CHAPTER 1
The Language and Tools of Algebra

1-1. Variables and Expressions

In algebra, **variables** are symbols used to represent unspecified numbers or values.
An **algebraic expression** is a collection of numbers, variables, operations, and grouping symbols.

	Verbal Phrase	**Algebraic Expressions**
Addition	The *sum* of twenty and a number n	$20+n$
	Nine *more than* twice a number a	$2a+9$
	A number m *increased* by 12	$m+12$
Subtraction	The *difference* between a number x and 7	$x-7$
	Three *less than* a number b	$b-3$
	Three times a number k *decreased* by five	$3k-5$
	Nine *minus* a number n	$9-n$
Multiplication	Eleven *times* z to the third power	$11z^3$
	The *product of* -2 and a number n	$-2n$
	Two thirds *of* a number x	$\dfrac{2}{3}x$
Division	n *divided* by 8	$n/8$
	The *quotient* of fifteen and a number d	$\dfrac{15}{d}$

Example 1 □ Write an algebraic expression for each verbal expression.

    a. Ten less than one-fourth the cube of p.

    b. Twice the difference between x and sixteen.

    c. Four times the sum of a number and three.

    d. Four times a number increased by three.

Solution □ a. $\dfrac{1}{4}p^3-10$

    b. $2(x-16)$

    c. $4(n+3)$

    d. $4n+3$

Example 2 □ Mr. and Mrs. Sawyer are taking their three children to an amusement park. The admission is a dollars per adult, c dollars per child and the cost of each ride is r dollars per person.

    a. Write an expression for the cost of admission plus 10 rides for the family.

    b. Find the cost of admission plus 10 rides if the admission per adult is 20 dollars, the admission per child is 12 dollars, and the cost of each ride is 8 dollars.

Solution □ a. $2a+3c+10r$

    b. $2\cdot20+3\cdot12+10\cdot8$ Substitute 20 for a, 12 for c, and 8 for r.
     $=156$

Exercise - Variables and Expressions

1

Twice the product of m and n decreased by the square of the sum of m and n.

Which of the following is an expression for the statement above?

A) $2mn - (m^2 + n^2)$

B) $2mn - (m + n)^2$

C) $(m + n)^2 - 2mn$

D) $(m^2 + n^2) - 2mn$

2

The product of a number x and four decreased by twelve.

Which of the following is an expression for the statement above?

A) $4x + 12$

B) $4(x + 12)$

C) $4(x - 12)$

D) $4x - 12$

3

The quotient of 19 and a number d increased by seven.

Which of the following is an expression for the statement above?

A) $\dfrac{19}{d} + 7$

B) $\dfrac{d}{19} + 7$

C) $\dfrac{19 + d}{7}$

D) $\dfrac{d + 7}{19}$

4

Mario received y text messages each minute for 10 minutes yesterday and received t text messages each minute for 20 minutes today. What is the total number of text messages he received for two days in terms of y and t?

A) $30yt$

B) $200yt$

C) $20y + 10t$

D) $10y + 20t$

5

Which of the following expressions represents the product of $3k$ and the sum of m and one third of n?

A) $3km + \dfrac{1}{3}n$

B) $3k \cdot \dfrac{1}{3}(m + n)$

C) $3k(m + \dfrac{1}{3}n)$

D) $3k(m + n + \dfrac{1}{3})$

6

The difference between two numbers is eight. If the smaller number is n to the third power what is the greater number?

A) $n^3 - 8$

B) $n^3 + 8$

C) $8 - n^3$

D) $8n^3$

1-2. Exponents and Order of Operations

An expression like 3^5 is called a **power**. The number 3 is the **base**, and the number 5 is the **exponent**.

$$3^5 = \underbrace{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}_{\text{5 factors of 3}}$$

To evaluate an expression involving more than one operation, we agree to perform operations
in the following order .

Order of Operations

1. Simplify the expressions inside grouping symbols, such as parentheses, brackets, and fraction bars.
2. Evaluate all powers.
3. Do all multiplications and divisions in order from left to right.
4. Do all additions and subtractions in order from left to right.

Example 1   □   Evaluate $(11 - 20 \div \dfrac{5^2 - 13}{3} + 8) \times 2$.

