8-24-11

Wednesday, August 10, 2011
9:21 AM

1.4 Multiplication

OBJECTIVES	
a	Multiply whole numbers.
b	Use multiplication in finding area.

a Multiply whole numbers.

The multiplication 4 × 5 corresponds to this repeated addition:

We combine 4 sets of 5 desks each.

5 desks
5 desks
5 desks
5 desks

Factor Factor Product

$4 \bullet 5$ desks $= 20$ desks

a Multiply whole numbers.

EXAMPLE A Multiply: 5 × 652.

Solution

	6 5 2	
×	5	
	1 0	Multiply the 2 ones by 5: 5 × 2 = 10
	2 5 0	Multiply the 5 tens by 5: 5 × 50 = 250
+	3 0 0 0	Multiply the 6 hundreds by 5: 5 × 600 = 3000
	3 2 6 0	Add.

a Multiply whole numbers.

EXAMPLE A Using a shorter form to multiply 5 × 652.

Solution

```
   2 1
   6 5 2
×      5
--------
 3 2 6 0
```

Multiply the ones by 5: 5 · (2 ones) = 10 ones = 1 ten + 0 ones. Write 0 in the ones column and 1 above the tens.

Multiply the 5 tens by 5: 5 · (5 tens) = 25 tens, 25 tens + 1 ten = 26 tens = 2 hundreds + 6 tens. Write 6 in the tens column and 2 above the hundreds.

Multiply the 6 hundreds by 5 and add 2 hundred: 5 · (6 hundreds) = 30 hundreds + 2 hundreds = 32 hundreds.

a Multiply whole numbers.

EXAMPLE B Multiply 53 × 47.

Solution

```
  1
  2
  5 3
× 4 7
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```

Multiplying by 7

Multiplying by 40. (We write a 0 and multiply 53 by 4)

Adding

a Multiply whole numbers.

EXAMPLE C Multiply: 325 × 674.

Solution

