Lesson 1.4 Operations with Rational Numbers (Fractions)

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MCA Lesson 1....

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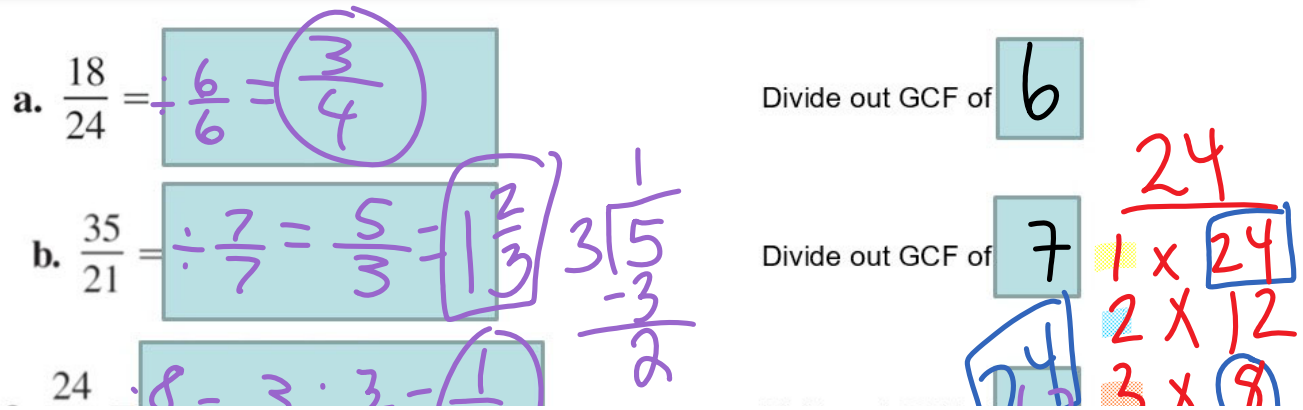
1.4 Operations with Rational Numbers

What You Will Learn

- Rewrite fractions as equivalent fractions.
- Add and subtract fractions.
- Multiply and divide fractions.
- Add, subtract, multiply, and divide decimals.

Example 1 – Writing Fractions in Simplest Form



c. $\frac{24}{72} = \frac{8}{8} = \frac{3}{9} \div \frac{3}{3} = \frac{1}{3}$

Divide out GCF of 12

$\frac{24}{72} \div \frac{24}{24}$ $\frac{24}{72} \div \frac{12}{12} = \frac{2}{6} \div \frac{2}{2} = \frac{1}{3}$

Example 3 – Writing Rational Numbers in Decimal Form 1

- You can divide any integer by any nonzero integer. rational numbers can be represented as **terminating** or **repeating decimals**. Here are some examples.

Terminating Decimals		*Repeating Decimals*	
$\frac{1}{4}$ =	0.25	$\frac{1}{3}$ =	$0.\overline{3}$
$\frac{3}{8}$ =	0.375	$\frac{2}{11}$ =	$0.\overline{18}$
$\frac{2}{10}$ =	0.2	$\frac{1}{12}$ =	$0.08\overline{3}$
$\frac{5}{16}$ =	0.3125	$\frac{8}{33}$ =	$0.\overline{24}$

- Note that bar notation is used to indicate the repeated digit (or digits) in decimal notation.

Example 3 – Writing Rational Numbers in Decimal Form 2

Write each rational number in decimal form.

a. $2\frac{1}{4}$ $\frac{9}{4} = 2.25$

b. $\frac{5}{12} = 0.41\overline{6}$

b. $\frac{5}{12}$ = 0.416

Solution

Begin by writing the mixed number as a fraction

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Example 5 – Adding and Subtracting with Like Denominators

a. $\frac{3}{12} + \frac{4}{12} =$ $\frac{7}{12}$

b. $\frac{7}{9} - \frac{2}{9} =$ $\frac{5}{9}$

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Example 6 – Adding and Subtracting with Unlike Denominators

$\frac{4}{5}$

a. $\frac{4}{5} + \frac{11}{15} =$ $\frac{4}{5} \times \frac{3}{3} = \frac{12}{15}$

$\frac{11}{15} \times 1 = \frac{1}{\quad}$

LCM of 5 and 15 is 15.

$= \frac{11}{15} \times \frac{1}{1} = \frac{1}{15}$

$= \frac{13}{15}$

Rewrite with like denominators.