Solution   □ $(11 - 20 \div \dfrac{5^2 - 13}{3} + 8) \times 2$

$= (11 - 20 \div \dfrac{25 - 13}{3} + 8) \times 2$ Evaluate power inside grouping symbols.

$= (11 - 20 \div \dfrac{12}{3} + 8) \times 2$ Evaluate expression inside grouping symbols.

$= (11 - 20 \div 4 + 8) \times 2$ Evaluate expression inside grouping symbols.

$= (11 - 5 + 8) \times 2$ Divide 20 by 4.

$= (6 + 8) \times 2$ Subtract 5 from 11.

$= (14) \times 2$ Evaluate expression inside grouping symbols.

$= 28$ Multiply.

Example 2   □   Evaluate $a^3 - \dfrac{b^2 + c}{a} + (ab + c)$ if $a = 4$, $b = -3$, and $c = 7$.

Solution   □ $a^3 - \dfrac{b^2 + c}{a} + (ab + c)$

$= 4^3 - \dfrac{(-3)^2 + 7}{4} + (4 \cdot (-3) + 7)$ Replace a with 4, b with -3 , and c with 7.

$= 64 - \dfrac{9 + 7}{4} + (-12 + 7)$ Evaluate 4^3 , $(-3)^2$, and $4 \cdot (-3)$.

$= 64 - \dfrac{16}{4} + (-5)$ Evaluate expression inside grouping symbols.

$= 64 - 4 + (-5)$ Divide 16 by 4.

$= 55$ Subtract and add.

Exercise - Exponents and Order of Operations

1

$[(7^2 - 9) \div 8]2 =$

5

What is the value of $(\dfrac{2c}{a})^2 - 10 \times \dfrac{(b+a)}{c}$

if $a = -2$, $b = 3$, and $c = 5$?

2

$19 - 3[20 - \dfrac{2^4 - 7}{4} \times 8] =$

6

What is the value of $9 - 2x \div (z - y)^3$ if $x = 4$,

$y = -1$, and $z = -3$?

3

$\dfrac{72 \div 3^2 \cdot 2}{6} =$

7

What is the value of $\dfrac{7 \div (q)^2 \cdot 2}{2p} \cdot \dfrac{-p + 6q - r}{-q}$

if $p = 4$, $q = \dfrac{1}{2}$, and $r = 2$?

4

$5^3 - \dfrac{1}{2}(12 + 12 \div 3) =$

8

What is the value of $\dfrac{c - 2(a+b)}{(c-a)^2}$ if $a = -\dfrac{1}{2}$,

$b = \dfrac{3}{2}$, and $c = \dfrac{5}{2}$?

1-3. Simplifying Algebraic Expressions

A **term** is a number, a variable, or a product or quotient of numbers and variables. For example 5, x, $7a$, b^2, and $2m^3n$ are all terms. **Like terms** contain identical variables. For example, in $5x^2 - 3x^2 + 3x$, the terms $5x^2$ and $-3x^2$ are like terms because the variable part of each term is identical.

The **coefficient** of a term is a number that multiplies a variable. For example, in $8x^2y$, the coefficient is 8, and in $\dfrac{4m}{5}$, the coefficient is $\dfrac{4}{5}$.

An expression is in **simplest form** when it is replaced by an equivalent expression having no like terms or parentheses. Simplifying means rewriting in simpler form.

Distributive Property

Symbols   For any real numbers a, b, and c

$a(b+c) = ab + ac$ $\qquad\qquad$ $a(b-c) = ab - ac$

Examples $4(7+3) = 4 \cdot 7 + 4 \cdot 3$ $\qquad\qquad$ $4(7-3) = 4 \cdot 7 - 4 \cdot 3$

Commutative Property

Symbols   For any real numbers a and b,

$a + b = b + a$ $\qquad\qquad$ $a \cdot b = b \cdot a$

Examples $3 + 4 = 4 + 3$ $\qquad\qquad$ $3 \cdot 4 = 4 \cdot 3$

Associative Property

Symbols   For any real numbers a, b, and c

$(a+b) + c = a + (b+c)$ $\qquad\qquad$ $(ab)c = a(bc)$

Examples $(3+4) + 7 = 3 + (4+7)$ $\qquad\qquad$ $(3 \cdot 4) \cdot 7 = 3 \cdot (4 \cdot 7)$

Example 1 □ Simplify each expression.

