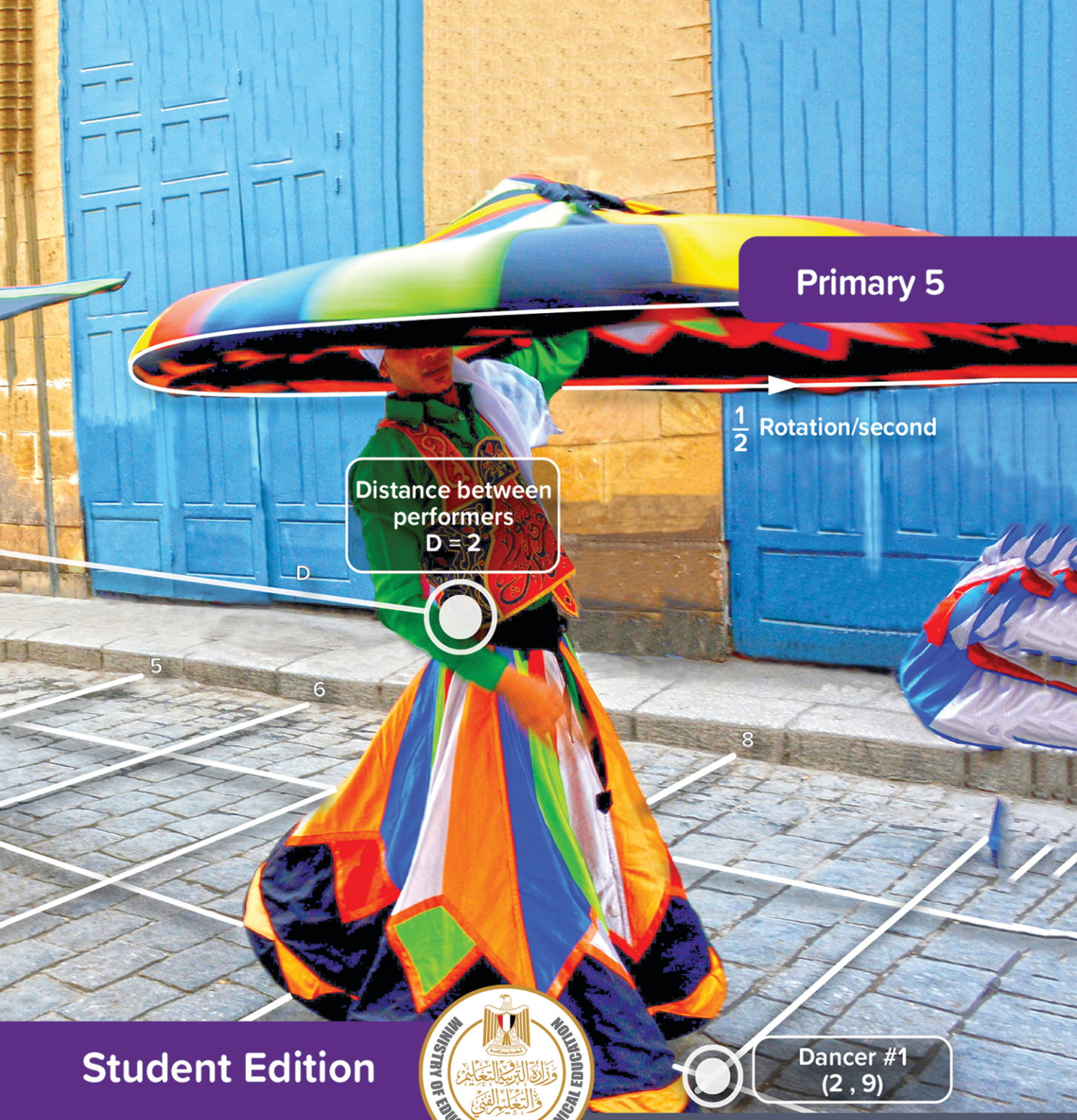


Student Edition

MINISTRY OF EDUCATION AND TECHNICAL EDUCATION

Math Term 2

2025 - 2026

Primary 5 Math

Name _____



FOREWORD

This is a pivotal time in the history of the Ministry of Education and Technical Education (MOETE) in Egypt. We are embarking on the transformation of Egypt's K-12 education system. We started in September 2018 with the rollout of KG1, KG2, and Primary 1. In 2021 we rolled out Primary 4, and we will continue with the rollout until 2030. We are transforming the way in which students learn to prepare Egypt's youth to succeed in a future world that we cannot entirely imagine.

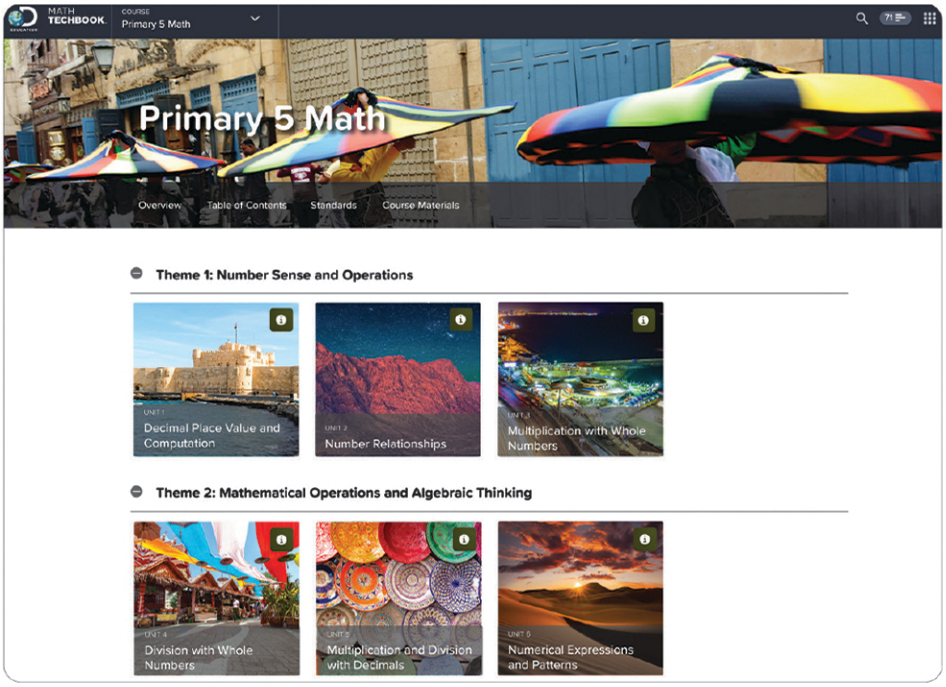
MOETE is very proud to present this new series of textbooks, with the accompanying digital learning materials that captures its vision of the transformation journey. This is the result of much consultation, much thought and a lot of work. We have drawn on the best expertise and experience from national and international organizations and education professionals to support us in translating our vision into an innovative national curriculum framework and exciting and inspiring print and digital learning materials.

The MOETE extends its deep appreciation to its own "Central Administration for Curriculum Development" (CACD) and "Discovery Education," .

This transformation of Egypt's education system would not have been possible without the significant support of Egypt's current president, His Excellency President Abdel Fattah el-Sisi. Overhauling the education system is part of the president's vision of "rebuilding the Egyptian citizen" and it is closely coordinated with the ministries of Higher Education & Scientific Research, Culture, and Youth & Sports. Education 2.0 is only a part in a bigger national effort to propel Egypt to the ranks of developed countries and to ensure a great future to all of its citizens.

Dear Parent/Guardian,

Welcome to Primary 5 Mathematics Techbook™! This comprehensive program inspires students to make sense of the world around them and to think and act like mathematicians. Throughout the digital and print program, students learn to reason mathematically, communicate using mathematical language, ask meaningful questions, solve complex problems, and work collaboratively with peers.



Primary 5 Mathematics Techbook was designed and written to teach to the Ministry of Education and Technical Education (MOETE) Primary 5 mathematics standards. The structure of Primary 5 Mathematics Techbook represents the Ministry's shifts in the Framework for Education 2.0, specifically focusing on accessing new and prior knowledge, building contextual understanding and procedural fluency, and making connections across mathematics to support application of skills and concepts. To help students make sense of mathematical content, the program also integrates a thematic approach and a variety of real-world scenarios.



Dear Parent/Guardian, *continued*

Primary 5 Mathematics Techbook challenges students to build on what they learned in previous grades, applying concepts and skills in new ways. Students also learn new and complex concepts and skills that prepare them for the challenges of Primary 6 and beyond. Primary 5 students assume greater responsibility for their own learning and are encouraged to seek opportunities to apply the mathematics they are learning in the world around them.

The major work of Primary 5 includes multiplication and division of whole numbers, fractions, mixed numbers, and decimals, as well as numerical expressions. Students also explore patterns, coordinate planes, and pie charts. Although these may seem like separate topics, students investigate and apply patterns and relationships among the topics to build a deeper understanding of each. They explore relationships between fractions and decimals, connect their understanding of two-dimensional figures to coordinate grids, apply the inverse relationship between multiplication and division, and draw parallels between fractions, decimals, and pie charts. Students learn to think like mathematicians as they notice patterns and rules, persevere to solve challenging problems, represent and explain their thinking, model their solutions, and strive for accuracy.

To inspire and motivate learning and curiosity, Primary 5 Mathematics Techbook features clear and engaging text, videos, digital tools, and Hands-On Activities. Hands-On Activities require students to investigate patterns and rules in mathematics and challenge them to communicate using mathematical language and models. The program also engages students in many kinds of writing and asks them to explain their reasoning and support their thinking using words, numbers, pictures, and symbols. When students engage in rich tasks that access prior knowledge and build reasoning, it is easier for them to make connections to the real world and to other mathematical learning.





Primary 5 Mathematics Techbook is divided into units. Each unit is divided into concepts, and each concept is divided into lessons. Each lesson has three main sections: ACCESS, BUILD, and CONNECT.

ACCESS Students activate their prior knowledge and begin to develop and express mathematical language.

BUILD Students focus on communicating their understanding, reasoning, evidence, and mathematical strategies.

CONNECT Students build deep conceptual understanding and a strong foundation for accessing knowledge in future lessons.

In addition, **WRAP-UP**, **PRACTICE**, and **CHECK YOUR UNDERSTANDING** features allow students to demonstrate their learning either verbally or in writing.

Within this Student Edition, you will find QR codes and Quick codes that take you and your student to a corresponding section of Primary 5 Mathematics Techbook online.

We encourage you to support your student in using the print and online interactive materials on any device. Together, may you and your student enjoy a fantastic year of mathematics.

Sincerely,

The Math Team



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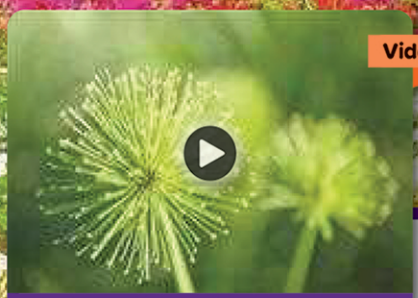
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UNIT

7

Theme 3 | Fractions, Decimals, and Proportional Relationships

Unit 7 Adding and Subtracting Fractions



Fractions and Papyrus

Unit Video Questions

The Unit 7 Opener Video explores math around Egypt through fractions. In this unit, you will learn to add and subtract fractions. You will explore strategies to help you solve problems.

Quick Code
egm5145

- ☐ How did Omar and Mariam make sense of the world around them using fractions?
- ☐ What did Omar and Mariam discover about adding and subtracting fractions?

MINISTRY OF EDUCATION AND TECHNICAL EDUCATION
وزارة التربية والتعليم والتعليم الفني

LESSON 1

Finding Like Denominators Using the LCM

Learning Targets

- I can generate pairs of fractions with like denominators.
- I can explain how to find like denominators.

ACCESS

Equivalent Fractions on a Multiplication Chart On your multiplication chart, highlight the row with the first 12 multiples of 2 and the row with the first 12 multiples of 3. Write the vertical pairs of numbers that are highlighted as fractions.

BUILD

Multiples on the Multiplication Chart Use the multiplication chart to find like denominators. Rewrite one or both fractions so they have the same denominator.

1. $\frac{1}{4}$ and $\frac{3}{12}$

2. $\frac{2}{5}$ and $\frac{5}{8}$

3. $\frac{2}{3}$ and $\frac{5}{9}$

4. $\frac{3}{7}$ and $\frac{3}{8}$

5. $\frac{2}{6}$ and $\frac{4}{5}$

Photo Credit: Nae84 / Shutterstock.com



Using the LCM Find the smallest like denominator for the fractions listed. Then, change each fraction so that each fraction is rewritten with the smallest like denominator.

1. $\frac{4}{9}$ and $\frac{2}{3}$

2. $\frac{1}{3}$ and $\frac{2}{7}$

3. $\frac{1}{5}$ and $\frac{1}{4}$

4. $\frac{2}{9}$ and $\frac{7}{12}$

5. $\frac{5}{6}$ and $\frac{3}{8}$

6. $\frac{2}{3}$ and $\frac{1}{4}$

7. $\frac{3}{4}$ and $\frac{5}{12}$

8. $\frac{5}{8}$ and $\frac{7}{12}$

Photo Credit: Nae84 / Shutterstock.com

CONNECT

Writing About Math Explain in your own words two ways to find equivalent fractions.

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 2

Using Models to Add and Subtract Fractions with Unlike Denominators

Learning Target

- I can use models to represent addition and subtraction of fractions with **unlike denominators**.

ACCESS

Error Analysis Hend told Gehad about a garden she visited over the weekend. She said that the garden was split into sections and that $\frac{4}{5}$ of the sections were red poppies and $\frac{2}{3}$ of the sections were cornflowers. Hend also mentioned that each section had only one type of flower. Gehad told Hend that she must have made a mistake because $\frac{4}{5}$ and $\frac{2}{3}$ would be more than the whole garden.

Is Gehad correct? Explain your reasoning.

BUILD

Whiteboard: Modeling with a Fraction Wall Model fraction addition and subtraction using fraction wall pieces for fractions up to sixths.

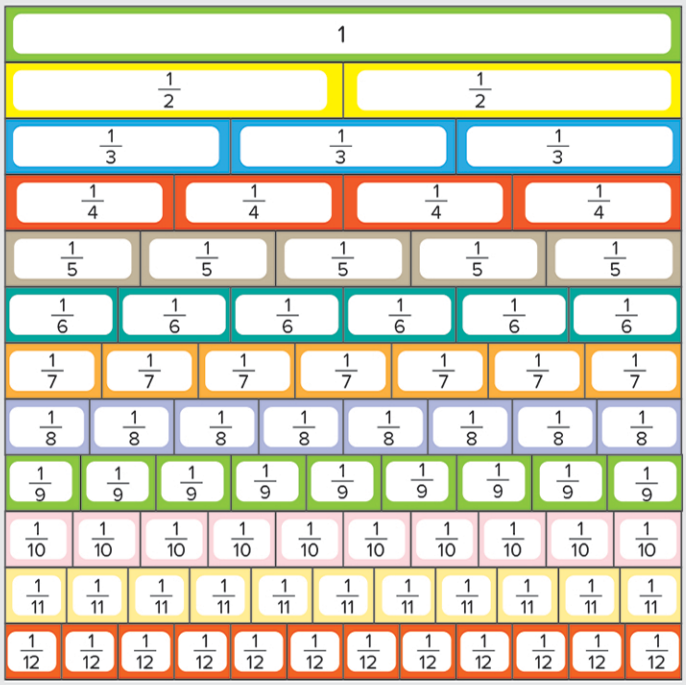


Photo Credit: Nae84 / Shutterstock.com



Modeling with a Fraction Wall Use the fraction wall to evaluate each sum or difference.

1. $\frac{2}{3}+\frac{1}{4}=$ _____
2. $\frac{1}{3}+\frac{5}{6}=$ _____
3. $\frac{3}{10}-\frac{1}{5}=$ _____
4. $\frac{3}{4}+\frac{1}{3}=$ _____
5. $\frac{4}{5}-\frac{1}{2}=$ _____
6. $\frac{1}{3}+\frac{1}{6}=$ _____
7. $\frac{2}{4}-\frac{2}{8}=$ _____
8. $\frac{5}{8}+\frac{1}{4}=$ _____
9. $\frac{1}{2}-\frac{2}{6}=$ _____
10. $\frac{1}{2}+\frac{3}{4}=$ _____

CONNECT

Writing About Math Hend and Gehad evaluate the given expression.

$$\frac{7}{8}-\frac{3}{4}$$

Gehad said that the difference is $\frac{4}{4}$, and Hend said that the difference is $\frac{1}{8}$.

Who is correct? Show your work and explain your thinking using numbers, words, and pictures.

Photo Credit: Nae84 / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 3

Adding and Subtracting Fractions with Unlike Denominators

Learning Targets

- I can add and subtract fractions with unlike denominators.
- I can use benchmark fractions and number sense of fractions to assess the reasonableness of answers.

ACCESS

Chamomile Crops Chamomile is one of the most important flowers that grow in Egypt. Its scent is often used in products like soaps and perfumes. It is also used in some foods and teas.

At Shorouk's chamomile farm, $\frac{1}{10}$ of the crop is used for food and another $\frac{2}{5}$ is for making chamomile tea.

Draw a diagram or use the fraction wall to find the fraction of Shorouk's crop used for food and tea.

Chamomile Crops, Continued In one field, $\frac{4}{9}$ of the chamomile crop is used for soap, and the remaining chamomile is for perfume.

Draw a diagram or use the fraction wall to find the fraction of the field that is left for perfume.



Chamomile

Photo Credit: Nae84 / Shutterstock.com

BUILD

Unlike to Like Evaluate by rewriting the fractions with like denominators. Use estimation to check that your answer is reasonable.