Add numerators.

b. $1\frac{7}{9} - \frac{11}{12} = \frac{16}{9} \times \frac{4}{4} = \frac{64}{36}$

$= \frac{11}{12} \times \frac{3}{3} = \frac{33}{36}$

$= \frac{31}{36}$

Rewrite $1\frac{7}{9}$ as $\frac{16}{9}$.

LCM of 9 and 12 is 36.

Rewrite with like denominators

Subtract numerators.

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Example 8 – Finding the Yardage for a Clothing Design

A designer uses $3\frac{1}{6}$ yards of material to make a skirt $2\frac{3}{4}$ and yards to make a shirt. Find the total amount of material required.

6, 12, 18
4, 8, 12

Solution

$\frac{19}{6} \times \frac{2}{2} = \frac{38}{12}$

$+ \frac{11}{4} \times \frac{3}{3} = \frac{33}{12}$

$\frac{71}{12}$

$12\overline{)71}$ $\quad 5$, -60, 11

$5\frac{11}{12}$ yds

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Example 9 – Multiplying Fractions

Example 9 – Multiplying Fractions

$$\frac{5}{8} \cdot \frac{3}{2} = \frac{15}{16}$$ Multiply numerators and denominators

$$= \frac{15}{16}$$ Simplify.

Let *a*, *b*, *c*, and *d* be integers with $b \neq 0$, $c \neq 0$, and $d \neq 0$.

Then the quotient of a/b and c/d is

keep

$$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$$ flip

Change

Invert divisor and multiply.

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Example 10 – Dividing Fractions

$$\frac{5}{8} \div \frac{20}{12} =$$

Keep

$$\frac{5}{8} \times \frac{12}{20}$$

Change

$$= \frac{5}{8} \times \frac{12}{20}$$

$$= \frac{5}{8} \times \frac{12}{20} = \frac{60}{160} \quad \frac{6}{16} \div \frac{2}{2} = \frac{3}{8}$$

$$1 \quad 3 \qquad = \frac{3}{8}$$

$$\frac{5}{8} \times \frac{12}{20} = \frac{3}{8}$$

$$2 \quad 4 \qquad 4$$

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Example 11 – Finding the Numbers of Calories Burned

You decide to take a tennis class. You burn about 400 calories per hour playing tennis. In one week, you played tennis for $\frac{3}{4}$ hour on Tuesday, 2 hours on Wednesday, and $1\frac{1}{2}$ on Thursday.

400 1H
800 2H
1200 3H

0.75 x 400 = 300

400 x 2 = 800

1.5 x 400 = 600

How many total calories did you burn playing tennis during that week?

1700

What was your average number of calories burned per day playing tennis?

$\frac{300 + 800 + 600}{3} = \frac{1700}{3} = 566.\overline{6}$

Example 11 – Finding the Numbers of Calories Burned cont'd

Solution

The total number of calories you burned playing tennis during the week was

$$400\left(\frac{3}{4}\right) + 400(2) + 400\left(1\frac{1}{2}\right) = 300 + 800 + 600$$
$$= 1700 \text{ calories.}$$

The average number of calories burned per day was

$$\frac{1700 \text{ calories}}{3 \text{ days}} = 566\frac{2}{3} \text{ calories per day.}$$

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Example 12 – Adding and Multiplying Decimals

a.

$$\begin{array}{r} 0.5830 \\ 1.0600 \\ +\ 2.9104 \\ \hline 4.5534 \end{array}$$

b.

$$\begin{array}{r} -3.57 \\ \times\ 0.032 \\ \hline -0.11424 \end{array}$$

Two decimal places
Three decimal places

Five decimal places

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Example 13 – Dividing Decimals

$$\frac{1.483}{0.56}$$

265

Example 14 – Finding a Cell Phone Charge

A cellular provider charges $5.35 for the first 200 text messages per month and $0.10 for each additional text message.

a. Find the cost of 263 text messages. $0.10(63) = 6.30 + 5.35 = 11.65$

b. Can you save money by switching to a plan that allows unlimited text messages for $10 per month? $11 > 10$

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Example 14 – Finding a Cell Phone Charge cont'd

Solution

a. You sent or received 63 text messages above 200. The cost of these is

$$(\$0.10)(63) = \$6.30$$

So, your total charge for the month is

$$\$5.35 + \$6.30 = \$11.65$$

b. If you continue to send and receive this number of text messages each month, you can save money by

b. If you continue to send and receive this number of text messages each month, you can save money by switching to plan that allows unlimited text messages for $10 per month.