# Applications Involving Rational Functions

## MATH 101 *College Algebra*

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# Objectives

In this lesson we will learn to:

- solve applied problems related to fractions,
- solve applied problems related to work, and
- solve applications involving distance, speed, and time.

# Reminder: Word Problem Strategy

In order to solve a word problem:

1. Read the problem carefully (several times, if necessary).
2. Assign a variable to the unknown quantity being asked for.
3. Draw a picture or set up a chart if possible.
4. Compose an equation relating the quantities mentioned in the problem.
5. Solve the equation.
6. Check the solution for consistency with the original problem.

# Problems Related to Fractions

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Let $x$ be the original number.

$$\frac{x-4}{2} = 1 + \frac{1}{5}x \quad \text{(LCM: 10)}$$

$$10\left[\frac{x-4}{2}\right] = 10\left[1 + \frac{1}{5}x\right]$$

$$5(x-4) = 10 + 2x$$

$$5x - 20 = 10 + 2x$$

$$3x = 30$$

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Check: $\frac{10-4}{2} = \frac{6}{2} = 3 = 1 + \frac{1}{5}(10) = 1 + 2 = 3$

# Problems Related to Work (1 of 2)

A carpenter and her partner can build a patio cover in $3\frac{3}{7}$ hours. The partner working alone can build the patio cover in 8 hours. How long would it take the carpenter working alone to build the patio cover?

# Problems Related to Work (1 of 2)

A carpenter and her partner can build a patio cover in $3\frac{3}{7}$ hours. The partner working alone can build the patio cover in 8 hours. How long would it take the carpenter working alone to build the patio cover?

- $3\frac{3}{7} = \frac{24}{7}$ hours.
- The partner builds $1/8$ of the patio cover per hour.
- Let $t$ be the number of hours the carpenter needs to build the patio cover alone.
- The carpenter builds $1/t$ of the patio cover per hour.
- Working together they build $\frac{1}{t} + \frac{1}{8}$ of the patio cover per hour.

# Problems Related to Work (2 of 2)

A carpenter and her partner can build a patio cover in $3\frac{3}{7}$ hours. The partner working alone can build the patio cover in 8 hours. How long would it take the carpenter working alone to build the patio cover?

# Problems Related to Work (2 of 2)

A carpenter and her partner can build a patio cover in $3\frac{3}{7}$ hours. The partner working alone can build the patio cover in 8 hours. How long would it take the carpenter working alone to build the patio cover?

Working together then the two build 1 patio cover in $24/7$ hours.

$$\left[\frac{1}{t}+\frac{1}{8}\right]\frac{24}{7}=1$$

$$\frac{1}{t}+\frac{1}{8}=\frac{7}{24}$$

$$24t\left[\frac{1}{t}+\frac{1}{8}\right]=24t\left[\frac{7}{24}\right]$$

$$24+3t=7t$$

$$24=4t$$

$$t=6 \quad \text{hours}$$

# Problems Related to Distance, Speed, and Time

**Recall:** $d = rt$ or $r = \frac{d}{t}$ or $t = \frac{d}{r}$.

Kirk can bike 32 miles in the same amount of time as Karl can bike 24 miles. If Kirk bikes 2 mph faster than Karl, how fast does each man bike?

# Problems Related to Distance, Speed, and Time

**Recall:** $d = rt$ or $r = \frac{d}{t}$ or $t = \frac{d}{r}$.

Kirk can bike 32 miles in the same amount of time as Karl can bike 24 miles. If Kirk bikes 2 mph faster than Karl, how fast does each man bike?

Let $r$ be Kirk's speed.

$$\frac{32}{r} = \frac{24}{r-2} \quad \text{(LCM: } r(r-2)\text{)}$$

$$r(r-2)\left[\frac{32}{r}\right] = r(r-2)\left[\frac{24}{r-2}\right]$$

$$32(r-2) = 24r$$

$$32r - 64 = 24r$$

$$8r = 64$$

$$r = 8$$

Kirk bikes at 8 mph and Karl bikes at 6 mph.