



HESI A2 Math Overview



CONTENTS COVERED

- Whole Numbers (addition, subtraction, multiplication, division)
- Fractions
- Decimals
- Algebra (basic)
- Percentages
- Ratios & Proportions
- Unit Conversions
- 12-hours vs. Military Time

Whole Number Review: Word Problems—Practice

Directions: For each problem, choose the correct answer.

- A ferry that goes to an island carries 18 cars per trip. If 3,762 cars go to the island in June and 5,778 cars go to the island in July, how many trips will the ferry have to make during the two months?

a. 207 b. 321 c. 428 d. 530 e. 726
- Before shipping the last 17,043 telephones to the Phone Mart, a control clerk checked every 39th telephone to make sure it worked properly. The clerk discovered 1 damaged telephone. How many telephones did the clerk check that were not damaged?

a. 45 b. 347 c. 420 d. 436
e. Insufficient data is given to solve the problem.
- A crate of 357 oranges that cost \$65 is sent to an office where 17 people work. If each person eats one orange each day, how many weeks will it be before the oranges are all gone?

a. 3 b. 4 c. 12 d. 15 e. 21
- Suzanne jogged 2,250 miles last year. After she jogs 250 miles, she needs to buy new jogging shoes that cost \$49. How much money did she spend on jogging shoes last year?

a. \$292 b. 392 c. \$441 d. \$490 e. \$500
- Each of the 73 members of the club donated an equal amount of money each month to pay the rent and the utility bills for the club room. If the rent was \$584 and the utilities were \$219 for the month, how much did each member donate this month?

a. \$5 b. \$6 c. \$8 d. \$10 e. \$11
- If a man earns \$5 an hour, how much does he earn in a 40-hour week?

a. \$200 b. \$210 c. \$218 d. \$2,000 e. \$2,100
- How many miles can a truck driver drive if she averages 52 miles per hour for 13 hours?

a. 650 b. 666 c. 676 d. 705
e. Insufficient data is given to solve the problem.

8. If a pair of rabbits produces 24 offspring a year, how many babies will 178 pairs of rabbits have?
- a. 4,262 b. 4,227 c. 4,772 d. 4,272 e. 4,622
9. A delivery cart holding 308 dozen eggs tipped, and 56 eggs were smashed. How many eggs are left?
- a. 3,640 b. 252 c. 3,642 d. 364 e. 3,696
10. Mrs. Ginn bought 9 yards of material at \$5 a yard and a pattern for \$3. Which of the following expressions correctly represents the total of Mrs. Ginn's purchase?
- a. $9 \times \$5$ b. $9(\$5) + \3 c. $9(\$5 + \$3)$ d. $\$5 + \3 e. $\$5 \times (9 + 3)$
11. Jeff receives a commission of \$78 on every set of encyclopedias he sells. In May he sold 63 sets, and in June he sold less than he sold in May. How much more money did Jeff earn in May than in June?
- a. \$468 b. \$1,468 c. \$4,446 d. \$9,360
e. Insufficient data is given to solve the problem.

Answers:

1. d
2. d
3. a
4. c
5. e
6. a
7. c
8. d
9. a
10. b
11. e

Fractions: Review—Practice 1

$$1. \quad \begin{array}{r} \frac{6}{11} \\ + \frac{3}{11} \\ \hline \end{array}$$

$$2. \quad \begin{array}{r} 3\frac{3}{4} \\ + 2\frac{5}{7} \\ \hline \end{array}$$

$$3. \quad \begin{array}{r} \frac{5}{12} \\ + \frac{1}{8} \\ \hline \end{array}$$

$$4. \quad \begin{array}{r} \frac{7}{8} \\ - \frac{3}{8} \\ \hline \end{array}$$

$$5. \quad \begin{array}{r} 9\frac{2}{3} \\ - 6\frac{1}{6} \\ \hline \end{array}$$

$$6. \quad \begin{array}{r} 7\frac{3}{4} \\ - 2\frac{2}{3} \\ \hline \end{array}$$

$$7. \quad \frac{1}{5} \times \frac{2}{3}$$

$$8. \quad \frac{1}{4} \div \frac{2}{3}$$

$$9. \quad \frac{7}{15} \times \frac{3}{14}$$

$$10. \quad \frac{2}{3} \div \frac{5}{6}$$

$$11. \quad \frac{5}{6} \times 30$$

$$12. \quad \frac{4}{7} \div 8$$

$$13. \quad \begin{array}{r} 6\frac{1}{2} \\ \frac{3}{5} \\ + 9\frac{7}{10} \\ \hline \end{array}$$

$$14. \quad \begin{array}{r} 8 \\ - \frac{2}{5} \\ \hline \end{array}$$

15. $1\frac{2}{5} \times 2\frac{1}{2}$

16. $7 \div 4\frac{2}{3}$

17. $7\frac{3}{4} - 4\frac{5}{6}$

18. $3\frac{2}{5} \div 1\frac{2}{15}$

Answers:

1. $\frac{9}{11}$

7. $\frac{2}{15}$

13. $16\frac{4}{5}$

2. $6\frac{13}{28}$

8. $\frac{3}{8}$

14. $7\frac{3}{5}$

3. $\frac{13}{24}$

9. $\frac{1}{10}$

15. $3\frac{1}{2}$

4. $\frac{1}{2}$

10. $\frac{4}{5}$

16. $1\frac{1}{2}$

5. $3\frac{1}{2}$

11. 25

17. $2\frac{11}{12}$

6. $5\frac{1}{12}$

12. $\frac{1}{14}$

18. 3

Decimal Review—Practice

1. What is the value of the place occupied by the 5 in 1.509?
2. What digit is in the thousandths place in the decimal 0.5321?
3. Write .21 using words.
4. Write 20.003 using words.
5. Write “forty-six and three hundredths” as a decimal.
6. Which number is larger? 0.905 or 0.91
7. Which number is larger? 0.4545 or 0.05454.
8. Round to the nearest tenth 4.78.
9. Round to the nearest hundredth 0.406.
10. Round to the nearest thousandth 7.4294.
11. $0.12 + 3.006 + 0.4357$
12. $0.9564 - 0.4392$
13. $17 + 3.24 + 0.256 + 0.3689$
14. $16 - 13.87$
15. 85.4×6.2
16. 1000×3.48
17. 749×0.43
18. $0.83 \overline{)4.067}$
19. $0.1278 \div 0.01$
20. $12 \overline{)89.76}$

21. Write $\frac{4}{5}$ as a decimal.
22. Write $\frac{1}{40}$ as a decimal.
23. Write 0.48 as a fraction and reduce.
24. Estimate the product 8.91×22.457 by rounding to the nearest one.
25. Estimate the quotient $78.2209 \div 16.09$ by rounding to the nearest ten.

