UNIT 5

Dividing Whole Numbers

Objectives

After studying this unit, you will be able to:

- Practice the method used to divide whole numbers.
- Solve division problems with remainders.
- Check division problems with multiplication.
- Solve division problems with denominate numbers.

Division is the last of the four basic mathematical operations. While subtraction was thought of as the inverse of addition, division is thought of as the inverse of multiplication. **Division** is the operation of separating a quantity into a specific number of equally sized portions. For example, if you needed to know how many times 7 can go into 84, this can be determined by subtracting 7 multiple times. After multiple steps of subtraction problems, we determine that 7 can go into 84 a total of 12 times:

(1) $84 - 7 = 77$
(2) $77 - 7 = 70$
(3) $70 - 7 = 63$
(4) $63 - 7 = 56$
(5) $56 - 7 = 49$
(6) $49 - 7 = 42$
(7) $42 - 7 = 35$
(8) $35 - 7 = 28$
(9) $28 - 7 = 21$
(10) $21 - 7 = 14$
(11) $14 - 7 = 7$
(12) $7 - 7 = 0$

Using division, this problem can be solved much faster and with fewer steps. A **division sign (÷)** is placed between the numbers to signify a division problem.

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Using division, this problem can be solved much faster and with fewer steps.

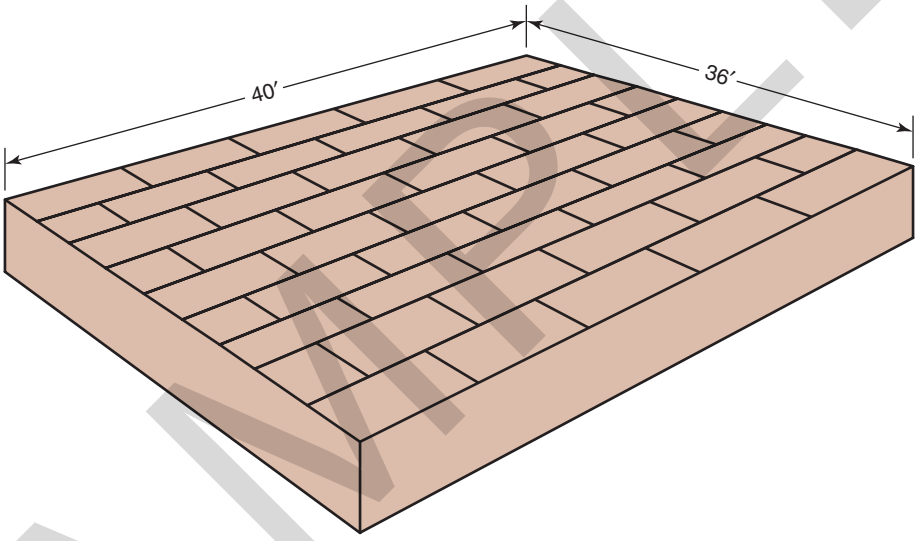
$$84 \div 7 = 12$$

This division problem can be expressed in multiple ways:

- 84 divided by 7 equals 12.
- There are 12 7s in 84.
- 12 goes into 84 7 times.
- 7 divides into 84 12 times.

Example 5-1

Division is useful in determining quantities of materials or performing estimates. A carpenter uses division to determine how many sheets of subfloor to buy to cover a 40′ × 36′ floor system.



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Multiply the length of the floor system by the width to determine the area:

$$40' \times 36' = 1{,}440 \text{ sq ft}$$

Divide the total by 32 since 1 sheet will cover 32 sq ft:

$$1{,}440 \text{ sq ft} \div 32 \text{ sq ft/sheet} = 45 \text{ sheets}$$

Example 5-2

*See Appendix A
Interior Finish

How many pieces of 8′ ***base**** trim would be needed to cover a 40′ × 36′ room?