```
        3  2  5
    ×   6  7  4
   ------------
     1  3  0  0     Multiplying 325 by 4
  2  2  7  5  0     Multiplying 325 by 70
1 9  5  0  0  0     Multiplying 325 by 600
---------------
2 1  9, 0  5  0     Adding
```

a Multiply whole numbers.

EXAMPLE D Multiply: 450 × 326.

Solution

$$\begin{array}{r} 326 \\ \times\ 450 \\ \hline \end{array}$$

Multiplying by 5 tens. (We write 0 and then multiply 326 by 5.

Multiplying by 4 hundreds. (We write 00 and then multiply 326 by 4.

Adding

a Multiply whole numbers.

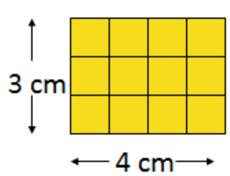
EXAMPLE E Estimate the following product by first rounding to the nearest ten and to the nearest hundred: 763 × 357.

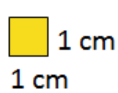
Solution

Nearest ten	Nearest hundred	Exact
760	800	763
×360	×400	×357
45600	320,000	5341
228000		38150
273,600		228900
		272,391

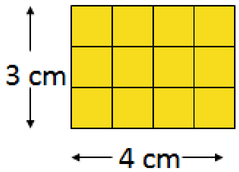
b Use multiplication in finding area.

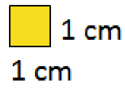
The area of a rectangular region can be considered to be the number of square units needed to fill it. Here is a rectangle 4 cm (centimeters) long and 3 cm wide. It takes 12 square centimeters (sq cm) to fill it.





b Use multiplication in finding area.





In this case, we have a rectangular array of 3 rows, each of which contains 4 squares. That is,

A = l × w = 3 cm × 4 cm = 12 sq cm.

b Use multiplication in finding area.

EXAMPLE F An adult soccer goal is 24 feet wide by 8 feet high. Find the shooting area.

Solution

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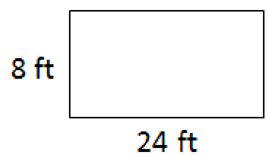


1.5 Division

OBJECTIVES

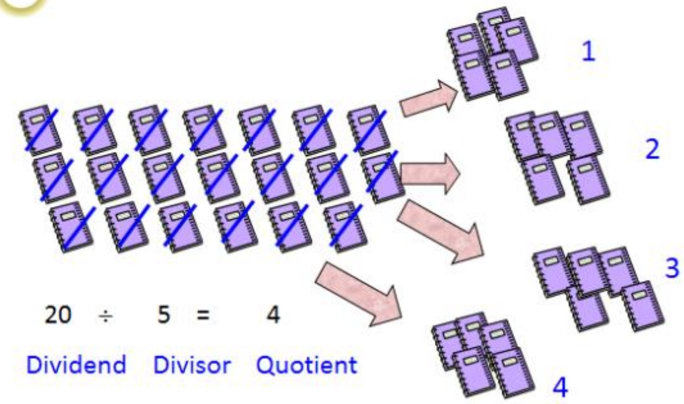
a Divide whole numbers.

a Divide whole numbers.

Division of whole numbers applies to two kinds of situations. The first is repeated subtraction. Suppose we have 20 notebooks in a pile, and we want to find out how many sets of 5 there are.

One way to do this is to repeatedly subtract sets of 5.

a Divide whole numbers.



a Divide whole numbers.

We can also think of division in terms of rectangular arrays. Consider again the pile of 20 notebooks and division by 5. We can arrange the notebooks in a rectangular array with 5 rows and ask, “How many are in each row?”

We can also consider a rectangular array with 5 notebooks in each column and ask, “How many columns are there?” The answer is still 4.

In each case, we are asking, “What do we multiply 5 by in order to get 20?”

5 × ?? = 20 20 ÷ 5 = ??

Division

The quotient $a \div b$, where $b \neq 0$, is that unique whole number c for which $a = b \cdot c$.

a Divide whole numbers.

EXAMPLE A Write two related division sentences: $9 \times 8 = 72$.

Solution

$$9 \cdot 8 = 72$$

This factor becomes a divisor.

$$9 = 72 \div 8$$

$$9 \cdot 8 = 72$$

Dividing by 1

Any number divided by 1 is that same number:

$$a \div 1 = \frac{a}{1} = a.$$

Dividing a Number by Itself

Any nonzero number divided by itself is 1:

$$\frac{a}{a} = 1,\ a \neq 0.$$

Dividends of Zero

Zero divided by any nonzero number is 0:

$$\frac{0}{a} = 0,\ a \neq 0.$$

Excluding Division by Zero

Division by 0 is not defined. (we agree not to divide by 0.)

$\frac{a}{0}$ is undefined or not defined.

Recall notebook example. How do you divide 20 notebooks into groups with 0 many notebooks?

a Divide whole numbers

EXAMPLE B Divide by repeated subtraction: 24 ÷ 7.

Solution

$$\begin{array}{r} 24 \\ -\ 7 \\ \hline 17 \\ -\ 7 \\ \hline 10 \\ -\ 7 \\ \hline 3 \end{array}$$

Subtracting 3 times

3 ← Remainder

a Divide whole numbers.

EXAMPLE C Divide $4369 \div 6.$

Solution $6\overline{)4369}$

Whole Number Division

a Divide whole numbers.

Whole Number Division

To do division of whole numbers:

a) Estimate.
b) Multiply.
c) Subtract.

a Divide whole numbers.

EXAMPLE D Divide $9858 \div 62$.

Solution

$$62\overline{)9858}$$

1.6 Rounding and Estimating; Order

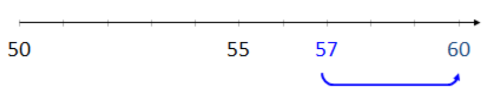
OBJECTIVES

- a Round to the nearest ten, hundred, or thousand.
- b Estimate sums, differences, products, and quotients by rounding.
- c Use < or > for □ to write a true sentence in a situation like 6 □ 10.

a Round to the nearest ten, hundred, or thousand.

EXAMPLE A Round 57 to the nearest ten.

Solution

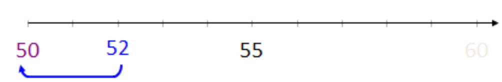


Since 57 is closer to 60, we round up to 60.

a Round to the nearest ten, hundred, or thousand.

EXAMPLE B Round 52 to the nearest ten.

Solution

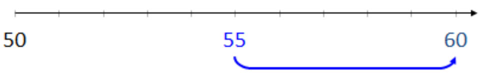


Since 52 is closer to 50, we round down to 50.

a Round to the nearest ten, hundred, or thousand.

EXAMPLE C Round 55 to the nearest ten.

Solution



We agree to round up to 60.

When a number is halfway between rounding numbers, round up.