Answer Key
Decimal Review – Practice

- | | |
|---------------------------------|---------------------|
| 1. tenths | 15. 529.48 |
| 2. 2 | 16. 3480 |
| 3. twenty-one hundredths | 17. 322.07 |
| 4. twenty and three thousandths | 18. 4.9 |
| 5. 46.03 | 19. 12.78 |
| 6. 0.91 | 20. 7.48 |
| 7. 0.4545 | 21. 0.8 |
| 8. 4.8 | 22. 0.025 |
| 9. 0.41 | 23. $\frac{12}{25}$ |
| 10. 7.429 | 24. 198 |
| 11. 3.5617 | 25. 4 |
| 12. 0.5172 | |
| 13. 20.8649 | |
| 14. 2.13 | |

Basic Algebra

Algebra is mathematics that deals with unknown quantities. These unknowns are given a letter name, such as x or y . This letter is usually called the *variable* or the *unknown*.

If the variable is placed in an *equation*, any phrase with an equal (=) sign, then we can *solve* the equation. Solve means to find the value of the variable.

An example of an equation is: $x + 2 = 5$ x represents the unknown quantity.

To solve this equation, we are required to find the value of x . This is the same as $1x$.

Think of an equation as if it were a balance. The left side of the equation always must balance or equal the right side. Any action we take on one side of the equals sign must also be taken on the other side of the equals sign.

This equation is solved when only x (or any variable with a coefficient of 1) is on one side of the equation and all the numbers or other variables are on the other side of the equation.

In this example, we will add -2 to *both sides of the equation*. This *isolates* the x on one side of the equals sign and 3 on the other side of the equals sign. Thus, the value of x is 3.

$x + 2 = 5$	Original equation
$x + 2 - 2 = 5 - 2$	Add -2 to both sides of the equation to isolate the x . -2 is added, because it is the opposite sign or the inverse of $+2$. Adding $+2$ and -2 results in 0, therefore, the x is isolated or by itself on one side of the equation.
$x = 3$	Once the x is isolated, the equation is solved.

In this equation we chose to do the *opposite* or *inverse* operation to remove the 2 from the left side of the equation. Depending on the equation, we can use any of the following operations to isolate the variable:

- Add a number or variable of the opposite sign
- Multiply to cancel a fraction
- Divide to remove a coefficient (any value multiplied by the variable is the coefficient of that variable), e.g. $2x$, where 2 is the coefficient of x .
- To keep the equation balanced, we must perform the same operation on both sides of the equation

Examples and Practice Problems

Solve the following equations by isolating the unknown.

1. $y + 3 = 7$
 $y + 3 - 3 = 7 - 3$
 $y = 4$

In this equation, 3 is added to y.
In order to isolate the y, add -3, the inverse of +3, to both sides of the equation.
The 3's on the left side of the equation cancel each other.
Solution
2. $a + 6 = 8$
3. $z - 4 = 6$
 $z - 4 + 4 = 6 + 4$
 $z = 10$

4 is being subtracted from the z.
Add +4 to both sides, this is the opposite of -4.
4. $z - 21 = 34$
5. $5y = 35$
 $\frac{5y}{5} = \frac{35}{5}$
 $y = 7$

Y is multiplied by 5, it is the coefficient of y.
Divide both sides of the equation by 5 to remove the coefficient of y. The 5's on the left side of the equation cancel each other. $5 \div 5 = 1$, the y remains.
6. $8a = 2$

Some values may be fractions, reduce to the lowest terms
7. $-7y = 28$

Divide both sides by -7; the divisor must be exactly the same as the coefficient.
8. $-x = -17$

-x is the same as -1x, just as x is 1x.
9. $\frac{y}{5} = 7$
 $\frac{5 \cdot y}{1 \cdot 5} = 5 \cdot 7$
 $y = 35$

Y is divided 5, use the inverse operation of multiplication to cancel the 5.
The 5's cancel leaving 1y
 $1y = y$
10. $\frac{c}{6} = \frac{2}{3}$

C is divided by 6, use the inverse operation of multiplication to cancel the 6.
11. $\frac{x}{7} = -8$
12. $\frac{5z}{6} = 10$
13. $\frac{3a}{7} = 21$

14. $\frac{-5x}{8} = 15$

15. $3x + 11 = 20$

16. $4z - 8 = 24$

17. $\frac{z}{2} + 6 = 7$

18. $-3a - 4 = 17$

19. $13 - 9x = -41$

20. $\frac{5x}{6} + 9 = 24$

21. $2 + 3a = 11$

22. $\frac{x}{2} + 7 = 9$

23. $7y - 3y = 23 + 9$ Combine like terms before solving.

