

Study Guide

Order of Operations

Algebraic expressions are evaluated using these rules.

Order of Operations
1. Do all operations within grouping symbols first.
2. Multiply and divide in order from left to right.
3. Add and subtract in order from left to right.

Example Evaluate $56 \div (17 - 9) + 7 \times 3$.

$$\begin{aligned} 56 \div (17 - 9) + 7 \times 3 &= 56 \div 8 + 7 \times 3 && \text{Subtract 9 from 17.} \\ &= 7 + 7 \times 3 && \text{Divide 56 by 8.} \\ &= 7 + 21 && \text{Multiply 7 and 3.} \\ &= 28 && \text{Add 7 and 21.} \end{aligned}$$

Name the operation that should be done first in each expression.

1. $(9 + 3) \times 7$

2. $98 - 5 \times 7$

3. $5 \times (9 - 1)$

4. $(15 \div 3) + (4 + 5)$

5. $5 \times 4 \div 2$

6. $5(5 - 3) \times 2$

Evaluate each expression.

7. $2 \times 9 + 5 \times 3$

8. $(9 - 4) \div 5$

9. $10 - 4 + 1$

10. $15 - 18 \div 9 + 3$

11. $30 \div (12 - 6) + 4$

12. $(72 - 12) \div 2$

13. $2(16 - 9) - (5 + 1)$

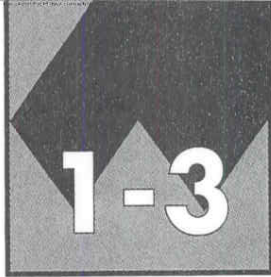
14. $(43 - 23) - 2 \times 5$

15. $90 - 45 - 24 \div 2$

16. $81 \div (13 - 4)$

17. $7 \times 8 - 2 \times 8$

18. $71 + (34 - 34)$



Study Guide

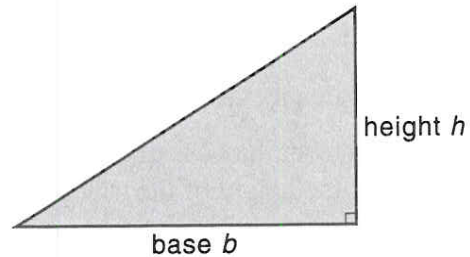
Integration: Algebra Variables and Expressions

The area of a triangle can be found by multiplying the base of the triangle by the height of the triangle and then dividing by 2.

If we use b to represent the base of the triangle and h to represent the height of the triangle, the area of the triangle can be found by evaluating the **algebraic expression** below.

$$\frac{bh}{2}$$

The values of b and h change for different triangles. They are called **variables**.



Examples Find the area of each triangle.

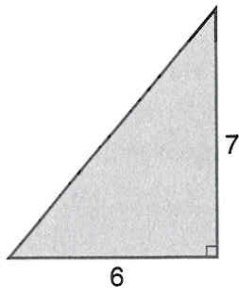
Triangle A:

Evaluate $\frac{bh}{2}$

if $b = 6$
and $h = 7$.

$$\frac{6 \times 7}{2} = \frac{42}{2}$$

$$= 21$$



The area is 21 square units.

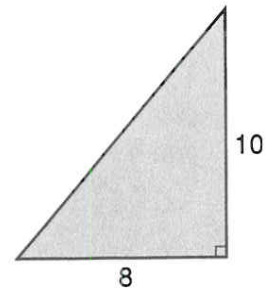
Triangle B:

Evaluate $\frac{bh}{2}$

if $b = 8$
and $h = 10$.

$$\frac{8 \times 10}{2} = \frac{80}{2}$$

$$= 40$$



The area is 40 square units.

Evaluate each expression if $a = 2$, $b = 3$, $c = 4$, and $d = 12$.

1. $c + 2a$

2. $19 - d$

3. $3(b + 5)$

4. $bc \div 12$

5. $d - c + 6$

6. $a(d - b)$

7. $15 - ab$

8. $6ca$

9. $6 + \frac{d}{c}$

10. $\frac{d}{a} - b$

11. $20 - \frac{2b}{a}$

12. $6c - 4b$

13. $7ab$

14. $a(6 + c) + 1$

15. $2c + 2b - d$

16. $d + ac$

**1-4****Study Guide****Integration: Algebra
Powers and Exponents**

A **power** can be used to show repeated multiplication of a number.