1. $\frac{3}{4} + \frac{5}{12} =$ _____
2. $\frac{15}{15} - \frac{2}{3} =$ _____
3. $\frac{7}{9} - \frac{1}{3} =$ _____
4. $\frac{1}{2} + \frac{11}{12} =$ _____
5. $\frac{5}{8} - \frac{1}{2} =$ _____
6. $\frac{7}{9} - \frac{2}{3} =$ _____
7. $\frac{6}{7} - \frac{3}{14} =$ _____
8. $\frac{4}{5} - \frac{3}{10} =$ _____
9. $\frac{5}{12} - \frac{7}{36} =$ _____
10. $\frac{2}{3} - \frac{17}{30} =$ _____

Who Is Correct? Soliman, Seif, and Samar each added these fractions. Who is correct? Why?

$$\frac{1}{12} + \frac{2}{3}$$

Soliman's answer: $\frac{9}{12}$ Seif's answer: $\frac{3}{15}$ Samar's answer: $\frac{3}{4}$

1. Is Soliman correct? Why or why not?

2. Is Seif correct? Why or why not?

3. Is Samar correct? Why or why not?

Challenge Write your own subtraction problem with two fractions with unlike denominators and three possible solutions. Solve the problem and ask your classmates to decide which solutions are correct or incorrect.

CONNECT

Whiteboard: Flowering Quilt Project Abeer, Badr, Ehab, and Doha are making a quilt of 36 equal-sized fabric squares to represent flowering plants in Egypt.

Abeer made squares for $\frac{11}{36}$ of the quilt's area. Badr made squares for $\frac{1}{6}$ of the quilt's area.

What fraction of the quilt must Ehab make so that $\frac{1}{6}$ of the quilt's area will remain for Doha?

Represent different squares needed for given fractions of a quilt. Label the diagram and explain your thinking.

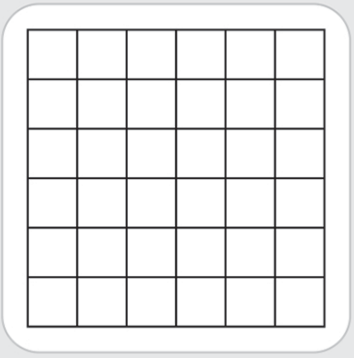


Photo Credit: Nae84 / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 4

More of Adding and Subtracting Fractions with Unlike Denominators

Learning Target

- I can add and subtract fractions with unlike denominators.

ACCESS

Create Your Own Write three different addition problems and three different subtraction problems using the given fractions. You do not need to find exact answers.

$\frac{1}{2}$	$\frac{4}{9}$	$\frac{3}{8}$	$\frac{5}{6}$	$\frac{2}{5}$
$\frac{1}{21}$	$\frac{8}{11}$	$\frac{6}{7}$	$\frac{7}{12}$	$\frac{9}{10}$

Photo Credit: Nae84 / Shutterstock.com

BUILD

Comvert from unlike to like fractions Evaluate each expression by rewriting the fractions with like denominators.

1. $\frac{1}{3}+\frac{1}{4}=$ _____

2. $\frac{1}{3}-\frac{1}{4}=$ _____

3. $\frac{1}{2}+\frac{2}{5}=$ _____

4. $\frac{1}{2}-\frac{2}{5}=$ _____

5. $\frac{5}{6}+\frac{3}{8}=$ _____

6. $\frac{5}{6}-\frac{3}{8}=$ _____



Partner Practice Evaluate each expression by rewriting the fractions with like denominators.

1. $\frac{3}{5}+\frac{1}{3}=$ _____

2. $\frac{11}{12}-\frac{7}{8}=$ _____

3. $\frac{1}{5}+\frac{1}{2}=$ _____

4. $\frac{5}{9}+\frac{1}{2}=$ _____

5. $\frac{3}{4}-\frac{1}{3}=$ _____

6. $\frac{1}{2}+\frac{1}{3}=$ _____

7. $\frac{1}{6}+\frac{5}{8}=$ _____

8. $\frac{7}{9}-\frac{1}{6}=$ _____

9. $\frac{1}{8}+\frac{3}{5}+\frac{9}{10}=$ _____

10. $1-\frac{1}{4}-\frac{1}{6}=$ _____

11. $1+\frac{7}{10}+\frac{3}{4}=$ _____

12. $2-\frac{7}{9}-\frac{1}{6}=$ _____

CONNECT

Writing About Math Reflect on the Essential Question: *Why does the denominator sometimes change when adding and subtracting fractions?* Explain your thinking.

Photo Credit: Nae84 / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

UNIT 8

Unit 8 Adding and Subtracting Mixed Numbers



Picking Mixed Numbers

Unit Video Questions

The Unit 8 Opener Video, Picking Mixed Numbers, explores math around Egypt through mixed numbers. In this unit, you will use models to help you add and subtract mixed numbers. You will use models and equivalent fractions to help you solve problems.

Quick Code egm5167

- [ ] How did the students use mixed numbers to make sense of the world around them?
- [ ] What did the students discover about adding and subtracting mixed numbers?

LESSON 1

Adding and Subtracting Mixed Numbers with Like Denominators

Learning Target

- I can add and subtract **mixed numbers** with **like denominators**.

ACCESS

Rewriting Fractions Greater Than One Complete the chart by rewriting the given values in two other forms.

	Mixed Number	Improper Fraction Equivalent	Mixed Number Equivalent
1.	$3\frac{1}{3}$	A. $\frac{?}{?}$	B. $2\frac{?}{?}$
2.	$2\frac{5}{8}$	A. $\frac{?}{?}$	B. $1\frac{?}{?}$
3.	A. $__\frac{?}{?}$	$\frac{28}{5}$	B. $3\frac{?}{?}$
4.	$4\frac{3}{4}$	A. $\frac{?}{?}$	B. $3\frac{?}{?}$
5.	A. $__\frac{?}{?}$	$\frac{9}{2}$	B. $2\frac{?}{?}$
6.	A. $__\frac{?}{?}$	$\frac{22}{4}$	B. $3\frac{?}{?}$

Photo Credit: Matveev Aleksandr / Shutterstock.com

BUILD

Addition and Subtraction Strategies Evaluate each sum or difference. Simplify if possible.

1. $1\frac{3}{5} + 3\frac{1}{5} =$ _____
2. $2\frac{5}{6} + 2\frac{3}{6} =$ _____
3. $3\frac{2}{5} - 1\frac{4}{5} =$ _____
4. $2\frac{1}{4} + 2\frac{3}{4} =$ _____
5. $8\frac{3}{7} - 8\frac{1}{7} =$ _____
6. $1\frac{2}{3} + 3\frac{2}{3} =$ _____
7. $5\frac{1}{4} - 2\frac{3}{4} =$ _____
8. $4\frac{5}{6} - 2\frac{1}{6} =$ _____

Addition and Subtraction Match Choose from the given values to solve each equation.

$\frac{1}{3}$	$\frac{2}{3}$	$1\frac{1}{3}$	$1\frac{2}{3}$	$5\frac{1}{4}$
$5\frac{2}{4}$	$5\frac{3}{4}$	$\frac{1}{5}$	$2\frac{2}{5}$	
$2\frac{3}{5}$	$2\frac{4}{5}$	$\frac{5}{8}$	$1\frac{3}{8}$	$1\frac{5}{8}$

1. $3\frac{1}{5} + b = 5\frac{3}{5}$ $b =$ _____
2. $c + 4\frac{2}{3} = 5\frac{1}{3}$ $c =$ _____
3. $2\frac{4}{8} - d = 1\frac{1}{8}$ $d =$ _____
4. $f + 1\frac{3}{4} = 7\frac{1}{4}$ $f =$ _____
5. $g - \frac{7}{8} = \frac{6}{8}$ $g =$ _____
6. $2\frac{2}{3} - h = 1$ $h =$ _____
7. $j + 3\frac{3}{4} = 9\frac{2}{4}$ $j =$ _____
8. $8\frac{1}{5} - k = 5\frac{3}{5}$ $k =$ _____
9. $4 - p = 1\frac{1}{5}$ $p =$ _____
10. $r + 6\frac{5}{8} = 7\frac{2}{8}$ $r =$ _____

Photo Credit: Matveev Aleksandr / Shutterstock.com

CONNECT

Writing About Math Read the problem. Then, explain how you would regroup quantities to solve the problem.

This summer, Nagi and his brother helped harvest cotton. There were 10 square meters of cotton that needed to be harvested. Nagi and his brother each harvested $3\frac{3}{4}$ m^2 of cotton. How many square meters of cotton were left?



Cotton Plant

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 2

Finding Like Denominators of The Mixed Numbers

Learning Targets

- I can generate pairs of mixed numbers with like denominators.
- I can explain how to find like denominators for mixed numbers.

ACCESS

Denominator Dilemma Fady is writing $\frac{16}{24}$ and $\frac{3}{5}$ with like denominators. He is concerned that the denominator of the new fractions will be very large and that he will make a mistake rewriting the fractions. Identify the missing values to rewrite each fraction with 120 as the denominator.

1. $\frac{16}{24} = \frac{?}{120}$

2. $\frac{3}{5} = \frac{?}{120}$

3. Is there a denominator less than 120 that can be used? Explain your reasoning.

BUILD

Finding Like Denominators Rewrite the given mixed numbers with like denominators in two different ways.

		First Rewrite	Second Rewrite
1.	$1\frac{3}{4}$ and $1\frac{6}{15}$	A. _____ and _____	B. _____ and _____
2.	$3\frac{6}{8}$ and $2\frac{8}{12}$	A. _____ and _____	B. _____ and _____
3.	$2\frac{9}{18}$ and $2\frac{14}{24}$	A. _____ and _____	B. _____ and _____
4.	$3\frac{12}{16}$ and $1\frac{15}{24}$	A. _____ and _____	B. _____ and _____
5.	$10\frac{5}{6}$ and $5\frac{15}{27}$	A. _____ and _____	B. _____ and _____

Photo Credit: Matveev Aleksandr / Shutterstock.com

Choose a Mixed Number For each task:

- Take turns with your partner to choose a mixed number from the given list and enter it under the given number. Think carefully because once a mixed number has been used, it cannot be reused.
- Identify a like denominator between the two fractions.
- Rewrite both mixed numbers with the like denominator using equivalent fractions.

Example	Mixed Number	Like Denominator	Rewritten in Equivalent Form
Given	$1\frac{8}{10}$	5	$1\frac{4}{5}$
Choose	$2\frac{9}{15}$		$2\frac{3}{5}$

$2\frac{6}{20}$ $4\frac{1}{4}$ $3\frac{20}{30}$ $4\frac{15}{25}$ $1\frac{4}{8}$ $4\frac{2}{5}$

		Mixed Number	Like Denominator	Rewritten in Equivalent Form
1.	Given	$3\frac{50}{100}$	_____	_____
	Choose	_____		_____
2.	Given	$1\frac{30}{40}$	_____	_____
	Choose	_____		_____
3.	Given	$2\frac{9}{15}$	_____	_____
	Choose	_____		_____

Choose a Mixed Number For each task:

- Take turns with your partner to choose a mixed number from the given list and enter it under the given number. Think carefully because once a mixed number has been used, it cannot be reused.
- Identify a like denominator between the two fractions.
- Rewrite both mixed numbers with the like denominator using equivalent fractions.

Photo Credit: Matveev Aleksandr / Shutterstock.com

a. $2\frac{20}{24}$ $4\frac{15}{25}$ $2\frac{6}{20}$ $3\frac{12}{18}$ $4\frac{2}{5}$ $5\frac{2}{3}$

		Mixed Number	Like Denominator	Rewritten in Equivalent Form
1.	Given	$2\frac{6}{9}$	_____	_____
	Choice	_____		_____
2.	Given	$5\frac{2}{6}$	_____	_____
	Choice	_____		_____
3.	Given	$2\frac{9}{15}$	_____	_____
	Choice	_____		_____

b. $4\frac{15}{25}$ $3\frac{8}{12}$ $2\frac{20}{24}$ $2\frac{9}{15}$ $1\frac{8}{10}$ $2\frac{6}{20}$

		Mixed Number	Like Denominator	Rewritten in Equivalent Form
1.	Given	$2\frac{6}{36}$	_____	_____
	Choice	_____		_____
2.	Given	$6\frac{7}{14}$	_____	_____
	Choice	_____		_____
3.	Given	$3\frac{20}{30}$	_____	_____
	Choice	_____		_____

Photo Credit: Matveev Aleksandr / Shutterstock.com

CONNECT

Writing About Math Read the problem. Then, explain one way to rewrite the mixed numbers with like denominators using equivalent fractions.

Egyptian cotton is popular because the fibers are long, making Egyptian cotton smoother and silkier than other cotton fabrics. Egyptian cotton fibers usually range in length from about 3 to 5 centimeters. These fibers are first spun into thread, and then the thread is woven into fabric.

Warda measured 3 pieces of Egyptian cotton fabric in meters.

$5\frac{16}{20}$ m $\qquad$ $3\frac{18}{45}$ m $\qquad$ $3\frac{5}{25}$ m

How would you rewrite the mixed numbers with like denominators?

Why did you select that denominator?



Spinning Cotton

Photo Credit: Matveev Aleksandr / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 3

Using Models to Add and Subtract Mixed Numbers

Learning Target

- I can use models to represent addition and subtraction of mixed numbers with **unlike denominators**.

ACCESS

Mental Math Use mental math to solve the problems your teacher displays.

BUILD

Whiteboard: Using Area Models to Add Mixed Numbers Use an area model to find each sum.

1. $2\frac{2}{5} + 1\frac{1}{2} =$ _____
2. $3\frac{2}{3} + 2\frac{4}{5} =$ _____
3. $4\frac{2}{3} + 2\frac{3}{4} =$ _____
4. $2\frac{3}{8} + 5\frac{3}{4} =$ _____
5. $9\frac{5}{12} + 1\frac{1}{6} =$ _____
6. $2\frac{3}{4} + 1\frac{4}{10} =$ _____

Whiteboard: Using Area Models to Subtract Mixed Numbers Use an area model to find each difference.

1. $3\frac{1}{2} - 1\frac{2}{5} =$ _____
2. $4\frac{1}{6} - 2\frac{5}{12} =$ _____
3. $1\frac{2}{3} - \frac{1}{2} =$ _____
4. $4\frac{5}{8} - 3\frac{1}{6} =$ _____

Photo Credit: Abdelrahman Hassanein / Shutterstock.com

Whiteboard: Using Number Lines to Subtract Mixed Numbers Use a number line to find the difference.

1. $5\frac{1}{4} - 3\frac{1}{6} =$ _____
2. $6\frac{1}{3} - 3\frac{4}{5} =$ _____
3. $2\frac{7}{8} - 1\frac{1}{2} =$ _____
4. $9\frac{1}{4} - 8\frac{3}{5} =$ _____

CONNECT

Writing About Math Read the story problem and then answer the questions about one student's solution.

Heba and her neighbor, Ezz, enjoy having flowerpots in their yards. Heba's pot of cornflowers has a mass of $3\frac{1}{4}$ kilograms and her pot of poppies has a mass of $1\frac{9}{10}$ kg. Ezz's pot of cornflowers has a mass of $3\frac{1}{2}$ kg and her pot of poppies has a mass of $1\frac{3}{4}$ kg. Whose pots have a greater mass? By how much?



Potted Plants

Photo Credit: Abdelrahman Hassanein / Shutterstock.com

A student wrote this solution to the problem about Heba and Ezz. Is the student's work correct? Explain why or why not.

Heba's pots have a mass of $4\frac{10}{14}$ kg and Ezz's pots have a mass of $4\frac{4}{6}$ kg.

Heba's pots have a greater mass by $\frac{6}{8}$ kg.

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 4

Adding and Subtracting Mixed Numbers

Learning Target

- I can add and subtract fractions and mixed numbers with unlike denominators.

ACCESS

Rewriting Mixed Numbers Rewrite the mixed numbers in two different ways.

1. $4\frac{3}{5}$
2. $4\frac{1}{4}$
3. $3\frac{7}{9}$
4. $3\frac{5}{6}$
5. $5\frac{1}{7}$

BUILD

Adding and Subtracting Mixed Numbers Evaluate. Simplify if possible.

Set 1

1. $4\frac{3}{5} - 2\frac{1}{3} =$ _____
2. $8\frac{1}{2} - 2\frac{3}{7} =$ _____
3. $7\frac{1}{2} - 2\frac{7}{8} =$ _____
4. $5\frac{7}{9} + 2\frac{2}{3} =$ _____
5. $4\frac{1}{4} - 2\frac{5}{6} =$ _____

Set 2

6. $3\frac{4}{5} + 2\frac{2}{3} =$ _____
7. $9\frac{1}{6} - 3\frac{1}{3} =$ _____
8. $1\frac{2}{3} - 1\frac{3}{5} =$ _____
9. $4\frac{3}{4} + 9\frac{5}{12} =$ _____
10. $2\frac{1}{4} + 1\frac{11}{16} =$ _____
11. $5\frac{7}{10} + 8\frac{3}{4} =$ _____
12. $9\frac{1}{10} - 5\frac{7}{12} =$ _____
13. $5\frac{1}{3} - 2\frac{4}{5} =$ _____
14. $1\frac{2}{3} - 1\frac{15}{24} =$ _____

Photo Credit: Abdelrahman Hassanein / Shutterstock.com

CONNECT

Writing About Math Read the problem and analyze the work submitted by one student.

Wael collected $4\frac{1}{4}$ kilograms of dates. He gave $2\frac{3}{5}$ kg to a friend. He wants to know how many kilograms are left.

Wael's work:

$$4\frac{1}{4} \qquad 4\frac{5}{20}$$
$$-2\frac{3}{5} \qquad -2\frac{12}{20}$$
$$\overline{\qquad\qquad\qquad}$$
$$2\frac{7}{20}$$

Is Wael's response correct? Explain why or why not.



Ripening Dates

Photo Credit: Abdelrahman Hassanein / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 5

More of Adding and Subtracting Mixed Numbers

Learning Target

- I can add and subtract fractions and mixed numbers with unlike denominators.

ACCESS

Give and Take Solve each equation by adjusting the mixed numbers.

1. $3\frac{7}{8} + \frac{1}{4} = 4 + _____$
2. $7\frac{5}{7} - 5\frac{6}{7} = _____ - 6$
3. $1\frac{5}{6} + 3\frac{1}{3} = 2 + _____$
4. $6\frac{1}{8} - 3\frac{3}{4} = _____ - 4$

BUILD

Many Ways Identify the strategy used and what is correct and incorrect about each evaluation of the expression $7\frac{7}{9} - 5\frac{8}{12}$.