$\qquad$ a. $\dfrac{1}{3}m - 4n + 2\dfrac{2}{3}m$ $\qquad$ b. $4x^3 - 2(x^3 + 3x)$ $\qquad$ c. $a(2-b) - 2(a-b)$

Solution   □   a. $\dfrac{1}{3}m - 4n + 2\dfrac{2}{3}m$

$\qquad\qquad = (\dfrac{1}{3} + 2\dfrac{2}{3})m - 4n$ $\qquad\qquad\qquad$ Combine like terms.

$\qquad\qquad = 3m - 4n$ $\qquad\qquad\qquad\qquad$ Simplify.

$\qquad$ b. $4x^3 - 3(x^3 + 2x)$

$\qquad\qquad = 4x^3 - 3(x^3) - 3(2x)$ $\qquad\qquad$ Distributive property

$\qquad\qquad = 4x^3 - 3x^3 - 6x$ $\qquad\qquad\qquad$ Multiply.

$\qquad\qquad = x^3 - 6x$ $\qquad\qquad\qquad\qquad$ Combine like terms.

$\qquad$ c. $a(2-b) - 2(a-b)$

$\qquad\qquad = 2a - ab - 2a + 2b$ $\qquad\qquad$ Distributive property

$\qquad\qquad = 2a - 2a - ab + 2b$ $\qquad\qquad$ Commutative property

$\qquad\qquad = -ab + 2b$ $\qquad\qquad\qquad\qquad$ Simplify.

Exercise - Simplifying Algebraic Expressions

1

Which of the following expressions is equivalent to $\frac{2}{3}(a^2 - a - 3) + \frac{1}{3}(a^2 + 2a + 6)$?

A) a^2

B) $a^2 + a$

C) $a^2 - a$

D) $a^2 - 1$

2

Which of the following expressions is equivalent to $5.4(x - 2y) - 2.7(x - 3y)$?

A) $2.7(x + y)$

B) $2.7(x - y)$

C) $2.7x + 3.6y$

D) $2.7x - 3.6y$

3

Which of the following expressions is equivalent to $\frac{1}{2}(2a + 3b + 4c) - \frac{3}{2}(b + 2c)$?

A) $a - 3c$

B) $a + 5c$

C) $a + c$

D) $a - c$

4

Which of the following expressions is equivalent to $a(b - c) - b(a + c) - c(a - b)$?

A) bc

B) $2ac$

C) $-2bc$

D) $-2ac$

5

Which of the following expressions is NOT equivalent to $3[6a - 3(1 - a) - 5(a + 1)]$?

A) $12a - 24$

B) $24(a - \frac{1}{2})$

C) $12(a - 2)$

D) $24(\frac{1}{2}a - 1)$

6

Which of the following expressions is NOT equivalent to $p - \frac{2}{3}(2p - 3q) - \frac{1}{3}(p + 4q)$?

A) $-\frac{2}{3}(p - q)$

B) $-\frac{2}{3}p + \frac{2}{3}q$

C) $-\frac{2}{3}(p + q)$

D) $-\frac{1}{3}(2p - 2q)$

1-4. Rational, Irrational, and Decimal

Numbers can be pictured as points on a horizontal line called a **number line**. The point for 0 is the **origin**. Points to the left of 0 represent **negative numbers**, and points to the right of 0 represent **positive numbers**. Numbers increase in value from left to right. The point that corresponds to a number is called the **graph** of the number. Each number in a pair such as 3 and −3 is called the **opposite** of the other number. The opposite of a is written $-a$.
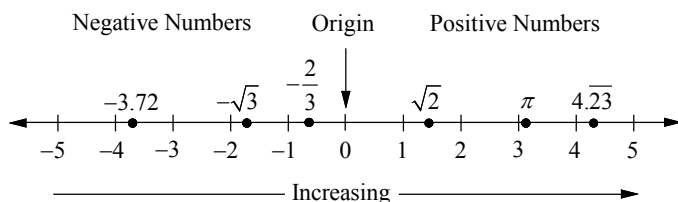
natural numbers:	{1, 2, 3, ...}
whole numbers:	{0, 1, 2, 3, ...}
integers:	{..., −3, −2, −1, 0, 1, 2, 3, ...}

rational numbers: A rational number is one that can be expressed as a ratio $\dfrac{a}{b}$, where a and b are integers and b is not zero, such as -3.72, $-\dfrac{2}{3}$, 0, 2, and $4.\overline{23}$. The decimal form of a rational number is either a terminating or repeating decimal.