4×4 can be written 4^2 . This is read *4 squared* or *4 to the second power*.

The exponent, 2, tells you how many times the base, 4, is used as a factor.

base \longrightarrow 4^2 \longleftarrow exponent

Examples 1 Write $6 \times 6 \times 6 \times 6$ using exponents.

The base, 6, is used as a factor 4 times. So, $6 \times 6 \times 6 \times 6 = 6^4$.

2 Write 12^3 as a product.

The exponent 3 means that 12 is used as a factor 3 times.

$$12^3 = 12 \times 12 \times 12$$

3 Evaluate 6^4 .

$$6 \times 6 \times 6 \times 6 = 1,296$$

Write each power as a product of the same factor.

1. 7^4

2. 5^5

3. 4^6

4. 8^2

5. 9^3

6. 6^1

7. 2^5

8. m^4

Write each product using exponents.

9. $5 \times 5 \times 5$

10. 10×10

11. $6 \times 6 \times 6 \times 6 \times 6$

12. $3 \times 3 \times 3 \times 3$

Evaluate each expression.

13. 8^2

14. 1^6

15. 3^4

16. 12^1

17. 2^5

18. 5^3

19. 4^4

20. 6^2

**1-5****Study Guide****Integration: Algebra**
Solving Equations

An equation is a mathematical sentence that contains an equals sign.

Example Phil can address 50 envelopes in an hour. How long will it take him to address 300 envelopes?

Let h represent the number of hours. The problem can be represented by $50 \times h = 300$.

$$50 \times h = 300$$

$$50 \times 6 \stackrel{?}{=} 300$$

You know that $50 \times 6 = 300$.

The solution is 6.

It will take Phil 6 hours to address 300 envelopes.

Name the number that is a solution of the given equation.

1. $r - 12 = 20$; 8, 24, 32

2. $10m = 80$; 8, 10, 70

3. $k + 25 = 50$; 15, 25, 75

4. $y \div 9 = 8$; 64, 72, 80

5. $6p = 72$; 8, 10, 12

6. $48 - n = 12$; 32, 36, 60

Solve each equation.

7. $x + 22 = 66$

8. $t - 17 = 23$

9. $12f = 144$

10. $\frac{t}{7} = 10$

11. $25w = 225$

12. $176 - 45 = b$

13. $19 \times s = 171$

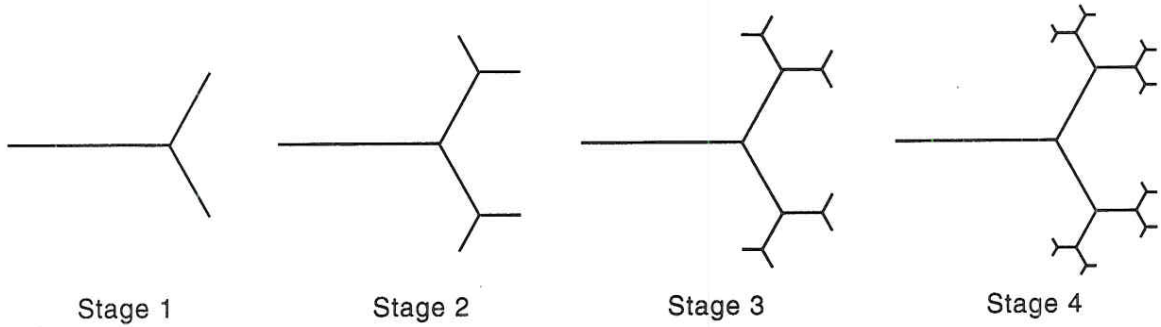
14. $210 \div v = 14$

1-6

Study Guide

Integration: Geometry Fractals and Other Patterns

A **fractal** is a geometric figure that is made up of smaller replicas of the entire shape repeated over and over again in different sizes. Note how the pattern continues for the fractal below.

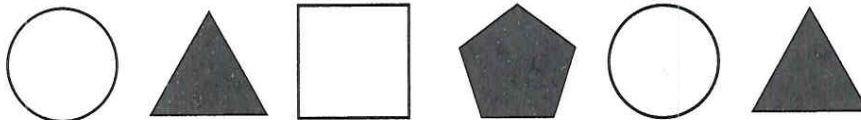


Draw the next two figures that continue each pattern.

