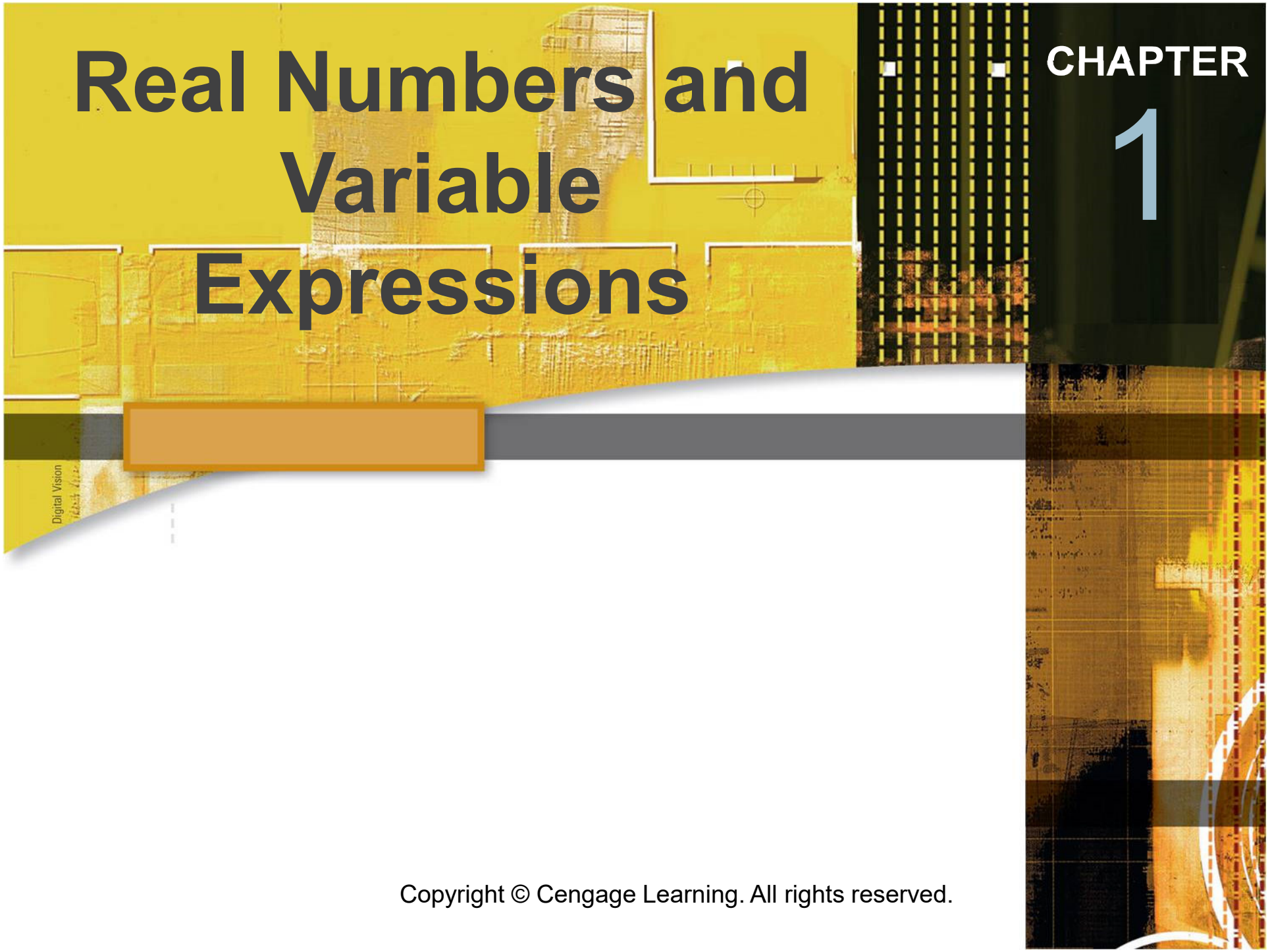
Real Numbers and Variable Expressions

CHAPTER 1



1.6 Translating Verbal Expressions into Variable Expressions

Objectives

1. Translate a verbal expression into a variable expression

2. Translate a verbal expression into a variable expression and then simplify the resulting expression

3. Translate application problems

Translate a verbal expression into a variable expression

Translate a verbal expression into a variable expression

One of the major skills required in applied mathematics is the ability to translate a verbal expression into a variable expression. This requires recognizing the verbal phrases that translate into mathematical operations. Here is a partial list of the phrases used to indicate the different mathematical operations.

