



## Powers

A steam locomotive has a mass of about 100 000 kg.

The number 100 000 is a **power of ten**.

A **power** is a product of equal factors.

*Factored Form:*

$$\boxed{100\ 000} \rightarrow 10 \times 10 \times 10 \times 10 \times 10 = 10^5$$

Power:  
base      exponent



Ten is not the only possible **base** in a power.

$$\boxed{25} \rightarrow 5 \times 5 = 5^2$$



$$\boxed{343} \rightarrow 7 \times 7 \times 7 = 7^3$$



$$\boxed{16} \rightarrow 2 \times 2 \times 2 \times 2 = 2^4$$



Special powers:

A number to the **first power** is itself.  $7^1 = 7, 20^1 = 20, 6^1 = 6$

A number to the **zero power** is one.  $10^0 = 1, 5^0 = 1, 2^0 = 1$

## EXERCISES

Write as a power.

1.  $10 \times 10 = 10^{\square}$

2.  $3 \times 3 = 3^{\square}$

3.  $8 \times 8 \times 8 \times 8 = 8^{\square}$

4.  $4 \times 4 \times 4 \times 4 \times 4 \times 4 = 4^{\square}$

5.  $9 \times 9 \times 9 = 9^{\square}$

6.  $1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 = 1^{\square}$

Write in factored form. Then write the product.

7.  $4^5 = \square \times \square \times \square \times \square \times \square$

8.  $10^3 = \square \times \square \times \square$

9.  $6^4 = \square \times \square \times \square \times \square$

10.  $2^5$

11.  $3^2$

12.  $10^4$

13.  $8^2$

14.  $9^3$

15.  $10^0$

16.  $6^1$

17.  $1^2$

18.  $2^0$

19.  $4^1$

## PRACTICE

Write as a power.

1.  $9 \times 9 = 9^{\square}$

2.  $2 \times 2 \times 2 \times 2 \times 2 = 2^{\square}$

3.  $10 \times 10 \times 10 \times 10 \times 10 = 10^{\square}$

4.  $6 \times 6 \times 6 \times 6 = 6^{\square}$

5.  $154 \times 154 = 154^{\square}$

6.  $35 \times 35 \times 35 = 35^{\square}$

7. four squared

8. thirteen cubed

9. nine to the sixth power

10.  $25$

11.  $1000$

12.  $9$

13.  $36$

14.  $8$

Evaluate.

15.  $25^2$

16.  $6^3$

17.  $14^0$

18.  $10^9$

19.  $5^1$

20.  $18^0$

21.  $9^2$

22.  $3^4$

23.  $2^2 + 3^2$

24.  $7^2 + 2^3$

25.  $10^3 - 8^2$

26.  $4^3 - 5^2$

27.  $2^2 + 3^2$

28.  $4^2 + 10^2$

29.  $10^2 \div 5^2$

## Short Cut

The products or quotients of powers with *identical bases* can be written as a power.

$$5^3 \times 5^2 = 5^{3+2} = 5^5 \longrightarrow 5 \times 5 \times 5 \times 5 \times 5 = 5 \times 5 \times 5 \times 5 \times 5$$

$$5^5 \div 5^2 = 5^{5-2} = 5^3 \longrightarrow 5 \times 5 \times 5 \times 5 \times 5 \div 5 \times 5 = 5 \times 5 \times 5$$

Write as a power.

1.  $2^3 \times 2^2 = 2^{3+2} = 2^5$

2.  $10^5 \times 10^3 = 10^{5+3} = 10^8$

3.  $2^7 \div 2^3 = 2^{7-3} = 2^4$

4.  $10^8 \div 10^6 = 10^{8-6} = 10^2$

5.  $7^3 \times 7^1 = 7^{3+1} = 7^4$

6.  $10^4 \div 10^2 = 10^{4-2} = 10^2$

7.  $2^5 \times 2^2 = 2^{5+2} = 2^7$

8.  $6^2 \div 6^1 = 6^{2-1} = 6^1$

9.  $6^1 \times 6^0 = 6^{1+0} = 6^1$

10.  $5^{11} \div 5^{10} = 5^{11-10} = 5^1$

# Decimals

The decimal number system is based on powers of ten.

thousand	hundred	ten	one	tenth	hundredth	thousandth
1000	100	10	1	0.1	0.01	0.001
$10 \times 10 \times 10$	$10 \times 10$	10	1	$0.1 \times 0.1$	$0.1 \times 0.1 \times 0.1$	
				$\frac{1}{10}$	$\frac{1}{10} \times \frac{1}{10}$	$\frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}$
$10^3$	$10^2$	$10^1$	$10^0$	$\frac{1}{10^1}$	$\frac{1}{10^2}$	$\frac{1}{10^3}$

Moving *left* on the chart, place values *increase* by 10 times.

Moving *right*, place values *decrease*.

Standard form decimals can be written in *expanded form* to show the place values of each digit.

*Standard Form:*    *Expanded Form:*

$$\begin{aligned} 12.25 &= 10 + 2 + 0.2 + 0.05 \\ &= (1 \times 10) + (2 \times 1) + (2 \times 0.1) + (5 \times 0.01) \\ &= (1 \times 10) + (2 \times 1) + \left(2 \times \frac{1}{10}\right) + \left(5 \times \frac{1}{100}\right) \\ &= (1 \times 10^1) + (2 \times 10^0) + \left(2 \times \frac{1}{10^1}\right) + \left(5 \times \frac{1}{10^2}\right) \end{aligned}$$

The 5 in 12.25 is in the hundredth's place and has a value of 0.05.

## EXERCISES

Name the place and value of each 4.

1. 0.4      2. 1.34      3. 4.132      4. 12.004      5. 0.3684

Write as standard form decimals.

6.  $20 + 7 + 0.6 + 0.04$       7.  $0.7 + 0.08 + 0.009$       8.  $0.02 + 0.0004$   
9.  $(3 \times 1) + (7 \times 0.1)$       10.  $(8 \times 1000) + (5 \times 10)$       11.  $(4 \times 0.001)$   
12.  $\left(1 \times \frac{1}{100}\right) + \left(3 \times \frac{1}{1000}\right)$       13.  $(1 \times 10^1) + (4 \times 10^0)$       14.  $\left(8 \times \frac{1}{10^2}\right)$

## PRACTICE

Name the place and value of each underlined digit.

1. 0.384
2. 2.706
3. 8.9432
4. 0.067
5. 0.400 05
6. 43.482
7. 634.46
8. 1042.021
9. 32.203
10. 1.302 45

Write as standard form decimals.

11.  $20 + 0.3 + 0.004$
12.  $100 + 7 + 0.07 + 0.000\ 04$
13.  $600 + 5 + 0.006 + 0.0007$
14.  $8000 + 0.8 + 0.000\ 09$
15.  $(3 \times 10) + (4 \times 1) + \left(2 \times \frac{1}{10}\right)$
16.  $(7 \times 1) + \left(9 \times \frac{1}{100}\right) + \left(2 \times \frac{1}{1000}\right)$
17.  $(5 \times 100) + (6 \times 1) + \left(5 \times \frac{1}{100}\right)$
18.  $(8 \times 10) + \left(5 \times \frac{1}{10}\right) + \left(4 \times \frac{1}{10\ 000}\right)$
19.  $(5 \times 10^4) + (8 \times 10^3) + (6 \times 10^0)$
20.  $(6 \times 10^1) + (2 \times 10^0) + \left(3 \times \frac{1}{10^1}\right)$
21.  $(1 \times 10^0) + \left(7 \times \frac{1}{10^2}\right) + \left(4 \times \frac{1}{10^3}\right)$
22.  $\left(3 \times \frac{1}{10^1}\right) + \left(4 \times \frac{1}{10^3}\right) + \left(5 \times \frac{1}{10^5}\right)$

Multiply each by 10.

23. 10 000
24. 0.01
25. 100
26. 0.000 01
27. 0.1

Divide each by 10.

28. 1000
29. 0.1
30. 100 000
31. 0.001
32. 1

## Calculator Power

A calculator can be used to evaluate an expression involving powers.

**Example:**

$$15^2 \times 3^3 = \boxed{1} \boxed{5} \boxed{\times} \boxed{1} \boxed{5} \boxed{\times} \boxed{3} \boxed{\times} \boxed{3} \boxed{\times} \boxed{3} \boxed{=}$$

or  $\boxed{1} \boxed{5} \boxed{\times} \boxed{=} \boxed{\times} \boxed{3} \boxed{\times} \boxed{3} \boxed{\times} \boxed{3} \boxed{=}$

$$6^3 \div 2^4 = \boxed{6} \boxed{\times} \boxed{6} \boxed{\times} \boxed{6} \boxed{\div} \boxed{2} \boxed{\div} \boxed{2} \boxed{\div} \boxed{2} \boxed{\div} \boxed{2} \boxed{=}$$

or  $\boxed{6} \boxed{\times} \boxed{=} \boxed{\div} \boxed{2} \boxed{\div} \boxed{2} \boxed{\div} \boxed{2} \boxed{\div} \boxed{2} \boxed{=}$

Use a calculator to evaluate each expression.

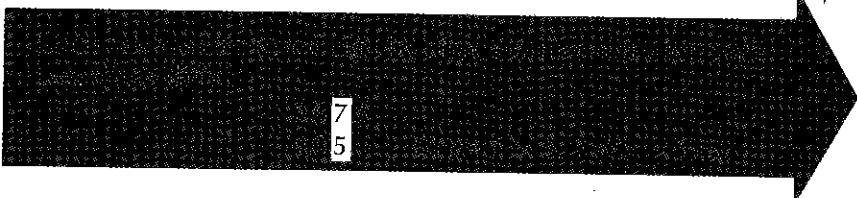
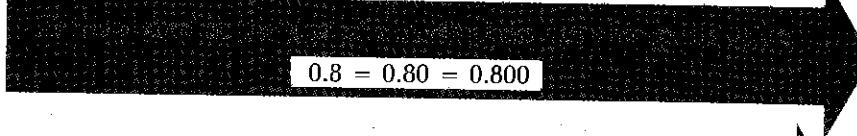
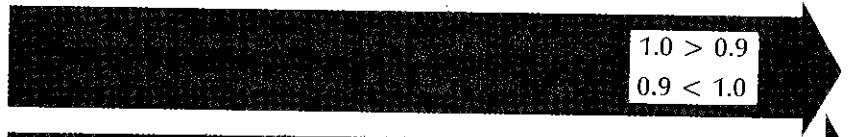
1.  $3^5 \times 2^3$
2.  $7^4 \div 4^2$
3.  $3^2 \times 2^3$
4.  $5^4 \times 6^2$
5.  $4^8 \div 8^4$
6.  $12^3 \times 14^2$
7.  $15^4 \div 9^3$
8.  $31^2 \times 11^4$

# The Number Line

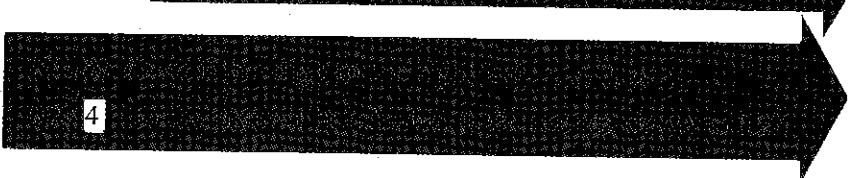
Decimal numbers can be graphed on a number line.