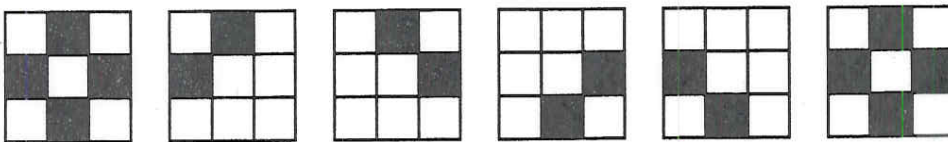
1.



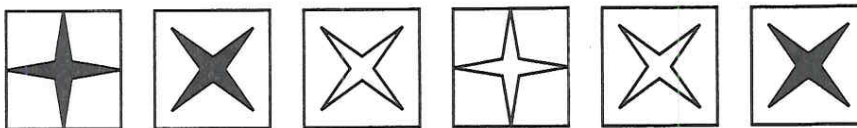
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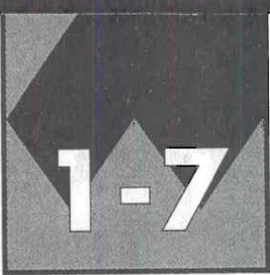


4.



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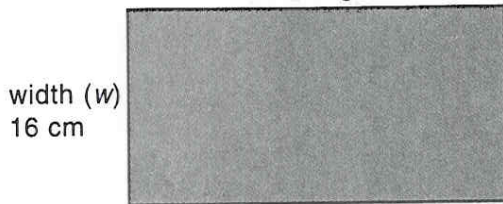




Study Guide

Integration: Geometry Area

Rectangle



length (ℓ) 40 cm

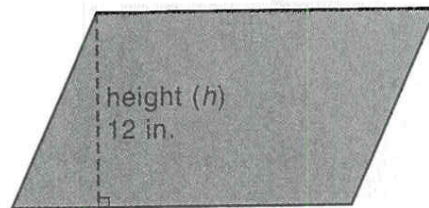
The area of a rectangle equals the product of its length and its width.

$$A = \ell w$$

$$A = 40 \cdot 16$$

$$A = 640 \text{ cm}^2$$

Parallelogram



base (b) 30 in.

The area of a parallelogram equals the product of its base and its height.

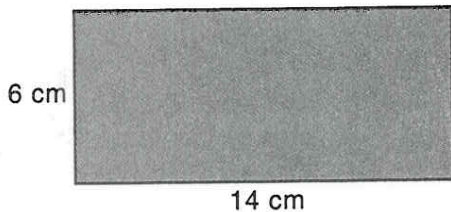
$$A = bh$$

$$A = 30 \cdot 12$$

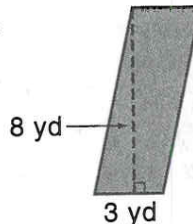
$$A = 360 \text{ in}^2$$

Find the area of each rectangle or parallelogram.

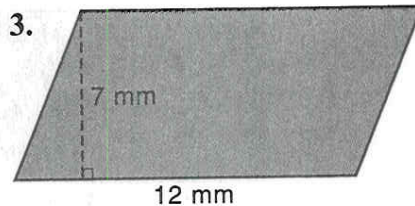
1.



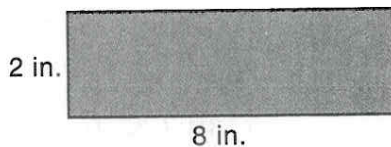
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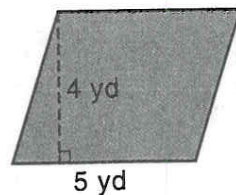
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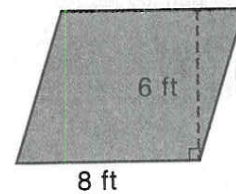
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5.



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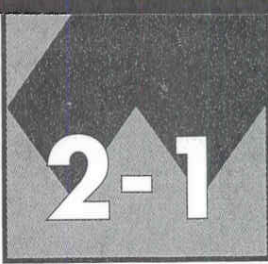


7. parallelogram: $b = 15 \text{ ft}$, $h = 21 \text{ ft}$

8. rectangle: $\ell = 8 \text{ cm}$, $w = 12 \text{ cm}$

9. parallelogram: $b = 5 \text{ m}$, $h = 2 \text{ m}$

10. rectangle: $\ell = 100 \text{ yd}$, $w = 50 \text{ yd}$

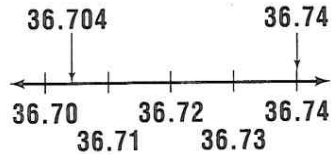


Study Guide

Comparing and Ordering Decimals

Which is greater, 36.74 or 36.704?