Solution A

$7\frac{7}{9} - 5\frac{8}{12}$

$7\frac{74}{108} - 5\frac{72}{108}$

$2\frac{2}{108}$

Solution B

$7\frac{7}{9} - 5\frac{8}{12}$

$7\frac{7}{9} - 5\frac{2}{3}$

$7\frac{7}{9} - 5\frac{6}{9}$

$6\frac{16}{9} - 5\frac{6}{9}$

$1\frac{10}{9}$

Solution C

$7\frac{7}{9} - 5\frac{8}{12}$

$\frac{70}{9} - \frac{60}{12}$

$\frac{280}{36} - \frac{180}{36}$

$\frac{100}{36}$

Solution D

$7\frac{7}{9} - 5\frac{8}{12}$

$7\frac{7}{9} - 5\frac{2}{3}$

$7\frac{7}{9} - 5\frac{6}{9}$

$7\frac{4}{9} - 6$

$1\frac{4}{9}$

Photo Credit: Abdelrahman Hassanein / Shutterstock.com

What's Missing? Find the missing number using any strategy. Simplify if possible.

1. $a + 5\frac{5}{6} = 9\frac{1}{12}$ $a =$ _____

2. $8\frac{7}{10} - b = 4\frac{9}{20}$ $b =$ _____

3. $9\frac{5}{20} - c = 4\frac{19}{20}$ $c =$ _____

4. $6\frac{7}{15} + d = 13\frac{3}{10}$ $d =$ _____

5. $f + 9\frac{1}{4} = 12\frac{15}{16}$ $f =$ _____

6. $g - 1\frac{3}{4} = 7\frac{3}{44}$ $g =$ _____

7. $4\frac{12}{18} + h = 11$ $h =$ _____

8. $j - 4\frac{7}{8} = 4\frac{37}{40}$ $j =$ _____

Photo Credit: Abdelrahman Hassanein / Shutterstock.com

CONNECT

Writing About Math Explain which strategy for adding and subtracting mixed numbers you prefer. You may use words, numbers, and models to support your thinking.

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 6

Story Problems with Mixed Numbers

Learning Target

- I can solve story problems involving addition and subtraction of fractions and mixed numbers.

ACCESS

Mixed Numbers in Time Convert the mixed numbers to units of time.

1. $7\frac{1}{10}$ minutes = (A) minutes and (B) seconds
2. $4\frac{3}{4}$ hours = (A) hours and (B) minutes
3. 80 minutes = _____ hours
4. $2\frac{1}{6}$ hours = _____ minutes
5. $6\frac{1}{2}$ years = (A) years and (B) months

BUILD

Up and Down the Nile Solve the problem with your group.

A ship traveling up the Nile takes $6\frac{1}{6}$ hours to reach its destination. On the way back, the current helps push the ship along, so it takes 30 fewer minutes for the return trip. How long is the ship's trip up and down the Nile? Give your answer both as a mixed number and in hours and minutes.

Plume Thistle Planting Solve the problem with your group.

Habiba is planting three plume thistle plants. It took her $\frac{5}{6}$ minute to plant the first one. The second plant took $\frac{1}{12}$ min longer to plant than the first one. The third plant took $\frac{1}{10}$ less time to plant than the second one. How long did it take to plant the third plume thistle?



Thistle Plant

Photo Credit: Abdelrahman Hassanein / Shutterstock.com

Enough Juice? Solve the problem with your group.

Abeer is mixing juice for a celebration. She mixes $5\frac{3}{4}$ liters of fruit juice concentrate with $1\frac{1}{2}$ L more water than fruit juice concentrate. She needs 12 L of the mixture for the celebration. Does she have enough? Why or why not? Explain.

You Be the Teacher Read the story problem and analyze each student's work. Explain whether each strategy was applied correctly or incorrectly.

On Monday, Afaf spent $5\frac{2}{3}$ hours researching papyrus plants for her presentation. The next day, she spent $\frac{11}{12}$ of an hour less putting her presentation together. Over both days, how many hours did Afaf spend on her presentation?

1. Nagi

$$5\frac{2}{3} - \frac{11}{12} = 5\frac{8}{12} - \frac{11}{12}$$

$$= 5\frac{3}{12}$$

$$5\frac{8}{12} + 5\frac{3}{12} = \square$$

2. Radwa

$$5\frac{2}{3} - \frac{11}{12} = \frac{17}{3} - \frac{11}{12}$$

$$= \frac{68}{12} - \frac{11}{12} = \frac{57}{12}$$

$$\frac{68}{12} + \frac{57}{12} = \frac{125}{12} = \square$$

3. Shehab

$$5\frac{2}{3} + \frac{11}{12} = 5\frac{8}{12} + \frac{11}{12}$$

$$= 5\frac{19}{12}$$

$$= \square$$

4. Tahani

$5\frac{2}{3}$ = 5 hr 40 min

$\frac{11}{12} = \frac{55}{60}$ or 55 min

5 hr 40 min − 55 min = 4 hr 45 min

$$\begin{array}{r} 5 \text{ hr } 40 \text{ min} \\ +\ 4 \text{ hr } 45 \text{ min} \\ \hline 9 \text{ hr } 85 \text{ min} = \square \end{array}$$

Photo Credit: Abdelrahman Hassanein / Shutterstock.com

5. Wagdy

$$5\frac{2}{3} - \frac{11}{12} = 5\frac{8}{12} - \frac{11}{12}$$

$$= 4\frac{20}{12} - \frac{11}{12} = 4\frac{9}{12}$$

$$5\frac{8}{12} + 4\frac{9}{12} = 9\frac{17}{12} = \square$$

CONNECT

Create a Mixed Number Story Problem Think about the whole numbers and the denominators in the given expression.

$3\frac{1}{8} + 2\frac{1}{3}$

Write a story problem that is reasonable for this pair of mixed numbers. Solve your problem.

Photo Credit: Abdelrahman Hassanein / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

UNIT 9

Unit 9 Multiplying and Dividing Fractions



Fractions of Dates

Unit Video Questions

The Unit 9 Opener Video, Fractions of Dates, explores math around Egypt through multiplication and division with fractions. In this unit, you will use models to help you understand how to multiply and divide fractions. You will use number relationships and your problem-solving skills to explore the operations.

Quick Code egm5189

- [ ] How did the students make sense of the world around them by multiplying and dividing fractions?
- [ ] What did the students discover about multiplying and dividing fractions?

LESSON 1

Multiplying a Fraction or Mixed Number by a Whole Number

Learning Target

- I can multiply a fraction or a mixed number by a whole number.

ACCESS

Factors and Products Write at least two different multiplication expressions that have the same product as $4 \times \frac{6}{10}$.

BUILD

Walking around the Garden As a caretaker, Ezz walks the perimeter of the garden 3 days per week. The perimeter of the garden is $2\frac{1}{5}$ kilometers. What is the total distance Ezz walks each week? Use the given strategies to create four different representations of the scenario.

1. Use repeated addition.

2. Draw a number line.

3. Draw a diagram.

4. Convert to meters to solve, then write the answer in kilometers.

Roses in Bloom Ezz notices that $\frac{2}{3}$ of the 6 rose bushes are in bloom. How many rose bushes are in bloom? Follow your teacher's directions to solve the problem using different strategies.

1. Draw a diagram.

2. Use another strategy.

Photo Credit: AlesiaKan / Shutterstock.com

Fraction Patterns Complete the input–output tables. Simplify your answers, if possible.

1.

RULE: $\times \frac{9}{10}$	
Input	**Output**
2	_____
4	_____
6	_____
8	_____

2.

RULE: $\times 10\frac{1}{4}$	
Input	**Output**
2	_____
4	_____
6	_____
8	_____

3.

RULE: $\times 3\frac{5}{8}$	
Input	**Output**
2	_____
4	_____
6	_____
8	_____

Photo Credit: AlesiaKan / Shutterstock.com

CONNECT

Writing About Math Today, you used several different strategies to multiply fractions, mixed numbers, and whole numbers. Which strategy do you prefer? Why? You may use words, numbers, and drawings to support your thinking.

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 2

Multiplying Fractions Using Models

Learning Target

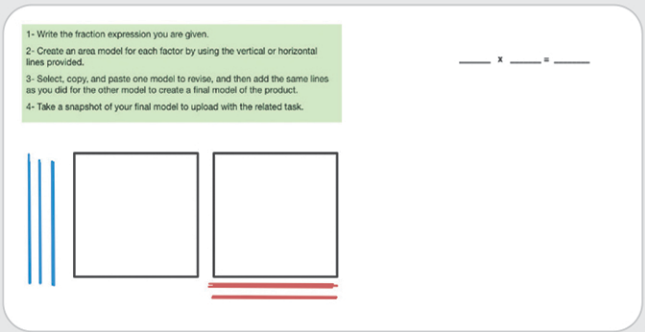
- I can use models to represent multiplication of a fraction by a fraction.

ACCESS

Make It Equal Multiply to find equivalent fractions. Do not simplify the products.

1. $\frac{1}{4} \times \frac{3}{3}$
2. $\frac{3}{5} \times \frac{4}{4}$
3. $\frac{7}{12} \times \frac{6}{6}$
4. $\frac{5}{8} \times \frac{2}{2}$

Whiteboard: Modeling Multiplication Use an area model to show fraction multiplication. Draw a model for each factor and then draw a model to represent the problem. Label each model. Use a different color for each factor. Simplify your answers, if possible.

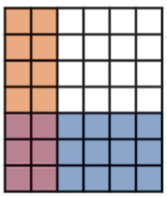


1. $\frac{1}{2} \times \frac{1}{5} =$ _____
2. $\frac{5}{6} \times \frac{2}{5} =$ _____
3. $\frac{3}{5} \times \frac{1}{4} =$ _____
4. $\frac{1}{3} \times \frac{3}{8} =$ _____
5. $\frac{3}{4} \times \frac{1}{2} =$ _____
6. $\frac{3}{6} \times \frac{5}{6} =$ _____
7. $\frac{3}{4} \times \frac{3}{8} =$ _____
8. $\frac{5}{8} \times \frac{3}{3} =$ _____

Photo Credit: AlesiaKan / Shutterstock.com

Missing Numbers Study the multiplication area models and fill in the missing fraction. Then, enter the product. Simplify your answers, if possible.

1.



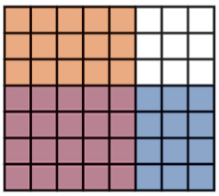
$\frac{2}{6} \times$ _____ = _____

2.



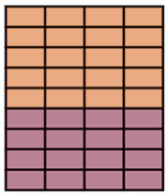
_____ $\times \frac{3}{5}$ = _____

3.



$\frac{5}{8} \times$ _____ = _____

4.



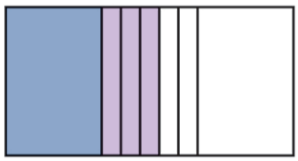
_____ $\times \frac{4}{9}$ = _____

Photo Credit: AlesiaKan / Shutterstock.com

CONNECT

Writing About Math Maha made a model for $\frac{1}{3} \times \frac{3}{5}$ but is having trouble finding the product.

Help her fix her model. Then, find the product and explain your thinking.



Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 3

Multiplying Fractions by Fractions

Learning Targets

- I can multiply a fraction by a fraction.
- I can **simplify** fractions.

ACCESS

Whiteboard: Garden Fractions Ashraf's rectangular garden is divided into thirds. He planted trees in one section, fruits and vegetables in another section, and flowers in the last section.

Half of the trees in his garden are jacaranda trees and the other half are eucalyptus trees. His garden has three types of vegetables—radishes, cabbage, and cucumbers—each in one third.

Ashraf loves fresh flowers, and he divided that section into fourths so he could plant poppies, irises, daisies, and jasmine.

Use graph paper or the Whiteboard: Garden Fractions to create and label a sketch of Ashraf's garden.

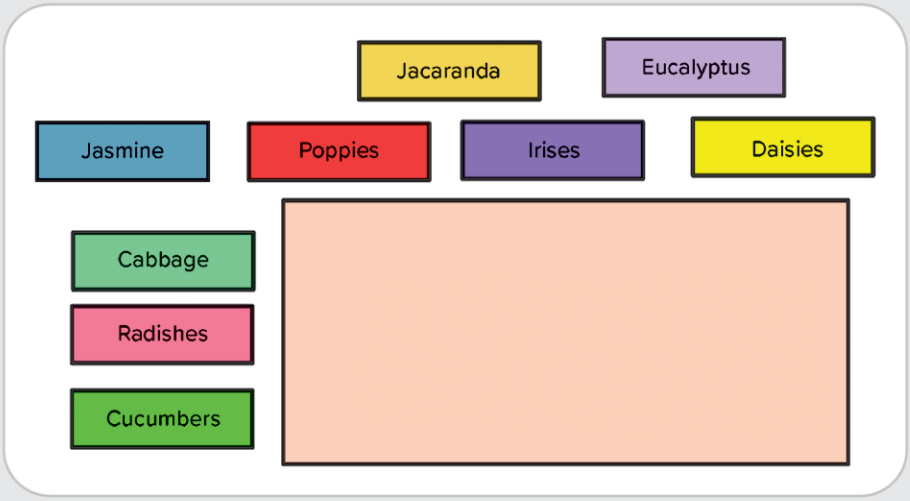


Photo Credit: AlesiaKan / Shutterstock.com

BUILD

Let's Multiply Find the product. Simply your answers, if possible.

1. $\frac{1}{2} \times \frac{2}{8} =$ _____
2. $\frac{1}{3} \times \frac{2}{7} =$ _____
3. $\frac{3}{9} \times \frac{3}{4} =$ _____
4. $\frac{1}{4} \times \frac{1}{4} =$ _____
5. $\frac{5}{10} \times \frac{8}{10} =$ _____

Make It Simpler Write each product in its simplest form.

1. $\frac{3}{8} \times \frac{1}{6} =$ _____
2. $\frac{1}{4} \times \frac{8}{11} =$ _____
3. $\frac{4}{5} \times \frac{4}{9} =$ _____
4. $\frac{5}{12} \times \frac{3}{5} =$ _____
5. $\frac{5}{8} \times \frac{2}{15} =$ _____

Photo Credit: AlesiaKan / Shutterstock.com

CONNECT

Writing About Math Aya is planning a garden. She wants $\frac{2}{3}$ of her garden to be planted with vegetables. She also wants $\frac{1}{4}$ of the vegetables to be leeks and $\frac{3}{4}$ of them to be peas.

Explain whether she can use multiplication to describe the fraction of her garden that will contain leeks and the fraction that will contain peas.



Pea Pods

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 4

Multiplying Fractions and Mixed Numbers

Learning Targets

- I can multiply a fraction by a mixed number.
- I can simplify fractions and mixed numbers.

ACCESS

Planting Seeds Solve the given problem and show your work. Use a Whiteboard or graph paper to draw a model if needed. Simplify your answer, if possible.

Ola and Omnia were planting flowers in their garden. Ola had 2 bags of flower seeds, but Omnia had only $\frac{3}{4}$ of a bag of seeds. Each girl planted $\frac{1}{2}$ of the seeds she had. How many bags of seeds did they plant altogether?



Planting Seeds

Photo Credit: AlesiaKan / Shutterstock.com

BUILD

Multiplying Fractions by Mixed Numbers Evaluate each product using the Distributive Property of Multiplication. Simplify your answers when possible.

1. $3\frac{4}{6} \times \frac{1}{4} =$ _____
2. $2\frac{2}{5} \times \frac{2}{3} =$ _____
3. $5\frac{1}{4} \times \frac{1}{2} =$ _____
4. $\frac{3}{4} \times 2\frac{1}{5} =$ _____
5. $\frac{1}{8} \times 3\frac{2}{5} =$ _____
6. $2\frac{4}{7} \times \frac{5}{8} =$ _____

Mix and See If They Match Choose one whole number and two fractions.

- Partner A will combine the whole number and the first fraction chosen to form a mixed number and multiply by the second fraction.
- Partner B will combine the whole number and the second fraction chosen to form a mixed number and multiply by the first fraction.

Compare your answers. Are they equivalent? Simplify your answers, if possible.

2	3	4	5	6	8	10	12	
$\frac{1}{2}$	$\frac{1}{3}$	$\frac{2}{3}$		$\frac{1}{4}$	$\frac{3}{4}$		$\frac{2}{5}$	$\frac{3}{5}$
$\frac{4}{5}$	$\frac{1}{6}$	$\frac{5}{6}$		$\frac{3}{7}$	$\frac{6}{7}$		$\frac{1}{8}$	$\frac{5}{8}$

Example: 2 $\frac{3}{4}$ $\frac{5}{6}$

Partner A

$2\frac{3}{4} \times \frac{5}{6} =$ _____

Partner B

$2\frac{5}{6} \times \frac{3}{4} =$ _____

1. _____ × _____ = _____ **2.** _____ × _____ = _____

3. _____ × _____ = _____ **4.** _____ × _____ = _____

5. _____ × _____ = _____ **6.** _____ × _____ = _____

CONNECT

Find the Error Two students tried multiplying a mixed number by a fraction using the Distributive Property of Multiplication. Look at their solutions. Find and correct the errors.

Given: $3\frac{5}{8} \times \frac{2}{3}$

Nabila's Solution	Basem's Solution
$3\frac{5}{8} \times \frac{2}{3}$	$3\frac{5}{8} \times \frac{2}{3}$
$\left(3 \times \frac{2}{3}\right) + \left(\frac{5}{8} \times \frac{2}{3}\right)$	$\left(3 \times \frac{2}{3}\right) \times \left(\frac{5}{8} \times \frac{2}{3}\right)$
$\frac{6}{3} + \frac{10}{24}$	$\frac{6}{3} \times \frac{10}{24}$
$\frac{16}{27}$	$\frac{60}{72} = \frac{5}{6}$

Check Your Understanding
Follow your teacher's instructions to complete this activity.