Determine the perimeter of the room:

$$40' + 40' + 36' + 36' = 152'$$

Divide the perimeter by 8, since each piece of trim measures 8′ long.

$$152' \div 8' = 19 \text{ pieces of trim}$$

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Method Used to Divide Whole Numbers

While addition (+), subtraction (–), and multiplication (×) each had a symbol to identify their operations, division can be identified by four symbols and methods to set up the problem.

Division bracket	$7\overline{)84}$
Division sign	$84 \div 7$
Division bar	$\frac{84}{7}$
Slanted bar	$84/7$

Because division problems can be set up using multiple symbols, it is important to learn the terminology and definitions associated with a common division problem.

$$\begin{array}{rl} & 12 \leftarrow \text{Quotient} \\ \text{Divisor} \rightarrow & 7\overline{)84} \leftarrow \text{Dividend} \end{array}$$

The **dividend** is the number that is being divided into smaller parts by the divisor.
The **divisor** is the number by which the dividend is being divided.
The **quotient** is the number of times the dividend is divided by the divisor.

While it is easy to recognize that $24 \div 12 = 2$, calculators are needed on many division problems because of their complexity. When working on a jobsite where a calculator may not be available, the long division bracket method can be used to solve complex division problems.

Example 5-3

Set up the problem by placing the dividend and divisor in their correct locations. For this example, division brackets are used.

$$8\overline{)1{,}968}$$

Starting on the left of 1,968, determine how many times the divisor (8) can go into the first digit of the dividend (1,968). In this example, 8 is larger than 1, so it cannot. When this happens, you then move one more digit to the right on the dividend and try again. This time 8 can divide into 19 two times. Since we were dividing into 19, the 2 is written directly above the 9 in 19.

$$\begin{array}{r} 2 \\ 8\overline{)1{,}968} \end{array}$$

After placing the 2 above the 9, multiply 2×8 and place the answer (16) under the 19. Subtract and insert the 3 as the answer.

$$\begin{array}{r} 2 \\ 8\overline{)1{,}968} \\ -\,1\,6 \\ \hline 3 \end{array}$$

(Continued)

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Bring down the next digit in the dividend (6) and place it to the right of the 3. The new remainder becomes 36. It is very important when bringing down numbers that they move directly down and remain in the same column.

$$\begin{array}{r} 2 \\ 8\overline{)1{,}968} \\ -16\downarrow \\ \hline 36 \end{array}$$

The division process continues by determining if 8 will divide into 36. In this case it does, 4 times. The 4 is placed above the 6 and multiplied by the divisor (4×8). The answer (32) is placed below the 36 and subtracted.

$$\begin{array}{r} 24 \\ 8\overline{)1{,}968} \\ -16 \\ \hline 36 \\ -32 \\ \hline 4 \end{array}$$

This cycle is repeated until all the digits in the dividend have been used.

$$\begin{array}{r} 246 \\ 8\overline{)1{,}968} \\ -16 \\ \hline 36 \\ -32\downarrow \\ \hline 48 \\ -48 \\ \hline 0 \end{array}$$

Math Tip

Neat and orderly handwriting is very important when calculating math operations. Keeping numbers properly aligned when dividing will help to avoid errors. Misaligned numbers can make it easy to bring down a number from the wrong column.

Remainders in Division Problems

The type of division problems covered so far in this unit have been ones in which the divisor divides evenly into the dividend.

In reality, many division problems do not work out evenly. A **remainder** is a number that remains after the entire dividend has been divided. The remainder is attached to the quotient with the letter "r."

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Example 5-4

$$\begin{array}{r} 106\text{ r}3 \\ 9\overline{)957} \\ -\,9 \\ \hline 05 \\ -\,0 \\ \hline 57 \\ -\,54 \\ \hline 3 \end{array}$$

Checking Division

Division can be thought of as the inverse of multiplication. Because of this, division problems can be checked by multiplication. Once a division problem has been calculated, it can be checked by multiplying the quotient by the divisor. If there was a remainder in the answer, it is then added to the answer. For example, the division problem 76 ÷ 6 is checked with multiplication.