You can compare decimals like 36.74 and 36.704 on a number line. Numbers to the right are greater than numbers to the left.



You can also compare decimals by comparing the digits in each place-value position.

Find the first place in which the digits are different.

36.704
36.74

Compare the digits.

0 is less than 4.
 $0 < 4$

The decimal with the greater digit is greater.

$36.704 < 36.74$

1. **Draw a number line to show which decimal is greater.**

1. 0.39, 0.35

2. 1.95, 2.02

3. 6.55, 6.50

Replace each \bigcirc with $<$, $>$, or $=$ to make a true sentence.

4. 8.05 \bigcirc 8.5

5. 0.76 \bigcirc 0.67

6. 18.20 \bigcirc 18.2

7. 7.004 \bigcirc 7.044

8. 6.79 \bigcirc 6.8

9. 29.922 \bigcirc 29.299

Order each set of numbers from least to greatest.

10. 0.067, 0.6, 0.76, 0.07

11. 56.2, 55.6, 52.2, 56.02

12. 600.09, 609.06, 600.9, 609.9

13. 0.88, 0.9, 0.08, 0.89

2-2

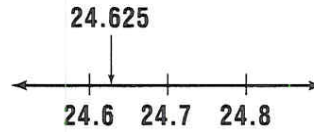
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Study Guide

Rounding Decimals

Round 24.625 to the nearest tenth.

You can use a number line.



Find the approximate location of 24.625 on the number line.

24.625 is closer to 24.6 than to 24.7.

24.625 rounded to the nearest tenth is 24.6.

You can also round without a number line.

Find the place to which you want to round.

Look at the digit to the right of the place being rounded. The digit remains the same if the digit to the right is 0, 1, 2, 3, or 4. Round up if the digit to the right is 5, 6, 7, 8, or 9.

2 is less than 5.
Do not change the digit.

24.625

24.625

24.6

1.

Round each number to the underlined place-value position.

1. 46.124

2. 29.915

3. 15.1733

4. 0.159

5. 308.862

6. 0.0561

7. 0.577

8. 0.0089

9. 2.62

10. 76.0552

11. 12.1903

12. 0.855

13. 331.98

14. 0.0549

15. 6.03

16. 173.99

17. 84.012

18. 0.846

19. 12.7642

20. 0.062

Study Guide

Estimating with Decimals

One way to estimate is by rounding to the greatest place-value position.

Example 1

$$\begin{array}{r} 73.2 \\ \times 9.6 \\ \hline \end{array} \longrightarrow \begin{array}{r} 70 \\ \times 10 \\ \hline 700 \end{array}$$

Estimate a division problem by rounding the divisor. Then round the dividend to a multiple of the divisor.

Example 2

$$72.8 \div 8.9 \longrightarrow 72.8 \div 9$$

$$72 \div 9 = 8$$

Use clustering to estimate sums if the numbers group around a common quantity.

Example 3 $19.3 + 22.4 + 20.9 + 18.6 + 21.2 + 19.1 + 20.5 + 18.9$

All 8 numbers are clustered around 20. The sum is about 20×8 or 160.

1.

Estimate. Use an appropriate strategy.

1. $\begin{array}{r} 32.19 \\ 29.36 \\ 30.08 \\ 28.9 \\ + 31.0 \end{array}$

2. $\begin{array}{r} 5.6 \\ \times 2.1 \end{array}$

3. $\begin{array}{r} 16.7 \\ - 12.2 \end{array}$

4. $\begin{array}{r} 93.5 \\ 22.1 \\ 49.9 \\ + 18.8 \end{array}$

5. $61.9 \div 7.1$

6. 8.8×2.1

7. $41.2 \div 5.9$

8. $56.82 - 21.12$

9. $\begin{array}{r} \$3.92 \\ + 4.18 \end{array}$

10. $\begin{array}{r} 49.7 \\ \times 30.5 \end{array}$

11. $\begin{array}{r} 9.74 \\ \times 4.08 \end{array}$

12. $\begin{array}{r} \$41.15 \\ - 19.09 \end{array}$

13. $878 \div 8$

14. $\begin{array}{r} 18.6 \\ \times 2.4 \end{array}$

15. $97.7 \div 9.8$

16. $\begin{array}{r} \$45.92 \\ - 33.35 \end{array}$

2-4

Study Guide

Multiplying Decimals

Multiply decimals just like you multiply whole numbers. The number of decimal places in the product is equal to the sum of the number of decimal places in the factors.

