top and 8 on the bottom.

Answer: E. $\frac{4}{8} \times 50$

Method Two – Calculation. Calculate the value of the cross multiplication expression, and then calculate the value of each multiple choice answer until you find a match.

Cross multiplication expression: $50 \times 4 \div 8 = 25$

Try A. $\frac{8}{50} \times 4 = 0.64$ **Does not** = 25, so **is not** correct.

Try B. $\frac{50}{8} + 4 = 10.25$ **Does not** = 25, so **is not** correct.

Try C. $\frac{50}{8} \times 3 = 18.75$ **Does not** = 25, so **is not** correct.

Try D. $\frac{4}{7} \times 50 = 28.57$ **Does not** = 25, so **is not** correct.

Try E. $\frac{4}{8} \times 50 = 25$ **Does** = 25, so **is** correct. **Answer: E. $\frac{4}{8} \times 50$**

29. The number of elementary and secondary schools per 100,000 population for different states is shown in the chart below. If California has a population of about 40 million, which expression shows about how many elementary and secondary schools are in California?

A. $\frac{100,000}{40,000,000} \times 26$

B. $40,000,000 \div 100,000$

C. $\frac{40,000,000}{100,000} \times 26$

D. $\frac{4,000,000}{100,000} \times 26$

E. $\frac{40,000,000}{26} \times 100,000$

State	El. & Sec. Schools per 100,000 Population
Vermont	63
West Virginia	44
Kentucky	35
Tennessee	28
California	26

Be very careful. 40 million is 40,000,000.

$$\frac{\text{schools}}{\text{population}}$$

$$\frac{26}{100,000} = \frac{x}{40,000,000}$$

The cross multiplication expression is:

$$26 \times 40,000,000 \div 100,000 \quad \text{or}$$

$$40,000,000 \times 26 \div 100,000$$

All the answer choices are in fraction form, so you must figure out which of the answer choices is the same as one of your cross multiplication expressions. Use either the scan for correct fraction method or the calculation method.

Method One – Scan answers choices for the correct fraction.

The cross multiplication expressions are both $\div 100,000$, so the correct fraction will have 100,000 on the bottom and either $26 \times 40,000,000$ or $40,000,000 \times 26$ on top.

Think of answer C. as $\frac{40,000,000}{100,000} \times \frac{26}{1}$ and you can see $40,000,000 \times 26$ on top and 100,000 on the bottom.

Answer: C. $\frac{40,000,000}{100,000} \times 26$

Method Two – Calculation. Calculate the value of the cross multiplication expression, and then calculate the value of each multiple choice answer until you find a match.

Cross multiplication expression: $26 \times 40,000,000 \div 100,000 = 10,400$

Try A. $\frac{100,000}{40,000,000} \times 26 = 0.065$

Does not = 10,400, so **is not** correct.

Try B. $40,000,000 \div 100,000 = 400$

Does not = 10,400, so **is not** correct.

Try C. $\frac{40,000,000}{100,000} \times 26 = 10,400$

Does = 10,400, so **is** correct.

Answer: C. $\frac{40,000,000}{100,000} \times 26$

30. A flavor formula calls for $1\frac{1}{2}$ grams of coffee and 2 liters of water (H₂O). Which of the following combinations will produce the same concentration of these two ingredients?

- A. $\frac{1}{2}$ gram coffee & 3 liters water B. 3 grams coffee & 6 liters water
C. **$8\frac{1}{4}$ grams coffee & 11 liters water** D. $2\frac{1}{2}$ grams coffee & 6 liters water
E. $10\frac{1}{2}$ grams coffee & 5 liters water

In this type of problem, the question provides the first ratio of a proportion, and the answer choices provide five possibilities for the second ratio of the proportion. Remember that both ratios in a proportion are equal so both will simplify to the same number.

Step 1 – Simplify the first ratio of the proportion that is given in the problem.

You are given: $\frac{\text{grams of coffee}}{\text{liters of H}_2\text{O}} \frac{1\frac{1}{2}}{2}$ Divide to simplify: $1.5 \div 2 = 0.75$

Step 2 – Find one of the answer choices that also simplifies to 0.75 and you will have found the other half of your proportion.

Try A. $\frac{\text{grams of coffee}}{\text{liters of H}_2\text{O}} \frac{\frac{1}{2}}{3}$ $0.5 \div 3 = 0.17$
Does not simplify to 0.75, so **is not** correct.

Try B. $\frac{\text{grams of coffee}}{\text{liters of H}_2\text{O}} \frac{\frac{3}{6}}{6}$ $3 \div 6 = 0.5$
Does not simplify to 0.75, so **is not** correct.

Try C. $\frac{\text{grams of coffee}}{\text{liters of H}_2\text{O}} \frac{8\frac{1}{4}}{11}$ $8.25 \div 11 = 0.75$
Does simplify to 0.75, so **is** correct.

Answer: C. $8\frac{1}{4}$ grams coffee & 11 liters water