Any two unequal numbers can be compared using the *inequality symbols*  $<$  and  $>$ .



Sometimes a decimal is **rounded** to a value that approximates it.

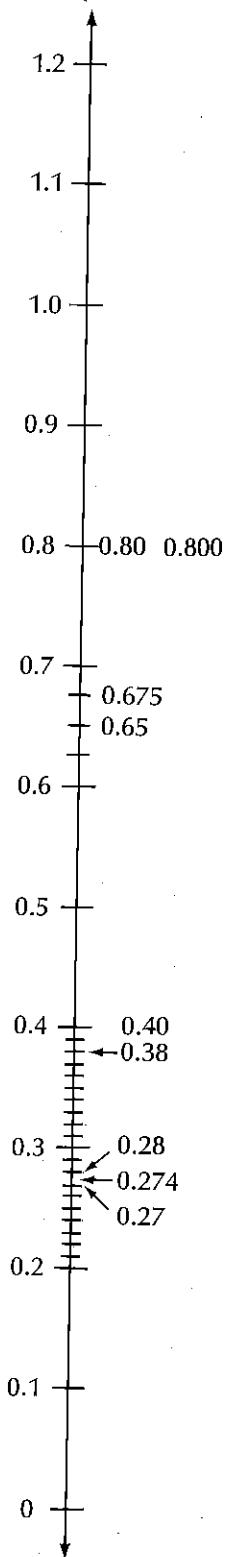


**Examples:**

0.8 2 to the nearest tenth, 0.842 rounds down to 0.8.

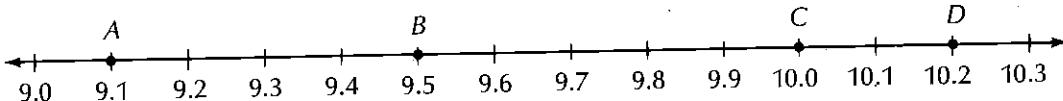
0.75 5 to the nearest hundredth, 0.755 rounds up to 0.76.

0.976 7 to the nearest thousandth, 0.9767 rounds up to 0.977.

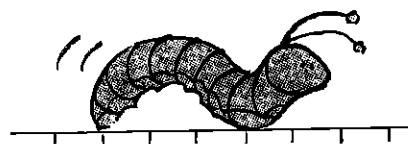


## EXERCISES

Use the number line below for problems 1 to 4.



1. What number is graphed at point C?
2. What number is graphed at point A?
3. What point is graphed at 9.5?
4. What point is graphed at 10.2?



Compare the pair of numbers using <.

- |               |                 |                  |                    |
|---------------|-----------------|------------------|--------------------|
| 5. 6.5, 6.399 | 6. 0.42, 0.5    | 7. 1, 0.9876     | 8. 0.89104, 0.8912 |
| 9. 16, 16.2   | 10. 48.5, 48.05 | 11. 1.011, 1.101 | 12. 3.0007, 3.007  |

Copy and compare using <, >, or =.

- |                     |                     |                       |
|---------------------|---------------------|-----------------------|
| 13. 1.5 ● 1.500     | 14. 3 ● 2.9         | 15. 8.36 ● 8.24       |
| 16. 0.05 ● 0.005    | 17. 1.07 ● 0.07     | 18. 12.367 ● 12.3099  |
| 19. 1.0003 ● 0.0003 | 20. 0.0065 ● 0.0074 | 21. 0.03827 ● 0.03826 |

Order the decimals from least to greatest.

- |                            |                         |
|----------------------------|-------------------------|
| 22. 3.1, 3.09, 2.0         | 23. 0.76, 0.706, 0.097  |
| 24. 6.32, 6.30, 6.23       | 25. 80.35, 8.99, 80.99  |
| 26. 18.357, 18.358, 18.860 | 27. 0.073, 0.037, 0.107 |

Round to the nearest tenth.

- |          |           |           |             |
|----------|-----------|-----------|-------------|
| 28. 3.55 | 29. 4.006 | 30. 13.94 | 31. 9.84999 |
|----------|-----------|-----------|-------------|

Round to the nearest hundredth.

- |           |            |           |           |
|-----------|------------|-----------|-----------|
| 32. 2.085 | 33. 10.074 | 34. 9.997 | 35. 0.708 |
|-----------|------------|-----------|-----------|

Round to the nearest thousandth.

- |            |            |            |             |
|------------|------------|------------|-------------|
| 36. 3.6458 | 37. 8.7999 | 38. 6.0001 | 39. 9.99997 |
|------------|------------|------------|-------------|

Round to the nearest whole number.

- |          |           |           |            |
|----------|-----------|-----------|------------|
| 40. 9.93 | 41. 3.002 | 42. 4.007 | 43. 4.5000 |
|----------|-----------|-----------|------------|

Write an equivalent decimal.

- |           |          |          |             |
|-----------|----------|----------|-------------|
| 44. 7.300 | 45. 8.40 | 46. 9.36 | 47. 4.73800 |
|-----------|----------|----------|-------------|

# PRACTICE

Draw a number line and graph the numbers.

1. {0, 0.25, 0.5, 0.75, 1, 1.25}    2. {0.6, 0.9, 1.2, 1.5, 1.8}

Compare the pair of numbers using  $>$ .

- |                  |                 |                 |               |
|------------------|-----------------|-----------------|---------------|
| 3. 0.7, 0.1      | 4. 6, 0.9       | 5. 0.05, 0.5    | 6. 1.46, 1.64 |
| 7. 9.008, 9.0008 | 8. 1.103, 1.301 | 9. 0.002, 0.020 | 10. 4, 0.994  |

Copy and compare using  $<$ ,  $>$ , and  $=$ .

- |                    |                    |                      |  |
|--------------------|--------------------|----------------------|--|
| 11. 3.84 ● 3.839   | 12. 7.0002 ● 7.004 | 13. 4.734 ● 4.734 00 |  |
| 14. 0.382 ● 0.3799 | 15. 0.076 ● 0.0901 | 16. 73.00 ● 73       |  |

Order from least to greatest.

- |  |  |  |  |
|--|--|--|--|
| 17. 3.4 m, 3.04 m, 4.03 m, 3.40 m, 3.44 m, 4.33 m              |  |  |  |
| 18. \$10.38, \$11.07, \$10.24, \$9.94, \$9.08, \$10.78         |  |  |  |
| 19. 0.563 kg, 0.389 kg, 0.098 kg, 0.570 kg, 0.609 kg, 1.002 kg |  |  |  |
| 20. \$97.84, \$79.48, \$49.78, \$84.97, \$89.74, \$47.98       |  |  |  |

Copy and complete.

	Round to the nearest			
	thousandth	hundredth	tenth	whole number
21. 3.807 56				
22. 0.733 52				
23. 90.249 05				
24. 19.7993				

Round to the nearest dollar.

25. \$1.75    26. \$4.50    27. \$7.39    28. \$28.99    29. \$82.50

Round to the nearest metre.

30. 6.172 m    31. 0.98 m    32. 36.17 m    33. 0.532 m    34. 7.011 m

35. Write a decimal that lies between those given.

- |                   |                  |                   |
|-------------------|------------------|-------------------|
| a. 2.3 and 2.4    | b. 3.16 and 3.17 | c. 10 and 9.9     |
| d. 0.74 and 0.734 | e. 7.387 and 7.4 | f. 6.09 and 6.091 |

## Introducing INTeger

The INT function is used in BASIC to remove the decimal part of a number by rounding down.

Study the program at the right.  
Then evaluate these expressions.

- a. INT (8.384)    b. INT (7.58)
- c. INT (105.7)    d. INT (107)
- e. INT (0.345)    f. INT (0.01)

```
LIST
10 PRINT "ENTER A NUMBER ";
20 INPUT A
30 PRINT "INT(";A;") = ";INT(A)
40 GOTO 10
50 END
```

```
RUN
ENTER A NUMBER ? 15.7
INT( 15.7 ) = 15
ENTER A NUMBER ? 19.382
INT ( 19.382 ) = 19
ENTER A NUMBER ?
```

- g. INT can be used to round decimals to the nearest whole number.  
What is one value for N that will give the following four results?

$$\text{INT}(17.7 + N) \text{ equals } 18$$

$$\text{INT}(10.3 + N) \text{ equals } 10$$

$$\text{INT}(12.5 + N) \text{ equals } 13$$

$$\text{INT}(54.49 + N) \text{ equals } 54$$

## Powers in BASIC

The symbol  $\wedge$  is used in BASIC to exponentiate.

10  $\wedge$  3 means  $10^3$

Find the value of  $A \wedge B$  for

- a.  $A = 3, B = 2$ .
- b.  $A = 10, B = 5$ .
- c.  $A = 2, B = 10$ .

Study the computer program.

- d. What would the output be if  $A = 5$  and  $B = 7$ ?
- e. Is it easier to use this program to find  $4^3$  and  $10^3$  or to find  $3^4$  and  $4^7$ ? Explain.
- f. How would you change line 70 so that it would be easy to use the program to find  $4^3$  and  $10^3$ ?

```
LIST
10 PRINT "ENTER A BASE ";
20 INPUT A
30 PRINT "ENTER AN EXPONENT ";
40 INPUT B
50 PRINT "THE VALUE OF ";A;"^";B;
60 PRINT " IS ";A^B
70 GOTO 30
80 END
```

```
RUN
ENTER A BASE ? 3
ENTER AN EXPONENT ? 2
THE VALUE OF 3 ^ 2 IS 9
```

The GOTO statement in line 70 transfers the program's execution back to line 30. This creates an *infinite loop*.

