

Solve Ratio and Proportion Set-Up Problems

A **proportion** is a mathematical statement that two ratios are equal.

When you read TASC problems, determine whether you can represent a problem as a proportion. If you can identify two values to form one ratio, a third value, and an unknown (represent with x), you can set up a proportion to solve for the missing value.

Example

Sandi bought three tickets to a baseball game for \$19.50. At the same rate, how much would she pay for five tickets?

 **THINK:** *I will write a proportion using x to represent the cost of five tickets.*

Start with the ratio *tickets : dollars*. The numerators should both represent a number of tickets, and the denominators should be dollar amounts.

Step 1: Write the proportion using the ratio *tickets to dollars*:

$$\frac{\text{tickets}}{\text{dollars}} \quad \frac{3}{19.50} = \frac{5}{x}$$

Step 2: Solve. Find the two numbers that are diagonal from each other across the equals sign. Multiply these numbers. (This process is often called cross-multiplying.) Then divide by the remaining term: $(\$19.50 \times 5) \div 3 = \32.50 .

SOLUTION: Five tickets would cost **\$32.50**.

On the TASC, you may see set-up problems that are based on solving a proportion. To answer a set-up problem, read the problem and write a proportion. Write an expression that cross-multiplies and divides by the remaining term. Compare your expression to the options given.


The correct set-up for this example could be written $(\$19.50 \times 5) \div 3$ or $\frac{\$19.50(5)}{3}$.

Both expressions contain the same sequence of operations.

TASC Problem

If 6 pounds of fertilizer will cover 1,000 square feet of lawn, which of the following expressions could be used to find out how many pounds will be needed to cover 2,500 square feet?

- A $\frac{2500}{6(1000)}$
- B $(6 \times 1000) \div 2500$
- C $\frac{6(2500)}{1000}$
- D $\frac{1000}{6(2500)}$

 **THINK:** *The answer choices are expressions, so I should write a proportion and then find the answer choice that performs the operations in the correct order.*

Step 1: The problem compares pounds to square feet. Write a proportion, using x for the unknown value.

$$\frac{\text{pounds}}{\text{square feet}} \quad \frac{6}{1000} = \frac{x}{2500}$$

Step 2: To solve, I would multiply 6 and 2,500 and divide by 1,000. Only option C shows this.

ANSWER: C $\frac{6(2500)}{1000}$ 15

TESTWISE

In a proportion, both ratios have to have the labels in the same order. If you put *pounds* on top in one ratio, *pounds* must also be on top in the other ratio.

Solve the problems below. For questions 1–3, write the correct proportion first. Then choose the correct expression.

1. A scale on a map is 2 inches to 300 miles. Which of the following expressions could be used to find how many miles are between two cities that are 5 inches apart on the map?
- A** $(300 \times 2) \div 5$
B $(2 \times 5) \div 300$
C $300 \div (2 \times 5)$
D $(300 \times 5) \div 2$

Proportion: _____

2. Cathy drives 144 miles on 6 gallons of gas. Which of the following expressions could be used to find how many miles she could drive on a full tank of 13 gallons of gas?
- A** $\frac{144(6)}{13}$
B $\frac{144(13)}{6}$
C $\frac{6(13)}{144}$
D $\frac{13}{6(144)}$

Proportion: _____

3. On an assembly line, Marcia can inspect 12 products in 1.5 hours. Which of the following expressions could be used to find how many products she can inspect in 8 hours?
- A** $12 \div (1.5 \times 8)$
B $\frac{12(1.5)}{8}$
C $\frac{12(8)}{1.5}$
D $\frac{1.5(8)}{12}$

Proportion: _____

4. A cookbook recommends a 12-pound turkey to serve five dinner guests. Which expression could be used to find out how many dinner guests a 20-pound turkey will serve?
- A** $(5 \times 20) \div 12$
B $5 \times (20 \div 12)$
C $20 \times (5 \div 12)$
D $(5 \times 12) \div 20$

5. A wood floor cleaner has the following instruction label:



Add 7 cups of water to 2 cups of cleaner.

Stan has 15 cups of floor cleaner left. Which of the following expressions could be used to find how many cups of water he should add to the available cleaner?

- A** $\frac{15(2)}{7}$
B $\frac{7(2)}{15}$
C $\frac{15+7}{2}$
D $\frac{15(7)}{2}$

6. Gracie earned \$63.75 for five hours of work. Which expression could be used to find how much she would earn for two hours of work?
- A** $(\$63.75 \times 2) \div 5$
B $(2 \times 5) \div \$63.75$
C $\$63.75 \div (2 \times 5)$
D $(\$63.75 \times 5) \div 2$

Word Problems with Ratios and Proportions

<p>1. D $(300 * 5) \div 2$</p>	$\frac{2 \text{ inches}}{300 \text{ miles}} = \frac{5 \text{ inches}}{X \text{ miles}}$ <p>On this and all other proportion problems, proportions could both be flipped (miles on top)and also be correct, i.e.</p> $\frac{300 \text{ miles}}{2 \text{ inches}} = \frac{x \text{ miles}}{5 \text{ inches}}$
<p>2. B $\frac{144(13)}{6}$</p>	$\frac{144 \text{ miles}}{6 \text{ gallons}} = \frac{x \text{ miles}}{13 \text{ gallons}}$
<p>3. C $\frac{12(8)}{1.5}$</p>	$\frac{12 \text{ products}}{1.5 \text{ hrs}} = \frac{x \text{ products}}{8 \text{ hrs}}$
<p>4. A $(5 * 20) \div 12$</p>	$\frac{12 \text{ lbs}}{5 \text{ guests}} = \frac{20 \text{ lbs}}{x \text{ guests}}$
<p>5. D $\frac{15(7)}{2}$</p>	$\frac{7 \text{ cups water}}{2 \text{ cups cleaner}} = \frac{x \text{ cups water}}{15 \text{ cups cleaner}}$
<p>6. A $(\\$63.75 * 2) \div 5$</p>	$\frac{\$63.75}{5 \text{ hrs}} = \frac{\$ x}{2 \text{ hrs}}$