

NAME _____

DATE _____

ACCEPTABLE SCORE **19**

YOUR SCORE _____



PRETEST



Complete the Proportions Pretest. A score of 19 out of 20 indicates an acceptable understanding of and competency in basic calculations involving proportions. You may skip to the Review of Mathematics Posttest on p. 105. However, if you score 18 or below, completion of Chapter 5, Proportions, will be helpful for your continued success in the calculation of drug dosages.

DIRECTIONS: Find the value of x . Show your work.

1. $25 : 75 :: x : 300$ _____
2. $450 : 15 :: 225 : x$ _____
3. $x : \frac{1}{4}\% :: 8 : 12$ _____
4. $12 : 3 :: x : 0.8$ _____
5. $0.6 : 2.4 :: 32 : x$ _____
6. $150 : x :: 75 : 2$ _____
7. $\frac{1}{8} : \frac{2}{3} :: 75 : x$ _____
8. $\frac{1}{200} : 8 :: x : 800$ _____
9. $x : \frac{1}{2} :: \frac{3}{4} : \frac{7}{8}$ _____
10. $16 : x :: 24 : 12$ _____
11. $\frac{2}{3} : \frac{1}{5} :: x : 24$ _____
12. $x : 9 :: \frac{2}{3} : 36$ _____
13. $\frac{1}{7} : x :: \frac{1}{2} : 49$ _____
14. $0.8 : 4 :: 9.6 : x$ _____
15. $\frac{4}{5} : x :: \frac{2}{3} : \frac{1}{4}$ _____
16. $40 : 80 :: x : 160$ _____
17. $2.5 : x :: 4 : 16$ _____
18. $8 : 72 :: 14 : x$ _____
19. $x : \frac{1}{15} :: 50 : 500$ _____
20. $5 : 100 :: x : 325$ _____

ANSWERS ON P. 104.



Proportions

LEARNING OBJECTIVES

Upon completion of the materials provided in this chapter, you will be able to perform computations accurately by mastering the following mathematical concepts:

- 1 Solving simple proportion problems
- 2 Solving proportion problems involving fractions, decimals, and percents

Most problems concerning drug dosage can be solved by a proportion problem, whether it involves fractions, decimals, or percents. If a proportion problem contains any combination of fractions, decimals, or percents, all forms within the problem must be converted to either fractions or decimals.

Study the introductory material on proportions. The process for the calculation of proportion problems is listed in steps. Memorize the steps before beginning the work sheet. Complete the work sheet at the end of this chapter, which provides for extensive practice in the manipulation of proportions. Check your answers. If you have difficulties, go back and review the necessary steps. When you feel ready to evaluate your learning, take the first posttest. Check your answers. An acceptable score as indicated on the posttest signifies that you are ready for the next chapter. An unacceptable score signifies a need for further study before taking the second posttest.



A **proportion** consists of two ratios of equal value. The ratios are connected by a double colon ($::$), which symbolizes the word *as*.

$$2 : 3 :: 4 : 6$$

Read the above proportion: "Two is to three as four is to six."

The first and fourth terms of the proportion are the **extremes**. The second and third terms are the **means**.

$$2 : 3 :: 4 : 6$$

2 and 6 are the extremes

3 and 4 are the means

A helpful way to remember the correct location of the extremes and means is

E = The *end* of the problem

M = The *middle* of the problem

In a proportion the product of the means equals the product of the extremes because the ratios are of equal value. This principle may be used to verify your answer in a proportion problem.

$$3 \times 4 = 12, \text{ product of the means}$$

$$2 \times 6 = 12, \text{ product of the extremes}$$

If three terms in the proportion are known and one term is unknown, an x is inserted in the space for the unknown term.

$$2 : 3 :: 4 : x$$

SOLVING A SIMPLE PROPORTION PROBLEM

1. Multiply the extremes.
2. Multiply the means.
3. Place the product that includes the x on the *left* of the equal sign and the product of the known terms on the *right* of the equal sign.
4. Divide the product of the known terms by the number next to x . The quotient will be the value of x .