Photo Credit: AlesiaKan / Shutterstock.com

LESSON 5

Multiplying Mixed Numbers Using Improper Fractions

Learning Targets

- I can multiply mixed numbers using improper fractions.
- I can simplify fractions and mixed numbers.

ACCESS

Mixed Number Match Match each mixed number to its equivalent improper fraction.

Mixed Number	Improper Fraction
$3\frac{1}{2}$	$\frac{31}{5}$
$4\frac{3}{5}$	$\frac{7}{2}$
$2\frac{1}{5}$	$\frac{4}{3}$
$6\frac{1}{5}$	$\frac{11}{5}$
$5\frac{1}{2}$	$\frac{13}{5}$
$2\frac{3}{5}$	$\frac{8}{3}$
$1\frac{1}{3}$	$\frac{23}{5}$
$2\frac{2}{3}$	$\frac{11}{2}$

Photo Credit: AlesiaKan / Shutterstock.com

BUILD

Multiplying Mixed Numbers Find the product. Be sure to simplify your answers.

1. $2\frac{1}{4} \times 2\frac{2}{3} =$ _____

2. $1\frac{5}{6} \times 4\frac{2}{5} =$ _____

3. $3\frac{1}{2} \times 1\frac{3}{4} =$ _____

4. $4\frac{2}{7} \times 2\frac{1}{3} =$ _____

5. $1\frac{1}{3} \times 1\frac{3}{8} =$ _____

6. $3\frac{1}{3} \times 5\frac{2}{5} =$ _____

7. $5\frac{2}{7} \times 2\frac{6}{11} =$ _____

8. $10\frac{2}{5} \times 4\frac{3}{8} =$ _____

Photo Credit: AlesiaKan / Shutterstock.com

CONNECT

Writing About Math Ayman is taking inventory of his landscaping supplies. He has $3\frac{1}{2}$ bags of fertilizer. Each bag weighs $7\frac{3}{4}$ kilograms. He writes that there are $21\frac{3}{8}$ kg of fertilizer in all.

Is Ayman correct? Explain your thinking.



Fertilizer

Photo Credit: (a) Alesiakan / Shutterstock.com, (b) Zakhar Mar / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 6

Story Problems Involving Multiplication of Fractions and Mixed Numbers

Learning Targets

- I can solve story problems involving multiplication of fractions and mixed numbers.
- I can simplify fractions and mixed numbers.

ACCESS

Mixed Numbers in My Life Think of situations in which mixed numbers could be used to describe aspects of your own life. Share your ideas with the class.

BUILD

Why Multiply? Solve each problem. Be sure to simplify your answer when possible.

1. Aya purchased a bag of tomatoes from the market that has a mass of $2\frac{1}{3}$ kilograms. Her brother, Ameen, purchased a bag of potatoes that has a mass $1\frac{1}{2}$ times more than Aya's bag of tomatoes. What is the mass of Ameen's bag of potatoes?

Photo Credit: AlesiaKan / Shutterstock.com

2. Moustafa is harvesting sugarcane. He can harvest $3\frac{3}{4}$ kilograms of sugarcane in 1 hour. If he plans to work for $2\frac{1}{2}$ hours, how much sugarcane will he harvest?

3. Seif bought 4 bags of soil for his garden. Each bag has a mass of $3\frac{1}{3}$ kilograms. If he only used $3\frac{3}{4}$ bags of soil, how many kilograms did he use?



Sugarcane

4. Farida is reading a chapter book. She can usually read $20\frac{1}{2}$ pages in 1 hour. If she plans to read for 1 hour and 15 minutes, how many pages will she read?

Photo Credit: AlesiaKan / Shutterstock.com

Time for a Story Write a multiplication story problem using each given pair of mixed numbers. Share your problem with a partner, and then solve your partner's problem. Be sure to simplify your answers, if possible.

1. $12\frac{1}{2}$ and $3\frac{2}{3}$

2. $1\frac{4}{5}$ and $\frac{2}{3}$

3. $5\frac{3}{4}$ and $1\frac{1}{5}$

CONNECT

Writing About Math Gamila is thinking about what it means to multiply by $\frac{1}{2}$. She says that multiplying by $\frac{1}{2}$ is kind of like division.

Do you agree? Explain your thinking. You may use numbers, words, and pictures.

Check Your Understanding
Follow your teacher's instructions to complete this activity.



Photo Credit: OlegD / Shutterstock.com

LESSON 7

Fractions as Division

Learning Target

- I can explain how fractions represent division of whole numbers.

ACCESS

Sharing Cotton Match each situation with the division expression that represents it.

1. 2 bales of cotton shared by 3 manufacturers
2. 3 bales of cotton shared by 2 manufacturers
3. 5 bales of cotton shared by 2 manufacturers
4. 3 bales of cotton shared by 5 manufacturers
5. 2 bales of cotton shared by 4 manufacturers
6. 2 bales of cotton shared by 5 manufacturers

A. $4 \div 2$
B. $2 \div 5$
C. $2 \div 3$
D. $3 \div 2$
E. $5 \div 3$
F. $2 \div 4$
G. $5 \div 2$
H. $3 \div 5$

BUILD

Whiteboard: Divisors and Dividends Model division expressions based on the meaning of the values. Using graph paper or the Whiteboard, create a model that represents each scenario. Then find the quotient. Simplify your answer, if possible.

For each cotton bale scenario, start by creating the number of whole bales by using each rectangle that defines one fractional part.

Duplicate or delete rectangles as needed. Group additional rectangles to create more bales. Then label each rectangle within a bale with the related fraction and complete the task.

This configuration can be used to model 2 bales of cotton shared by 3 manufacturers. *Change this model as needed for other scenarios.*



1. 2 bales of cotton shared by 3 manufacturers
2. 3 bales of cotton shared by 2 manufacturers
3. 5 bales of cotton shared by 2 manufacturers
4. 3 bales of cotton shared by 5 manufacturers
5. 2 bales of cotton shared by 4 manufacturers
6. 2 bales of cotton shared by 5 manufacturers

Photo Credit: OlegD / Shutterstock.com

Remainders as Fractions Complete the chart. Write the quotient as an improper fraction and simplify, if possible. Then, use the division algorithm and write the remainder as a fraction. You may wish to use a Whiteboard to do the division.

Expression	Division Algorithm	Quotient
Example: $6 \div 5$	$5\overline{)6}$ with 1, -5, 1	$\frac{6}{5} = 1\frac{1}{5}$
1. $8 \div 5$		
2. $4 \div 3$		
3. $6 \div 3$		
4. $5 \div 4$		
5. $3 \div 2$		



Photo Credit: OlegD / Shutterstock.com

CONNECT

Writing About Math Explain in your own words how $\frac{3}{4}$ can be interpreted as a division problem. You may also use numbers and pictures to support your thinking.

Check Your Understanding
Follow your teacher's instructions to complete this activity.



LESSON 8

Dividing Unit Fractions by Whole Numbers

Learning Targets

- I can use models to divide **unit fractions** by whole numbers.
- I can explain the relationship between division and multiplication of fractions.

ACCESS

Always, Sometimes, Never Read each statement and indicate whether it is always true, sometimes true, or never true. Think of an example to support your thinking.

1. Unit fractions are less than $\frac{1}{2}$.
2. A unit fraction multiplied by the number in the denominator equals 1.
3. The larger the number in the denominator of a unit fraction, the larger the fraction.

BUILD

Whiteboard: Using Area Models to Divide Unit Fractions by Whole Numbers Use the Whiteboard or graph paper to create an area model to find each quotient. Simplify answers, if possible.

Build an area model to find the quotients in the related tasks.

- Enter the given expression and divide the model into the needed sections to represent the dividend and divisor.
- Adjust the rectangles and add segments as needed.
- Enter the quotient on the line to the right.

Take a snapshot of your model to upload with the related task.

Expression: _____

Quotient: _____

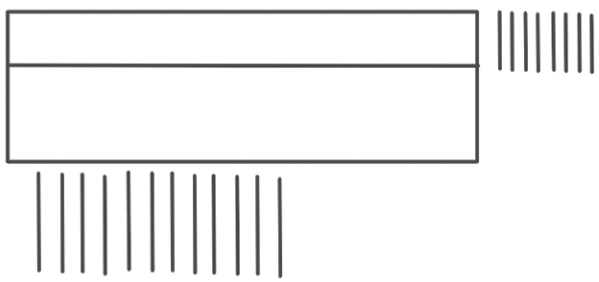


Photo Credit: OlegD / Shutterstock.com

1. $\frac{1}{3} \div 5 =$ _____
2. $\frac{1}{2} \div 3 =$ _____
3. $\frac{1}{3} \div 2 =$ _____
4. $\frac{1}{3} \div 4 =$ _____
5. $\frac{1}{2} \div 7 =$ _____
6. $\frac{1}{8} \div 2 =$ _____
7. $\frac{1}{6} \div 3 =$ _____
8. $\frac{1}{5} \div 5 =$ _____

Divide or Multiply? Write the missing number in each equation.

1.	$\frac{1}{3} \div a = \frac{1}{12}$	$\frac{1}{3} \times b = \frac{1}{12}$	$a =$ _____	$b =$ _____
2.	$\frac{1}{4} \div c = \frac{1}{20}$	$\frac{1}{4} \times d = \frac{1}{20}$	$c =$ _____	$d =$ _____
3.	$\frac{1}{5} \div e = \frac{1}{30}$	$\frac{1}{5} \times f = \frac{1}{30}$	$e =$ _____	$f =$ _____
4.	$\frac{1}{8} \div g = \frac{1}{24}$	$\frac{1}{8} \times h = \frac{1}{24}$	$g =$ _____	$h =$ _____
5.	$\frac{1}{2} \times j = \frac{1}{14}$	$\frac{1}{2} \div k = \frac{1}{14}$	$j =$ _____	$k =$ _____
6.	$\frac{1}{7} \times m = \frac{1}{21}$	$\frac{1}{7} \div n = \frac{1}{21}$	$m =$ _____	$n =$ _____
7.	$\frac{1}{6} \div p = \frac{1}{12}$	$\frac{1}{6} \times q = \frac{1}{12}$	$p =$ _____	$q =$ _____
8.	$\frac{1}{10} \times r = \frac{1}{40}$	$\frac{1}{10} \div s = \frac{1}{40}$	$r =$ _____	$s =$ _____

CONNECT

Writing About Math Explain the relationship between fraction division and multiplication. Use examples from BUILD to support your thinking.

Check Your Understanding
Follow your teacher's instructions to complete this activity.

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LESSON 9

Dividing Whole Numbers by Unit Fractions

Learning Targets

- I can use models to divide whole numbers by unit fractions.
- I can apply the relationship between division and multiplication of fractions to solve problems.

ACCESS

Missing Factors Find the missing value that makes each statement true.

1. $\frac{1}{3} \times ___ = 1$
2. $\frac{1}{3} \times ___ = 2$
3. $\frac{1}{3} \times ___ = 3$
4. $\frac{1}{4} \times ___ = 1$
5. $\frac{1}{4} \times ___ = 2$
6. $\frac{1}{4} \times ___ = 3$

Photo Credit: OlegD / Shutterstock.com

BUILD

Whiteboard: Using Area Models to Divide Whole Numbers by Unit Fractions

Use graph paper or the Whiteboard to draw an area model to find the quotient.

1. $4 \div \frac{1}{3}$
2. $3 \div \frac{1}{5}$
3. $5 \div \frac{1}{2}$
4. $2 \div \frac{1}{4}$
5. $3 \div \frac{1}{4}$
6. $4 \div \frac{1}{5}$
7. $8 \div \frac{1}{2}$
8. $6 \div \frac{1}{3}$

Applying Mathematical Relationships to Simplify Expressions Write the missing number in each equation.

1. $5 \div a = 15$, $5 \times b = 15$ — $a =$ _____ $b =$ _____
2. $8 \div c = 32$, $8 \times d = 32$ — $c =$ _____ $d =$ _____
3. $3 \times f = 6$, $3 \div g = 6$ — $f =$ _____ $g =$ _____
4. $6 \div h = 30$, $6 \times j = 30$ — $h =$ _____ $j =$ _____
5. $8 \times k = 24$, $8 \div m = 24$ — $k =$ _____ $m =$ _____
6. $7 \div n = 35$, $7 \times p = 35$ — $n =$ _____ $p =$ _____
7. $3 \times q = 57$, $3 \div r = 57$ — $q =$ _____ $r =$ _____
8. $9 \div s = 126$, $9 \times t = 126$ — $s =$ _____ $t =$ _____

Photo Credit: OlegD / Shutterstock.com

CONNECT

Writing About Math Read the given problems and compare the operation needed for each, identifying the values and their meanings. Then, apply your strategies to solve both problems.

1. On Tuesday morning, Farha's Flower Shop made 7 bouquets of daffodils which were $\frac{1}{5}$ of the number of bouquets ordered for that day. How many total bouquets were ordered from Farha's Flower Shop on Tuesday?
2. Aya's Floral Shop has 7 liters of special water to use for bouquets of myrtles. Each bouquet requires $\frac{1}{5}$ of a liter of the special water. How many bouquets can Aya's Floral Shop make?

Check Your Understanding
Follow your teacher's instructions to complete this activity.



LESSON 10

Story Problems Involving Division of Whole Numbers and Unit Fractions

Learning Targets

- I can solve story problems involving division of whole numbers and unit fractions.
- I can simplify fractions and mixed numbers.

ACCESS

Choose the Operation For each problem, identify which operation (addition, subtraction, multiplication, or division) should be used to model the situation described.

1. There are 4 kilograms of hummus. A worker separates the hummus into packages of $\frac{1}{4}$ kg. How many packages will be made?
2. There are 4 bags of fava beans. Each bag has a mass of $\frac{3}{4}$ of a kilogram. What is the total mass of the fava beans?
3. Gehad mixes $\frac{1}{2}$ liter of blue paint with $\frac{3}{8}$ L of red paint to make a shade of purple paint. How many liters of purple paint does Gehad make?
4. Fatma feeds her cat $\frac{1}{8}$ of a kilogram of cat food each day. How many days will 4 kg of cat food last?
5. Manal has $2\frac{1}{2}$ hours to complete her schoolwork. She finishes her math in $\frac{3}{4}$ of an hour. How much time remains for the rest of her schoolwork?
6. After the party, $\frac{1}{5}$ of the food remains. Hoda gives $\frac{1}{2}$ of the remaining food to her aunt. What fraction of the total amount of food did her aunt receive?
7. Nader has 8 liters of fruit juice. If he drinks $\frac{1}{4}$ L of juice each day, how many days will it take him to finish all the juice?
8. The factory's staff is $\frac{5}{8}$ female. How much of the staff is male?

Photo Credit: OlegD / Shutterstock.com

BUILD

Divide the Fraction or Divide the Whole Number? Select the expression that represents the problem, and then evaluate it.

1. If a turtle can crawl $\frac{1}{2}$ kilometers per hour, how many hours would it take for the turtle to travel 8 km?

   Choose: $\frac{1}{2} \div 8$ or $8 \div \frac{1}{2}$



Turtle

Photo Credit: OlegD / Shutterstock.com

2. A teacher wants to give $\frac{1}{8}$ of a box of pencils to each student. She has 5 boxes of pencils. To how many students will she be able to give pencils?

   Choose: $\frac{1}{8} \div 5$ or $5 \div \frac{1}{8}$

3. Abdallah has 3 identical gifts to wrap. He uses $\frac{1}{2}$ of a roll of paper to wrap the gifts. If each gift uses the same amount of paper, how much paper did Abdallah use for each gift?

   Choose: $\frac{1}{2} \div 3$ or $3 \div \frac{1}{2}$

4. Afaf and Adel pulled up weeds in $\frac{1}{6}$ of the garden's area. If they divided the weeding equally, what total area of the garden did Afaf weed?

   Choose: $\frac{1}{6} \div 2$ or $2 \div \frac{1}{6}$



5. A toddler eats $\frac{1}{3}$ of a piece of bread each day for breakfast. If the loaf of bread contains 12 pieces, how many days of breakfast will the loaf of bread provide?

   Choose: $\frac{1}{3} \div 12$ or $12 \div \frac{1}{3}$

6. A computer takes $\frac{1}{200}$ of a second to complete a math problem. How many math problems can the computer answer in 120 seconds?

   Choose: $\frac{1}{200} \div 120$ or $120 \div \frac{1}{200}$

7. A box of dry milk powder contains 15 servings. The box of milk powder weighs $\frac{1}{2}$ of a kilogram. What is the weight of each serving of dry milk powder?

   Choose: $\frac{1}{2} \div 15$ or $15 \div \frac{1}{2}$

8. It takes Aya $\frac{1}{3}$ of an hour to model 4 identical clay figures. How long does it take for Aya to model one clay figure?

   Choose: $\frac{1}{3} \div 4$ or $4 \div \frac{1}{3}$

CONNECT

Writing About Math Reflect on the Lesson Essential Question "What strategies can we use to divide whole numbers and unit fractions?"

Answer the question in your own words and explain the difference between $6 \div \frac{1}{4}$ and $\frac{1}{4} \div 6$ in your reflection.

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Check Your Understanding
Follow your teacher's instructions to complete this activity.

UNIT 10

Unit 10 Two-Dimensional Figures and Coordinate Planes



Egyptian Triangles

Unit Video Questions

Quick Code egm5219

The Unit 10 Opener Video, Egyptian Triangles, explores math around Egypt through two-dimensional shapes. In this unit, you will learn to describe plane figures by their attributes. You will investigate coordinate planes and use them to solve problems.

- ☐ How did the students use two-dimensional figures to make sense of the world around them?
- ☐ What did the students discover about coordinate planes?

MINISTRY OF EDUCATION AND TECHNICAL EDUCATION

LESSON 1

Categories of Shapes

Learning Targets

- I can classify two-dimensional figures into categories based on their **attributes**.
- I can classify two-dimensional figures into categories and subcategories based on their attributes.
- I can explain how two figures can belong to more than one subcategory.