Example Multiply 0.038 and 0.17.

$$\begin{array}{r}
 0.038 \quad \leftarrow \text{three decimal places} \\
 \times 0.17 \quad \leftarrow \text{two decimal places} \\
 \hline
 266 \\
 \underline{38} \\
 0.00646 \quad \leftarrow \text{five decimal places}
 \end{array}$$

The product is 0.00646.

Multiply.

1. 0.8
 $\times 7$

2. 0.04
 $\times 0.3$

3. 0.16
 $\times 26$

4. 0.003
 $\times 4.2$

5. 12.2×0.06

6. 0.0015×0.15

7. 1.9×2.2

8. 3.59×0.02

9. 12.2×0.007

10. 0.7×3.11

Evaluate each expression if $m = 0.9$ and $n = 6.2$.

11. $m \times 0.43$

12. $0.002 \times n$

13. $17.4 \times m$

14. $n \times 0.0001$

2-5

Study Guide

Powers of Ten

You can find the product of a number and a power of 10 without using a calculator or paper and pencil. Suppose you wanted to find the product of 23.7 and powers of 10.

Decimal	Power of Ten	Product
23.7	$\times 0.001$	$= 0.0237$
23.7	$\times 0.01$	$= 0.237$
23.7	$\times 0.1$	$= 2.37$
23.7	$\times 10^0$ or 1	$= 23.7$
23.7	$\times 10^1$ or 10	$= 237$
23.7	$\times 10^2$ or 100	$= 2,370$
23.7	$\times 10^3$ or 1,000	$= 23,700$
23.7	$\times 10^4$ or 10,000	$= 237,000$

For powers of 10 that are greater than 1, the exponent in the power of 10 tells you the number of places to move the decimal point to the right. For powers of 10 that are less than 1, the decimal point moves to the left.

1.

Examples 1 $0.08 \times 10^4 = 800$ *Move the decimal point 4 places to the right.*

2 $6.25 \times 0.001 = 0.00625$ *Move the decimal point 3 places to the left.*

Multiply mentally.

1. 0.8×0.1

2. 6.12×10^2

3. $8.4 \times 1,000$

4. 9.3×0.001

5. 4.006×100

6. 67.8×0.01

Solve each equation.

7. $x = 89 \times 10,000$

8. $2.9 \times 10^3 = n$

9. $y = 24.78 \times 0.01$

10. $0.0004 \times 10^4 = p$

11. $v = 589 \times 0.001$

12. $r = 0.01 \times 10^0$

2-6

Name _____ Date _____

Study Guide

Dividing Decimals

To divide by a decimal, change the divisor to a whole number.

Example Find $0.5194 \div 0.49$.

$$\begin{array}{r} 1.06 \\ 0.49 \overline{)0.51.94} \\ \underline{49} \\ 294 \\ \underline{294} \\ 0 \end{array}$$

Change 0.49 to 49.

Move the decimal point two places to the right.

Move the decimal point in the dividend the same number of places to the right.

Divide as with whole numbers.

Without finding or changing each quotient, change each problem so that the divisor is a whole number.

1. $3.4 \div 1.1$

2. $76.44 \div 0.006$

3. $0.56 \div 0.4$

1. $89.45 \div 0.908$

5. $5.675 \div 6.8$

6. $0.00864 \div 0.012$

Divide.

7. $0.9 \overline{)6.3}$

8. $0.6 \overline{)0.540}$

9. $0.3 \overline{)129}$

10. $2.4 \overline{)0.192}$

11. $0.44 \overline{)5.28}$

12. $0.025 \overline{)0.04}$

13. $1.3 \overline{)780}$

14. $0.08 \overline{)0.0012}$

15. $0.7 \overline{)5.95}$

Solve each equation.

16. $y = 0.0528 \div 0.06$

17. $16.84 \div 0.4 = m$

18. $k = 2.05 \div 0.5$

Study Guide

Decimals and Fractions

To express a fraction as a decimal, divide the numerator of the fraction by the denominator.