24. $9z - z - 5 = 11$

25. $12y - 11y = 17$

Basic Algebra

Answer Key

1. $y = 4$
2. $a = 2$
3. $z = 10$
4. $z = 55$
5. $y = 7$
6. $a = \frac{1}{4}$
7. $y = -4$
8. $x = 17$
9. $y = 35$
10. $c = 4$
11. $x = -56$
12. $z = 12$
13. $a = 49$
14. $x = -24$
15. $x = 3$
16. $z = 8$
17. $z = 2$
18. $a = -7$
19. $x = 6$
20. $x = 18$
21. $a = 3$
22. $x = 4$
23. $y = 8$
24. $z = 2$
25. $y = 17$

LPN Math – Percents

Change to percents:

- 1) 0.014 2) 2.435 3) .37 4) 0.0056 5) 3

Change to decimals:

- 6) 3% 7) 25% 8) 1.5% 9) 40% 10) 0.6%

Change to percents:

- 11) $\frac{5}{8}$ 12) $\frac{1}{2}$ 13) $\frac{7}{10}$ 14) $\frac{1}{6}$ 15) $\frac{17}{100}$

Change to common fractions:

- 16) 14% 17) $12\frac{1}{2}\%$ 18) 2% 19) 60% 20) $16\frac{2}{3}\%$

Solve:

- 21) 3% of 15 = 22) 10% of 125 = 23) 25% of 160 =
 24) 75% of 200 = 25) 0.5% of 40 = 26) 0.6% of 180 =
 27) 5 is what % of 10? 28) 34 is what % of 100? 29) 40 is what % of 320?
 30) 45 is what % of 180? 31) 16 is what % of 64? 32) 12 is what % of 60 ?
 33) 25% of what number is 10? 34) 60% of what number is 30?
 35) 100% of what number is 75? 36) 35% of what number is 8.4?
 37) $62\frac{1}{2}\%$ of what number is 120? 38) 12.6% of what number is 189?
 39) Taxes are often discounted if paid at an early date. Joy received a 3% discount on his tax bill of \$120. How much tax did she have to pay?
 40) A merchant was allowed $\frac{1}{2}\%$ discount for prompt payment of a bill amounting to \$400. What was the amount of her discount?
 41) Jarrett Inc., who employed 125 workers, decreased their force by 20%. How many do they employ now?

Percents Answer Key

- 1) 1.4% 2) 243.5% 3) 37% 4) 0.56% 5) 300%
- 6) 0.03 7) 0.25 8) 0.015 9) 0.4 10) 0.006
- 11) 62.5% 12) 50% 13) 0.7 14) 16 2/3 % 15) 17%
-
- 16) $14/100 = 7/50$ 17) $12 \frac{1}{2} / 100 = 1/8$ 18) $2/100 = 1/50$
- 19) $60/100 = 3/5$ 20) $16 \frac{2}{3} / 100 = 50/3 / 100 = 1/6$ 21) 0.45
-
- 22) 12.5 23) 40 24) 150 25) 0.2 26) 6.48
-
- 27) $5 = \underline{\hspace{1cm}} \% \times 10$
 $5/10 = 0.5 = 50\%$ 28) 34% 29) $40 = \underline{\hspace{1cm}} \% \times 320$
 $40/320 = 1/8 = 0.125 =$
 $= 12.5\%$
- 30) $45 = \underline{\hspace{1cm}} \% \times 180$
 $45/180 = 1/4 = 0.25$
 $= 25\%$ 31) $16 = \underline{\hspace{1cm}} \% \times 64$
 $16/64 = 1/4 = .25$
 $= 25\%$ 32) $12 = \underline{\hspace{1cm}} \% \times 60$
 $12/60 = 1/5 = .20$
 $= 20\%$
-
- 33) $25\% \times \underline{\hspace{1cm}} = 10$
 $0.25 \times \underline{\hspace{1cm}} = 10$
 $10/0.25 = 40$ 34) $60\% \times \underline{\hspace{1cm}} = 30$
 $0.60 \times \underline{\hspace{1cm}} = 30$
 $30/0.60 = 50$ 35) 75
-
- 36) $35\% \times \underline{\hspace{1cm}} = 8.4$
 $0.35 \times \underline{\hspace{1cm}} = 8.4$
 $8.4/.35 = 24$ 37) $62 \frac{1}{2} \% \times \underline{\hspace{1cm}} = 120$
 $62.5\% \times \underline{\hspace{1cm}} = 120$
 $0.625 \times \underline{\hspace{1cm}} = 120$
 $120/.625 = 192$ 38) $12.6\% \times \underline{\hspace{1cm}} = 189$
 $0.126 \times \underline{\hspace{1cm}} = 189$
 $189/.126 = 1500$
-
- 39) 3% of \$120 =
 $0.03 \times \$120 = \3.60
 $\$120 - \$3.60 = \$116.40$ 40) 1/2 % of \$400 =
 $0.5\% \times \$400 =$
 $0.005 \times \$400 = \2.00 41) 20% of 125 =
 $0.2 \times 125 = 25$
 $125 - 25 = 100$

Percent: Word Problems—Practice

Solve:

1. A company built and equipped a new suite of offices for \$200,000. Of this amount, \$40,000 was for equipment and furnishings. What percent of the total expenditure was for equipment and furnishings?
2. Twelve years ago, a building was valued at \$120,000. Today the building has a value of \$200,000. What percent of the price twelve years ago is the value today?
3. A used car dealer estimates that 65% of the company's sales will occur on Thursday, Friday, or Saturday. Using this estimate, how many cars out of the 80 sold last month were sold on Thursday, Friday, or Saturday?
4. Approximately 70% of the employees in a company purchase supplementary dental insurance. Using this estimate, how many of the company's 200 employees purchased dental insurance?
5. The value of a service truck is 60% of its value two years ago. The value two years ago was \$12,500. What is the value of the truck today?
6. A computer dealer estimates that 12.5% of the computers sold will require service during the one year warranty period. Using this estimate, how many computers were sold in a year in which 75 new computers were serviced?
7. The number of employees in a business is 50. Ten of the employees are men. What percent of the employees are men?
8. The salary of an office manager, which had been \$25,000, was increased by \$6,000. What percent of her previous salary does this represent?
9. The number of building permits issued in a city this year was 72,000. This represents 125% of last year's number of permits. How many building permits were issued last year?
10. The annual license fee on a van is 1.5% of the value of the van. What is the value of a van during a year in which the license fee was \$120?