# Adding and Subtracting Decimals

In a 200 m race, Mike ran the first 100 m in 12.42 s and the second 100 m in 13.74 s. How long did it take him to run 200 m?



## Step 1: Estimate.

Round off the numbers and add.

$$\begin{array}{r} 12.42 \approx 12 \\ 13.74 \approx 14 \\ \hline +14 \end{array}$$

$$\begin{array}{r} 12 \\ +14 \\ \hline 26 \end{array}$$

## Step 2: Calculate.

Line up decimals and add.

$$\begin{array}{r} 12.42 \\ +13.74 \\ \hline 26.16 \end{array}$$

Michelle ran her 200 m race in 28.07 s. She ran the first 100 m in 13.5 s. How long did it take her to run the second 100 m?

## Step 1: Estimate.

Round off and subtract.

$$\begin{array}{r} 28.07 \approx 28 \\ 13.5 \approx 14 \\ \hline -14 \end{array}$$

$$\begin{array}{r} 28 \\ -14 \\ \hline 14 \end{array}$$

## Step 2: Calculate.

Line up decimals and subtract.

$$\begin{array}{r} 28.07 \\ -13.50 \\ \hline 14.57 \end{array}$$

## EXERCISES

### Estimate. Then calculate.

$$\begin{array}{r} 1. \quad 1.7 \\ +3.2 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad 4.68 \\ +7.27 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 18.3 \\ -12.7 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 4.138 \\ -1.74 \\ \hline \end{array}$$

$$\begin{array}{r} 5. \quad 0.6 \\ +0.91 \\ \hline \end{array}$$

$$\begin{array}{r} 6. \quad 0.038 \\ +0.07 \\ \hline \end{array}$$

$$\begin{array}{r} 7. \quad 0.0384 \\ -0.021 \\ \hline \end{array}$$

$$\begin{array}{r} 8. \quad 0.0768 \\ -0.009 \\ \hline \end{array}$$

$$9. \quad 3.8 + 7.7$$

$$10. \quad 7.6 - 3.6$$

$$11. \quad 89.45 + 93.25$$

$$12. \quad 92.3 - 81$$

$$13. \quad 83.64 + 8$$

$$14. \quad 76.79 - 5.8$$

$$15. \quad 70.45 + 8.943$$

$$16. \quad 80 - 13.75$$

$$17. \quad 1.56 + 84$$

$$18. \quad 0.064 - 0.01387$$

$$19. \quad 0.00887 + 0.121$$

$$20. \quad 0.0038 - 0.0019$$

$$21. \quad 26 - 18.4$$

$$22. \quad 0.06 + 3 + 0.495$$

$$23. \quad 2 + 0.007 + 3.15$$

# PRACTICE

Estimate. Then calculate.

1.  $7.38 + 14.9$
2.  $36.45 + 8.7 + 9.38$
3.  $18 - 2.98$
4.  $14 - 5.76$
5.  $3567 + 0.0465 + 2.5$
6.  $0.09 - 0.00748$
7.  $10.874 - 0.09809$
8.  $4 + 0.0654 + 0.738 + 1.0467$
9.  $9.123 - 6$
10.  $0.62 + 8.3 + 7 + 0.064 + 8.57$

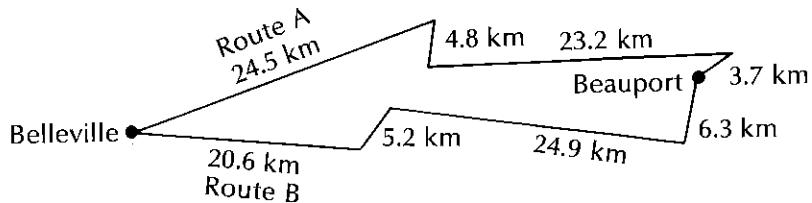
Estimate. Then solve.

11. Marianne bought gifts for \$5.65, \$8.76, and \$3.52. She paid for the items with a \$20 bill. What was her change?
12. At a garage sale, Bruce sold a shirt for \$7.45, a coat for \$23.75, and a lamp for \$15.50. How much did he make from the clothing?
13. Jeff had \$50 in quarters. He gave \$12.75 to his sister and \$2.50 to each of his aunt and his uncle. How much did he give away?

14. At the right is a record of Laura Halloway's chequing account transactions for October.  
 a. What was the total amount of money withdrawn in cheques for the month?  
 b. How much money was deposited into the account in October?  
 c. What is Ms. Halloway's balance at the end of the month?

Date	Cheques	Deposit	Balance
1 Oct.			\$42.15
2 Oct.		\$846.25	
5 Oct.	\$357.19		
5 Oct.	\$68.45		
16 Oct.	\$170.00		
20 Oct.	\$220.00		
20 Oct.		\$56.80	
29 Oct.	\$95.32		

15. Which is the shortest distance between Belleville and Beauport?



## Calculator Challenge

Devise a way to complete these problems with a calculator.

a. 
$$\begin{array}{r} 0.038\ 246\ 794\ 583\ 7 \\ + 0.163\ 874\ 768\ 432\ 1 \\ \hline \end{array}$$

Hint: Use  $\boxed{+}$  twice.

b. 
$$\begin{array}{r} 73.642\ 233\ 510\ 57 \\ - 14.782\ 344\ 789\ 21 \\ \hline \end{array}$$

Hint: Use  $\boxed{-}$  twice.

# Multiplying and Dividing by Powers of Ten

*Multiplying by a Power of Ten > 1  
The result is *larger*.  
The decimal moves to the *right*.*

$$10^1 \times 0.0345 = 10 \times 0.0\cancel{3}45 = 0.345$$

$$10^2 \times 0.0345 = 100 \times 0.0\cancel{3}45 = 3.45$$

$$10^3 \times 0.0345 = 1000 \times 0.0\cancel{3}45 = 34.5$$

*Dividing by a Power of Ten < 1  
The result is *larger*.  
The decimal moves to the *right*.*

$$0.0345 \div \frac{1}{10^1} = 0.0\cancel{3}45 \div 0.1 = 0.345$$

$$0.0345 \div \frac{1}{10^2} = 0.0\cancel{3}45 \div 0.01 = 3.45$$

$$0.0345 \div \frac{1}{10^3} = 0.0\cancel{3}45 \div 0.001 = 34.5$$

*Multiplying by a Power of Ten < 1  
The result is *smaller*.  
The decimal moves to the *left*.*

$$\frac{1}{10^1} \times 7.3 = 0.1 \times \cancel{7.3} = 0.73$$

$$\frac{1}{10^2} \times 7.3 = 0.01 \times \cancel{7.3} = 0.073$$

$$\frac{1}{10^3} \times 7.3 = 0.001 \times \cancel{07.3} = 0.0073$$

*Dividing by a Power of Ten > 1  
The result is *smaller*.  
The decimal moves to the *left*.*

$$7.3 \div 10^1 = \cancel{7.3} \div 10 = 0.73$$

$$7.3 \div 10^2 = \cancel{07.3} \div 100 = 0.073$$

$$7.3 \div 10^3 = \cancel{007.3} \div 1000 = 0.0073$$

Multiply.

## EXERCISES

1.  $0.376 \times 10$

$0.376 \times 100$

$0.376 \times 1000$

$0.376 \times 0.1$

$0.376 \times 0.01$

2.  $8.5 \times 10$

$8.5 \times 100$

$8.5 \times 1000$

$8.5 \times 0.1$

$8.5 \times 0.01$

3.  $70.2 \times 10$

$70.2 \times 100$

$70.2 \times 1000$

$70.2 \times 0.1$

$70.2 \times 0.01$

4.  $6.4 \times 100$

5.  $1.274 \times 10000$

6.  $0.03 \times 0.01$

7.  $17 \times 0.00001$

8.  $4.3 \times 10^2$

9.  $6.073 \times 10^3$

10.  $84.2 \times \frac{1}{10^1}$

11.  $1.2 \times \frac{1}{10^4}$

Divide.

12.  $70.2 \div 10$

$70.2 \div 100$

$70.2 \div 1000$

$70.2 \div 0.1$

$70.2 \div 0.01$

13.  $8.5 \div 10$

$8.5 \div 100$

$8.5 \div 1000$

$8.5 \div 0.1$

$8.5 \div 0.01$

14.  $0.376 \div 10$

$0.376 \div 100$

$0.376 \div 1000$

$0.376 \div 0.1$

$0.376 \div 0.01$

15.  $3.38 \div 10$

16.  $0.3 \div 1000$

17.  $354 \div 0.0001$

18.  $836 \div 0.01$

19.  $8.2 \div 10^2$

20.  $38.4 \div 10^4$

21.  $7.4 \div \frac{1}{10^1}$

22.  $0.48 \div \frac{1}{10^3}$

## PRACTICE

Find the product or quotient.

1.  $8.3 \times 0.1$

2.  $85.7 \div 0.1$

3.  $0.63 \times 100$

4.  $0.7 \div 10$

5.  $9.78 \times 1000$

6.  $0.02 \div 100$

7.  $0.45 \times 0.01$

8.  $4.8 \div 1000$

9.  $93.2 \times 0.01$

10.  $653 \div 0.1$

11.  $0.07 \times 10\,000$

12.  $0.82 \div 0.001$

13.  $35.4 \times 100\,000$

14.  $6.8 \div 0.001$

15.  $0.023 \times 10^3$

16.  $85.6 \div 10^2$

17.  $0.04 \times \frac{1}{10^3}$

18.  $10.7 \div \frac{1}{10^1}$

19.  $4.5 \times \frac{1}{10^2}$

20.  $903.2 \div \frac{1}{10^3}$

Solve.

21. A package of meat used to cost \$0.97. Twenty years later it cost 10 times more. By how much did the price increase in 20 years?

## Scientific Notation

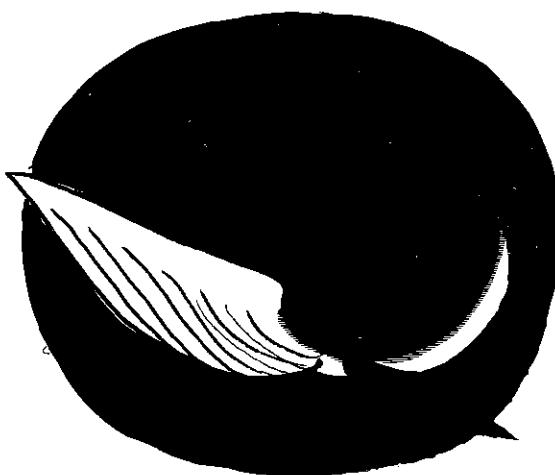
There are about 33 000 000 000 000 000 000 molecules in one cubic centimetre of water.