$$\begin{array}{r} 12\text{ r}4 \\ 6\overline{)76} \\ -\,6 \\ \hline 16 \\ -\,12 \\ \hline 4 \end{array} \qquad \begin{array}{r} {\scriptstyle 1} \\ 12 \\ \times\ 6 \\ \hline 72 \\ +\ 4 \\ \hline 76 \end{array}$$

Division can also be used to check the accuracy of a multiplication problem.

$$48 \div 6 = 8 \text{ or } 48 \div 8 = 6$$

Dividing Denominate Numbers

When dividing a denominate number by a whole number, the denominate number's unit of measure is applied to the final answer.

$$12 \text{ yd} \div 3 = 4 \text{ yd}$$

$$18' \div 6 = 3'$$

When dividing two denominate numbers containing a squared dividend, the divisor's unit of measure will cancel out the part of the dividend's unit they have in common, resulting in the answer containing a single unit of measure.

$$\frac{81 \text{ sq ft}}{9'} = 9'$$

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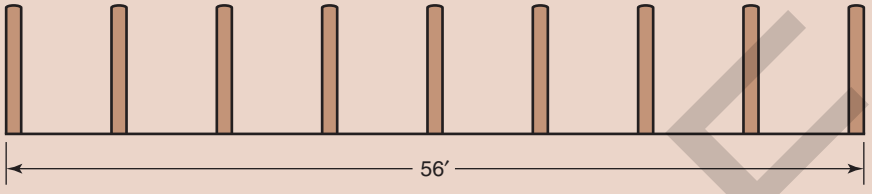
Carpentry Notes

Equal Spacing of Posts

Division is an operation that is often used to space objects out equally. For example, during the erection of a fence, locations need to be established and drilled for the fence posts. The 56′ fence is built with 9 equally spaced poles. Division is used to determine the post spacing.



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Since there will be 8 equal spaces between the 9 poles, the 56′ length will be divided by 8.

$$56' \div 8 = 7'$$

Through division, it has been determined that spacing from post to post will be 7′.

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Unit 5 Review

Name _____ **Date** _____ **Class** _____

Divide the following numbers without the use of a calculator. Show all of your work.

1. $35 \div 7 =$

2. $12 \div 3 =$

3. $18 \div 6 =$

4. $24 \div 4 =$

5. $45 \div 9 =$

6. $6\overline{)210}$

7. $4\overline{)344}$

8. $11\overline{)588}$

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9. $8\overline{)4{,}975}$

10. $13\overline{)3{,}627}$

11. $18\overline{)15{,}148}$

12. $127\overline{)2{,}132}$

13. $352\overline{)44{,}444}$

14. $249\overline{)170{,}316}$

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Name _____ **Date** _____ **Class** _____

Divide the following numbers without the use of a calculator. Then, check your accuracy through multiplication. Show all your work.

15. 3,465 ÷ 55 =

16. 2,106 ÷ 27 =

17. Divide 8,364 by 68.

18. 6,315 ÷ 145 =

19. 46,972 ÷ 264 =

20. 7,461 divided by 37

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21. How long does it take to install 450 sq ft of hardwood flooring at the rate of 75 sq ft per hour?

_____

22. A room measures 14′ × 16′ and has 8′ high walls. At 400 sq ft of coverage per gallon, how many gallons are needed to paint the walls with two coats of paint?