irrational numbers Any real number that is not rational is irrational. $-\sqrt{3}$, $\sqrt{2}$, and π are irrational.

Rounding Decimals

To round a decimal to the desired place, underline the digit in the place to be rounded.
1) If the digit to the right of the underlined digit is 5 or more, increase the underlined digit by one (round up).
2) If the digit to the right of the underlined digit is less than 5, leave the underlined digit as it is (round down).
3) Drop all digits to the right of the underlined digit.

Example 1 □ On the number line below, the marks are equally spaced. What is the coordinate of P?
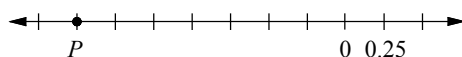
Solution □ Since the distance between the marks is 0.25, the coordinate of P is 7×-0.25, or -1.75.

Example 2 □ Round 52.348 to the nearest a) integer and b) hundredth.

Solution □ a) Underline 2, the digit in the ones place. 5<u>2</u>.348
The digit to the right of the underlined digit is less than 5, keep the underlined digit.
Therefore, 52.348 rounded to the nearest integer is 52.

b) Underline 4, the digit in the hundredths place. 52.3<u>4</u>8
The digit to the right of the underlined digit is more than 5, round up.
Therefore, 52.348 rounded to the nearest hundredths place is 52.35.

Exercise – Rational, Irrational, and Decimal

1

Which of the following shows the numbers arranged in increasing order?

A) $-\sqrt{3},\ -5,\ \dfrac{2}{3},\ 4,\ \sqrt{10}$

B) $-\sqrt{3},\ -5,\ \dfrac{2}{3},\ \sqrt{10},\ 4$

C) $-5,\ -\sqrt{3},\ \dfrac{2}{3},\ \sqrt{10},\ 4$

D) $\dfrac{2}{3},\ -\sqrt{3},\ \sqrt{10},\ 4,\ -5$

2

$11 - 2(2 - 0.8^2) + 24 \div (-4) =$

A) 1.68

B) 2.28

C) 2.78

D) 3.18

3

To the nearest cents, what is the value of $\$500(1 + 0.045)^8 - \$500(1 + 0.04)^8$?

A) $25.45

B) $26.00

C) $26.77

D) $28.25

4

Which of the following is an irrational number?

A) -1.2

B) $\dfrac{4}{3}$

C) $-\sqrt{16}$

D) $-\sqrt{10}$

5
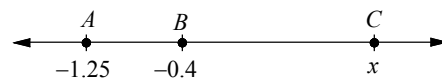
Which of the following is a rational number?

A) $\sqrt{1.6}$

B) $\sqrt{\dfrac{49}{64}}$

C) $\sqrt{0.9}$

D) $-\sqrt{250}$

6

In three plays, a football team loses 5 yards and then gains 32 yards by completing a pass. Then a penalty was called and the team lost 10 yards. How many yards did the team actually gain?

7

On the number line above, if $BC = 2AB$ what is the value of x ?

Chapter 1 Practice Test

1

Two less than the quotient of three and a number n

Which of the following is an expression for the statement above?

A) $2 - \dfrac{n}{3}$

B) $\dfrac{n}{3} - 2$

C) $\dfrac{3}{n} - 2$

D) $2 - \dfrac{3}{n}$

2

How much greater than $n - 11$ is $n + 3$?

A) 8

B) 10

C) 12

D) 14

3

Johnny received m text messages on Friday, three less than twice as many text messages on Saturday than on Friday, and five more text messages on Sunday than on Saturday. What is the total number of text messages he received over the three days?

A) $4m + 2$

B) $5m - 1$

C) $4m - 2$

D) $5m + 1$

4

What number is halfway between $-\dfrac{5}{6}$ and $\dfrac{1}{3}$ on a number line?