WORDS OR PHRASES FOR ADDITION

added to	6 added to y	$y + 6$
more than	8 more than x	$x + 8$
the sum of	the sum of x and z	$x + z$
increased by	t increased by 9	$t + 9$
the total of	the total of 5 and d	$5 + d$
plus	b plus 17	$b + 17$

Translate a verbal expression into a variable expression

WORDS OR PHRASES FOR SUBTRACTION

minus	x minus 2	$x - 2$
less than	7 less than t	$t - 7$
less	7 less t	$7 - t$
subtracted from	5 subtracted from d	$d - 5$
decreased by	m decreased by 3	$m - 3$
the difference between	the difference between y and 4	$y - 4$

WORDS OR PHRASES FOR MULTIPLICATION

times	10 times t	$10t$
of	one-half of x	$\frac{1}{2}x$
the product of	the product of y and z	yz
multiplied by	b multiplied by 11	$11b$
twice	twice n	$2n$

Translate a verbal expression into a variable expression

PHRASES FOR DIVISION

divided by	x divided by 12	$\frac{x}{12}$
the quotient of	the quotient of y and z	$\frac{y}{z}$
the ratio of	the ratio of t to 9	$\frac{t}{9}$

PHRASES FOR POWER

the square of	the square of x	x^2
the cube of	the cube of a	a^3

Example 1

Translate into a variable expression.

A. the total of five times b and c

B. the quotient of eight less than n and fourteen

C. thirteen more than the sum of seven and the square of x

Solution:

A. the total of five times b and c

Identify words that indicate mathematical operations.

$5b + c$

Use the operations to write the variable expression.

Example 1 – *Solution*

cont'd

B. the quotient of eight less than *n* and fourteen

$$\frac{n - 8}{14}$$

Identify words that indicate mathematical operations.

Use the operations to write the variable expression.

C. thirteen more than the sum of seven and the square of *x*

$$(7 + x^2) + 13$$

Translate a verbal expression into a variable expression

In most applications that involve translating phrases into variable expressions, the variable to be used is not given.

To translate these phrases, a variable must be assigned to an unknown quantity before the variable expression can be written.

Example 2

Translate “a number multiplied by the total of six and the cube of the number” into a variable expression.

Solution:

the unknown number: n

Assign a variable to one of the unknown quantities.

the cube of the number: n^3

Use the assigned variable to write an expression for any other unknown quantity.

the total of six and the cube of the number: $6 + n^3$

$n(6 + n^3)$

Use the assigned variable to write the variable expression.

Translate a verbal expression into a variable expression and then simplify the resulting expression

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After translating a verbal expression into a variable expression, simplify the variable expression by using the Properties of the Real Numbers.

Example 4

Translate and simplify "the total of four times an unknown number and twice the difference between the number and eight."

Solution:

the unknown number: n

Assign a variable to one of the unknown quantities.

four times the unknown number: $4n$

Use the assigned variable to write an expression for any other unknown quantity.

twice the difference between the number and eight: $2(n - 8)$

Example 4 – *Solution*

cont'd

$4n + 2(n - 8)$

$= 4n + 2n - 16$ Use the assigned variable to write the variable expression.

$= 6n - 16$ Simplify the variable expression.

Translate application problems

Translate application problems

Many of the applications of mathematics require that you identify an unknown quantity, assign a variable to that quantity, and then attempt to express another unknown quantity in terms of that variable.

Example 6

The length of a swimming pool is 20 ft longer than the width. Express the length of the pool in terms of the width.

Solution:

the width of the pool: W	Assign a variable to the width of the pool.
the length is 20 more than the width: $W + 20$	Express the length of the pool in terms of W.