a Round to the nearest ten, hundred, or thousand.

Rounding Whole Numbers

To round to a certain place:

a) Locate the digit in that place.
b) Consider the next digit to the right.
c) If the digit to the right is 5 or higher, round up. If the digit to the right is 4 or lower, round down.
d) Change all digits to the right of the rounding location to zeros.

a Round to the nearest ten, hundred, or thousand.

EXAMPLE D Round 7564 to the nearest hundred.

Solution

a) Locate the digit in the hundreds place, 5.

7 5 6 4

b) Consider the next digit to the right, 6.

7 5 6 4

c) Since that digit is 5 or higher, round 5 hundreds up to 6 hundreds.

d) Change all digits to the right of the hundreds digit to zeros.

7 6 0 0

a Round to the nearest ten, hundred, or thousand.

EXAMPLE E Round 88,696 to the nearest ten.

Solution

a) Locate the digit in the tens place, 9.

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b) Consider the next digit to the right, 6.

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c) ______________________________

d) ______________________________

b Estimate sums, differences, products, and quotients by rounding.

EXAMPLE F Mario and Greta are considering buying a new computer. There are two models, and each has options beyond the basic price, as shown below. Mario and Greta have a budget of $1100. Make a quick estimate to determine if the XS with a monitor, memory upgrade to 80 gig and a printer is within their budget.

EXAMPLE F Table

XS Model	LT Model
Basic price: $595	Basic price: $825
Monitor: $220	Monitor: $275
Memory upgrade: 40 gig: $75 80 gig: $90	Memory upgrade: 80 gig: $110
Printer: $120	Printer: included

EXAMPLE F **Solution**

XS Model
Basic price: $595
Monitor: $220
Memory upgrade: 40 gig: $75 80 gig: $90
Printer: $120

First, we list the base price and then the cost of each option. We then round each number to the nearest hundred and add.

XS	$595	$600
Monitor	$220	$200
Memory	$90	$100
Printer	+ $120	+ $100
		1000

The price of the computer is within their budget.

b Estimate sums, differences, products, and quotients by rounding.

EXAMPLE G Estimate the difference by first rounding to the nearest thousand: 8426 - 3840.

Solution

$$\begin{array}{r} 8426 \\ -\,3840 \\ \hline \end{array}$$

Order of Whole Numbers

For any whole numbers *a* and *b*:

1. $a < b$ (read "*a* is less than *b*") is true when *a* is to the left of *b* on a number line.
2. $a > b$ ("read *a* is greater than *b*") is true when *a* is to the right of *b* on a number line.

We call < and > **inequality symbols.**

c Use < or > for □ to write a true sentence in a situation like 6 □ 10.

EXAMPLE H Use < or > for □ to write a true sentence: 84 □ 94.

Solution

Since 84 is to the left of 94 on a number line, $84 < 94$.

1.7 Solving Equations

OBJECTIVES	
a	Solve simple equations by trial.
b	Solve equations like $t + 28 = 54$, $28 \cdot x = 168$, and $98 \cdot 2 = y$.

Solutions of an Equation

A **solution** is a replacement for the variable that makes the equation true. When we find all the solutions, we say that we have **solved** the equation.

a Solve simple equations by trial.

EXAMPLE A Solve $x + 15 = 39$ by trial.

Solution

We replace *x* with several numbers.

If we replace *x* with 22, we get a false equation: $22 + 15 = 39$.

If we replace *x* with 23, we get a false equation: $23 + 15 = 39$.

If we replace *x* with 24, we get a true equation: $24 + 15 = 39$.

No other replacement makes the equation true, so the solution is 24.

a Solve simple equations by trial.

EXAMPLE B Solve: 1. $8 + n = 35$
2. $54 \div 9 = y$

Solution

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Solving $x + a = b$

To solve $x + a = b$ for x, subtract a from both sides.

b Solve equations like $t + 28 = 54$, $28 \cdot x = 168$, and $98 \cdot 2 = y$.

EXAMPLE C Solve: $t + 37 = 83$.

Solution

$t + 37 = 83$

$t + 37 - 37 = 83 - 37$ Subtracting 37 from both sides.

$t + 0 = 46$

$t = 46.$

Check: $t + 37 = 83$

46 + 37	83
83	true

b Solve equations like $t + 28 = 54$, $28 \cdot x = 168$, and $98 \cdot 2 = y$.

EXAMPLE D Solve: $8365 + x = 9301$.

Solution

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Check:

Solving $a \cdot x = b$

To solve $a \cdot x = b$ for x, divide both sides by a.

b Solve equations like $t + 28 = 54$, $28 \cdot x = 168$, and $98 \cdot 2 = y$.

EXAMPLE E Solve: $18 \cdot y = 1476$

Solution

$18 \cdot y = 1476$

$\frac{18 \cdot y}{18} = \frac{1476}{18}$ Dividing both sides by 18

$y = 82$

Check: $18 \cdot y = 1476$

$18 \cdot 82 = 1476$

$1476 = 1476$ True

b Solve equations like $t + 28 = 54$, $28 \cdot x = 168$, and $98 \cdot 2 = y$.

EXAMPLE F Solve: $4032 = 56 \cdot y$

Solution

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