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

Answer Key
Percent: Word Problems – Practice

1. 20%
2. $166\frac{2}{3}\%$
3. 52 cars
4. 140 employees
5. \$7,500
6. 600 computers
7. 20%
8. 24%
9. 57,600 building permits
10. \$8,000

Ratio and Proportion for Health Science

Ratio A ratio consists of two numbers that have a significant relationship to each other.

*For example, if the records at the Humane Society indicate that, historically, they have 10 dogs for every 9 cats. The ratio of dogs to cats is 10 to 9. The ratio can be written one of two ways: 10:9 or $\frac{10}{9}$. The ratio is read, 10 to 9.

9

This is a relation of dogs to cats, so the number of dogs is written first and then the number of cats. In the fraction form, the first number (dogs) is written on top, or as the numerator and the second number (cats) is written below, or as the denominator.

*Like fractions, ratios can be reduced to their lowest terms. $\frac{12}{3}$ reduces to $\frac{4}{1}$

1. Write and reduce these ratios: 6 to 8, 27 to 9, 1 to 4, and 18 to 9.
2. What is the ratio of 3 eggs to 1 chicken?

Proportion - A proportion shows the relationship between two ratios.

*The fraction $\frac{2}{3}$ is equal to $\frac{4}{6}$. The relationship of 2 to 3 is the same as the relationship of 4 to 6.

*Write this proportion as one ratio ($\frac{2}{3}$) followed by an = sign, and then the second ratio ($\frac{4}{6}$).

$$\frac{2}{3} = \frac{4}{6} \quad \text{This is read: 2 is to 3 as 4 is to 6.}$$

*Prove this is a true ratio/proportion by cross-multiplying. Multiply 2×6 and 3×4 . Both equal 12.

When the cross products of a proportion are equal, it is true or correct.

$$\begin{array}{ccc} \swarrow 2 = 4 \swarrow & 2 \times 6 = 12 & 3 \times 4 = 12 \\ \nearrow 3 & 6 \nearrow & \end{array}$$

3. Are $\frac{5}{16}$ and $\frac{3}{7}$ proportionate or true?

*Find a missing term in a ratio/proportion.

The unknown can be any one of the 4 numbers. There can only be one unknown number.

Substitute X for the missing number and write the proportion. 12 is to 5 as 8 is to ___? $\frac{12}{5} = \frac{8}{X}$

What is the ratio of 24 apples to 2 trees? $\frac{24 \text{ apples}}{2 \text{ trees}}$

Write the ratio/proportion for finding the number of apples per tree. $\frac{24 \text{ apples}}{2 \text{ trees}} = \frac{X \text{ apples}}{1 \text{ tree}}$ *

***Note:** It is **very** important to keep the relationship of the terms the same in each ratio; in this example: apples to trees, apples to trees.

*Solve for a missing term.

- a. Cross multiply

$$\frac{10}{3} = \frac{7}{X} \quad \rightarrow \quad 10X = 21$$

- b. Divide both sides of the equation by the coefficient of X which is 10

$$\frac{10X}{10} = \frac{21}{10}$$

- c. $X = 2.1$

Practice problems. Find the missing term for each proportion:

4. $\frac{4}{9} = \frac{X}{18}$

5. $\frac{5}{3} = \frac{30}{X}$

6. $\frac{9}{X} = \frac{12}{15}$

7. $\frac{X}{12} = \frac{30}{40}$

Solve these problems using ratio/proportion:

8. If 3 candy bars cost \$1.20, how much will a dozen cost?
9. If 3 apples cost \$1.00, how many can I buy for \$5.00?
10. If oranges cost 2 for \$.29, what will 8 cost?
11. What will 5 pencils cost, if they are 10 for \$.80?
12. You need 20 yards of concrete. How many trips will the cement truck have to make, if it can haul 3yards/trip?

Answers:

1. $\frac{6}{8} \rightarrow \frac{3}{4}$ $\frac{27}{9} \rightarrow \frac{3}{1}$ $\frac{1}{4}$ $\frac{18}{9} \rightarrow \frac{2}{1}$

Note: 3/1 and 2/1 remain fractions,
do not change to integers

2. 3 eggs
1 chicken
3. No
4. 8
5. 18
6. 11.25
7. 9
8. \$4.80
9. 15
10. \$1.16
11. \$.40
12. 7 trips

LPN Math Workshop - Metrics

Grams, liters, or any other base unit of the metric system can replace the meters in the following chart. Regardless of which of these units we use, the procedure will be the same. For the purpose of explanation, I have used the meter.

kilometer	hectometer	dekameter	meter	decimeter	centimeter	millimeter
km	hm	dam	m	dm	cm	mm
1,000 m	100m	10m	1m	0.1 m	0.01m	0.001m

The table tells us that 1 hectometer = 100 meters and 1 millimeter = .001 meter. The millimeter is the smallest unit in the table. A centimeter is 10 times larger a millimeter, a decimeter is 10 times large {than a centimeter, a meter is 10 times larger than a decimeter, etc. Since each unit is 10 times larger than the unit on its right, converting from one unit to another is simply a matter of multiplying or dividing by 10.

- | | |
|----------------------|---------------------------|
| 1) 712 m = _____ km | 2) 320 m = 0.323 _____ |
| 3) 6.2 km = _____ m | 4) 3,725 mm = 37.25 _____ |
| 5) 85 cm = _____ mm | 6) 8.71 hm = 8,710 _____ |
| 7) 35 cm = _____ m | 8) 4,975 cm = 4.975 _____ |
| 9) 25 m = _____ km | 10) 18 dm = 1.8 _____ |
| 11) 4.8 m = _____ cm | 12) 2,500 _____ = 2.5 km |

- 13) A medication is provided in container quantities of 50 mL. How many times can a 15 mL syringe be filled from this single container?
- 14) Liquid medication is administered to a patient every four hours.
- a) If the dose is 15 mL, how many milliliters are administered in 24 hours?
 - b) If the dose is 5 mL, how many milliliters are administered in 16 hours?
- 15) A one-liter graduated cylinder contains 942 mL of distilled water. A total of 127 mL is removed. What is the amount remaining in the cylinder?
- 16) Brand A of gauze is found to cost \$12.60 per 15-meter roll.
Brand B comes in 25-meter rolls costing \$23.90 each.
- a) Find the cost per meter of Brand A.
 - b) Find the cost per meter of Brand B.
 - c) Which is the better buy?

