## Concrete Ratios

In this lesson, students use ratio reasoning to determine the quantity of pervious concrete needed to build a walkway.

LANGUAGE SUPPORT
MATH TERMS
ratio
relationship between two or more numbers
volume
the measurement of the 3-dimensional space that an object occupies

## ACADEMIC LANGUAGE

aggregate
a mixture of sand, gravel, and crushed rocks
pervious concrete porous concrete that absorbs water for better drainage

## SET UP

## Introduce Chapter 4 from Math Meets Homebuilding.

Ask questions to review Lesson 2 and connect to Lesson 3.
For example: How did drawing a model help you solve the problem in the last lesson? (The visual model helped me to understand and compare the dimensions by considering the shape and size of the areas.)

Have students make a list of environmental factors that affect their region. (snow, heat waves, ice, drought, flooding)
Today, we'll find the amounts of aggregate and cement needed to make a special type of concrete that helps reduce the negative effects of flooding.

## (1) Play Chapter 4: Concrete Ratios.


[Pause at 1:51.]

## PLAN

## Create a plan to solve the problem.

A walkway is 11 feet long, 7 feet wide, and 0.5 foot deep. The basic pervious concrete mix is 4 parts aggregate to 4.5 parts loose cement, with some water added. How many cubic feet of aggregate and cubic feet of cement do we need to build the walkway?

Read the problem aloud to students.
Guide students to analyze the quantities and look for entry points to solve the problem.

For example: What is the problem asking us to find? (the amounts of aggregate and cement needed to make enough pervious concrete for the walkway)
Point out to students that they can create a ratio table to analyze the different parts.

What information do we have? (the ratio of aggregate to cement; the dimensions of the walkway) How do we begin solving the problem? (Find the volume of concrete needed for the walkway.)

Use Tools Strategically Students choose to use a ratio table, an equation, or a proportion to solve a multi-step problem.

Use Repeated Reasoning Students use repeated reasoning to generate equivalent ratios and find the missing quantities.

## SOLVE

## Have student pairs solve the problem as you circulate.

Encourage students to come up with multiple strategies and represent the problem situation in different ways. Guide students to work backwards to check their work.

## SUPPORT

Ask questions based on common errors to support student understanding.

- What units do we use to measure volume?
- Will the final mixture have more aggregate or more loose cement? How do you know?
- This problem gives us a part-part ratio of aggregate to cement. How can we create a part-whole ratio?


## EXTEND

Ask questions to encourage students to extend their thinking.

- Why can't we set up a proportion with the given ratio and the total volume?
- What type of ratio can we create to set up a proportion? How can we create it?
- If we use a part-whole ratio, what do we need to do at the end to get our answer?


## SHARE

## Have students present their solutions.

Ask students from each pair to explain their solutions to the class. Show at least two different approaches to solving the problem and one incorrect solution. To extend classroom discussion, call on students to explain the reasoning of the student who is presenting.

## Possible student work:

Volume $=1 \times w \times h$

$$
\begin{aligned}
\frac{4}{8.5} & =\frac{x}{38.5} \\
4 \times 38.5 & =8.5 x \\
154 & =8.5 x \\
\frac{154}{8.5} & =x \\
x & \approx 18.12
\end{aligned}
$$

$11 \mathrm{ft} \times 7 \mathrm{ft} \times 0.5 \mathrm{ft}=38.5 \mathrm{cu} \mathrm{ft}$
Aggregate : cement $=4: 4.5$
Aggregate: Whole $=4: 8.5$
Let $x$ represent the amount of aggregate.

The mixture will use 18.12 cu ft of aggregate
38.5 and 20.38 cu ft of cement.
$\frac{-18.12}{20.38}$
Play the Chapter 4 Solution from Math Meets Homebuilding.
Have students complete the Practice and Reflect sections on Student Page 2.

## HOMEWORK

 IDEASHave students apply ratio reasoning!
Students estimate the ratios of parts of a building.

- What is the ratio of windows to wall space? The ratio of outdoor space to indoor space?
- What other types of ratios do you think people consider when buying a home?
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## PLAN Create a plan to solve the problem with your partner.

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## PRACTICE Apply your skills to solve another problem.

A living room will be painted blue with white trim. The ratio of the surface area between the trim and the walls is $1: 10$. If 2 gallons of blue paint are used for the walls, how many pints of white paint do we need for the trim? (Hint: 1 gallon = 8 pints)

## REFLECT Explain how you made sense of the math.

How did you find the unknown quantities?
I found the unknown quantities by $\qquad$
$\qquad$
$\qquad$
$\qquad$

Why are ratios important in homebuilding?
Ratios are important in homebuilding because
$\qquad$
$\qquad$