ACCESS

Whiteboard: Vocabulary Sketch Work with a partner to sketch a quick image representing each of the given vocabulary terms. Use the Whiteboard or your Math Notebook.

parallel lines	right angle	quadrilateral
perpendicular lines	shape with a line of symmetry	parallelogram
acute angle	ray	polygon
obtuse angle	two congruent shapes	intersecting lines

parallel lines	perpendicular lines	acute angle	obtuse angle
right angle	a shape with a line of symmetry	a ray	two congruent shapes
a quadrilateral	a parallelogram	a polygon	intersecting lines

Vocabulary Sketch Which of your sketches might need angle or side markers to ensure that your sketch could be categorized as an example of that term?

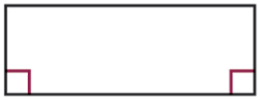
Photo Credit: Abdelrahman Beltagy / Shutterstock.com

BUILD

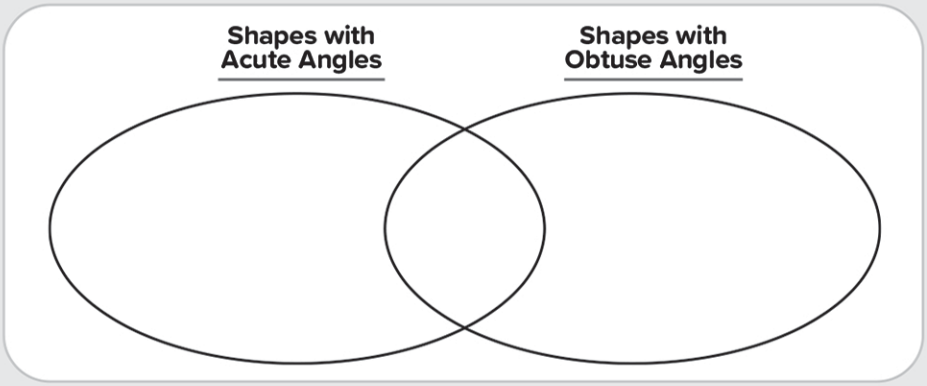
Categorizing Shapes Follow your teacher's directions to describe the attributes of the shapes with a partner.

1. 

2. 

3. 

Whiteboard: Categorizing Shapes Classify shapes using a Venn diagram. Use the Whiteboard: Categorizing Shapes or your Math Notebook to place the polygons into the Venn diagram. Some shapes may be placed outside the circles.



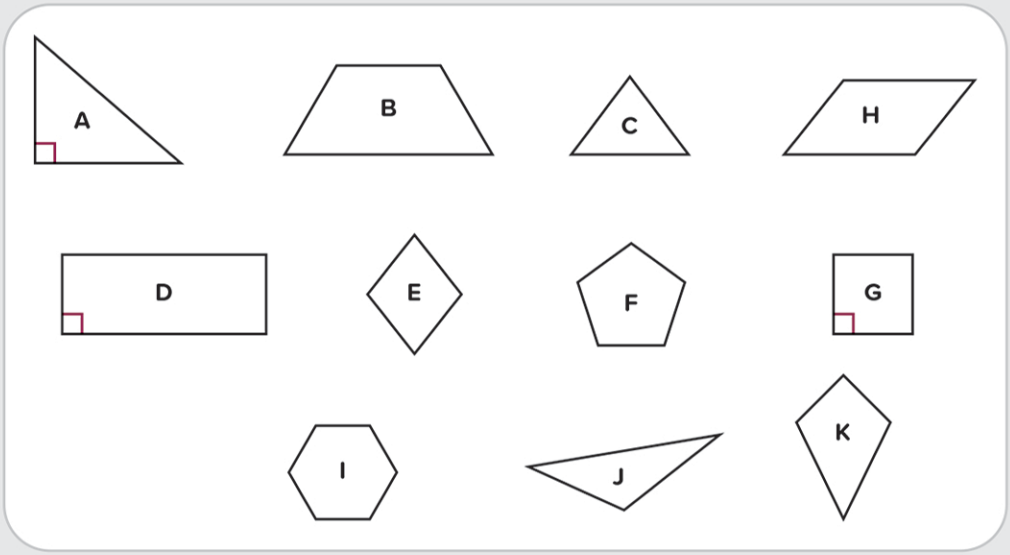
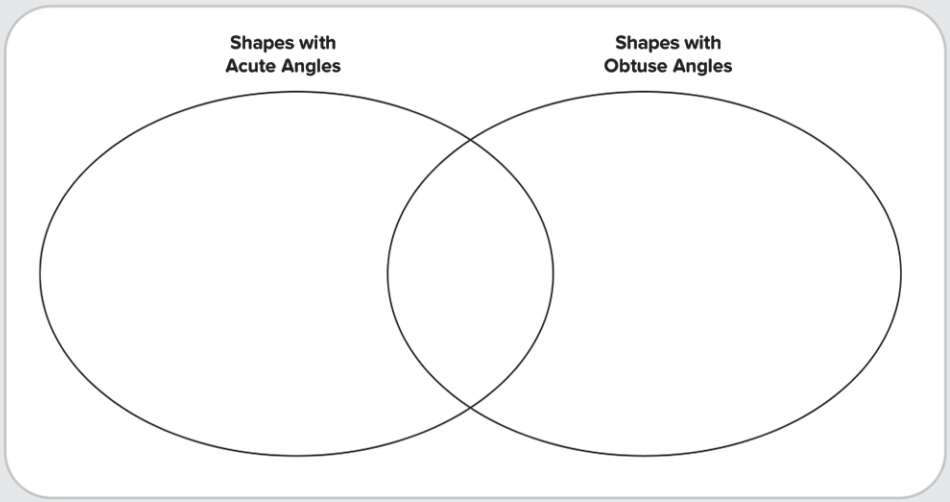


Photo Credit: Abdelrahman Beltagy / Shutterstock.com



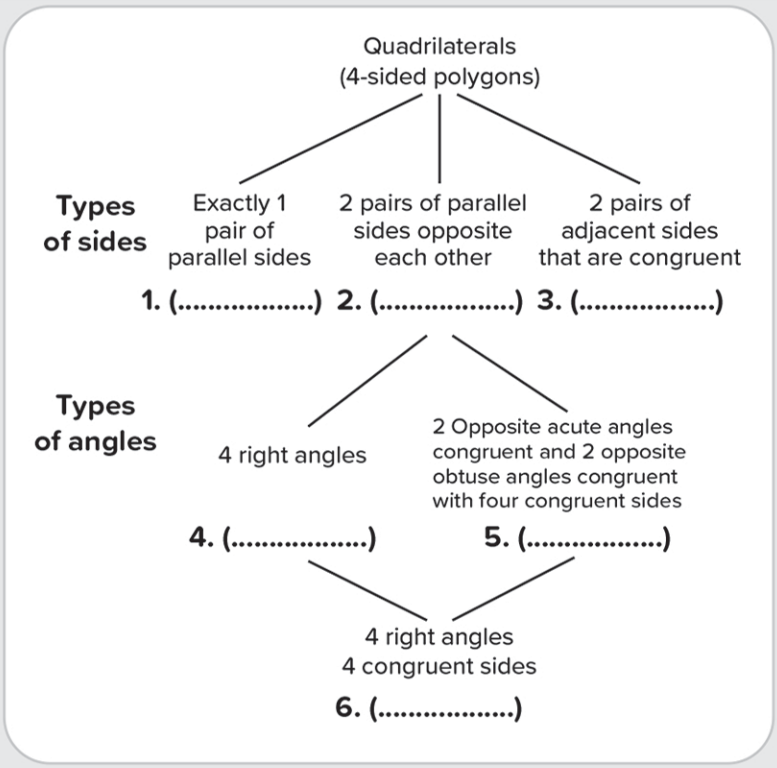
More Categorizing Shapes Answer the questions.

1. What subcategory could shapes A and D share?
   - A. Quadrilaterals
   - B. Parallel sides
   - C. Right angles
   - D. Obtuse angles
2. Which of the subcategories could include shapes D and G?
   - A. Four right angles
   - B. Quadrilaterals
   - C. Parallel sides
   - D. Perpendicular sides
   - E. All of the above

Whiteboard: Quadrilaterals Use the list of quadrilaterals to fill in the chart. Remember that the hierarchy goes from most general to more specific.

Rectangle Parallelogram Rhombus
Square Trapezium Kite

Photo Credit: Abdelrahman Beltagy / Shutterstock.com



CONNECT


Citadel of Saladin

Urban Planning Work with your teacher to read the passage, and then answer the question.

Modern city planning, or urban planning, in Cairo began in the 1830s, when the city was transformed during Ismail's reign (1863–1879). He was inspired by the renovation of Paris, France, and applied a French planning style to the design of the growing city.

Cairo and the surrounding area saw significant growth once the monarchy ended in 1952. Transportation improved, new bridges were built, and new towns and suburbs were created in the desert. In 1965, the Greater Cairo Planning Commission was developed. Today, Cairo is a vibrant city with various neighborhoods and business areas.

Why would it be important to understand shapes and geometric vocabulary when planning a modern city?

Check Your Understanding
Follow your teacher's instructions to complete this activity.

Photo Credit: Abdelrahman Beltagy / Shutterstock.com

LESSON 2

Tricky Triangles

Learning Targets

- I can measure the sides of triangles.
- I can categorize triangles based on their properties.

ACCESS

Error Analysis Read the problem and complete the error analysis.

Is a square also a parallelogram?

Farha answered,

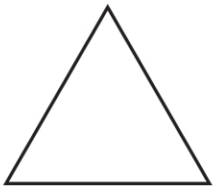
> No, a square is not a parallelogram because a square has four right angles, and a parallelogram does not.

1. What did the student do correctly?
2. What did the student do incorrectly? Why do you think she made this error?
3. Try to solve the problem. Explain your thinking.

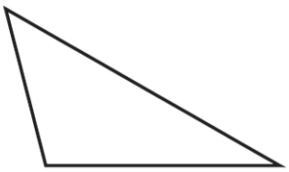
BUILD

Tricky Triangles Label the angles of each triangle. In each angle, place an A for acute, O for obtuse, and R for right.

1.



2.



3.



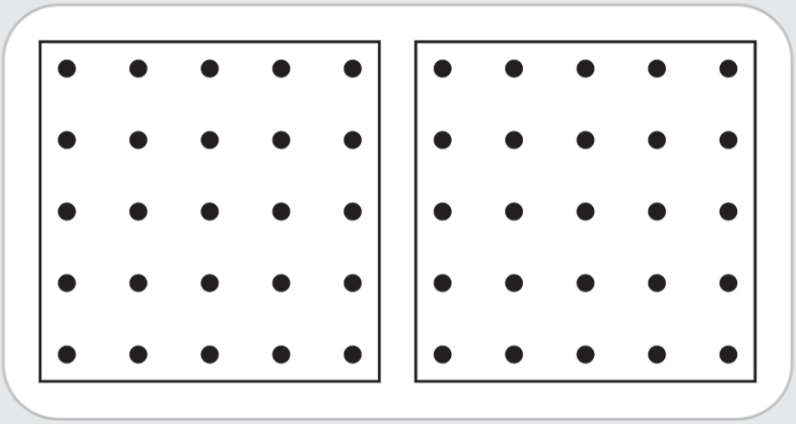
4.



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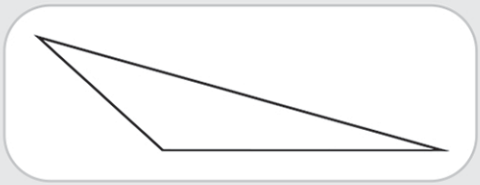
Whiteboard: Dot Paper Using the dot paper, can you draw:

- A triangle with two right angles?
- A triangle with two obtuse angles?

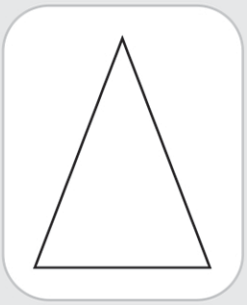


Whiteboard: Measuring Sides Use the Whiteboard or a ruler to measure the length of each side of the triangles. Measure to the nearest $\frac{1}{2}$ cm. Then, record your measurements in centimeters (cm).

1.



3.



2.



4.

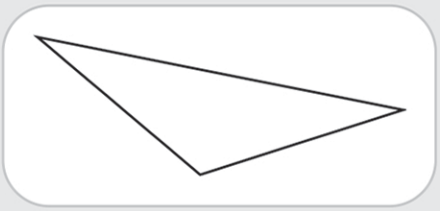
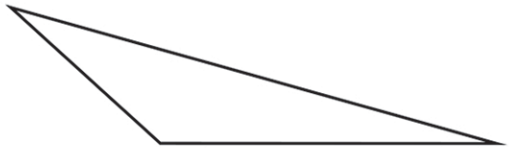


Photo Credit: Abdelrahman Beltagy / Shutterstock.com

Identify Triangle Types Using Measurement Measure and label each triangle. Then, select the best name for each triangle based on its properties. Some triangles may be classified in more than one way.

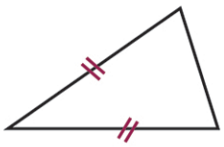
1.



Which two types of triangles are shown?

A. scalene triangle
B. isosceles triangle
C. equilateral triangle
D. right triangle
E. acute triangle
F. obtuse triangle

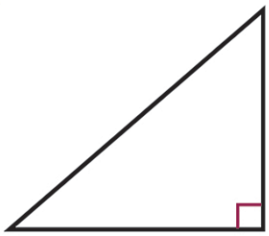
2.



Which two types of triangles are shown?

A. scalene triangle
B. isosceles triangle
C. equilateral triangle
D. right triangle
E. acute triangle
F. obtuse triangle

3.



Which two types of triangles are shown?

A. scalene triangle
B. isosceles triangle
C. equilateral triangle
D. right triangle
E. acute triangle
F. obtuse triangle

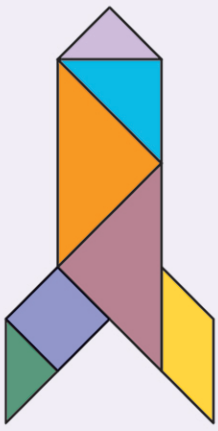
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HANDS-ON ACTIVITY

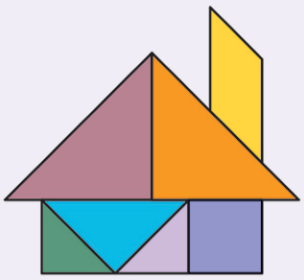
Tangram Art

Shown are examples of tangrams, images that can be created using various polygons. Draw a design of your own using the shapes listed.

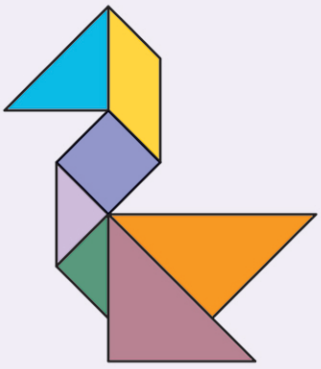
- One **obtuse isosceles** triangle with the equal sides measuring 3 cm
- One **equilateral** triangle of side length 4 cm.
- One right triangle
- One **scalene** triangle
- One quadrilateral of your choosing



Rocket



House



Goose

Photo Credit: Abdelrahman Beltagy / Shutterstock.com

CONNECT

Truss Bridges Work with your teacher to read the passage. Then, answer the question.

A truss bridge is built from a series of wooden or metal triangles, known as trusses. Trusses are used mainly for bridges that must carry heavy weight, such as railroad bridges.

The triangle is used because it is the simplest of the polygons, but exceptionally strong. It is the only shape that can be made from straight struts of metal and remain rigid by taking force from a single point and distributing it across a wide base.

Other shapes can be deformed by the force required to hold a bridge together. The Mansoura Rail Bridge in Mansoura, Egypt, is an example of a truss bridge that carries the railroad across the Nile River. It is about 279 meters long and has been in use since 1913.



Truss Bridge

Photo Credit: Abdelrahman Beltagy / Shutterstock.com

1. What type of triangle is being used in the truss bridge shown?
2. Why would architects use equilateral triangles for truss bridges and not scalene triangles?

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 3

Using Tiling to Calculate Area

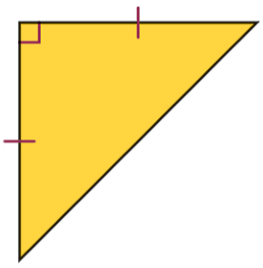
Learning Target

- I can use **tiling** to find the **areas** of rectangles with whole number and fractional **dimensions**.

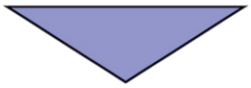
ACCESS

Triangles to Quadrilaterals Answer the questions.

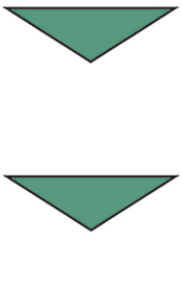
1. What type of triangle is shown, based on its angles AND side lengths?

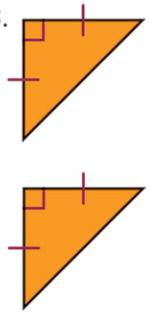


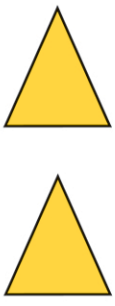
2. Can you use two of these to create a quadrilateral?
3. If so, what type of quadrilateral?
4. What type of triangle is this, based on its angles AND side lengths?



5. Can you use two of these to create a quadrilateral?
6. If so, what type of quadrilateral?
7. Select the two sets of triangles that can be joined along one edge to create a quadrilateral with right angles.

A. 

B. 

C. 

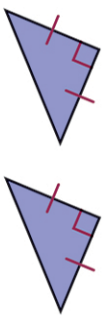
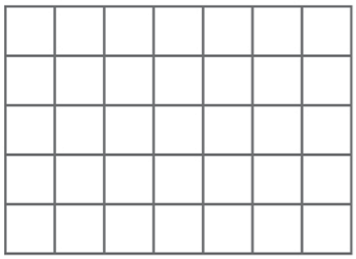
D. 

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BUILD

Whole Number Tiling You may choose to use a Whiteboard or your Math Notebook where indicated for the next tasks.