Proportion Problem Involving Whole Numbers

EXAMPLE: $2 : 3 :: 4 : x$

Step 1. $2x = 3 \times 4$

Step 2. $2x = 12$

Step 3. $x = 12 \div 2$

Step 4. $x = \frac{12}{2}$

Step 5. $x = 6$

Proportion Problem Involving Fractions

EXAMPLE: $\frac{1}{150} : \frac{1}{100} :: x : 60$

Step 1. $\frac{1}{100}x = \frac{1}{150} \times 60$

Step 2. $\frac{1}{100}x = \frac{2}{5}$

Step 3. $x = \frac{2}{5} \div \frac{1}{100}$

Step 4. $x = \frac{2}{5} \times \frac{100}{1}$

Step 5. $x = 40$

Proportion Problem Involving Decimals

EXAMPLE: $0.4 : 0.8 :: 0.25 : x$

Step 1. $0.4x = 0.8 \times 0.25$

Step 2. $0.4x = 0.2$

Step 3. $x = 0.2 \div 0.4$

Step 4. $x = 0.5$

Proportion Problem Involving Fractions and Percents

EXAMPLE: $x : \frac{1}{4}\% :: 9\frac{3}{5} : \frac{1}{200}$

Convert $\frac{1}{4}\%$ to a proper fraction and $9\frac{3}{5}$ to an improper fraction. Then rewrite the proportion using these fractions.

$$\text{Step 1. } x : \frac{1}{400} :: \frac{48}{5} : \frac{1}{200}$$

$$\text{Step 2. } \frac{1}{200}x = \frac{1}{400} \times \frac{48}{5}$$

$$\text{Step 3. } \frac{1}{200}x = \frac{1}{\cancel{400}^{25}} \times \frac{\cancel{48}^3}{5}$$

$$\text{Step 4. } \frac{1}{200}x = \frac{3}{125}$$

$$\text{Step 5. } x = \frac{3}{125} \div \frac{1}{200}$$

$$\text{Step 6. } x = \frac{3}{\cancel{125}_5} \times \frac{\cancel{200}^8}{1}$$

$$\text{Step 7. } x = \frac{24}{5}$$

$$\text{Step 8. } x = 4\frac{4}{5}$$

Proportion Problem Involving Decimals and Percents

EXAMPLE: $0.3\% : 1.8 :: x : 14.4$

Convert 0.3% to a decimal.

$$\text{Step 1. } 0.003 : 1.8 = x : 14.4$$

$$\text{Step 2. } 1.8x = 0.003 \times 14.4$$

$$\text{Step 3. } 1.8x = 0.0432$$

$$\text{Step 4. } x = 0.0432 \div 1.8$$

$$\text{Step 5. } x = 0.024$$

Proportion Problem Involving Numerous Zeros

EXAMPLE: $250,000 : x :: 500,000 : 4$

$$\text{Step 1. } 500,000x = 250,000 \times 4$$

$$\text{Step 2. } 500,000x = 1,000,000$$

$$\text{Step 3. } x = 1,000,000 \div 500,000$$

$$\text{Step 4. } x = \frac{1,000,000}{500,000}$$

$$\text{Step 5. } x = 2$$



WORK SHEET



DIRECTIONS: Find the value of x . Show your work.