Example 1 Express $\frac{3}{8}$ as a decimal.

$$\begin{array}{r} 0.375 \\ 8 \overline{)3.000} \end{array} \quad \frac{3}{8} = 0.375$$

A decimal like 0.375 is a terminating decimal. The decimal equivalents for some fractions are repeating decimals rather than terminating decimals. Use a bar to indicate the digits that repeat.

Examples 2 Express $\frac{5}{12}$ as a decimal.

$$\begin{array}{r} 0.41666 \\ 12 \overline{)5.00000} \end{array} = 0.41\overline{6}$$

3 Express $\frac{13}{33}$ as a decimal.

$$\begin{array}{r} 0.393939 \dots \\ 33 \overline{)13.000000} \end{array} = 0.\overline{39}$$

4 Express $5\frac{2}{5}$ as a decimal.

$$\begin{array}{r} 0.4 \\ 5 \overline{)2.0} \end{array} = 0.4 \quad 5\frac{2}{5} = 5.4$$

Express each fraction or mixed number as a decimal. If the decimal is a repeating decimal, use bar notation.

1. $\frac{7}{20}$

2. $\frac{7}{10}$

3. $\frac{3}{4}$

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

5. $\frac{9}{50}$

6. $\frac{1}{99}$

7. $\frac{7}{11}$

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

9. $\frac{11}{12}$

10. $\frac{5}{8}$

11. $\frac{7}{200}$

12. $\frac{17}{25}$

Study Guide

Integration: Measurement The Metric System

The metric system is a base-10 system. The meter is the basic unit of length. The liter is the basic unit of capacity. The gram is the basic unit of mass.

Prefix	Meaning	Length	Capacity	Mass
kilo-	1,000	kilometer (km)	kiloliter (kL)	kilogram (kg)
	1	meter (m)	liter (L)	gram (g)
centi-	0.01	centimeter (cm)	centiliter (cL)	centigram (cg)
milli-	0.001	millimeter (mm)	milliliter (mL)	milligram (mg)

You can change units by multiplying or dividing by multiples of 10.

Examples 1 $1.543 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$

*To change from liters
to milliliters, multiply by
1,000 since $1 \text{ L} = 1,000 \text{ mL}$.*

$$1.543 \text{ L} \times 1,000 = 1,543 \text{ mL}$$

2 $6,724 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$

*To change from grams
to kilograms, divide by
1,000 since $1 \text{ kg} = 1,000 \text{ g}$.*

$$6,724 \text{ g} \div 1,000 = 6.724 \text{ kg}$$

Complete.

1. $0.6 \text{ L} = \underline{\hspace{2cm}} \text{ mL}$

2. $89 \text{ L} = \underline{\hspace{2cm}} \text{ kL}$

3. $62.4 \text{ kg} = \underline{\hspace{2cm}} \text{ g}$

4. $673 \text{ mm} = \underline{\hspace{2cm}} \text{ cm}$

5. $9.2 \text{ m} = \underline{\hspace{2cm}} \text{ cm}$

6. $55.2 \text{ g} = \underline{\hspace{2cm}} \text{ kg}$

7. $20 \text{ km} = \underline{\hspace{2cm}} \text{ m}$

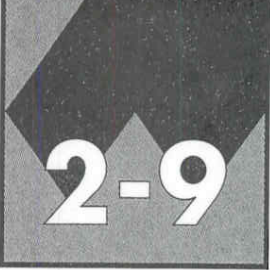
8. $0.6 \text{ cm} = \underline{\hspace{2cm}} \text{ mm}$

9. $2.2 \text{ kL} = \underline{\hspace{2cm}} \text{ L}$

10. $4.5 \text{ g} = \underline{\hspace{2cm}} \text{ mg}$

11. $5,900 \text{ mL} = \underline{\hspace{2cm}} \text{ L}$

12. $2.5 \text{ m} = \underline{\hspace{2cm}} \text{ mm}$



Study Guide

Scientific Notation

A number in scientific notation is written as the product of a number that is at least one but less than 10 and a power of ten.

Example Write 254,000,000 in scientific notation.

2.54000000 *Move the decimal point to get a number between 1 and 10.*

2.54×10^8 *The decimal point was moved 8 places. The exponent is 8.*

Write each number in scientific notation.

1. 760

2. 8,400

3. 17,400

4. 900,000

5. 12,000,000

6. 64

7. 5,130,000

8. 189,000,000,000

9. 91,000

10. 800

11. 114,500

12. 3,060

13. 26,600,000

14. 7,500,000

15. 303

16. 810,000,000