Metrics Answer Key:

- 1) .712 km
- 3) 6200 m
- 5) 850 mm
- 7) .35
- 9) .025 km
- 11) 480 cm
- 13) 3 times

- 15) 815 mL

- 2) km
- 4) dm
- 6) dm
- 8) dam
- 10) m
- 12) m
- 14) a) 90 mL
b) 20mL
- 16) a) 0.84 per m
b) 0.96 per m
c) Brand A

Answer Key 11.7

Answer Key 11.8

Answer Key 11.9

Final Exam: Version A Answer Key

Final Exam: Version B Answer Key

Versioning History

1.6 Unit Conversion Word Problems

One application of rational expressions deals with converting units. Units of measure can be converted by multiplying several fractions together in a process known as dimensional analysis.

The trick is to decide what fractions to multiply. If an expression is multiplied by 1, its value does not change. The number 1 can be written as a fraction in many different ways, so long as the numerator and denominator are identical in value. Note that the numerator and denominator need not be identical in appearance, but rather only identical in value. Below are several fractions, each equal to 1, where the numerator and the denominator are identical in value. This is why, when doing dimensional analysis, it is very important to use units in the setup of the problem, so as to ensure that the conversion factor is set up correctly.

Example 1.6.1

If 1 pound = 16 ounces, how many pounds are in 435 ounces?

$$435 \text{ oz} = 435 \cancel{\text{oz}} \times \frac{1 \text{ lb}}{16 \cancel{\text{oz}}} \quad \text{This operation cancels the oz and leaves the lbs}$$

$$= \frac{435 \text{ lb}}{16} \quad \text{Which reduces to}$$

$$= 27 \frac{3}{16} \text{ lb} \quad \text{Solution}$$

The same process can be used to convert problems with several units in them. Consider the following example.

A student averaged 45 miles per hour on a trip. What was the student's speed in feet per second?

$$45 \text{ mi/h} = \frac{45 \cancel{\text{mi}}}{\cancel{\text{hr}}} \times \frac{5280 \text{ ft}}{1 \cancel{\text{mi}}} \times \frac{1 \cancel{\text{hr}}}{3600 \text{ s}} \quad \text{This will cancel the miles and hours}$$

$$= 45 \times \frac{5280}{1} \times \frac{1}{3600} \text{ ft/s} \quad \text{This reduces to}$$

$$= 66 \text{ ft/s} \quad \text{Solution}$$

Convert 8 ft^3 to yd^3 .

$$8 \text{ ft}^3 = 8 \text{ ft}^3 \times \frac{(1 \text{ yd})^3}{(3 \text{ ft})^3}$$

Cube the parentheses

$$= 8 \cancel{\text{ft}^3} \times \frac{1 \text{ yd}^3}{27 \cancel{\text{ft}^3}}$$

This will cancel the ft^3 and replace them with yd^3

$$= 8 \times \frac{1 \text{ yd}^3}{27}$$

Which reduces to

$$= \frac{8}{27} \text{ yd}^3 \text{ or } 0.296 \text{ yd}^3 \quad \text{Solution}$$

Example 1.6.4

A room is 10 ft by 12 ft. How many square yards are in the room? The area of the room is 120 ft^2 (area = length \times width).

Converting the area yields:

$$120 \text{ ft}^2 = 120 \cancel{\text{ft}^2} \times \frac{(1 \text{ yd})^2}{(3 \cancel{\text{ft}})^2} \quad \text{Cancel } \text{ft}^2 \text{ and replace with } \text{yd}^2$$

$$= \frac{120 \text{ yd}^2}{9}$$

This reduces to

$$= 13\frac{1}{3} \text{ yd}^2$$

Solution

The process of dimensional analysis can be used to convert other types of units as well. Once relationships that represent the same value have been identified, a conversion factor can be determined.

Example 1.6.5

$$\begin{aligned}
 3 \text{ prescriptions} &= 3 \text{ pres.} \times \frac{60 \text{ tablets}}{1 \text{ pres.}} \times \frac{4 \text{ mg}}{1 \text{ tablet}} \times \frac{1 \text{ dosage}}{12 \text{ mg}} && \text{This cancels all unwanted units} \\
 &= \frac{3 \times 60 \times 4 \times 1}{1 \times 1 \times 12} \text{ or } \frac{720}{12} \text{ dosages} && \text{Which reduces to} \\
 &= 60 \text{ daily dosages} && \text{Solution}
 \end{aligned}$$

Metric and Imperial (U.S.) Conversions

Distance

$$\begin{array}{ll}
 12 \text{ in} = 1 \text{ ft} & 10 \text{ mm} = 1 \text{ cm} \\
 3 \text{ ft} = 1 \text{ yd} & 100 \text{ cm} = 1 \text{ m} \\
 1760 \text{ yds} = 1 \text{ mi} & 1000 \text{ m} = 1 \text{ km} \\
 5280 \text{ ft} = 1 \text{ mi} &
 \end{array}$$

Imperial to metric conversions:

$$\begin{array}{l}
 1 \text{ inch} = 2.54 \text{ cm} \\
 1 \text{ ft} = 0.3048 \text{ m} \\
 1 \text{ mile} = 1.61 \text{ km}
 \end{array}$$

Area

$$\begin{array}{ll}
 144 \text{ in}^2 = 1 \text{ ft}^2 & 10,000 \text{ cm}^2 = 1 \text{ m}^2 \\
 43,560 \text{ ft}^2 = 1 \text{ acre} & 10,000 \text{ m}^2 = 1 \text{ hectare} \\
 640 \text{ acres} = 1 \text{ mi}^2 & 100 \text{ hectares} = 1 \text{ km}^2
 \end{array}$$