1. $20 : 400 :: x : 1680$ _____

2. $0.9 : 2.4 :: x : 75$ _____

3. $\frac{5}{6} : x :: \frac{5}{9} : \frac{4}{5}$ _____

4. $3 : 90 :: 1\frac{3}{4} : x$ _____

5. $75 : x :: 100 : 2$ _____

6. $\frac{1}{6} : 1 :: \frac{1}{8} : x$ _____

7. $200,000 : x :: 1,000,000 : 5$ _____

8. $x : \frac{3}{4}\% :: 3\frac{1}{5} : \frac{1}{200}$ _____

9. $\frac{1}{150} : 1 :: \frac{1}{100} : x$ _____

10. $3 : 150 :: 40 : x$ _____

11. $\frac{1}{8} : x :: 7 : 56$ _____

12. $\frac{1}{200} : 40 :: \frac{1}{100} : x$ _____

13. $12\frac{1}{2} : x :: 50 : 2400$ _____

14. $\frac{1}{2}\% : \frac{1}{100} :: x : 80$ _____

15. $x : 6.4 :: 0.03 : 6$ _____

16. $0.25 : 1 :: 0.05 : x$ _____

17. $\frac{1}{120} : 2 :: 4 : x$ _____

18. $x : \frac{1}{1000} :: 5 : \frac{1}{5000}$ _____

19. $6:15::8:x$ _____

20. $x:3::9:54$ _____

21. $1.4:0.4::4.2:x$ _____

22. $x:0.65::9:5$ _____

23. $12\frac{1}{2}\%:5::x:120$ _____

24. $\frac{1}{300}:6::\frac{1}{120}:x$ _____

25. $25:75::16:x$ _____

26. $0.3:x::7:21$ _____

27. $4:x::12:48$ _____

28. $x:12::2:4$ _____

29. $\frac{4}{5}:x::\frac{1}{3}:\frac{5}{9}$ _____

30. $0.6:x::7:42$ _____

31. $15:x::20:600$ _____

32. $9\%:x::11:73$ _____

33. $500,000:1::300,000:x$ _____

34. $\frac{1}{6}:\frac{9}{10}::\frac{1}{2}:x$ _____

35. $2.8:12::40:x$ _____

36. $8:\frac{8}{100}::x:5$ _____

37. $\frac{1}{8}\%:\frac{1}{200}::x:40$ _____

38. $x:25::18:36$ _____

39. $0.15:0.25::x:400$ _____

40. $\frac{1}{20}:\frac{1}{15}::x:25$ _____

41. $800,000 : 5 :: 960,000 : x$ _____

42. $27 : x :: 9 : 60$ _____

43. $\frac{1}{20} : \frac{1}{5} :: x : 50$ _____

44. $\frac{1}{150} : \frac{1}{200} :: x : 60$ _____

45. $\frac{1}{2}\% : 4 :: x : 25$ _____

46. $500 : 2.5 :: x : 8.1$ _____

ANSWERS ON P. 104.

NAME _____

DATE _____

ACCEPTABLE SCORE **19**

YOUR SCORE _____

CHAPTER 5
Proportions

POSTTEST 1

**DIRECTIONS:** Find the value of x . Show your work.

1. $x : 2.5 :: 4 : 5$ _____

2. $\frac{7}{8} : x :: \frac{4}{5} : \frac{2}{3}$ _____

3. $30 : 90 :: 2 : x$ _____

4. $x : 3.5 :: 25 : 14$ _____

5. $\frac{2}{7} : \frac{1}{2} :: x : 56$ _____

6. $\frac{1}{4} : x :: 160 : 320$ _____

7. $x : 7 :: 5 : 14$ _____

8. $3 : x :: 18 : 12$ _____

9. $\frac{1}{5} : 90 :: x : 250$ _____

10. $1.8 : 4.8 :: x : 96$ _____

11. $x : 8 :: 10 : 20$ _____

12. $\frac{2}{3} : x :: 4.5 : 27$ _____

13. $\frac{1}{150} : x :: \frac{1}{200} : 6$ _____

14. $\frac{2}{3}\% : \frac{1}{5} :: 50 : x$ _____

15. $14 : x :: 6 : 18$ _____

16. $x : \frac{2}{3} :: 12 : 18$ _____

17. $50 : 250 :: \frac{4}{5} : x$ _____

18. $50 : 3 :: x : 6$ _____

19. $\frac{1}{2} : x :: 40 : 80$ _____

20. $0.8 : 10 :: x : 40$ _____

ANSWERS ON P. 104.

NAME _____

DATE _____

ACCEPTABLE SCORE **19**

YOUR SCORE _____

CHAPTER 5
Proportions

POSTTEST 2

**DIRECTIONS:** Find the value of x . Show your work.

1. $x : 300 :: 9 : 12$ _____

2. $4 : 32\% :: 16 : x$ _____

3. $18 : x :: 6 : 40$ _____

4. $1.8 : 2.5 :: x : 9.5$ _____

5. $x : 30 :: \frac{1}{3} : \frac{3}{4}$ _____

6. $\frac{7}{8} : x :: \frac{5}{8} : 40$ _____

7. $400 : 500 :: \frac{4}{5} : x$ _____

8. $x : 7.6 :: 3 : 6$ _____

9. $\frac{1}{4} : x :: \frac{2}{3} : \frac{2}{5}$ _____

10. $\frac{1}{150} : \frac{1}{100} :: x : 60$ _____

11. $0.6 : x :: 15 : 90$ _____

12. $3.5 : 12 :: x : 360$ _____

13. $\frac{2}{9} : \frac{4}{5} :: \frac{3}{4} : x$ _____

14. $\frac{1}{8} : x :: \frac{1}{7} : \frac{5}{9}$ _____

15. $x : 2.5 :: 16 : 4$ _____

16. $0.6 : 3 :: 72 : x$ _____

17. $20 : x :: 6 : 4.5$ _____

18. $x : \frac{1}{4} :: 96 : \frac{1}{3}$ _____

19. $300 : 5000 :: x : 18$ _____

20. $\frac{1}{3} : x :: \frac{1}{5} : 90$ _____

ANSWERS ON P. 104.