A) $-\dfrac{1}{4}$

B) $-\dfrac{1}{3}$

C) $-\dfrac{1}{2}$

D) $-\dfrac{5}{12}$

5

What is 4.4985 rounded to the nearest hundredth?

A) 4.49

B) 4.498

C) 4.499

D) 4.50

6

Which of the following expressions is equivalent to $3a + \dfrac{1}{2}(b - 2c) - \dfrac{1}{2}(2a + 3b)$?

A) $\dfrac{3}{2}a - \dfrac{1}{2}b - c$

B) $\dfrac{3}{2}a + b - c$

C) $2a - b - c$

D) $2a + b - c$

7

How many minutes are there in $2h$ hours and $6m$ minutes?

A) $60h + 12m$

B) $120h + 6m$

C) $60h + 6m$

D) $120h + 60m$

10

If $x = 10$, what is the value of $\dfrac{x}{2} + \dfrac{x}{20} + \dfrac{x}{200}$?

8

1. Add 5 to a number n.
2. Divide by 8.
3. Subtract by 1.
4. Multiply by 8.

When the sequence of operations above has been completed in order, which of the following is an expression for the statement above?

A) $n - 1$

B) $n - 2$

C) $n - 3$

D) $n - 4$

11

If x and y are positive integers and $2x + 5y = 18$, what is the value of x ?

9

Which of the following expressions is equivalent to $(2y - x) - 2(y - 2z) - 4(x + z)$?

A) $-3x$

B) $-5x$

C) $-3x + 8z$

D) $-5x - 8z$

12

If $a = 3$, $b = -1$, and $c = -2$, what is the value of $7 - \dfrac{a - 12 \div (2 - b)}{c + 3}$?

Answer Key

Section 1-1

1. B   2. D   3. A   4. D   5. C

6. B

Section 1-2

1. 10   2. 13   3. 8/3   4. 117   5. 23

6. 10   7. 42   8. $\dfrac{1}{18}$

Section 1-3

1. A   2. B   3. D   4. D   5. B

6. C

Section 1-4

1. C   2. B   3. C   4. D   5. B

6. 17   7. 1.3

Chapter 1 Practice Test

1. C   2. D   3. B   4. A   5. D

6. C   7. B   8. C   9. B   10. 5.55

11. 4   12. 8

Note: Throughout the book, the symbol "$\Rightarrow$" is used to indicate that one step of an equation implies the next step of the equation.

Answers and Explanations

Section 1-1

1. B

$$\underbrace{2mn}_{\substack{\text{twice the product}\\\text{of } m \text{ and } n}} \underbrace{-}_{\text{decreased by}} \underbrace{(m+n)^2}_{\substack{\text{the square of the}\\\text{sum of } m \text{ and } n}}$$

2. D

$$\underbrace{4x}_{\substack{\text{the product of}\\\text{a number } x \text{ and } 4}} \underbrace{-}_{\text{decreased by}} \underbrace{12}_{\text{twelve}}$$

3. A

$$\underbrace{\dfrac{19}{d}}_{\substack{\text{the quotient of } 19\\\text{and a number } d}} \underbrace{+}_{\text{increased by}} \underbrace{7}_{\text{seven}}$$

4. D

The number of text messages Mario received yesterday $=10y$.

The number of text messages Mario received today $=20t$

The total number of text messages he received for two days $=10y+20t$.

5. C

$$\underbrace{3k}_{3\text{ times } k}\ (\ \underbrace{m+\dfrac{1}{3}n}_{\substack{\text{sum of } m \text{ and}\\\text{one third of } n}}\ )$$

$3k(m+\dfrac{1}{3}n)$ stands for $3k\times(m+\dfrac{1}{3}n)$.

6. B

If the smaller number is n to the third power, which is n^3, the greater number is 8 more than n^3, which is n^3+8.