To avoid writing all of the zeros, such numbers can be written in *scientific notation*.

$$33\,000\,000\,000\,000\,000\,000 = 3.3 \times 10^{22}$$

A power of ten.  
The exponent equals  
the number of places  
the decimal point is  
shifted.

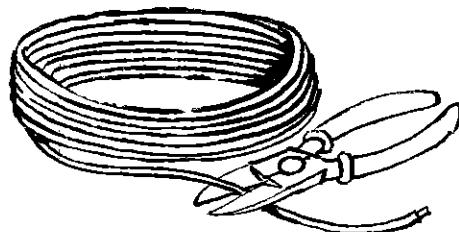
A number between  
1 and 10.



- Write these numbers in scientific notation.
- The mass of the blue whale is about 13 800 000 g.
  - The mass of the Saturn V rocket is about 2 960 000 kg.
  - The mean distance from the Earth to the Sun is about 150 000 000 km.
  - The mean distance from Pluto to the Sun is about 5 950 000 000 km.
  - The distance light travels in one year is about 9 460 500 000 000 km.
  - The surface of the earth is about 510 000 000 km<sup>2</sup>.

# Multiplying Decimals

Roberto bought 12.2 m of plastic-coated wire. He used three fourths (0.75) of it as a clothes line. How much of the wire was used as a clothes line?



*Step 1: Estimate.*

Round each factor.

Multiply as if the factors were whole numbers.

Place the decimal so the product makes sense.

$$\begin{array}{r} 12.2 \\ \times 0.75 \\ \hline 12 \\ 85 \\ \hline 9.15 \end{array}$$

$$\begin{array}{r} 12 \\ \times 0.8 \\ \hline 96 \end{array}$$

$$\begin{array}{r} 12 \times 0.8 \approx 12 \times 1 = 12 \\ \text{So, } 12 \times 0.8 = 9.6 \end{array}$$

*Step 2: Calculate.*

Align the right-hand digits. Multiply.

Place the decimal point in the product.

$$\begin{array}{r} 12.2 \\ \times 0.75 \\ \hline 610 \\ 854 \\ \hline 9150 \end{array}$$

$$\begin{array}{r} 12.2 \\ \times 0.75 \\ \hline 610 \\ 854 \\ \hline 9.150 \end{array}$$

1 decimal place  
+2 decimal places  
3 decimal places

Since the estimate was 9.6 m, the result, 9.15 m, is reasonable.

## EXERCISES

Which is the most reasonable estimate?

1.  $2.7 \times 0.3 \approx$  9, 0.9, or 0.09
2.  $39.8 \times 0.95 \approx$  0.4, 400, or 40
3.  $6.25 \times 18 \approx$  120, 12, or 0.12
4.  $0.094 \times 0.063 \approx$  0.54, 0.0054, or 0.054

How many decimal places will be in each product?

- |                         |                         |                             |
|-------------------------|-------------------------|-----------------------------|
| 5. $28.2 \times 4.24$   | 6. $1.9 \times 0.7$     | 7. $116 \times 0.4$         |
| 8. $0.05 \times 0.003$  | 9. $7.142 \times 2.006$ | 10. $0.0001 \times 0.0001$  |
| 11. $2437.5 \times 1.5$ | 12. $0.172 \times 52$   | 13. $31.375 \times 0.00025$ |

Estimate the product.

$$14. \begin{array}{r} 9 \\ \times 0.7 \\ \hline \end{array}$$

$$15. \begin{array}{r} 9 \\ \times 0.1 \\ \hline \end{array}$$

$$16. \begin{array}{r} 78 \\ \times 2.2 \\ \hline \end{array}$$

$$17. \begin{array}{r} 78 \\ \times 1.2 \\ \hline \end{array}$$

$$18. \begin{array}{r} \$4.93 \\ \times 0.9 \\ \hline \end{array}$$

$$19. \begin{array}{r} \$4.43 \\ \times 9 \\ \hline \end{array}$$

$$20. \begin{array}{r} \$21.79 \\ \times 47 \\ \hline \end{array}$$

$$21. \begin{array}{r} \$21.79 \\ \times 4.7 \\ \hline \end{array}$$

$$22. \begin{array}{r} 5.71 \\ \times 9.2 \\ \hline \end{array}$$

$$23. \begin{array}{r} 57.1 \\ \times 9.2 \\ \hline \end{array}$$

$$24. \begin{array}{r} 0.384 \\ \times 9.3 \\ \hline \end{array}$$

$$25. \begin{array}{r} 0.384 \\ \times 0.93 \\ \hline \end{array}$$

$$26. \begin{array}{r} 0.038 \\ \times 12 \\ \hline \end{array}$$

$$27. \begin{array}{r} 0.038 \\ \times 1.2 \\ \hline \end{array}$$

$$28. \begin{array}{r} 0.0631 \\ \times 87 \\ \hline \end{array}$$

$$29. \begin{array}{r} 0.0631 \\ \times 8.7 \\ \hline \end{array}$$

$$30. \begin{array}{r} 0.076 \\ \times 0.74 \\ \hline \end{array}$$

$$31. \begin{array}{r} 0.076 \\ \times 0.074 \\ \hline \end{array}$$

$$32. \begin{array}{r} 0.083 \\ \times 0.27 \\ \hline \end{array}$$

$$33. \begin{array}{r} 0.083 \\ \times 2.7 \\ \hline \end{array}$$

Multiply.

$$34. \begin{array}{r} 3.45 \\ \times 15 \\ \hline \end{array}$$

$$35. \begin{array}{r} 0.345 \\ \times 15 \\ \hline \end{array}$$

$$36. \begin{array}{r} 0.003\ 45 \\ \times 15 \\ \hline \end{array}$$

$$37. \begin{array}{r} 345 \\ \times 1.5 \\ \hline \end{array}$$

$$38. \begin{array}{r} 3.45 \\ \times 1.5 \\ \hline \end{array}$$

$$39. \begin{array}{r} 345 \\ \times 0.15 \\ \hline \end{array}$$

$$40. \begin{array}{r} 0.345 \\ \times 0.15 \\ \hline \end{array}$$

$$41. \begin{array}{r} 0.0345 \\ \times 0.015 \\ \hline \end{array}$$

$$42. \begin{array}{r} 72.4 \\ \times 8.9 \\ \hline \end{array}$$

$$43. \begin{array}{r} 724 \\ \times 0.89 \\ \hline \end{array}$$

$$44. \begin{array}{r} 7.24 \\ \times 0.089 \\ \hline \end{array}$$

$$45. \begin{array}{r} 0.724 \\ \times 0.089 \\ \hline \end{array}$$

$$46. \begin{array}{r} 4.35 \\ \times 12 \\ \hline \end{array}$$

$$47. \begin{array}{r} 435 \\ \times 0.012 \\ \hline \end{array}$$

$$48. \begin{array}{r} 0.435 \\ \times 1.2 \\ \hline \end{array}$$

$$49. \begin{array}{r} 4.35 \\ \times 0.012 \\ \hline \end{array}$$

$$50. \begin{array}{l} 48 \times 0.25 \\ 48 \times 0.5 \\ 48 \times 0.75 \end{array}$$

$$51. \begin{array}{l} 7.6 \times 0.25 \\ 7.6 \times 0.5 \\ 7.6 \times 0.75 \end{array}$$

$$52. \begin{array}{l} 0.084 \times 0.25 \\ 0.084 \times 0.5 \\ 0.084 \times 0.75 \end{array}$$

$$53. \begin{array}{l} 56 \times 0.1 \\ 56 \times 0.2 \\ 56 \times 0.3 \end{array}$$

$$54. \begin{array}{l} 3.8 \times 0.2 \\ 3.8 \times 0.4 \\ 3.8 \times 0.6 \end{array}$$

$$55. \begin{array}{l} 0.5 \times 0.05 \\ 0.5 \times 0.10 \\ 0.5 \times 0.15 \end{array}$$

$$56. \begin{array}{l} 35 \times 0.2 \\ 35 \times 0.4 \\ 35 \times 0.6 \end{array}$$

$$57. \begin{array}{l} 4.8 \times 0.02 \\ 4.8 \times 0.04 \\ 4.8 \times 0.06 \end{array}$$

$$58. \begin{array}{l} 0.014 \times 0.025 \\ 0.014 \times 0.05 \\ 0.014 \times 0.075 \end{array}$$

## PRACTICE

Estimate. Then calculate.

1. 
$$\begin{array}{r} 9.6 \\ \times 0.5 \\ \hline \end{array}$$

2. 
$$\begin{array}{r} 18.4 \\ \times 0.25 \\ \hline \end{array}$$

3. 
$$\begin{array}{r} 0.0016 \\ \times 0.2 \\ \hline \end{array}$$

4. 
$$\begin{array}{r} 0.36 \\ \times 0.75 \\ \hline \end{array}$$

5. 
$$\begin{array}{r} 98.6 \\ \times 7.2 \\ \hline \end{array}$$

6. 
$$\begin{array}{r} 7.36 \\ \times 9.7 \\ \hline \end{array}$$

7. 
$$\begin{array}{r} 84.7 \\ \times 2.83 \\ \hline \end{array}$$

8. 
$$\begin{array}{r} 0.0764 \\ \times 830 \\ \hline \end{array}$$

9. 
$$\begin{array}{r} 0.876 \\ \times 2.32 \\ \hline \end{array}$$

10. 
$$\begin{array}{r} 0.77 \\ \times 0.36 \\ \hline \end{array}$$

Calculate the product.

11. 
$$\begin{array}{r} 38.5 \\ \times 2.7 \\ \hline \end{array}$$

12. 
$$\begin{array}{r} 0.076 \\ \times 0.3 \\ \hline \end{array}$$

13. 
$$\begin{array}{r} 38.4 \\ \times 9 \\ \hline \end{array}$$

14. 
$$\begin{array}{r} 3.2 \\ \times 0.07 \\ \hline \end{array}$$

15. 
$$\begin{array}{r} 376.7 \\ \times 72.6 \\ \hline \end{array}$$

16. 
$$\begin{array}{r} 6.44 \\ \times 2.5 \\ \hline \end{array}$$

17. 
$$\begin{array}{r} 762 \\ \times 0.075 \\ \hline \end{array}$$

18. 
$$\begin{array}{r} 0.08 \\ \times 0.15 \\ \hline \end{array}$$

19. 
$$\begin{array}{r} 0.873 \\ \times 15 \\ \hline \end{array}$$

20. 
$$\begin{array}{r} 4.782 \\ \times 1.23 \\ \hline \end{array}$$

Estimate. Then solve.