_____

23. How many 4′ pieces can be cut from a 16′ board?

_____

24. A worker was paid $1,280 for 80 hours of work. How much did the worker earn per hour?

_____

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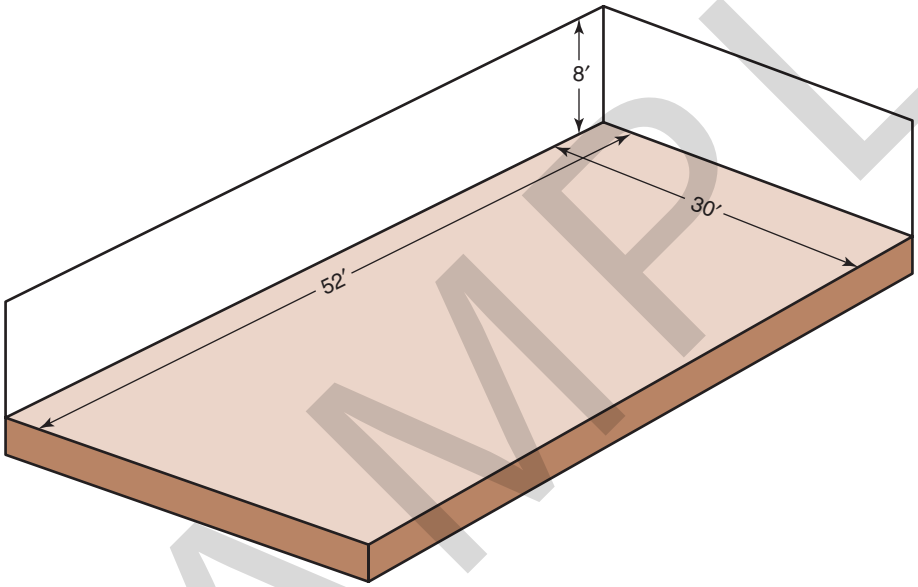
Name _____ **Date** _____ **Class** _____

25. A 72′ long pole barn needs trusses installed every 2′. How many trusses, including the trusses at the front and back of the 72′ barn, need to be ordered?

_____

Use the following image of a room to answer problems 26–28.



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26. How many sheets of subflooring are needed to cover the floor system, when each sheet covers 32 sq ft?

_____

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*See Appendix A
Wall Frame

27. To build the four exterior walls for the house, the builder is using $2 \times 4 \times 16'$ material for the ***sole plates**** and single ***top plates****. How many 16′ boards are needed for plates on the four exterior walls?

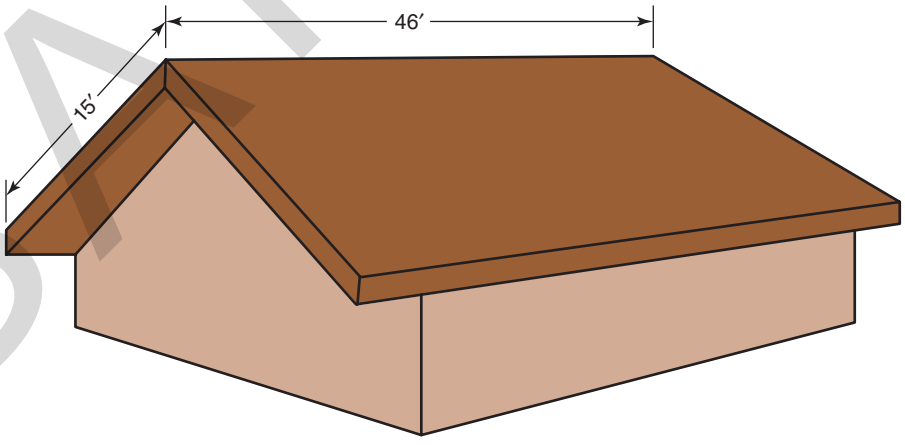
_____

28. How many pieces of sheeting are needed to cover the exterior walls, when each sheet covers 32 sq ft?

_____

29. How many squares of shingles are needed to cover both sides of the roof shown in the following illustration? A square of shingles covers 100 sq ft.