1. Count the unit tiles to determine the area of the rectangle.



2. Draw a rectangle with a length of 15 units and a width of 12 units.

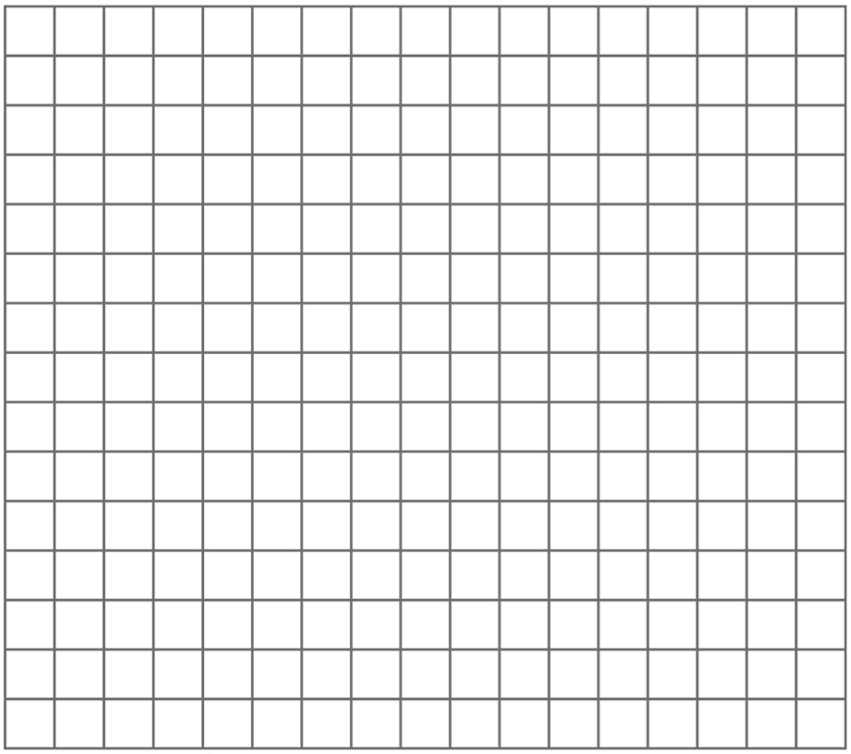
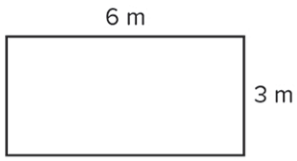


Photo Credit: Abdelrahman Beltagy / Shutterstock.com

3. Find the area of the rectangle you drew in Problem 2.

4. Find the area of the rectangle below by tiling (sketching in the unit squares).



5. Draw a rectangle with an area of 24 square units.

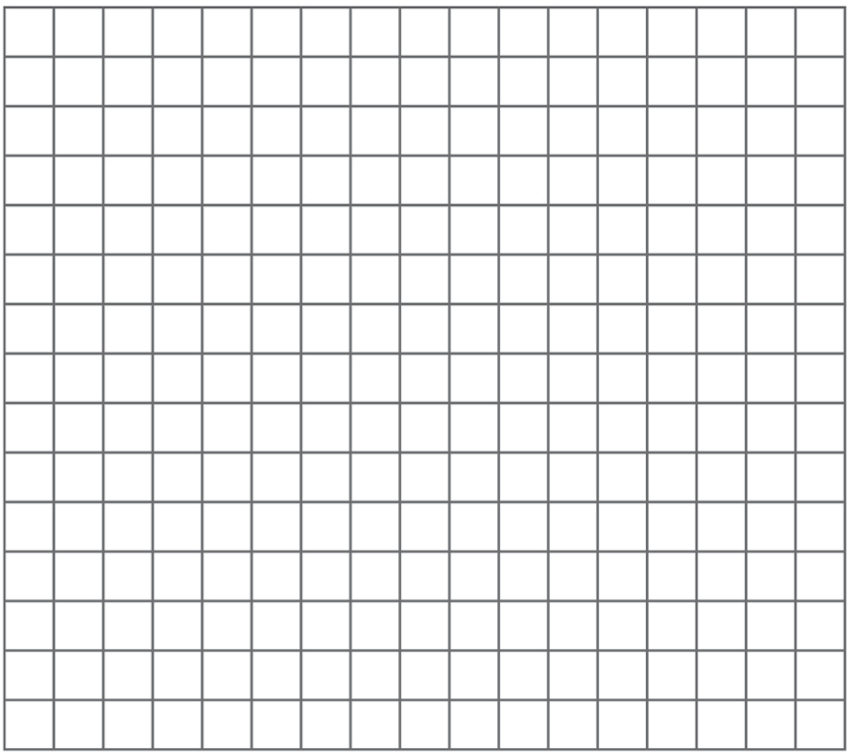
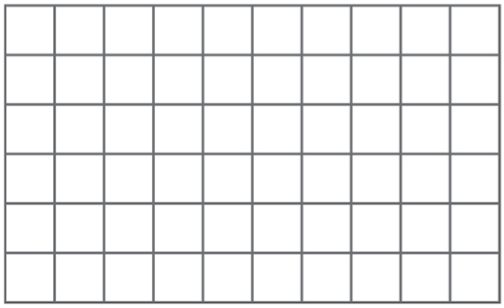


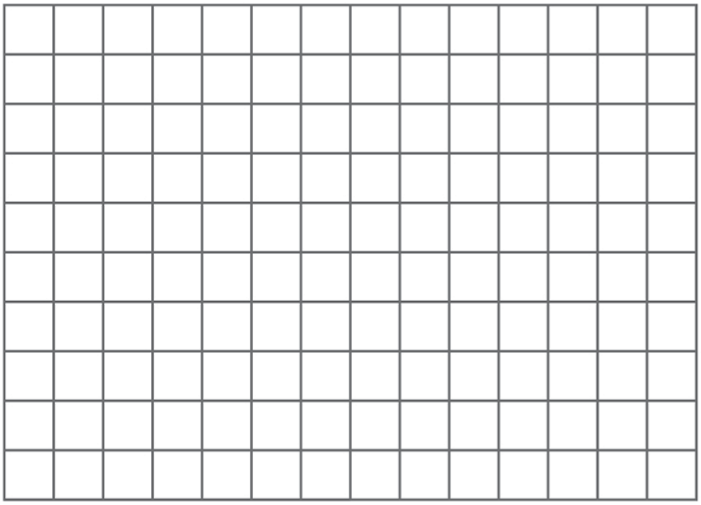
Photo Credit: Abdelrahman Beltagy / Shutterstock.com

Tiling with Fractional Dimensions You may choose to use your Math Notebook or a Whiteboard.

1. Draw a rectangle with dimensions $4 \text{ units} \times 2\frac{1}{2} \text{ units}$. Then, calculate and record its area. Be sure to label your answer.



2. Draw a rectangle with dimensions of $6\frac{1}{2} \text{ units} \times 4\frac{1}{2} \text{ units}$. Then, calculate and record its area. Be sure to label your answer.



CONNECT

Writing About Math Reflect on the work you did today. How does tiling to find area connect to multiplying to find area? Use one of the BUILD problems to illustrate your thinking.

Photo Credit: Abdelrahman Beltagy / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 4

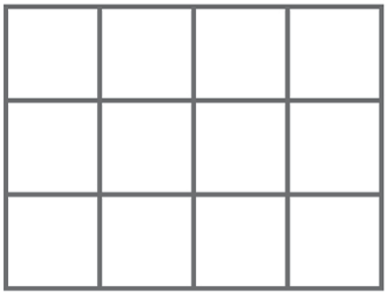
Applying the Area Formula

Learning Target

- I can multiply to find the area of rectangles with whole-number and fractional dimensions.

ACCESS

Puzzling Rectangles The rectangle shown is composed of squares that measure $2\frac{1}{4}$ centimeters on each side. What is its area in square centimeters? Explain your thinking in models and numbers.



BUILD

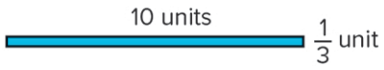
Multiplying Fractions Solve as many problems as possible in the time provided. Simplify all answers.

1. $2 \times \frac{1}{2} =$
2. $1\frac{1}{4} \times 3 =$
3. $\frac{3}{5} \times \frac{2}{9} =$
4. $2\frac{3}{4} \times 1\frac{1}{8} =$
5. $\frac{7}{8} \times \frac{5}{9} =$
6. $4\frac{3}{7} \times 2\frac{1}{8} =$
7. $3\frac{1}{8} \times \frac{1}{8} =$
8. $5\frac{2}{3} \times 2\frac{1}{3} =$

Photo Credit: Abdelrahman Beltagy / Shutterstock.com

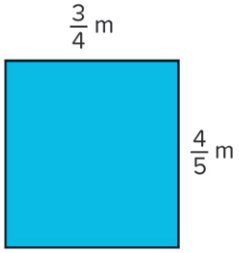
Multiplying to Find Area Solve each problem. Be sure to simplify all fractions and mixed numbers.

1. Akram's herb garden is 10 units long by $\frac{1}{3}$ unit wide. What is the area of Akram's herb garden?



2. A trench was dug in Doaa's backyard to fix her plumbing. The floor of ditch was 8 meters long and $\frac{1}{10}$ m wide. What is the floor of area of the ditch?

3. What is the area of the rectangle shown?



4. Omar owns a parking lot. The lot is 3 kilometers long and $2\frac{1}{2}$ km wide. What is the area of the parking lot?

5. A mosque has a window that is $\frac{3}{10}$ meter wide and 2 m long. What is the area of the window in square meters?

6. The university is building a new courtyard. The outline of the courtyard is shown. Find its area.

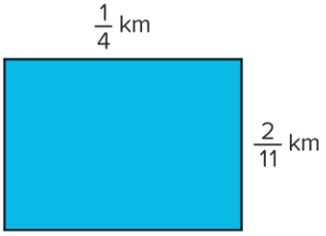


Photo Credit: Abdelrahman Beltagy / Shutterstock.com

CONNECT

The Egyptian Museum in Cairo Work with your teacher to read the passage. Then, answer the question.

The Egyptian Museum in Cairo is home to an impressive collection of Egyptian antiquities. Many of these pieces have formed traveling exhibits around the world. Visitors flock to see the ancient artifacts and learn about the pharaohs and their lives. The ground floor of the museum was thoughtfully laid out to house the treasures.

The floor plan of the various rooms is shown here.

The Egyptian Museum Floor Plan

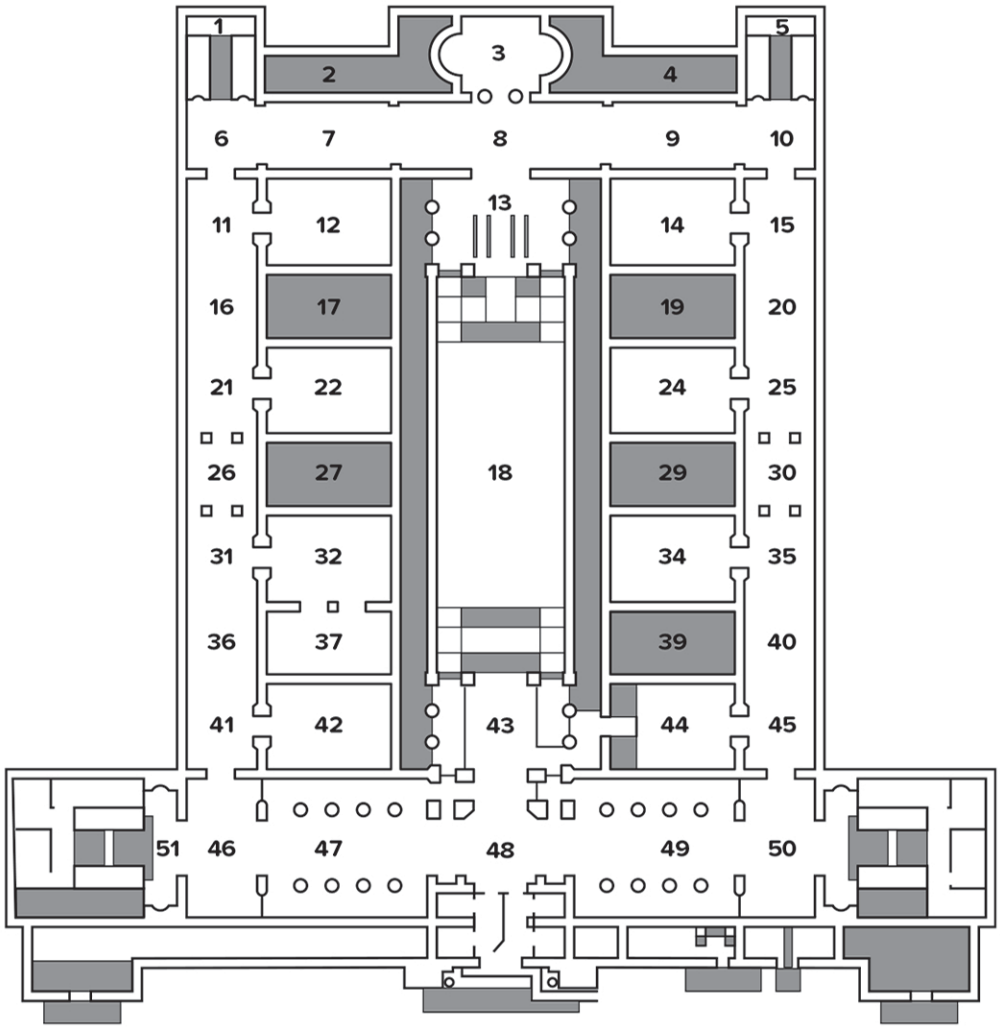


Photo Credit: Abdelrahman Beltagy / Shutterstock.com

New flooring will be installed in rooms 12 and 17, shown in the given map. In order to plan, the museum staff need to determine the areas of the floors.

- Room 12 measures $8\frac{1}{2}$ meters by $5\frac{1}{2}$ m.
- Room 17 measures $8\frac{1}{2}$ meters by 4 m.

1. What is the area of Room 12?
2. What is the area of Room 17?
3. What is the combined area of both rooms?

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 5

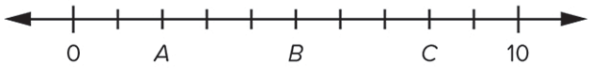
Introduction to Coordinate Planes

Learning Targets

- I can describe a **coordinate plane**.
- I can define elements of a coordinate plane.

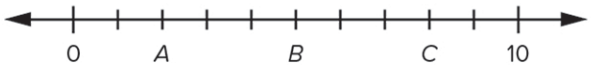
ACCESS

The Number Line Use the number line to answer the questions.

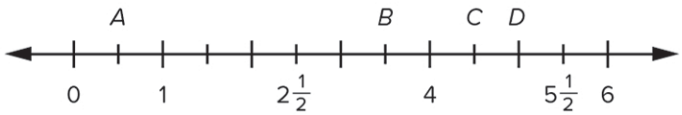


1. What is the value of B?
2. What is the value of A?
3. What is the value of C?

Write on the Number Line Copy the number line into your Math Notebook or a Whiteboard. Write a D above the point with a value of 7.



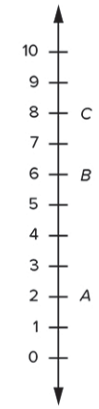
Another Number Line Use the number line to answer the questions.



1. What is the value of each space between the hashmarks?
2. What is the value of A?
3. What is the value of B?
4. What is the value of C?
5. What is the value of D?

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Vertical Number Line Use the number line to answer the questions.



1. What is the value of A?
2. What is the value of B?
3. What is the value of C?
4. How far is point C from point A?
5. How far is point B from point A?

Another Vertical Number Line What is the value of each space between the hashmarks?

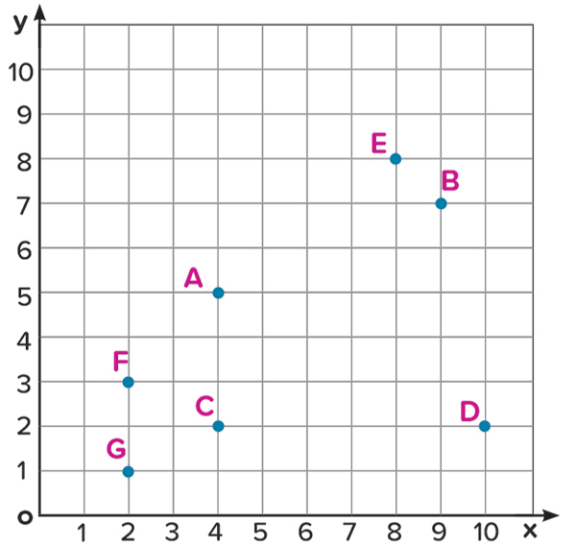


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BUILD

What Is a Coordinate Plane? Work with your teacher to learn about coordinate planes.

Visiting the Pyramids



A. Pyramid of Khufu
B. Pyramid of Khafre
C. Sphinx
D. Sphinx Temple
E. Valley Temple
F. Pyramid of Menkaure
G. Pyramids of Queens (3)

1. Use the vocabulary words to label the coordinate plane.

   The *x*-axis The *y*-axis origin point

2. Start at the origin. Move horizontally on the *x*-axis 4 units to the right and vertically on the *y*-axis 5 units up. What structure is located here?
3. From the origin, move 9 units horizontally on the *x*-axis and 7 units vertically on the *y*-axis. What structure is located here?
4. From the last point, move left on the *x*-axis 5 units and then down the *y*-axis 5 units. What structure is located here?
5. From the last point if we move 6 units to the right on the *x*-axis and zero units on the *y*-axis, what structure is located here?
6. Describe how to move from the Sphinx to the Valley Temple.

CONNECT

Whiteboard: Directions to the Queens' Pyramids Use the map of the Pyramids of Giza coordinate plane and follow the steps to solve the problem.

- Locate the Sphinx and the Pyramids of the Queens.
- Starting at the Sphinx, write directions to Pyramids of the Queens. Use directional words such as horizontally/left/right and vertically/up/down. Describe how to move using the vocabulary terms *x*-axis and *y*-axis. Remember to begin with directions along the *x*-axis.
- Exchange your work with a partner and see if, using your directions, your partner can move from the Sphinx to the Pyramids of the Queens.