Imperial to metric conversions:

$$\begin{array}{l}
 1 \text{ in}^2 = 6.45 \text{ cm}^2 \\
 1 \text{ ft}^2 = 0.092903 \text{ m}^2 \\
 1 \text{ mi}^2 = 2.59 \text{ km}^2
 \end{array}$$

Volume

$$57.75 \text{ in}^3 = 1 \text{ qt} \qquad 1 \text{ cm}^3 = 1 \text{ ml}$$

Imperial to metric conversions:

$$16.39 \text{ cm}^3 = 1 \text{ in}^3$$

$$1 \text{ ft}^3 = 0.0283168 \text{ m}^3$$

$$3.79 \text{ litres} = 1 \text{ gal}$$

Mass

$$437.5 \text{ grains} = 1 \text{ oz}$$

$$16 \text{ oz} = 1 \text{ lb}$$

$$2000 \text{ lb} = 1 \text{ short ton}$$

$$1000 \text{ mg} = 1 \text{ g}$$

$$1000 \text{ g} = 1 \text{ kg}$$

$$1000 \text{ kg} = 1 \text{ metric ton}$$

Imperial to metric conversions:

$$453 \text{ g} = 1 \text{ lb}$$

$$2.2 \text{ lb} = 1 \text{ kg}$$

Temperature

Fahrenheit to Celsius conversions:

$$^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32)$$

$$^{\circ}\text{F} = \frac{9}{5} (^{\circ}\text{C} + 32)$$

Celsius to Fahrenheit Conversion Scale

$^{\circ}\text{F}$	-40°F	-22°F	-4°F	14°F	32°F	50°F	68°F	86°F	104°F	122°F	140°F	158°F	176°F	194°F	212°F
$^{\circ}\text{C}$	-40°C	-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	90°C	100°C

Questions

For questions 1 to 18, use dimensional analysis to perform the indicated conversions.

1. 7 miles to yards

2. 234 oz to tons

4. 1.35 km to centimetres
5. 9,800,000 mm to miles
6. 4.5 ft^2 to square yards
7. $435,000 \text{ m}^2$ to square kilometres
8. 8 km^2 to square feet
9. 0.0065 km^3 to cubic metres
10. 14.62 in^3 to square centimetres
11. 5500 cm^3 to cubic yards
12. 3.5 mph (miles per hour) to feet per second
13. 185 yd per min. to miles per hour
14. 153 ft/s (feet per second) to miles per hour
15. 248 mph to metres per second
16. 186,000 mph to kilometres per year
17. 7.50 tons/yd^2 to pounds per square inch
18. 16 ft/s^2 to kilometres per hour squared

For questions 19 to 27, solve each conversion word problem.

19. On a recent trip, Jan travelled 260 miles using 8 gallons of gas. What was the car's miles per gallon for
-

20. A certain laser printer can print 12 pages per minute. Determine this printer's output in pages per day.
21. An average human heart beats 60 times per minute. If the average person lives to the age of 86, how many times does the average heart beat in a lifetime?
22. Blood sugar levels are measured in milligrams of glucose per decilitre of blood volume. If a person's blood sugar level measured 128 mg/dL, what is this in grams per litre?
23. You are buying carpet to cover a room that measures 38 ft by 40 ft. The carpet cost \$18 per square yard. How much will the carpet cost?
24. A cargo container is 50 ft long, 10 ft wide, and 8 ft tall. Find its volume in cubic yards and cubic metres.
25. A local zoning ordinance says that a house's "footprint" (area of its ground floor) cannot occupy more than $\frac{1}{4}$ of the lot it is built on. Suppose you own a $\frac{1}{3}$ -acre lot ($1 \text{ acre} = 43,560 \text{ ft}^2$). What is the maximum allowed footprint for your house in square feet? In square metres?
26. A car travels 23 km in 15 minutes. How fast is it going in kilometres per hour? In metres per second?
27. The largest single rough diamond ever found, the Cullinan Diamond, weighed 3106 carats. One carat is equivalent to the mass of 0.20 grams. What is the mass of this diamond in milligrams? Weight in pounds?

Answer Key 1.6



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INTERMEDIATE ALGEBRA

CONTENTS

Answer Key 1.6

$$\begin{aligned} 1. 7 \text{ mi} &= 7 \cancel{\text{mi}} \times \frac{1760 \text{ yd}}{\cancel{\text{mi}}} \\ &= 12,320 \text{ yd} \end{aligned}$$

$$\begin{aligned} 2. 234 \text{ oz} &= 234 \cancel{\text{oz}} \times \frac{1 \cancel{\text{lb}}}{16 \cancel{\text{oz}}} \times \frac{1 \text{ ton}}{2000 \cancel{\text{lb}}} \\ &= 0.0073 \text{ tons} \end{aligned}$$

$$3. 11.2 \text{ mg} = 11.2 \cancel{\text{mg}} \times \frac{1 \text{ g}}{1000 \cancel{\text{mg}}} \\ = 0.0112 \text{ g}$$

$$4. 1.35 \text{ km} = 1.35 \cancel{\text{km}} \times \frac{1000 \cancel{\text{m}}}{1 \cancel{\text{km}}} \times \frac{100 \text{ cm}}{1 \cancel{\text{m}}} \\ = 135,000 \text{ cm}$$

$$5. 9,800,000 \text{ mm} = 9,800,000 \cancel{\text{mm}} \times \frac{1 \cancel{\text{m}}}{1000 \cancel{\text{mm}}} \times \frac{1 \cancel{\text{km}}}{1000 \cancel{\text{m}}} \times \frac{1 \text{ mi}}{1.61 \cancel{\text{km}}} \\ = 6.09 \text{ mi (rounded)}$$

$$6. 4.5 \text{ ft}^2 = 4.5 \cancel{\text{ft}^2} \times \frac{(1 \text{ yd})^2}{(3 \cancel{\text{ft}})^2} \\ = 0.5 \text{ yd}^2$$