_____



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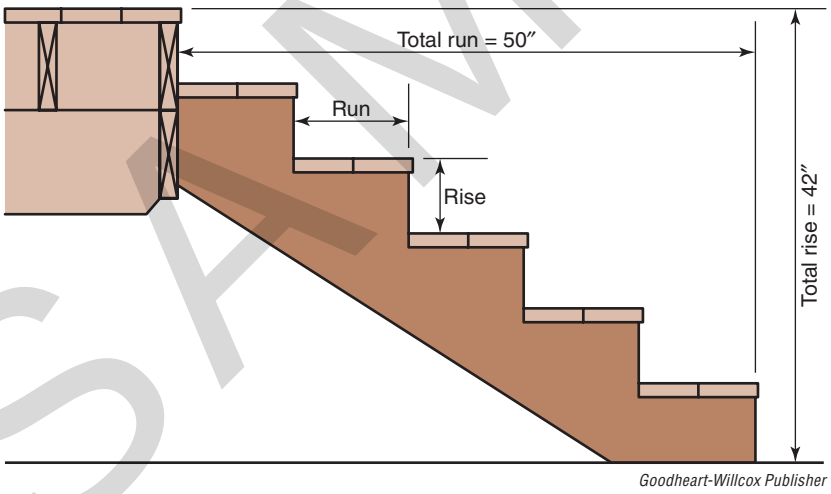
30. How many studs are needed to frame a 32′ wall (no windows or doors)? Studs will be placed 16″ on center (16″ between the centers of each stud).

_____

31. How many 2′ × 4′ ceiling tiles are needed for a 28′ × 56′ suspended ceiling?

_____

Use the following staircase plan to answer questions 32–33.



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32. What is the rise (height) of each step, assuming uniform rise in each step?

_____

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33. What is the run (width) of each step, assuming uniform run in each step?

_____

34. How many rolls of insulation are needed to insulate 1,680 sq ft of walls if each roll contains 49 sq ft of insulation?

_____

35. A contractor bidding a project has allowed $1,620 for labor. How many total hours can his 3-person crew work and still remain under budget, when each worker is making $12/hour?

_____

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Section 1 Exam

Name _____ **Date** _____ **Class** _____

Use the number 6,381,947 to answer questions 1–3.

1. Which digit is in the hundreds place?

   _____

2. Which digit is in the ten thousands place?

   _____

3. In which place value is the 3?

   _____

4. Round 319,462 to the thousands place value.

   _____

5. Three carpenters cut 16 deck posts to a length of 67″. Identify the denominate number.

   _____

6. 47″ + 52″ + 143″ =

7. 73 sq ft + 39 sq ft + 177 sq ft + 348 sq ft =

8. 458 yd + 145 yd + 227 yd + 98 yd =

9. 323 sq ft
   – 268 sq ft

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10. $\begin{array}{r} 42{,}291 \\ -\ 1{,}788 \\ \hline \end{array}$

11. $\begin{array}{r} 14{,}500 \text{ bd ft} \\ -\ 9{,}788 \text{ bd ft} \\ \hline \end{array}$

12. $\begin{array}{r} 15 \\ \times\ 9 \\ \hline \end{array}$

13. $\begin{array}{r} 42 \\ \times 17 \\ \hline \end{array}$

14. $\begin{array}{r} 438 \\ \times 612 \\ \hline \end{array}$

15. $\begin{array}{r} 3{,}487 \\ \times\ 525 \\ \hline \end{array}$

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Name _____ **Date** _____ **Class** _____

16. 1,566 ÷ 18 =

17. 3,971 ÷ 76 =

18. Divide 5,264 by 72.

19. 36,157 ÷ 444 =

20. A carpenter is giving a quote to install baseboard trim in rooms whose perimeters measure 52, 64, 48, 72, and 28 lineal feet. How many total lineal feet of trim is required?

_____

21. A crew of 4 construction workers worked three 11-hour days, one 7-hour day, and one 9-hour day. How many total hours were worked by the crew?

_____

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22. A contractor bid $45,000 on a construction project. Once the project was complete, $18,721 was spent on materials, $7,687 was paid to his workers, and $4,600 paid to a subcontractor. How much was left over for the carpenter to claim as profit?

_____

23. If three 18″ boards, two 9″ boards, and one 17″ board were cut from a 168″ board, how much is left over?

_____

24. A carpenter is installing wooden shelving in all the closets in a new home. Two closets need 7′ shelves, six closets need 6′ shelves, a linen closet needs five 2′ shelves, and the pantry needs six 4′ shelves. How many lineal feet of shelving is needed?

_____

25. A contractor budgeted $1,800 for labor for a job. How many hours can two workers, each making $14 an hour, work and remain under budget?

_____

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