21. Gas sells at 47¢/L. Find the cost of each amount of gas.

a. 69.4 L      b. 24.6 L      c. 72.5 L

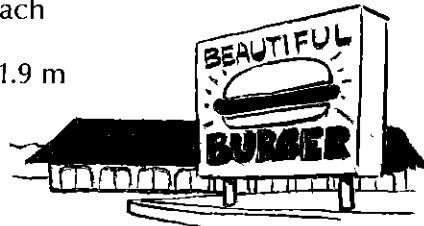
22. Pork chops sell for \$2.39/kg. What is the cost of each amount of pork chops?

a. 0.475 kg      b. 0.234 kg      c. 1.176 kg      d. 2.250 kg

23. Velvet sells for \$12.95/m. What is the cost of each amount of velvet?

a. 0.8 m      b. 3.5 m      c. 1.9 m

24. Marjorie gets paid \$3.95/h as a worker at Beautiful Burger. Last week she worked 8 hours on Tuesday and 6½ hours on Friday. How much money did she earn last week?

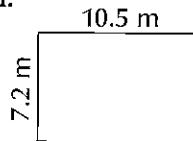


25. Area is found by multiplying the length by the width. What is the area of each rectangular carpet?

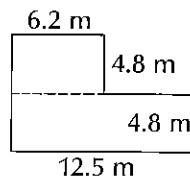
a. length: 6.8 m      b. length: 4.8 m      c. length: 12.75 m  
width: 5.5 m      width: 3.25 m      width: 9.5 m

26. Find the area of each.

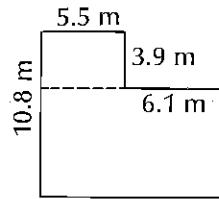
a.



b.



c.



# Calculator Challenge

Figure out a way to complete these problems with a calculator.

a. 
$$\begin{array}{r} 87\,692 \\ \times 8\,397 \\ \hline \end{array}$$

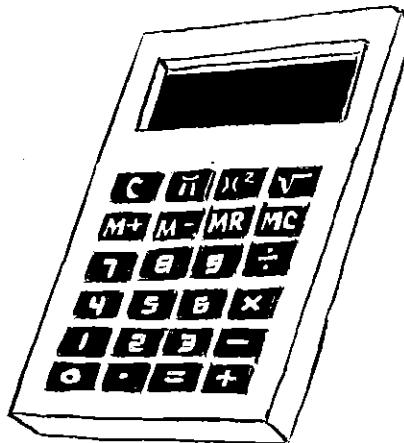
b. 
$$\begin{array}{r} 45\,676 \\ \times 2\,456 \\ \hline \end{array}$$

c. 
$$\begin{array}{r} 31.056\,979 \\ \times 23 \\ \hline \end{array}$$

d. 
$$\begin{array}{r} 125.056\,678 \\ \times 243 \\ \hline \end{array}$$

e. 
$$\begin{array}{r} 378\,042.186 \\ \times 58 \\ \hline \end{array}$$

f. 
$$\begin{array}{r} 7.004\,260\,075 \\ \times 84 \\ \hline \end{array}$$



## REVIEW

Evaluate.

1.  $2^3$

2.  $10^7$

3.  $3^4$

4.  $5^1$

5.  $10^0$

Write in standard form.

6.  $10 + 8 + 0.2 + 0.07$

7.  $(4 \times 100) + (9 \times 0.1) + (6 \times 0.01)$

8.  $(3 \times 100) + (6 \times 10) + \left(5 \times \frac{1}{10}\right)$

9.  $(4 \times 10^0) + \left(2 \times \frac{1}{10^1}\right) + \left(8 \times \frac{1}{10^2}\right)$

Compare using  $<$ ,  $>$ , or  $=$ .

10.  $0.0345 \bullet 0.003\,78$

11.  $15.73 \bullet 15.7300$

Round to the nearest tenth.

12. 4.74

13. 13.652

14. 1.97

15. 2.01

Add or subtract.

16. 
$$\begin{array}{r} 17.489 \\ + 3.94 \\ \hline \end{array}$$

17. 
$$\begin{array}{r} 0.038\,47 \\ - 0.006\,2 \\ \hline \end{array}$$

18. 
$$\begin{array}{r} 19.438 \\ - 7.5624 \\ \hline \end{array}$$

19. 
$$\begin{array}{r} 20.000 \\ - 7.654 \\ \hline \end{array}$$

Multiply or divide.

20.  $3.45 \times 10$

21.  $0.69 \div 100$

22.  $74 \times 0.1$

23.  $38 \div 100$

Estimate. Then multiply.

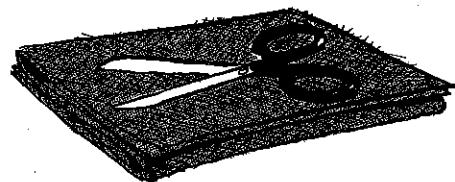
24. 
$$\begin{array}{r} 38.7 \\ \times 12 \\ \hline \end{array}$$

25. 
$$\begin{array}{r} 37.3 \\ \times 0.6 \\ \hline \end{array}$$

26. 
$$\begin{array}{r} 0.3876 \\ \times 21.1 \\ \hline \end{array}$$

27. 
$$\begin{array}{r} 0.352 \\ \times 0.024 \\ \hline \end{array}$$

# Dividing with Decimals



Florence wants to cut 8.6 m of burlap into 0.25 m pieces. How many pieces will she get?

*Step 1: Estimate.*

Round the divisor to its highest place value.

$$0.\underline{2}5)8.\underline{6}$$

$$0.\underline{3})8.\underline{6}$$

Round the dividend to a multiple of the divisor.

$$0.\underline{3})8.\underline{6}$$

$$0.\underline{3})9$$

Multiply the divisor and dividend by a power of ten so the divisor becomes a whole number.

$$\begin{array}{r} 30 \\ 3)90 \end{array}$$

*Step 2: Calculate.*

Multiply the divisor and dividend by a power of ten so the divisor becomes a whole number.

$$0.\underline{2}5)8.\underline{6}0$$

$$\times 100$$

Place the decimal in the quotient.  
Divide.

$$\begin{array}{r} 34.4 \\ 25)860.0 \\ -75 \\ \hline 110 \\ -100 \\ \hline 100 \\ -100 \\ \hline 0 \end{array}$$

Write a zero in the dividend to continue dividing.  
 $860 = 860.0$

Florence will get 34 pieces which is close to the estimate of 30 pieces.

## EXERCISES

Which is the most reasonable estimate?

- |                   |                 |                    |                      |
|-------------------|-----------------|--------------------|----------------------|
| 1. $72 \div 0.2$  | 3.6, 36, or 360 | 2. $28 \div 0.7$   | 4, 40, or 400        |
| 3. $54 \div 0.06$ | 900, 90, or 9   | 4. $32 \div 0.002$ | 160, 1600, or 16 000 |

Multiply the divisor and dividend by a power of ten so the divisor becomes a whole number.

$$5. 0.6)\overline{7.2}$$

$$8. 0.92)\overline{4.14}$$

$$11. 7.03)\overline{175.75}$$

$$6. 0.06)\overline{0.15}$$

$$9. 9.2)\overline{754}$$

$$12. 0.703)\overline{351.5}$$

$$7. 6.1)\overline{7.38}$$

$$10. 0.092)\overline{2116}$$

$$13. 70.3)\overline{253}$$

Estimate the quotient.

14.  $2.601 \div 0.48$

15.  $62.8 \div 0.81$

16.  $487 \div 7.3$

17.  $0.76 \overline{)57.04}$

18.  $7.3 \overline{)4107}$

19.  $4.8 \overline{)2.484}$

20.  $\frac{1.602}{3.45}$

21.  $\frac{23.81}{0.037}$

22.  $\frac{35.791}{46.8}$

Calculate the quotient.

23.  $5.7 \div 0.3$

24.  $64 \div 0.2$

25.  $3.6 \div 4$

$5.7 \div 0.03$

$64 \div 0.02$

$3.6 \div 0.4$

$5.7 \div 0.003$

$64 \div 0.002$

$3.6 \div 0.04$

$5.7 \div 0.0003$

$64 \div 0.0002$

$3.6 \div 0.004$

26.  $3.2 \div 0.2$

27.  $0.54 \div 6$

28.  $2 \div 0.25$

$3.2 \div 0.4$

$0.54 \div 3$

$2 \div 0.5$

$3.2 \div 0.8$

$0.54 \div 0.3$

$2 \div 0.75$

$3.2 \div 1.0$

$0.54 \div 0.6$

$2 \div 1$

29.  $8.75 \div 0.25$

30.  $8.4 \div 0.01$

31.  $240 \div 0.1$

$8.75 \div 0.5$

$8.4 \div 0.02$

$240 \div 0.2$

$8.75 \div 0.75$

$8.4 \div 0.03$

$240 \div 0.3$

$8.75 \div 1$

$8.4 \div 0.04$

$240 \div 0.4$

32.  $0.6 \overline{)27}$

33.  $0.06 \overline{)0.15}$

34.  $6 \overline{)73.8}$

35.  $8.1 \overline{)0.405}$

36.  $0.81 \overline{)37.26}$

37.  $81 \overline{)260.01}$

38.  $\frac{5488}{9.8}$

39.  $\frac{1.875}{0.3}$

40.  $\frac{3.2}{0.0512}$

41.  $\frac{0.344}{0.4}$

42.  $\frac{58.74}{2.2}$

43.  $\frac{282.2}{6.8}$

Divide. If the result is not exact, round to the nearest tenth.

44.  $8.4 \overline{)27}$

45.  $3.2 \overline{)102.4}$

46.  $0.09 \overline{)31}$

47.  $\frac{273}{0.9}$

48.  $\frac{51.8}{0.3}$

49.  $\frac{24.5}{0.7}$

50.  $\frac{248}{0.7}$

51.  $\frac{62.3}{0.5}$

52.  $\frac{24.8}{1.9}$

Estimate. Then solve.

53. Cut each ribbon into 1.3 m pieces. How many pieces can be cut from each?



## PRACTICE

Estimate. Then calculate.