Photo Credit: Medolka / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 6

Plotting Points on a Coordinate Plane

Learning Targets

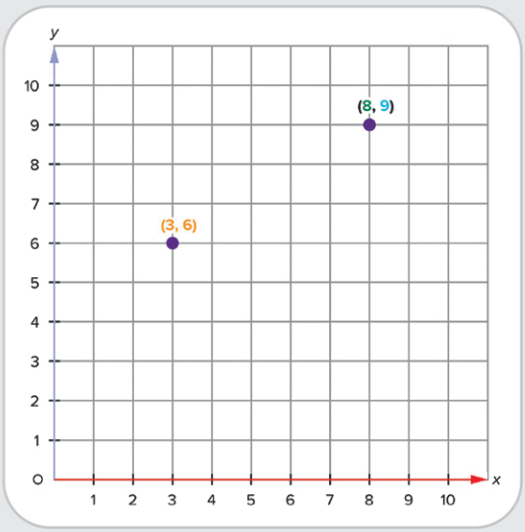
- I can identify points on a coordinate plane.
- I can name points on a coordinate plane.

ACCESS

Whiteboard: Graphing Vocabulary Use the terms to fill in the blanks on the coordinate plane.

Word	Definition
origin point	The point where the *x*-axis and the *y*-axis intersect at $(0,0)$. It is labeled as O.
The *x*-axis	The horizontal number line on a coordinate plane.
The *y*-axis	The vertical number line on a coordinate plane.
ordered pair	A pair of numbers used to locate any point on a coordinate plane. Ordered pairs are written left to right – (x, y).
x-coordinate	The first number in an ordered pair, which tells how far to move left or right from the origin. It is labeled as *x*.
y-coordinate	The second number in an ordered pair, which tells how far to move up or down from the origin. It is labeled as *y*.

Photo Credit: Medolka / Shutterstock.com



BUILD

Whiteboard: Plotting Ordered Pairs Record three ordered pairs that could be plotted on the given coordinate plane.

(_____, _____); (_____, _____); (_____, _____); (_____, _____); (_____, _____)

Then, plot your points on the coordinate plane.

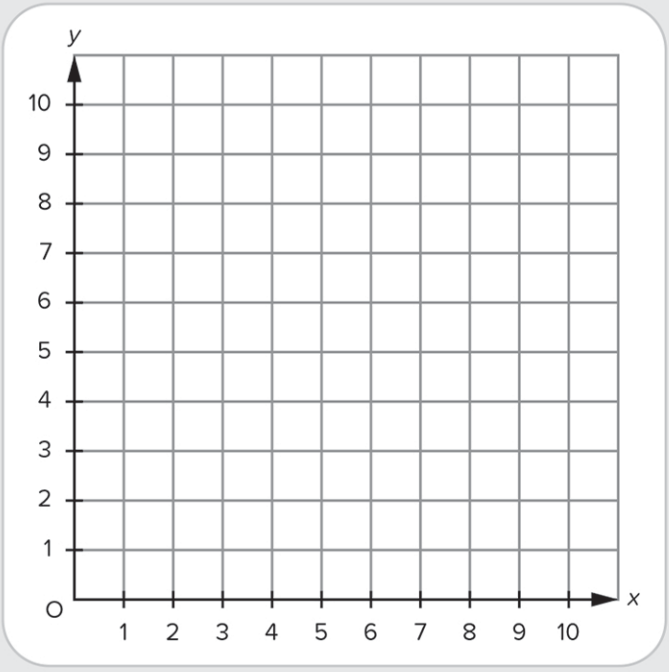


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Four Points in a Row

Follow the directions to play Four Points in a Row.

- Players choose to be X or O and decide who will go first.
- The first player chooses a point and describes it using an **ordered pair**, such as $(3,1)$. The player marks the **coordinate** on the Tic-Tac-Toe board and records it on the Player 1 list.
- Note: Unlike traditional Tic-Tac-Toe, the X or the O will be recorded on the intersection of a grid and not within a box.
- If a player states the wrong coordinate, they do not get to plot their point and their turn ends.
- Players take turns choosing coordinates, plotting points, and recording ordered pairs in one player's Student Materials. If time allows, play another game in the partner's Student Materials.
- To win, a player must get four coordinate points in an uninterrupted straight line. The line may be horizontal, vertical, or diagonal.

Four Points in a Row Recording Sheet

Game 1		Game 2	
Player 1	Player 2	Player 1	Player 2
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)
(___ , ___)	(___ , ___)	(___ , ___)	(___ , ___)

Photo Credit: Medolka / Shutterstock.com

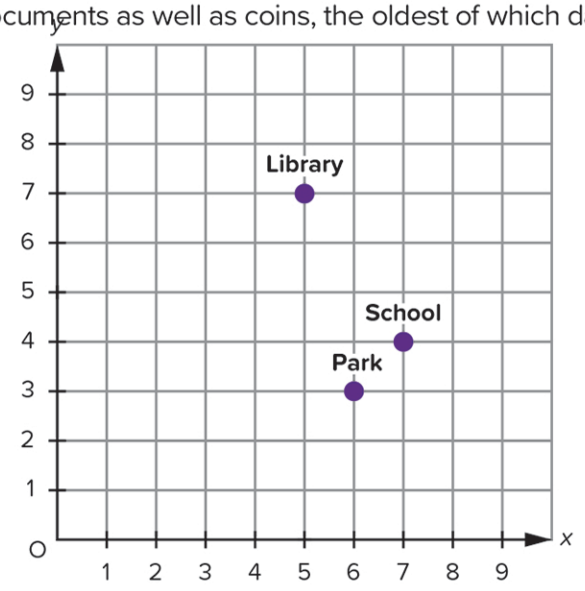
CONNECT


National Archives

The Egyptian National Library and Archives Work with your teacher to read the passage. Then, answer the questions. Remember to write ordered pairs in parentheses.

Libraries are important institutions of learning in cities, towns, and villages around the world. The Egyptian National Library and Archives was first established in 1870 on the ground floor of a palace. In 1971, the library was moved to the current building in Ramlet Bulaq. Today, it holds millions of volumes on a variety of topics.

The ancient works housed in the library are among the greatest in the world. There are ancient manuscripts of the Qur'an, illuminated manuscripts, and Arabic papyri from across Egypt dating to the 7th century AD and earlier. The library also houses Ottoman and Persian documents as well as coins, the oldest of which dates to 693 AD.



1. Using the coordinate grid, name the ordered pair that represents the library.
2. Using the coordinate grid, name the ordered pair that represents the park.
3. Using the coordinate grid, name the ordered pair that represents the school.
4. Fill in the blanks: To move from the school to the library, travel to the left of the *x*-coordinate _____ units. Then, travel up from the *y*-coordinate _____ units.

Check Your Understanding
Follow your teacher's instructions to complete this activity.

Photo Credit: Medolka / Shutterstock.com

LESSON 7

Coordinate Designs

Learning Target

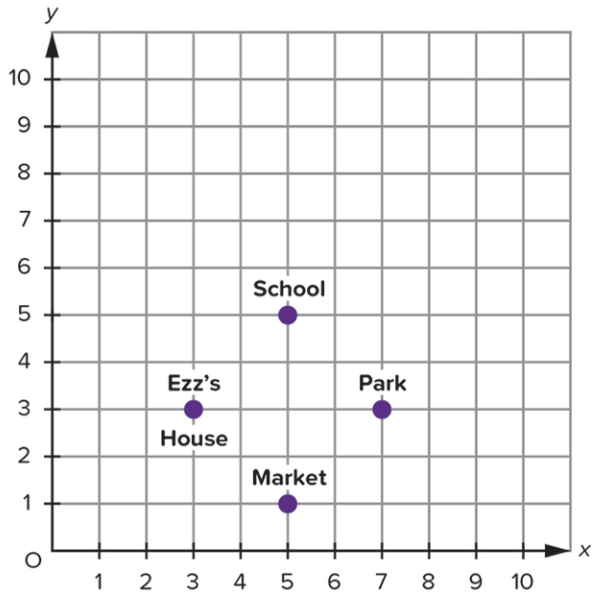
- I can plot ordered pairs on a coordinate plane to create a picture.

ACCESS

Grid Planning Work with your teacher to read the passage. Then, answer the questions.

The grid plan is a strategy for city planning in which streets and roads run at right angles to each other. The streets form a grid similar to a coordinate plane. This plan allows for frequent intersections, helps with pedestrian movement, and makes it easy for people to orient themselves and find destinations in large cities.

The grid plan has been in use for almost 5,000 years and exists in many communities around the world. Some of the earliest planned cities were built using grid plans. The figure shown represents a city designed with the grid plan.

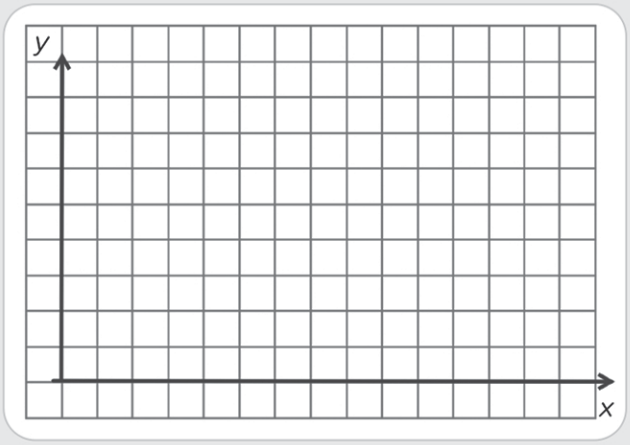


1. A "bird's-eye view" refers to looking down from above. If a bird were to fly directly from Ezz's house to the school, then to the park, and back to Ezz's house, what polygon would its flight path represent?
2. If the bird were instead to fly from the park to the market before going back to Ezz's house, what polygon would its path represent?

Photo Credit: Medolka / Shutterstock.com

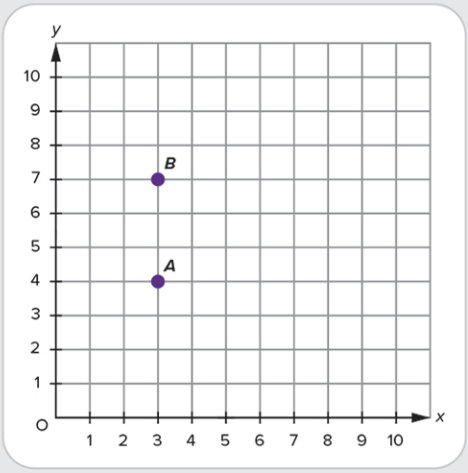
BUILD

Whiteboard: From Points to Pictures Use the Whiteboard to complete Problem 1 and Problem 2.



1. Plot the points on the coordinate grid.
   $A(3,2)$ $B(3,5)$ $C(6,5)$ $D(6,2)$
2. Connect the points in order. What polygon did you create?

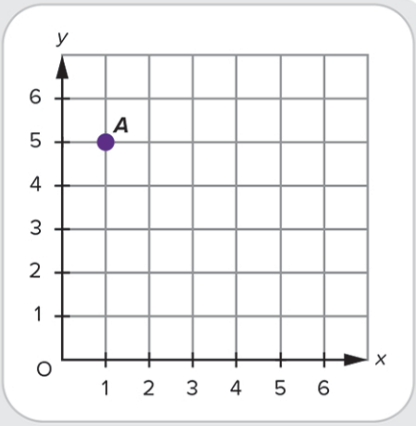
Whiteboard: 2 Use the Whiteboard to complete Problems 1, 2, and 3.



1. Record the ordered pairs for points A and B on the coordinate plane.
2. Draw a line connecting the two points.
3. Place a coordinate point C to create an isosceles right triangle with the right angle at point A. Record the ordered pair on the coordinate plane.

Photo Credit: Medolka / Shutterstock.com

Whiteboard: 3 On the coordinate plane, plot and label the given ordered pairs *A* through *J*. Then, connect the dots to create a picture. Connect point *J* to point *A* to close the shape. Point *A* is done for you.



A(1,5)	C(5,1)	E(4,2)	G(3,3)	I(2,4)
B(1,1)	D(5,2)	F(4,3)	H(3,4)	J(2,5)

Whiteboard: 4 On the coordinate plane, plot points *F, G,* and *H* to make a figure that is symmetrical along the vertical orange line drawn on the coordinate plane. (Point *F* should follow Point *E*.) Connect point H to point A to close the shape. Then, list the coordinates of *F, G,* and *H*.

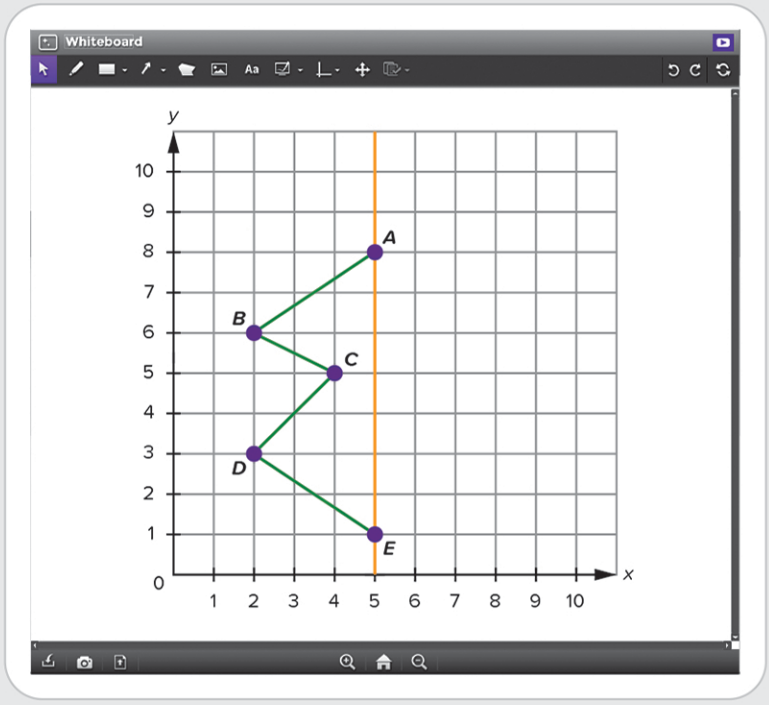


Photo Credit: Medolka / Shutterstock.com

Whiteboard: Challenge Choose one of the objects to graph on the coordinate plane by plotting points and connecting these points. List each of the points for your object as a set of ordered pairs.

Objects:

A star

A hexagon

A house

A pentagon

A right angled triangle

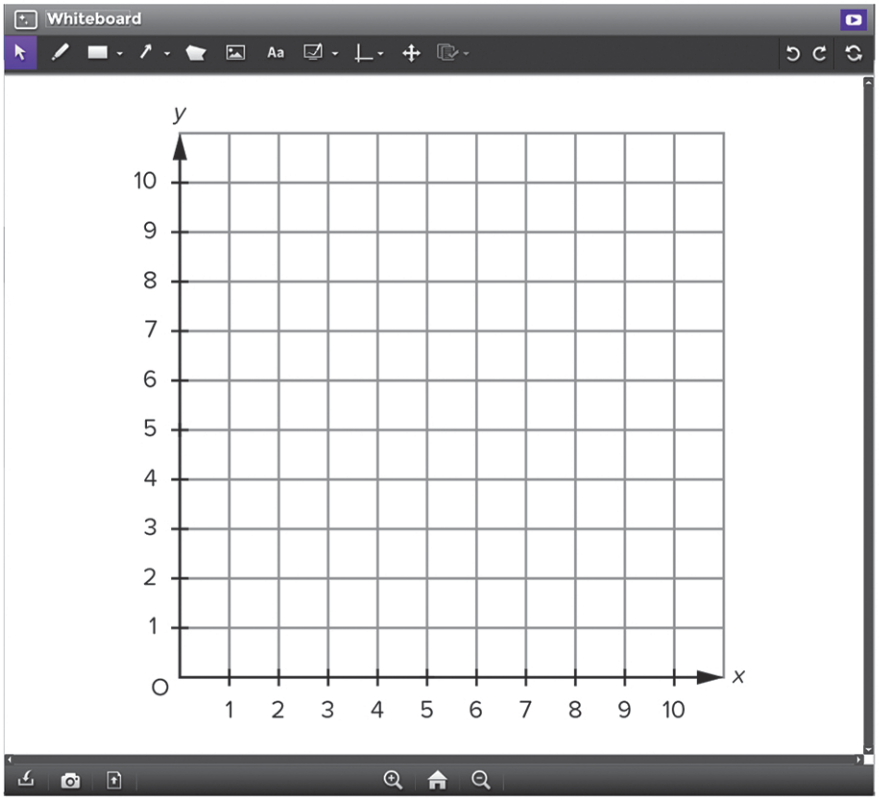


Photo Credit: Medolka / Shutterstock.com

CONNECT

The Giza Zoo Work with your teacher to read the passage. Then, complete the task.


Giza Zoo

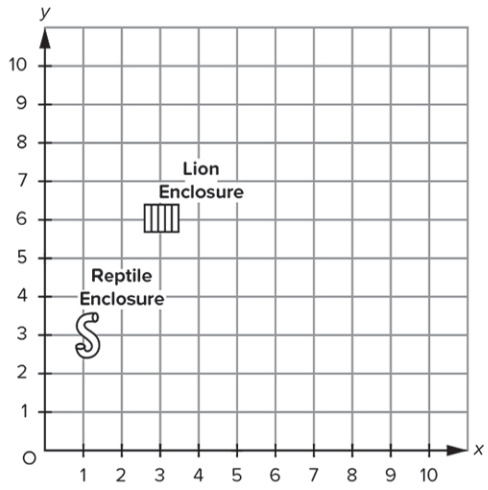
The Giza Zoo is located in Giza's largest park. It is one of the few green areas in the city and is home to many endangered animals and a variety of plant species. The zoo opened in 1891 and was built by Khedive Ismail who imported many plants from India, Africa, and South America. The original 180 birds and 78 other animals were from Khedive Ismail's private collection.