Section 1-2

1. 10

$$[(7^2-9)\div 8]2 = [(49-9)\div 8]2$$
$$= [(40)\div 8]2 = [5]2 = 10$$

2. 13

$$19-3[20-\dfrac{2^4-7}{4}\times 8]$$
$$= 19-3[20-\dfrac{16-7}{4}\times 8]$$
$$= 19-3[20-\dfrac{9}{4}\times 8] = 19-3[20-\dfrac{72}{4}]$$
$$= 19-3[20-18] = 19-3[2]$$
$$= 19-6 = 13$$

3. $\dfrac{8}{3}$

$$\dfrac{72\div 3^2\cdot 2}{6} = \dfrac{72\div 9\cdot 2}{6} = \dfrac{8\cdot 2}{6} = \dfrac{16}{6} = \dfrac{8}{3}$$

4. 117

$$5^3-\dfrac{1}{2}(12+12\div 3) = 125-\dfrac{1}{2}(12+4)$$
$$= 125-\dfrac{1}{2}(16) = 125-8 = 117$$

5. 23

$$(\frac{2c}{a})^2 - 10 \times \frac{(b+a)}{c} = (\frac{2 \cdot 5}{-2})^2 - 10 \times \frac{(3+-2)}{5}$$

$$= (-5)^2 - 10 \times (\frac{1}{5}) = 25 - 2 = 23$$

6. 10

$$9 - 2x \div (z-y)^3 = 9 - 2(4) \div (-3 - (-1))^3$$

$$= 9 - 8 \div (-2)^3 = 9 - 8 \div (-8) = 9 - (-1) = 10$$

7. 42

$$\frac{7 \div (q)^2 \cdot 2}{2p} \cdot \frac{-p + 6q - r}{-q}$$

$$= \frac{7 \div (\frac{1}{2})^2 \cdot 2}{2(4)} \cdot \frac{-(4) + 6(\frac{1}{2}) - 2}{-\frac{1}{2}}$$

$$= \frac{7 \div \frac{1}{4} \cdot 2}{8} \cdot \frac{-3}{-\frac{1}{2}} = \frac{28 \cdot 2}{8} \cdot 6 = 7 \cdot 6 = 42$$

8. $\dfrac{1}{18}$

$$\frac{c - 2(a+b)}{(c-a)^2} = \frac{\frac{5}{2} - 2(-\frac{1}{2} + \frac{3}{2})}{(\frac{5}{2} - (-\frac{1}{2}))^2} = \frac{\frac{5}{2} - 2(1)}{(3)^2}$$

$$= \frac{\frac{1}{2}}{9} = \frac{1}{18}$$

Section 1-3

1. A

$$\frac{2}{3}(a^2 - a - 3) + \frac{1}{3}(a^2 + 2a + 6)$$

$$= \frac{2}{3}a^2 - \frac{2}{3}a - 2 + \frac{1}{3}a^2 + \frac{2}{3}a + 2 = a^2$$

2. B

$$5.4(x - 2y) - 2.7(x - 3y)$$

$$= 5.4x - 10.8y - 2.7x + 8.1y$$

$$= 2.7x - 2.7y = 2.7(x - y)$$

3. D

$$\frac{1}{2}(2a + 3b + 4c) - \frac{3}{2}(b + 2c)$$

$$= a + \frac{3}{2}b + 2c - \frac{3}{2}b - 3c$$

$$= a - c$$

4. D

$$a(b-c) - b(a+c) - c(a-b)$$

$$= ab - ac - ab - bc - ac + bc$$

$$= -2ac$$

5. B

$$3[6a - 3(1-a) - 5(a+1)]$$

$$= 3[6a - 3 + 3a - 5a - 5]$$

$$= 3[4a - 8] = 12a - 24$$

All of the answer choices except B are equivalent to $12a - 24$.

6. C

$$p - \frac{2}{3}(2p - 3q) - \frac{1}{3}(p + 4q)$$

$$= p - \frac{4}{3}p + 2q - \frac{1}{3}p - \frac{4}{3}q$$

$$= -\frac{2}{3}p + \frac{2}{3}q$$

All of the answer choices except C are equivalent to $-\dfrac{2}{3}p + \dfrac{2}{3}q$.

Section 1-4

1. C

$$-5, \ -\sqrt{3}(\approx -1.73), \ \frac{2}{3}, \ \sqrt{10}(\approx 3.1), \ 4$$

Answer choice C shows the numbers arranged in increasing order.