1.  $126.63 \div 2.1$

4.  $0.31\overline{)0.1891}$

7.  $\frac{657.28}{7.9}$

2.  $30.24 \div 4.8$

5.  $0.29\overline{)0.754}$

8.  $\frac{1.9266}{0.038}$

3.  $16.653 \div 7.93$

6.  $37\overline{)466.2}$

9.  $\frac{30.094}{0.41}$

Calculate the quotient. If the result is not exact, round to the nearest tenth.

10.  $2.76 \div 1.2$

13.  $23.46 \div 0.23$

16.  $12\overline{)30.48}$

19.  $0.7\overline{)0.5117}$

22.  $\frac{2.885}{0.37}$

11.  $80 \div 3.2$

14.  $0.1728 \div 0.54$

17.  $45\overline{)79.695}$

20.  $0.059\overline{)4.12}$

23.  $\frac{1.34}{3.62}$

12.  $384 \div 32$

15.  $209 \div 0.52$

18.  $18\overline{)0.666}$

21.  $0.05\overline{)9.275}$

24.  $\frac{4.7328}{0.051}$

Estimate. Then solve.

25. A rope 118.7 m long is knotted at intervals of 3.05 m. About how many intervals of this length are there?

26. Party hats cost \$1.85.

Doug has \$78.76

About how many hats can he buy?

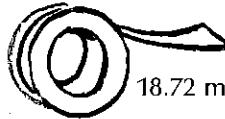
27. Sandwiches cost \$2.75.

Jane spent about \$39.00 on sandwiches.

About how many did she purchase?

28. Each ribbon is cut into 24 pieces. How long will the pieces be for each?

a.



18.72 m

b.



691.2 cm

c.



22.8 m

29. Find the missing dimension in each rectangle.

a.

Area = $7.59 \text{ m}^2$
6.9 m

b.

Area = $33 \text{ m}^2$
4.4 m

c.

Area = $50 \text{ m}^2$
6.25 m

# Calculators and Remainders

Most calculators show the remainder in a division as a decimal.

By hand:

$$\begin{array}{r} 1 \text{ R } 2 \\ 5 \overline{) 7 } \end{array}$$

By calculator:



1.4

To find the remainder as a whole number, multiply the *decimal part* of the quotient by the divisor.

$$\begin{array}{cccccc} 0 & . & 4 & \times & 5 & = \\ \text{decimal part} & & \text{divisor} & & & \end{array}$$

$$\begin{array}{c} 2 \\ \text{remainder} \end{array}$$

Solve using a calculator.

- Brenda cut a rope 32.25 m long into 1.25 m sections. How much of the rope was left over?
- Ellen wanted to paint 4 cm stripes on a pole 113 cm long. How many stripes can Ellen paint? How many centimetres of the pole would be left unpainted?
- Cathy arranged \$46.20 worth of change into piles of \$3.50. How much money was not put into piles?

## Programming for Input and Output

- Complete lines 10, 20, 30, and 40 in BASIC so that the program takes input and prints the output as shown.
- This program uses four variables.
  - Name them.
  - What does each represent?
- Explain the purpose of INT(Q) in line 70.
- This program prints the wrong answer for many remainders. How would the following line correct this problem?

75 LET R = INT (R + 0.1)

LIST

```
10 PRINT _____  
20 INPUT _____  
30 PRINT _____  
40 INPUT _____  
50 LET Q = A / B  
60 PRINT "THE WHOLE NUMBER QUOTIENT IS: ";INT(Q)  
70 LET R = (Q-INT(Q))*B  
80 PRINT "THE REMAINDER IS: ";R  
90 GOTO 10  
100 END
```

RUN

```
ENTER A DIVIDEND: ? 7  
ENTER A DIVISOR: ? 5  
THE WHOLE NUMBER QUOTIENT IS: 1  
THE REMAINDER IS: 2
```

# Order of Operations

Chris evaluated the expression  $\frac{15 - 6 \times 2}{3}$  in two different ways.



$$\begin{aligned}\frac{15 - 6 \times 2}{3} &= \frac{15 - 12}{3} \\ &= \frac{3}{3} \\ &= 1\end{aligned}$$

$$\begin{aligned}\frac{15 - 6 \times 2}{3} &= \frac{9 \times 2}{3} \\ &= \frac{18}{3} \\ &= 6\end{aligned}$$



Chris knew the correct evaluation.  
She used the rules for **order of operations**.

- Rules:**
1. First evaluate expressions in parentheses from the inside to the outside.
  2. Evaluate expressions above or below a division bar.
  3. Simplify multiplications and divisions from left to right.
  4. Simplify additions and subtractions from left to right.

## Examples:

$$9 \times 4 - 6 \div 2 + 5 = 36 - 3 + 5 \quad \text{Rule 3}$$
$$= 33 + 5 \quad \text{Rule 4}$$
$$= 38$$
$$\frac{(5 + 7) \times 2}{4} = \frac{12 \times 2}{4} \quad \text{Rule 1}$$
$$= \frac{24}{4}$$
$$= 6 \quad \text{Rule 2}$$

## EXERCISES

Evaluate the expression.

1.  $3 \times 7 - 7$

2.  $8 + 3 \times 2$

3.  $8 \div 4 \div 2$

4.  $9 - 3 - 2$

5.  $(10 - 3) \times 3$

6.  $8 \div (2 \times 2)$

7.  $6 \times [(10 + 10) \div 5]$

8.  $[8 + 3(2 + 4)] \times 3$

9.  $\frac{7 \times 6}{5 + 9}$

10.  $\frac{3 \times 9}{6 \div 2}$

11.  $\frac{12 - 6 - 2}{100 \div 2 \div 25}$

12.  $\frac{4 \times 4 \times 4}{2 \times 2 \times 2 \times 2 \times 2 \times 2}$

13.  $(3 - 2) \times 7$

14.  $9 \times (3 \times 2)$

15.  $9 \times (3 + 2)$

16.  $\frac{6 \times (3 + 2)}{15 \div (3 + 2)}$

17.  $8 \div (2 \times 2)$

18.  $\frac{(4 + 3) \times 5}{(16 + 5) \div 3}$

## PRACTICE

Evaluate the expression.

1.  $27 \div 3 \times 3$
2.  $27 \div (3 \times 3)$
3.  $15 - 2 \times 7$
4.  $(15 - 2) \times 7$
5.  $5 \times (10 \times 10) + 3$
6.  $25 - (3 + 3) \times 2$
7.  $(10 - 8 - 2) \times 2$
8.  $64 \div 8 \div 4$
9.  $64 \div (8 \div 4)$
10.  $\frac{6 \times 4}{6 - 2}$
11.  $\frac{16 \div 2}{16 \div 4}$
12.  $\frac{8 \times 10}{10 \times 10}$
13.  $\frac{10 \times 3 - 2}{15 - (6 + 2)}$
14.  $\frac{7 \times [(10 + 10) \div 5]}{10 \times 10}$
15.  $\frac{14 - 7 - 2}{15 \div 5 \div 3}$
16.  $3 \times (10 + 10) + 3 \times (40 \div 10)$
17.  $4 \times 4 + 2 \times 6 + 9 \div 3$
18.  $9 + 3 \div 10$
19.  $(2 \times 10) + 7 \times (8 \div 10)$
20.  $4 \div 10 + 9 \div 10$
21.  $6 + 8 \div 100 + 1$
22.  $\left(\frac{8+2}{5}\right) \times \left(\frac{8-2}{3}\right)$
23.  $\frac{8}{5 \times [(1+4) \times 4]}$
24.  $\left(\frac{3}{10}\right) + \left(\frac{4}{100}\right)$
25.  $\frac{[(12 + 8) \div 10] \times 14}{2 \times 14}$
26.  $\frac{(25 + 200 \div 8) + 15}{27 - (6 + 8)}$

Copy and complete with parentheses so as to make each equation true.

27.  $8 - 4 - 2 = 6$
28.  $2 + 3 \times 6 = 30$
29.  $3 \times 4 + 2 = 18$
30.  $3 \times 2 + 3 \times 4 = 60$
31.  $3 + 4 \times 7 = 49$
32.  $13 - 4 - 3 - 2 = 10$
33.  $18 - 7 - 3 - 1 = 7$
34.  $4 \times 3 + 2 \times 5 = 100$
35.  $32 \div 16 \div 8 \div 2 = 0.5$

## Operating in BASIC

Arithmetic expressions can be formed in BASIC using operators.

What is the output for each statement?

1. PRINT  $7 + 2 * (5 + 2)$
2. PRINT  $100 / (3 * 2 - 1)$
3. PRINT  $500 / 2 / 5 / 5$
4. PRINT  $(5 * 10 - 2) + (6 * 10 - 8)$
5. PRINT  $(42 - 3 * 3) / (24 - 3 * 7)$
6. PRINT  $3 * 3 + 5 * 5 * 5 * 4$

### Operators:

- + means add.
- means subtract.
- \* means multiply.
- / means divide.

# Powers and Order of Operations

When powers are present in expressions, they are evaluated before multiplication and division is done from left to right.

- Rules:**
1. First evaluate expressions in parentheses from the inside to the outside.
  2. Evaluate expressions above or below a division bar.
  3. Simplify powers expressions.
  4. Simplify multiplications and divisions from left to right.
  5. Simplify additions and subtractions from left to right.

Study the effects of powers:

$$\begin{aligned}(4 - 3)^2 \\= 1^2 \\= 1\end{aligned}\quad \longleftrightarrow \quad \begin{aligned}4^2 - 3^2 \\= 16 - 9 \\= 7\end{aligned}$$

$$\begin{aligned}(5 \times 3)^2 \\= (15)^2 \\= 225\end{aligned}\quad \longleftrightarrow \quad \begin{aligned}5 \times 3^2 \\= 5 \times 9 \\= 45\end{aligned}$$

$$\begin{aligned}\frac{(6 + 4)^2}{2} &= \frac{(10)^2}{2} \\&= \frac{100}{2} \\&= 50\end{aligned}\quad \longleftrightarrow \quad \begin{aligned}\frac{6 + 4^2}{2} &= \frac{6 + 16}{2} \\&= \frac{22}{2} \\&= 11\end{aligned}$$

## EXERCISES

Simplify.