ANSWERS

CHAPTER 5 Proportions—Pretest, p. 91

- | | | | |
|--------------------------|------------------|--------------------|------------------------------|
| 1. 100 | 6. 4 | 11. 80 | 16. 80 |
| 2. $7\frac{1}{2}$ or 7.5 | 7. 400 | 12. $\frac{1}{6}$ | 17. 10 |
| 3. $\frac{1}{600}$ | 8. $\frac{1}{2}$ | 13. 14 | 18. 126 |
| 4. 3.2 | 9. $\frac{3}{7}$ | 14. 48 | 19. $\frac{1}{150}$ |
| 5. 128 | 10. 8 | 15. $\frac{3}{10}$ | 20. $16\frac{1}{4}$ or 16.25 |

CHAPTER 5 Proportions—Work Sheet, pp. 97–99

- | | | | |
|--------------------------|--------------------------|---------------------------------|-------------------------------|
| 1. 84 | 13. 600 | 25. 48 | 37. 10 |
| 2. 28.125 | 14. 40 | 26. 0.9 | 38. $12\frac{1}{2}$ or 12.5 |
| 3. $1\frac{1}{5}$ | 15. 0.032 | 27. 16 | 39. 240 |
| 4. $52\frac{1}{2}$ | 16. 0.2 | 28. 6 | 40. $18\frac{3}{4}$ or 18.75 |
| 5. $1\frac{1}{2}$ or 1.5 | 17. 960 | 29. $1\frac{1}{3}$ | 41. 6 |
| 6. $\frac{3}{4}$ | 18. 25 | 30. 3.6 | 42. 180 |
| 7. 1 | 19. 20 | 31. 450 | 43. $12\frac{1}{2}$ or 12.5 |
| 8. $4\frac{4}{5}$ | 20. $\frac{1}{2}$ or 0.5 | 32. $\frac{657}{1100}$ or 0.597 | 44. 80 |
| 9. $1\frac{1}{2}$ or 1.5 | 21. 1.2 | 33. $\frac{3}{5}$ or 0.6 | 45. $\frac{1}{32}$ or 0.03125 |
| 10. 2000 | 22. 1.17 | 34. $27\frac{1}{10}$ | 46. 1620 |
| 11. 1 | 23. 3 | 35. 171.43 | |
| 12. 80 | 24. 15 | 36. 500 | |

CHAPTER 5 Proportions—Posttest 1, p. 101

- | | | | |
|--------------------|--------------------------|----------|-------------------|
| 1. 2 | 6. $\frac{1}{2}$ | 11. 4 | 16. $\frac{4}{9}$ |
| 2. $\frac{35}{48}$ | 7. $2\frac{1}{2}$ or 2.5 | 12. 4 | 17. 4 |
| 3. 6 | 8. 2 | 13. 8 | 18. 100 |
| 4. 6.25 | 9. $\frac{5}{9}$ | 14. 1500 | 19. 1 |
| 5. 32 | 10. 36 | 15. 42 | 20. 3.2 |

CHAPTER 5 Proportions—Posttest 2, p. 103

- | | | | |
|----------------------------|-------------------|----------------------|-----------------------------|
| 1. 225 | 6. 56 | 11. 3.6 | 16. 360 |
| 2. $17\frac{2}{5}$ or 1.28 | 7. 1 | 12. 105 | 17. 15 |
| 3. 120 | 8. 3.8 | 13. $27\frac{1}{10}$ | 18. 72 |
| 4. 6.84 | 9. $\frac{3}{20}$ | 14. $\frac{35}{72}$ | 19. $12\frac{2}{5}$ or 1.08 |
| 5. $13\frac{1}{3}$ | 10. 40 | 15. 10 | 20. 150 |