2. B

$$11 - 2(2 - 0.8^2) + 24 \div (-4)$$

$$= 11 - 2(2 - .64) + (-6)$$

$$= 11 - 2(1.36) - 6 = 2.28$$

3. C

    Use calculator.
    $$500(1+0.045)^8 - 500(1+0.04)^8$$
    $$= 500[(1.045)^8 - (1.04)^8]$$
    $$= 500(0.05353) \approx 26.76578$$

    26.765 rounded to the nearest hundredth is 26.77.

4. D

    $-\sqrt{10}$ is an irrational number.
    $-\sqrt{16} = -4$ is not an irrational number.
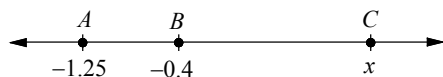
5. B

    $$\sqrt{\frac{49}{64}} = \frac{\sqrt{49}}{\sqrt{64}} = \frac{7}{8} \text{ is a rational number.}$$

6. 17

    $$-5+32-10=17$$

7. 1.3

    $$BC = 2AB$$
    $$x - (-0.4) = 2[-0.4 - (-1.25)]$$
    $$x + 0.4 = 2(0.85)$$
    $$x + 0.4 = 1.7$$
    $$x = 1.7 - 0.4 = 1.3$$

Chapter 1 Practice Test

1. C

    The phrase "two less than the quotient of three and a number n" is translated $\frac{3}{n} - 2$, not $2 - \frac{3}{n}$.

2. D

    $$(n+3)-(n-11) = n+3-n+11 = 14$$

3. B

    Number of text messages he received on Friday is m, on Saturday is $2m-3$, and on Sunday is $2m-3+5$
    The total number of text messages he received over the three days is
    $$m+(2m-3)+(2m-3+5) = 5m-1$$

4. A

    To find a number which is halfway between two numbers, find the average of the two numbers.
    $$\frac{-\frac{5}{6}+\frac{1}{3}}{2} = \frac{(-\frac{5}{6}+\frac{1}{3})6}{(2)6} = \frac{-5+2}{12} = \frac{-3}{12} = -\frac{1}{4}$$

5. D

    Underline 9, the digit in the hundredths place.
    4.4985
    The digit to the right of the underlined digit is more than 5, round up. Therefore, 4.4985 rounded to the nearest hundredths place is 4.50.

6. C

    $$3a+\frac{1}{2}(b-2c)-\frac{1}{2}(2a+3b)$$
    $$= 3a+\frac{1}{2}b-c-a-\frac{3}{2}b$$
    $$= 2a-b-c$$

7. B

    There are $2h \times 60$ minutes in $2h$ hours.
    There are $(120h+6m)$ minutes in $2h$ hours and $6m$ minutes.

8. C

    1. Add 5 to a number n. $\Rightarrow n+5$

    2. Divide by 8. $\Rightarrow \dfrac{(n+5)}{8}$

    3. Subtract by 1. $\Rightarrow \dfrac{(n+5)}{8}-1$

    4. Multiply by 8. $\Rightarrow [\dfrac{(n+5)}{8}-1] \times 8$

    $$[\frac{(n+5)}{8}-1] \times 8 = (n+5)-8 = n-3$$

9. B

    $$(2y-x)-2(y-2z)-4(x+z)$$
    $$= 2y-x-2y+4z-4x-4z$$
    $$= -5x$$

10. 5.55

    $$\frac{x}{2}+\frac{x}{20}+\frac{x}{200} = \frac{10}{2}+\frac{10}{20}+\frac{10}{200}$$
    $$= 5+0.5+0.05 = 5.55$$

11. 4

Choose the first few positive integers for x and make substitutions for the given equation. Construct a table of values.

x	y
1	not an integer
2	not an integer
3	not an integer
4	2

Both x and y are positive integers when x equals 4 and y equals 2. Therefore the value of x is 4.

12. 8

$$7 - \frac{a - 12 \div (2 - b)}{c + 3} = 7 - \frac{3 - 12 \div (2 - (-1))}{-2 + 3}$$

$$= 7 - \frac{3 - 12 \div (3)}{1} = 7 - \frac{3 - 4}{1} = 7 - \frac{-1}{1}$$

$$= 7 + 1 = 8$$