1.  $27 + 3^3$
2.  $14 - 1^9$
3.  $9 \times 6^2$
4.  $2^4 + 2^2$
5.  $2 \times 6 + 5$
6.  $(2 \times 6)^2 + 5$
7.  $2 \times (6 + 5)^2$
8.  $2^2 \times 6^2$
9.  $(6 - 5)^2$
10.  $6^2 - (2^2 - 1^2) \times 8$
11.  $2^6 - (3 + 5)^2 + 14$
12.  $\left(\frac{8 + 2}{5}\right)^2$
13.  $\frac{(8 + 2)^2}{5}$
14.  $\frac{8^2 + 2^2}{2^2}$
15.  $\frac{3^3 - (4^2 - 3^2)}{(6 + 9)^0 \times 5}$
16.  $2^3 \times 2^2 \times 2^4$
17.  $(81 - 5)^2$
18.  $81^2 - 5^2$

## PRACTICE

Simplify.

1.  $6^2 \div 3^2 \times 6$
2.  $13 + 10^2 \div 10^1$
3.  $162 - 5^2 \times 3 + 23$
4.  $4^4 \times (2^4 - 4^2)$
5.  $21 - 2^4$
6.  $2^5 - (0 \div 14)^1$
7.  $41 - 4^2 + 2^3$
8.  $[(3^3 \times 2) \div 9] \div 6$
9.  $45 \div (1 + 2)^2$
10.  $3^3 - (7 \times 1 + 9^0)$
11.  $[(3^2 + 4) - 7] \times 4 - 7$
12.  $4^3 \times [2^6 - (4 + 1)^2]$
13.  $\frac{16^2 \div 2^4}{1^8 \times 4^2}$
14.  $\frac{5 \times 10^2 - (10^2 \times 3)}{10^2}$
15.  $\frac{2^3 \times [(3^2 + 3^3) \div 6]}{2^3 \times 6}$

Copy and complete. Use  $<$ ,  $=$  or  $>$ .

16.  $2^2 \times 30 \div 10 \div 5 \bullet 2^2 \times (30 \div 10) \div 5$
17.  $2^4 \times 2^3 \times 10 \bullet 2^4 \times (2^3 \times 10)$
18.  $59 - (3^3 - 14) \bullet (59 - 3^3) - 14$
19.  $(6 \times 6)^2 \bullet 6 \times 6^2$
20.  $[(3^3 - 3^2) \div 3] \bullet 3^3 \div (3^2 \div 3)$
21.  $\frac{5^2 \times 2^2}{10^2} \bullet \left(\frac{5 \times 2}{10}\right)^2$
22.  $[(2^3 + 1) \div 3^1] \times 3 \bullet 2^3 + 1 \times 3^1 \div 3$

Rewrite with parentheses to make a true statement.

23.  $6^2 - 12 \div 2^2 = 6$
24.  $10 \times 2^3 - 5 = 30$
25.  $19 + 6^2 \times 5 = 275$
26.  $2 \times 6^2 \div 2^2 + 5 = 8$
27.  $5^0 + 3 \times 6 - 2^2 = 7$
28.  $2^2 \times 1^5 + 3 \times 5 + 7 = 192$
29.  $6 \times 3^2 - 12 + 22 = 20$
30.  $17 - 3^2 - 4^0 + 3 = 2^2$
31.  $12 \div 2^2 - 1 \times 2 = 2^3$
32.  $2^2 \times 3 - 2^2 + 5 = 3$
33.  $\frac{3^2 + 5 \times 2 + 2^3}{3} = 12$
34.  $2^2 + 2^4 - 3 \times 5 = 5$

**M+** and **MR**



Some calculators have memory keys called **M+** and **MR**.

**M+** adds the number showing on the calculator to a number stored in memory.

**MR** retrieves the current value stored in memory and displays it.

To find  $9 \div (1 + 2)$ , press **1** **+** **2** **M+** **9** **÷** **MR** **=**.

Give the keystrokes needed to evaluate these expressions.

- a.  $16 \div (3 + 1)$
- b.  $25 \div (2 + 3)$
- c.  $9 - (5 - 3)$
- d.  $14 - (9 \div 3)$
- e.  $50 \div (2 \times 5)$
- f.  $50 - (2 \times 5)$

# Expressions and Variables

An unknown value in an expression is called a *variable*.

English Expression	Variable Expression
eighteen increased by the number $n$	$18 + n$
to reverse even means the number $t$ divided by 2	$t \div 2$
five times the number $b$	$5b$
a number $x$ divided by 6	$x \div 6$

Multiplication and division with variables can be written in two ways.

Equivalent Multiplication Expressions	
$t \times 7$	$7t$
$a \times b \times c$	$abc$
$4 \times (g + 12)$	$4(g + 12)$
$6 \times r + s \times 8$	$6r + 8s$

Equivalent Division Expressions	
$3 \div (t + 4)$	$\frac{3}{t + 4}$
$a^2 \div (b \times c)$	$\frac{a^2}{bc}$

## EXERCISES

Choose the correct expression.

1. Twelve increased by the number  $n$ .  
a.  $12 - n$       b.  $12n$       c.  $n - 12$       d.  $12 + n$
2. The number  $k$  decreased by 4.  
a.  $k \div 4$       b.  $k - 4$       c.  $4 - k$       d.  $k + 4$
3. The product of 14 and the number  $y$ .  
a.  $14 + y$       b.  $\frac{14}{y}$       c.  $14y$       d.  $14 - y$
4. The number  $a$  divided by the number  $b$ .  
a.  $\frac{a}{b}$       b.  $\frac{b}{a}$       c.  $ba$       d.  $b \div a$
5. The sum of seven and the number  $t$  divided by 8.  
a.  $7t \div 8$       b.  $7 + t \div 8$       c.  $(7 + t) \div 8$       d.  $7 \times \frac{t}{8}$
6. Six times the sum of the numbers  $r$  and  $s$ .  
a.  $(6 + r)s$       b.  $6r + s$       c.  $6(rs)$       d.  $6(r + s)$

## PRACTICE

Write a variable expression for each.

1. ten divided by the number  $u$
2. the product of a number  $a$  and 3
3. a number  $s$  plus itself
4. twenty divided by two, less the number  $y$
5. a number  $x$  times three
6. a number  $k$  times the sum of the numbers  $l$  and  $m$
7. the product of the numbers  $x$ ,  $y$ , and  $z$
8. the fourth power of the number  $n$ , plus 6
9. the sum of 11 and the number  $c$  divided by 2
10. the cube of the product of the number  $n$  and 7

Write an English expression.

- |              |                 |                        |                       |
|--------------|-----------------|------------------------|-----------------------|
| 11. $x - 13$ | 12. $12 \div n$ | 13. $4 \times m$       | 14. $t^2$             |
| 15. $ab$     | 16. $a + b$     | 17. $3 \times (d - 2)$ | 18. $\frac{w + 7}{v}$ |

Write an equivalent expression in a different way.

- |                            |                         |                        |                           |
|----------------------------|-------------------------|------------------------|---------------------------|
| 19. $3 \times m$           | 20. $b \times (t + 10)$ | 21. $4 \div m$         | 22. $a \times b \times c$ |
| 23. $\frac{6 \times s}{t}$ | 24. $(8 + x) \div 2$    | 25. $(x - 1) \times 3$ | 26. $m \div (3 - t)^2$    |

## What Expression?

Describe the rule and write an expression.

- |  |  |  |
|--|--|--|
| 1.  | 2.  | 3.  |
| 4.  | 5.  | 6.  |
| 7.  |  |  |

# Substituting for Variables

A variable expression is *evaluated* when a value is substituted for the variable.

Variable Expression	Value of variable	Value of Expression
$5x + 3$	$x = 7$	$5(7) + 3 = 38$
$12 - 3y$	$y = 10$	$12 - 3(10) = -78$
$(x + z)^3$	$x = 10$ $z = 2$	$(10 + 2)^3 = 1000$
$\frac{2}{3}a^2$	$a = 0.5$	$\frac{2}{3}(0.5)^2 = \frac{1}{3}$
$0.007t$	$t = 2$	$0.007(2) = 0.014$

## EXERCISES

Evaluate by substituting and simplifying.

1.  $7n + 8m$ , for  $n = 3$  and  $m = 2$ .
2.  $120 \div (r \times t)$ , for  $r = 2$  and  $t = 10$ .
3.  $(x + z)^3$ , for  $x = 3$  and  $z = 2$ .
4.  $2(a + b) \div c$ , for  $a = 10$ ,  $b = 5$ , and  $c = 2$ .

Evaluate the expression.

Suppose  $a = 1$ ,  $b = 2$ , and  $c = 4$ .

- |                        |                                     |                             |
|------------------------|-------------------------------------|-----------------------------|
| 5. $a^2$               | 6. $abc$                            | 7. $a + b + c$              |
| 8. $4(b + c)$          | 9. $b^2 - c^2$                      | 10. $(4 - 3a) \times c$     |
| 11. $3a(12 - 2b)$      | 12. $(21 - a) \div c$               | 13. $(c + 3)(b - 1)$        |
| 14. $3 - ca^2$         | 15. $ac + 7b$                       | 16. $5(a^2 + c)$            |
| 17. $\frac{20 - c}{b}$ | 18. $\frac{21 - a}{c}$              | 19. $\frac{2(b + c)^2}{8a}$ |
| 20. $\frac{c^3}{b^2}$  | 21. $b \times 10^3 + c \times 10^2$ | 22. $\frac{c^2 - b^2}{a^2}$ |

# PRACTICE

Copy and complete.

a	b	$a^2 + b$
2	4	
3	3	
7	0	
0	8	
10	4	
5	5	

c	d	$c \div d + 4$
4	2	
20	4	
100	10	
4	10	
5	2	
0	8	

q	r	$\left(\frac{q - 3}{r}\right)^2$
7	2	
6	3	
3	4	
4	10	
8	10	
8	2	

Evaluate by substituting and simplifying.