$$7. 435,000 \text{ m}^2 = 435,000 \cancel{\text{m}^2} \times \frac{(1 \text{ km}^2)}{(1000 \cancel{\text{m}})^2} \\ = 0.435 \text{ km}^2$$

$$8. 8 \text{ km}^2 = 8 \cancel{\text{km}^2} \times \frac{1 \cancel{\text{mi}^2}}{(1.61 \cancel{\text{km}})^2} \times \frac{(5280 \text{ ft})^2}{(1 \cancel{\text{mi}})^2} \\ = 86,000,000 \text{ ft}^2 \text{ (rounded)}$$

$$9. 0.0065 \text{ km}^3 = 0.0065 \cancel{\text{km}^3} \times \frac{(1000 \text{ m})^3}{(1 \cancel{\text{km}})^3} \\ = 6,500,000 \text{ m}^3$$

$$10. 14.62 \text{ in}^2 = 14.62 \cancel{\text{in}^2} \times \frac{(2.54 \text{ cm})^2}{(1 \cancel{\text{in}})^2} \\ = 94.3 \text{ cm}^2$$

$$11. 5500 \text{ cm}^3 = 5500 \cancel{\text{cm}^3} \times \frac{(1 \cancel{\text{in}})^3}{(2.54 \cancel{\text{cm}})^3} \times \frac{(1 \text{ yd})^3}{(36 \cancel{\text{in}})^3}$$

$$= 0.0072 \text{ yd}^3$$

$$12. 3.5 \text{ mi/h} = \frac{3.5 \cancel{\text{mi}}}{\cancel{\text{h}}} \times \frac{5280 \text{ ft}}{1 \cancel{\text{mi}}} \times \frac{1 \cancel{\text{h}}}{3600 \text{ s}}$$

$$= 5.13 \text{ ft/s}$$

$$13. 185 \text{ yd/min.} = \frac{185 \cancel{\text{yd}}}{\cancel{\text{min.}}} \times \frac{1 \text{ mi}}{1760 \cancel{\text{yd}}} \times \frac{60 \cancel{\text{min.}}}{1 \text{ h}}$$

$$= 6.31 \text{ mi/h}$$

$$14. 153 \text{ ft/s} = \frac{153 \cancel{\text{ft}}}{\text{s}} \times \frac{1 \text{ mi}}{5280 \cancel{\text{ft}}} \times \frac{3600 \cancel{\text{s}}}{1 \text{ h}}$$

$$= 104.3 \text{ mi/h}$$

$$15. 248 \text{ mi/h} = \frac{248 \cancel{\text{mi}}}{\cancel{\text{h}}} \times \frac{1.61 \cancel{\text{km}}}{1 \cancel{\text{mi}}} \times \frac{1000 \text{ m}}{1 \cancel{\text{km}}} \times \frac{1 \cancel{\text{h}}}{3600 \text{ s}}$$

$$= 111 \text{ m/s}$$

$$16. 186,000 \text{ mi/h} = \frac{186,000 \cancel{\text{mi}}}{\cancel{\text{h}}} \times \frac{1.61 \text{ km}}{1 \cancel{\text{mi}}} \times \frac{24 \cancel{\text{h}}}{1 \cancel{\text{day}}} \times \frac{365 \cancel{\text{days}}}{1 \text{ yr}}$$

$$= 2,620,000,000 \text{ km/yr (rounded)}$$

$$17. 7.50 \text{ t/yd}^2 = \frac{7.50 \cancel{\text{t}}}{\cancel{\text{yd}^2}} \times \frac{2000 \text{ lb}}{1 \cancel{\text{t}}} \times \frac{(1 \cancel{\text{yd}})^2}{(36 \text{ in})^2}$$

$$= 11.57 \text{ lb/in}^2$$

$$18. 16 \text{ ft/s}^2 = \frac{16 \cancel{\text{ft}}}{\cancel{\text{s}^2}} \times \frac{1 \cancel{\text{mi}}}{5280 \cancel{\text{ft}}} \times \frac{1.61 \text{ km}}{1 \cancel{\text{mi}}} \times \frac{(3600 \cancel{\text{s}})^2}{(1 \text{ h})^2}$$

$$= 63,200 \text{ km/h}^2 \text{ (rounded)}$$

$$19. \text{ mpg: } \frac{260 \text{ mi}}{8 \text{ gal}} \Rightarrow 32.5 \text{ mpg}$$

$$32.5 \text{ mi/gal} = \frac{32.5 \cancel{\text{mi}}}{\cancel{\text{gal}}} \times \frac{1.602 \text{ km}}{1 \cancel{\text{mi}}} \times \frac{1 \cancel{\text{gal}}}{3.785 \text{ litres}}$$

$$= 13.8 \text{ km/litre}$$

$$32.5 \text{ mpg} = 13.8 \text{ km/l}$$

$$20. 12 \text{ pg/min} = \frac{12 \text{ pg}}{\cancel{\text{min}}} \times \frac{60 \cancel{\text{min}}}{1 \text{ hr}} \Rightarrow 720 \text{ pg/hr}$$

$$720 \text{ pg/hr} = \frac{720 \text{ pg}}{\cancel{\text{hr}}} \times \frac{24 \cancel{\text{hr}}}{1 \text{ d}} \Rightarrow 17,280 \text{ pg/d}$$

$$21. 60 \text{ beats/min} = \frac{60 \text{ beats}}{\cancel{\text{min}}} \times \frac{60 \cancel{\text{min}}}{1 \cancel{\text{hr}}} \times \frac{24 \cancel{\text{hr}}}{1 \cancel{\text{day}}} \times \frac{365.24 \cancel{\text{days}}}{\cancel{\text{yr}}} \times \frac{86 \cancel{\text{yrs}}}{\text{life}}$$

$$60 \text{ beats/min} = 2,713,879,296 \text{ beats/life}$$
$$= 2.71 \text{ million beats}$$

$$22. 128 \text{ mg/dL} = \frac{128 \cancel{\text{mg}}}{\cancel{\text{dL}}} \times \frac{1 \text{ g}}{1000 \cancel{\text{mg}}} \times \frac{10 \cancel{\text{dL}}}{\text{L}}$$

$$128 \text{ mg/dL} = 1.28 \text{ g/L}$$

23.