- |  |   |   |  |
|--|---|---|--|
| 4. $3t - 10$                               | a. $t = 4$                                    | b. $t = 7$                                    | c. $t = 10$                                      |
| 5. $10v - v$                               | a. $v = 3$                                    | b. $v = 1$                                    | c. $v = 0$                                       |
| 6. $s^3 - 1$                               | a. $s = 2$                                    | b. $s = 1$                                    | c. $s = 3$                                       |
| 7. $(t + 2)^2$                             | a. $t = 1$                                    | b. $t = 0$                                    | c. $t = 3$                                       |
| 8. $10 \times (m^3 \div 4)$                | a. $m = 2$                                    | b. $m = 1$                                    | c. $m = 0$                                       |
| 9. perimeter of a rectangle:<br>$2(l + w)$ | a. $l = 4 \text{ cm}$<br>$w = 2.5 \text{ cm}$ | b. $l = 25 \text{ m}$<br>$w = 38 \text{ m}$   | c. $l = 8.7 \text{ cm}$<br>$w = 12.9 \text{ cm}$ |
| 10. area of a triangle:<br>$\frac{bh}{2}$  | a. $b = 6 \text{ cm}$<br>$h = 8 \text{ cm}$   | b. $b = 3.2 \text{ cm}$<br>$h = 4 \text{ cm}$ | c. $b = 0.8 \text{ m}$<br>$h = 0.5 \text{ m}$    |

## LET Statements

In BASIC, the LET statement is used to store numerical values in the computer's memory. These values are stored in a memory location named by a letter or other variable name.

What would be the computer output if the program were RUN?

```
a. 10 LET A = 12
20 LET X = 37
30 LET R = X - A
40 LET D = R * 3
50 LET B = X + R + D
60 PRINT R + D,B / 100
70 END
```

```
b. 10 LET PRICE = 12.95
20 LET DISCOUNT = 1.8
30 LET TAX = .78
40 LET CST = PRICE - DISCOUNT + TAX
50 PRINT CST
60 END
```

# Properties of Addition and Multiplication

Evaluating expressions can be made easier by using the following properties.

Property	Example	For any numbers $a$ , $b$ , and $c$ :
Commutative: The order in which numbers are added or multiplied does not affect the sum or product.	$2 + 4 = 15 = 15 + 2$ $17 = 17$  $0.3 \times 5 = 5 \times 0.3$ $1.5 = 1.5$	$a + b = b + a$  $ab = ba$
Associative: The grouping of the numbers with parentheses does not affect the sum or product.	$(37 + 75) + 25 = 37 + (75 + 25)$ $112 = 137 = 137$  $(4 \times 3) \times 0.2 = 4 \times (3 \times 0.2)$ $12 \times 0.2 = 4 \times 0.6$ $2.4 = 2.4$	$(a + b) + c = a + (b + c)$  $a(bc) = (ab)c$
Distributive: The product of two numbers can be rewritten as a sum.	$7 \times (60 + 8) = (7 \times 60) + (7 \times 8)$ $7 \times 68 = 420 + 56$ $476 = 476$	$a(b + c) = ab + ac$
Identity Elements: The sum of 0 and any number is that number.  The product of 1 and any number is that number.	  $0 + 5 = 5$  $1 \times 2.5 = 2.5$	$0 + a = a$  $1 \times a = a$

## EXERCISES

Name the property illustrated.

1.  $(8 + 3) + 2 = 8 + (3 + 2)$
2.  $rs = sr$
3.  $7 \times (1 + 3) = (7 \times 1) + (7 \times 3)$
4.  $5 + 7 = 7 + 5$
5.  $(2 \times 3) \times 4 = 2 \times (3 \times 4)$
6.  $1 \times 13 = 13$
7.  $0 + 8 = 8$
8.  $6 \times (20 \times 2) = (6 \times 20) \times 2$

Copy and complete.

9.  $3 \times 0.5 = \blacksquare \times 3$
10.  $(2 + 0.4) + 7 = \blacksquare + (0.4 + 7)$
11.  $0.8 + 0.7 = 0.7 + \blacksquare$
12.  $\blacksquare + 14 = 14$
13.  $9.2 \times \blacksquare = 9.2$
14.  $4 \times (0.2 + 3) = (4 \times \blacksquare) + (4 \times \blacksquare)$

## PRACTICE

Write *true* or *false*.

1.  $3 + 5 = 5 + 3$
2.  $8 \times 0.4 = 0.4 \times 8$
3.  $6 + (3 + 7) = (6 + 3) + 7$
4.  $9 \times (2 \times 4) = (9 \times 2) \times 4$
5.  $0 + 0.9 = 0$
6.  $1 \times 0.8 = 1$
7.  $0.7 \times (3 + 2) = (0.7 + 3) \times (0.7 + 2)$
8.  $4 \times (6 - 2) = (4 \times 6) - (4 \times 2)$
9.  $3.1 \times (7 + 1) = (3.1 \times 1) + (7 \times 1)$
10.  $8 \times (4 + 0.3) = (4 + 0.3) \times 8$
11.  $(9 - 8) \times 1.5 = (9 \times 1.5) - (8 \times 1.5)$
12.  $6 \times (0.2 + 8) = (6 \times 0.2) + 8$

Evaluate in two ways.

13.  $3 \times (4 + 5)$
14.  $0.3 \times (7 - 3)$
15.  $0.5 \times (0.6 + 0.4)$
16.  $0.4 \times (5 - 1.3)$
17.  $2.4 \times (9.2 + 0.8)$
18.  $6 \times (3^2 - 2^2)$

Simplify. (Note: It is impossible to divide by zero.)

19.  $a + 0$
20.  $a - 0$
21.  $a \times 0$
22.  $0 \div a$
23.  $b \div b$
24.  $c \div 0$
25.  $b - b$
26.  $1 \times m$
27.  $\frac{c - b}{c - b}$
28.  $r \times \frac{s}{s}$
29.  $\frac{0}{x \div x}$
30.  $\left(\frac{c}{c} + \frac{d}{d}\right)^2$

## REVIEW

Divide.

1.  $0.4 \overline{)9.68}$
2.  $0.032 \overline{)6.72}$
3.  $5 \overline{)3.03}$

Estimate the quotient.

4.  $2.512 \div 0.47$
5.  $7.3 \overline{)5.07}$
6.  $\frac{49.7}{0.12}$

Evaluate.

7.  $9 \div 3 + 8 \div 2$
8.  $8 - (7 - 4)$
9.  $\left(\frac{8 \times 3}{2}\right)^2$

Write as an expression.

10. the product of the number  $k$  and 4 minus the number  $m$
11. the number  $r$  squared divided by 3

Evaluate the expression. Let  $m = 10$  and  $n = 5$ .

12.  $3m + n$
13.  $\frac{m}{n} + 2$
14.  $(m - n)^2$

# TEST

# UNIT 2

Evaluate.

1.  $3^3$

2.  $5^3$

3.  $10^0$

4.  $6^2$

5.  $2^8$

Name the place and value of each 3.

6. 0.0384

7. 2.345

8. 0.7003

9. 1.113 15

10. 3.0004

Round to the nearest tenth and to the nearest whole number.

11. 2.78

12. 0.93

13. 99.24

14. 2.496

15. 0.751 308

Add or subtract.

16.  $7.35 + 0.426$

17.  $80.47 - 7.5874$

18.  $0.0038 + 0.076$

19.  $9 - 3.624$

Multiply or divide.

20.  $0.387 \times 100$

21.  $4.782 \times 0.1$

22.  $57 \times 0.001$

23.  $6.95 \div 100$

24.  $72.4 \div 0.1$

25.  $0.03 \div 0.0001$

26.  $5.09 \times 10^3$

27.  $0.7 \div \frac{1}{10^2}$

28.  $0.2 \times \frac{1}{10^1}$

29.  $45.7 \times 0.9$

30.  $4.5 \times 45$

31.  $0.038 \times 0.072$

32.  $18 \overline{) 42.48}$

33.  $2.6 \overline{) 32.5}$

34.  $0.021 \overline{) 1.18083}$

Evaluate the expression.

35.  $4 \times 8 - 4 \div 2$

36.  $3 \times 4^2 \div 2$

37.  $10 - (7 - 2)$

38.  $\left( \frac{7 - 4 - 2}{2^3 + 2} \right)^2$

39.  $5 \times 10^2 + 3 \times 10^0$

40.  $\frac{35^1 - 25 \div 5}{20 \div (2 \div 2) \div 2}$

41.  $4 \times [(9 + 3) \div 6]$

42.  $\frac{(6 + 4)(20 - 5)}{3 \times 5^2}$

43.  $\frac{10^2 \times [3^0 + 6(7 - 5)]}{10^3}$

Write true or false.

44.  $(8 \times 7) \times 3 = 8 \times (7 \times 3)$

45.  $4.5 \times (6.3 + 3.6) = (4.5 + 6.3) \times (4.5 + 3.6)$

Write a variable expression for each.

46. Three less than the square of the number  $r$ .

47. The cube of the sum of 7 and the number  $t$  all divided by 4.

# LOOKING BACK

## Estimation and Statistics

Refer to the tables to answer the questions.

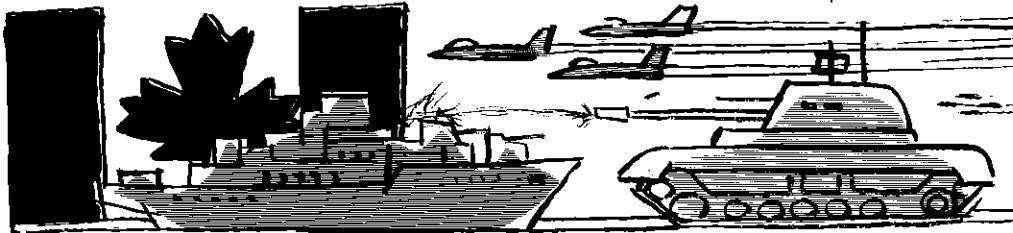
1. Estimate:
  - a. the increase in armed forces' strength from 1950 to 1955.
  - b. the decrease in armed forces strength from 1982 to 1983.
2. In what year were the Canadian Armed Forces the largest? the smallest?
3. Between which two years was the change the least?
4. Make a bar graph of the data in the Armed Forces table.

### CANADIAN ARMED FORCES

1945 (wartime)	761 041
1950	47 185
1955	118 077
1960	119 597
1965	114 164
1970	93 353
1975	79 817
1980	80 298
1981	80 861
1982	82 858
1983	82 675

SOURCE: Dept. of National Defence

These figures exclude reserve and civilian personnel



5. What are the range and the mean of the population per square kilometre to the nearest tenth?
6. What is the median of the population per square kilometre?
7. Which provinces have about 4 people/km<sup>2</sup>?
8. Make a line graph of the data in the population table.

Province or Territory	Population/km <sup>-2</sup> (mid 1983)
Newfoundland	1.4
Nova Scotia	15.5
Prince Edward Island	21.8
New Brunswick	9.6
Québec	4.2
Ontario	8.3
Saskatchewan	1.5
Manitoba	1.6
Alberta	3.6
British Columbia	3
Northwest Territories	0.01
Yukon	0.04