$$38 \text{ ft} = 38 \cancel{\text{ft}} \times \frac{1 \text{ yd}}{3 \cancel{\text{ft}}} \Rightarrow 12\frac{2}{3} \text{ yd}$$

$$40 \text{ ft} = 40 \cancel{\text{ft}} \times \frac{1 \text{ yd}}{3 \cancel{\text{ft}}} \Rightarrow 13\frac{1}{3} \text{ yd}$$

$$\text{Area} = 12\frac{2}{3} \text{ yd} \times 13\frac{1}{3} \text{ yd} \Rightarrow 168\frac{8}{9} \text{ yd}^2$$

24.

$$\text{Volume} = 50 \text{ ft} \times 10 \text{ ft} \times 8 \text{ ft} \Rightarrow 4000 \text{ ft}^3$$

$$4000 \text{ ft}^3 = 4000 \cancel{\text{ft}^3} \times \frac{1 \text{ yd}^3}{(3 \cancel{\text{ft}})^3} \Rightarrow 148 \text{ yd}^3$$

$$148 \text{ yd}^3 = 148 \cancel{\text{yd}^3} \times \frac{(0.9144 \text{ m})^3}{1 \cancel{\text{yd}^3}} \Rightarrow 113 \text{ m}^3$$

25.

$$\text{Area of lot} \Rightarrow \frac{1}{3} (43,560 \text{ ft}^2) \Rightarrow 14,520 \text{ ft}^2$$

$$\text{Now } \frac{1}{4} \text{ of this is} \Rightarrow \frac{1}{4} (14,520 \text{ ft}^2) \Rightarrow 3630 \text{ ft}^2$$

$$\text{Convert to square metres} \Rightarrow 3630 \cancel{\text{ft}^2} \times \frac{(1 \text{ yd})^2}{(3 \cancel{\text{ft}})^2} \Rightarrow 403 \frac{1}{3} \text{ yd}^2$$

26.

$$\text{Car speed} \Rightarrow \frac{23 \text{ km}}{15 \cancel{\text{min}}} \times \frac{60 \cancel{\text{min}}}{1 \text{ h}} \Rightarrow \frac{92 \text{ km}}{\text{h}}$$

$$\text{Convert to m/s} \Rightarrow \frac{92 \cancel{\text{km}}}{\cancel{\text{h}}} \times \frac{1000 \text{ m}}{1 \cancel{\text{km}}} \times \frac{1 \cancel{\text{h}}}{3600 \text{ s}} \Rightarrow 25.6 \text{ m/s}$$

27.

$$3106 \text{ carats} = 3106 \cancel{\text{carats}} \times \frac{0.20 \text{ g}}{1 \cancel{\text{carat}}} \Rightarrow 621.2 \text{ g}$$

$$621.2 \text{ g} = 621.2 \cancel{\text{g}} \times \frac{1000 \text{ mg}}{1 \cancel{\text{g}}} \Rightarrow 621,200 \text{ mg}$$

0.000005 lbs

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24-Hour Clock Nursing Practice Quiz (Military Time)

1. The nurse starts IV fluids at 1730. What is the time when using the AM and PM clock?

- A. 7:30 PM
- B. 5:30 AM
- C. 7:30 AM
- D. 5:30 PM

Answer: 5:30 PM

2. The nurse helps the patient ambulate up and down the hallway at 11:30 AM. How will the nurse chart the ambulation time using the 24-hour clock?

- A. 1130
- B. 2330
- C. 0030
- D. 0130

Answer: 1130

3. A patient was admitted to your unit at 0045. What time did the patient arrive to your unit when referring to the AM and PM clock?

- A. 12:45 AM
- B. 1:45 AM
- C. 12:45 PM
- D. 1:45 PM

Answer: 12:45 AM

4. At 18 minutes after midnight the nurse starts the 2nd unit of PRBCs (packed red blood cells) on a patient needing a total of 3 units. What time will the nurse document that the 2nd unit of PRBCs was started (using the 24-hour clock)?

- A. 2418
- B. 1218
- C. 0018
- D. 0118

Answer: 0018

5. The nurse administers a sleep medication to a patient with insomnia at 10:00 PM. What time did the nurse administer the medication using the 24-hour clock?

- A. 1000
- B. 1800
- C. 1900
- D. 2200

Answer: 2200

6. A patient can have pain medication every 4 hours as needed for pain. The patient requests a dose of pain medication. The nurse assesses the MAR and finds that the patient's last dose was at 1200. When can the patient have another dose of pain

Military Time Practice

medication?

A. 1400

B. 1600

C. 0400

D. 1800

Answer: 1600

7. A patient is being transported to ultrasound for testing. The transporter takes the patient to ultrasound at 1:39 PM. The nurse documents the patient left the room at what time (using the 24-hour clock)?

A. 0139

B. 0039

C. 1536

D. 1339

Answer: 1339

8. A patient's blood pressure is 190/114. The nurse assesses the patient's MAR and notes that the last dose of blood pressure medication was given at 1950. What is the time using the AM and PM clock?

A. 8:50 PM

B. 7:50 PM

C. 9:50 PM

D. 10:50 PM

Answer: 7:50 PM

9. The nurse performs endotracheal suctioning on a patient at 11:15 PM. The nurse will document the time as (using the 24-hour clock)?

A. 1115

B. 2415

C. 2315

D. 2215

Answer: 2315

10. A nurse from a previous shift entered a nursing note in the patient's record at 1749. What time was this note entered using the AM and PM clock?

A. 3:49 AM

B. 5:49 PM

C. 7:49 AM

D. 7:49 PM

Answer: 5:49 PM