Today, the zoo houses mammals from around the world, birds such as flamingos and falcons, and Egyptian reptiles like the Egyptian cobra and tortoise, as well as the Nile crocodile.

Look at the zoo map. The lion and the reptile houses have already been located. Place the Zebra Enclosure and the Snack Shop on the map according to the rules listed.

Rules:

- Zebras must be at least 3 units away from the lions.
- The Snack Shop cannot be closer than 6 units to the reptiles.
- The four structures must create a parallelogram on the zoo map.



Which two points will fit the given criteria?

A. Zebra Enclosure $(4,5)$; Snack Shop $(3,3)$

B. Zebra Enclosure $(9,6)$; Snack Shop $(7,3)$

C. Zebra Enclosure $(6,6)$; Snack Shop $(4,3)$

D. Zebra Enclosure $(6,6)$; Snack Shop $(3,4)$

Check Your Understanding
Follow your teacher's instructions to complete this activity.

Photo Credit: Medolka / Shutterstock.com

LESSON 8

Representing Points and Creating Patterns

Learning Targets

- I can identify and extend numerical **patterns**.
- I can graph points from a numerical pattern.

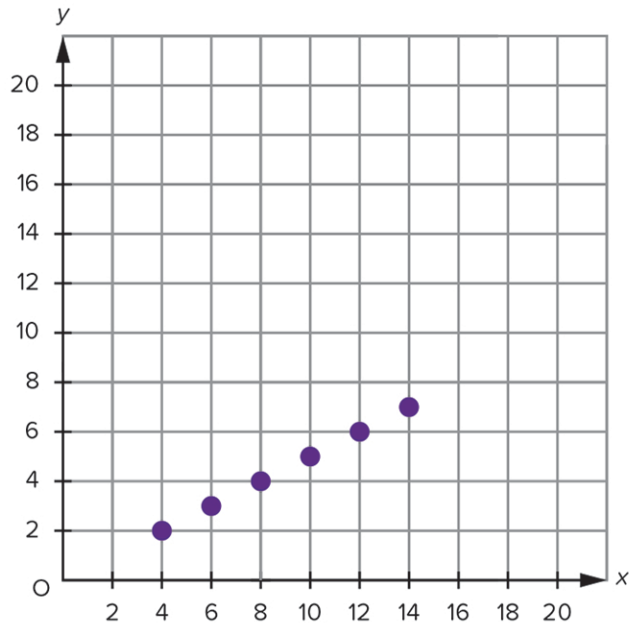
ACCESS

Error Analysis Read the problem and complete the error analysis.

Ehab was given these coordinate pairs to plot.

$(2,4)$; $(3,6)$; $(4,8)$; $(5,10)$; $(6,12)$; and $(7,14)$

Here is Ehab's graph.



1. What did Ehab do correctly?
2. What did Ehab do incorrectly? Why do you think he made this error?
3. Try to solve the problem correctly.

Photo Credit: Medolka / Shutterstock.com

BUILD

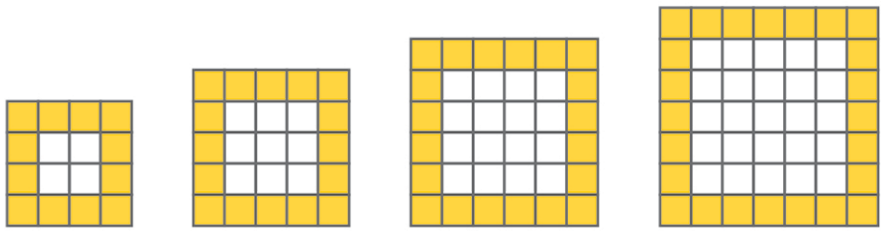
From Ordered Pairs to a Table Use the ordered pairs to fill in the table. The first ordered pair has been done for you.

(2,4); (3,6); (4,8); (5,10); (6,12); and (7,14)

***x* values**	2					
***y* values**	4					

Build a Garden Haitham is a city planner. He is building a collection of square garden beds in a local park.

In Haitham's design, the gardens increase in size as you move through the park. Shown are the sketches of his ideas. The yellow squares represent the square tile border around the outside of the garden. The white tiles represent square units of dirt.



1 2 3 4

Photo Credit: Medolka / Shutterstock.com

1. Work with your teacher to fill in the table for the yellow tiles in designs 1 to 4. Then, record your predictions for designs 5 and 6.

Garden Design, *x*	1	2	3	4	5	6
Number of Yellow Units, *y*						

2. Fill in the table below for the white tiles in designs 1 to 4. Then, record your predictions for designs 5 and 6.

Garden Design, *x*	1	2	3	4	5	6
Number of White Units, *y*						

Whiteboard: 3 Use the information from the tables you completed to plot the coordinates for designs and number of tiles.

Use one color to connect the first set of points and color in the Square Units around the Garden Key with that color. Use a different color to connect the second set of points and color in the Dirt Key with that color. Your finished coordinate grid will have two line graphs.

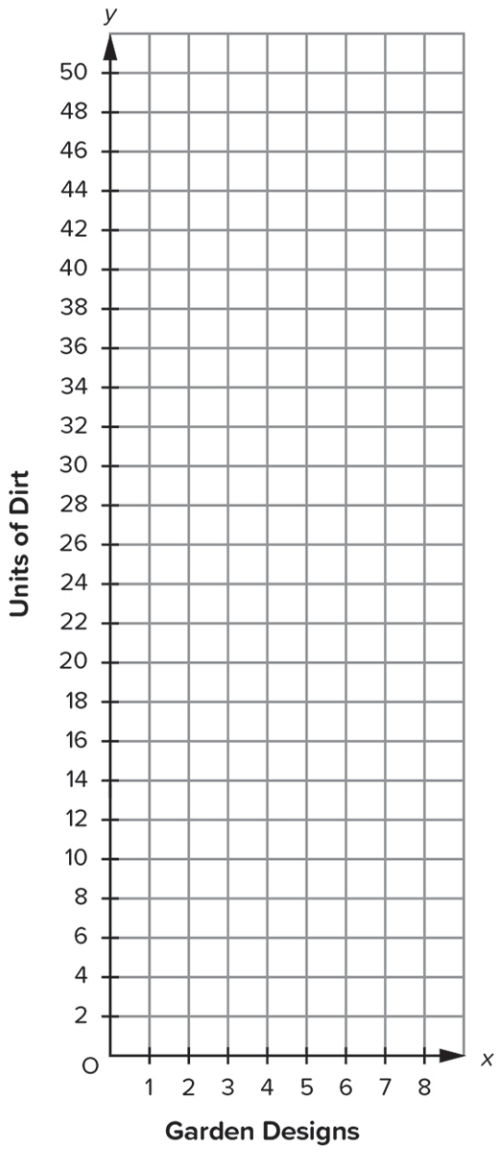


Photo Credit: Medolka / Shutterstock.com

Challenge 1 Look at the table and fill in the missing y values based on the pattern of plant height in Haitham's garden from one week to the next.

Weeks, x	1	2	3	4	5	6
Height of plants, y	$\frac{1}{2}$ cm	2 cm	$3\frac{1}{2}$ cm			

Challenge 2 Graph the coordinate points from the Challenge 1 table.

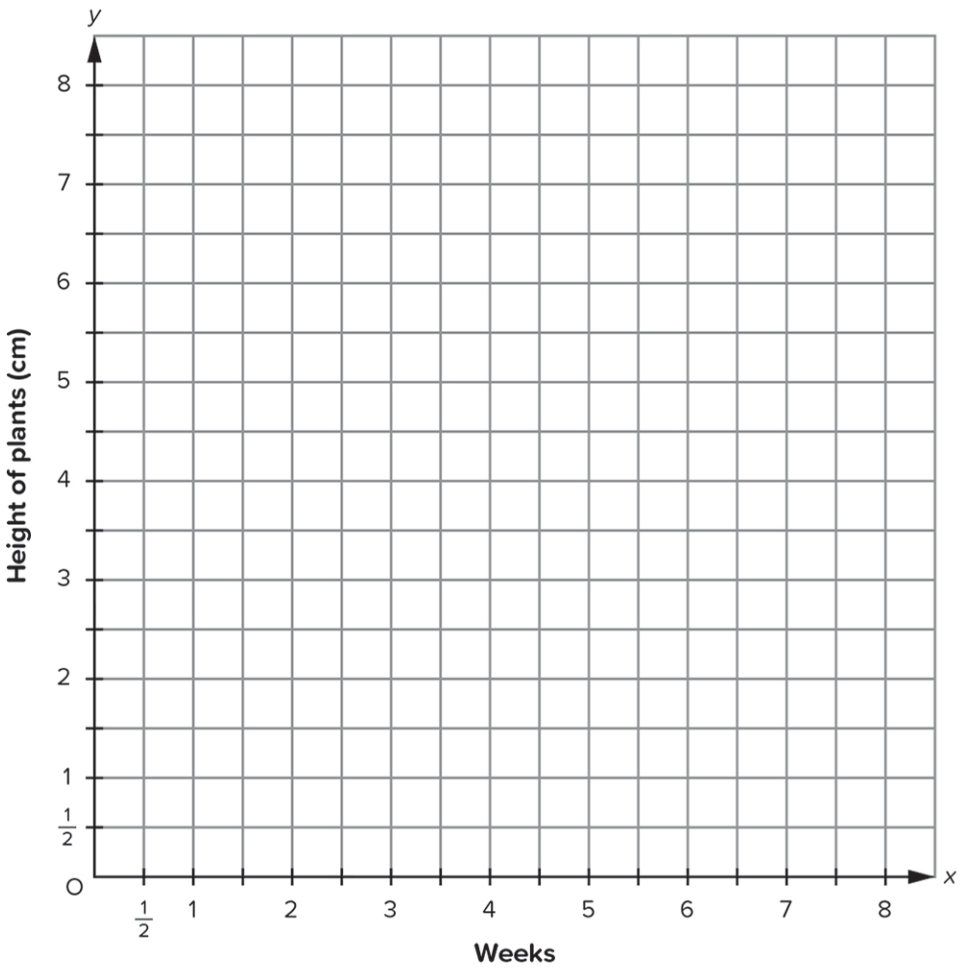


Photo Credit: Medolka / Shutterstock.com

Photo Credit: (a) Medolka / Shutterstock.com, (b) aaelrahman89 / Shutterstock.com

CONNECT



Minibus

Transportation Work with your teacher to read the passage. Then, answer the questions.

Transportation plays a vital role in city planning. Major cities around the world rely on buses, trolleys, trains, metros, and taxis to move people around. Public transportation usually runs on a set timetable so people can plan their travels based on arrivals and departures.

As population increases in different areas, governments respond by creating additional transportation options. In Cairo, some buses are run by the Cairo Transport Authority, while others are smaller minibuses run by private companies.

1. Kamal runs a transportation company and considers adding to his fleet of microbuses. Each bus can hold 15 passengers. Extend the pattern to complete the table.

Total Number of Passengers, *x*	A	30	C	60	E	90	G
Number of Microbuses, *y*	1	B	3	D	5	F	7

Whiteboard: 2 Graph the microbus data on the coordinate plane.

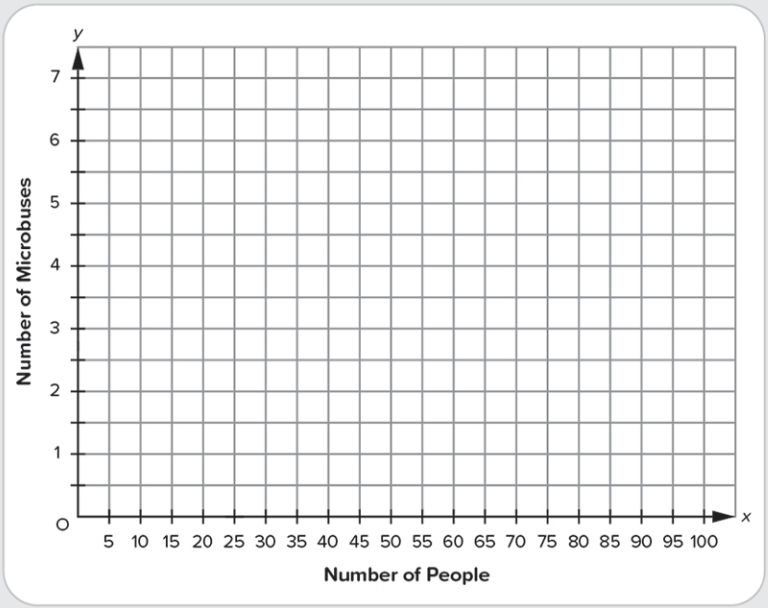


Photo Credit: Medolka / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 9

Graphing Real-World Data

Learning Targets

- I can interpret data on coordinate planes.
- I can solve real-world problems involving data on coordinate planes.

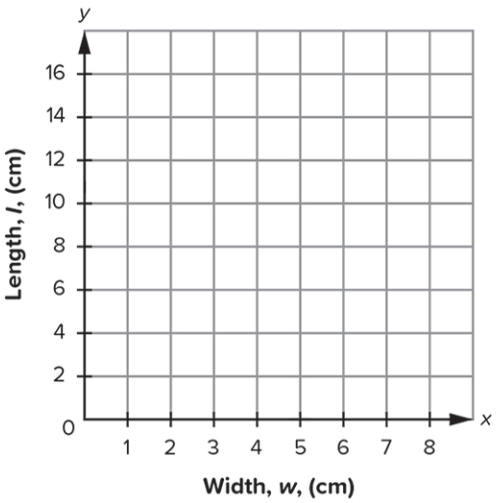
ACCESS

Graphing the Length and Width of Rectangles The length of a rectangle is twice its width, in centimeters. This information can be represented by the rule, Length (l) = 2 × Width (w).

1. Use the pattern to complete the table.

Width, w (cm)	1	2	A	5	C	8
Length, $l = 2w$ (cm)	2	4	8	B	12	D

2. Using the Width data as x-coordinates and the Length data as y-coordinates, plot the data on the coordinate grid. Then, draw a line to connect the points.



3. The width of the rectangle is 3 centimeters. The length is _____ cm.

4. The width of the rectangle is 5.5 centimeters. The length is _____ cm.

5. The length of the rectangle is 6 centimeters. The width is _____ cm.

6. The length of the rectangle is 14 centimeters. The width is _____ cm.

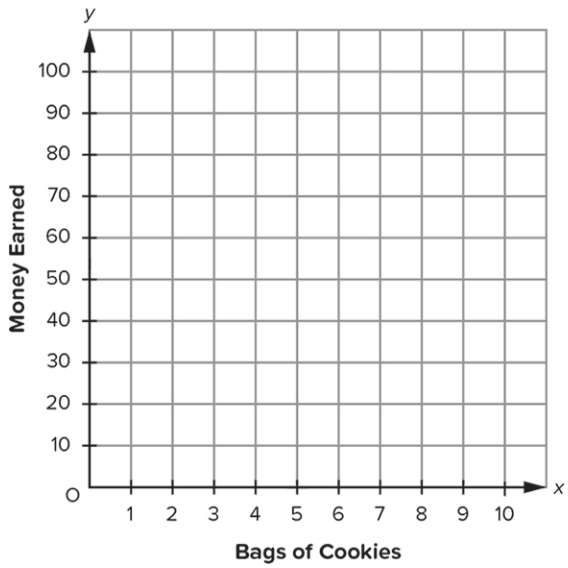
Photo Credit: Medolka / Shutterstock.com

BUILD

Interpreting Data on Coordinate Planes

1. Ola is selling bags of cookies in her neighborhood to make extra money to buy a new bike. She earns 5 LE for each bag of cookies she sells. Complete the table and then graph the points on the coordinate grid.

Bags of Cookies	Money Earned LE
2	
4	
7	
8	
10	



2. Nabil and Osman are in a 5-hour bike race. Nabil is traveling at a rate of 30 kilometers per hour. Osman is traveling at a rate of 60 km/hr. Use that information to complete the tables.

Nabil (30 km/hr)	
Number of Hours	Total Distance (km)
1	
2	
3	
4	
5	

Osman (60 km/hr)	
Number of Hours	Total Distance (km)
1	
2	
3	
4	
5	

a) Graph the data from your table on the coordinate plane. Use a different color to represent each biker's data. Remember to label the *x*-axis and the *y*-axis and determine the scale for each axis.

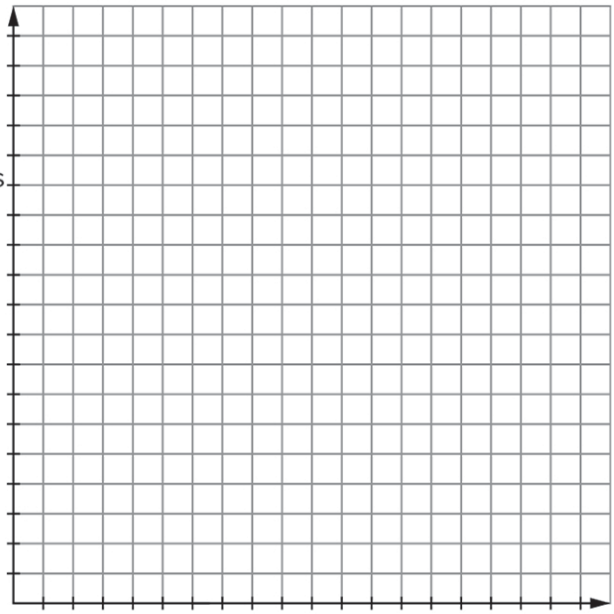
Photo Credit: Medolka / Shutterstock.com

b) At the end of the race, who traveled farther?

c) How much farther did he travel?

d) The boys biked 120 kilometers at different times. How long did it take each of them?

e) The What is one question that could be answered from this table or graph?



3. The table shows meerkat growth in the Kalahari of South Africa during their first 20 months of life. Graph the data on a coordinate plane and then connect the points with line segments.

Time in Months	0	2	4	6	8	10	12	14	16	18	20
Units of Height	3	5	6	7	8	9	10	12	12	12	12

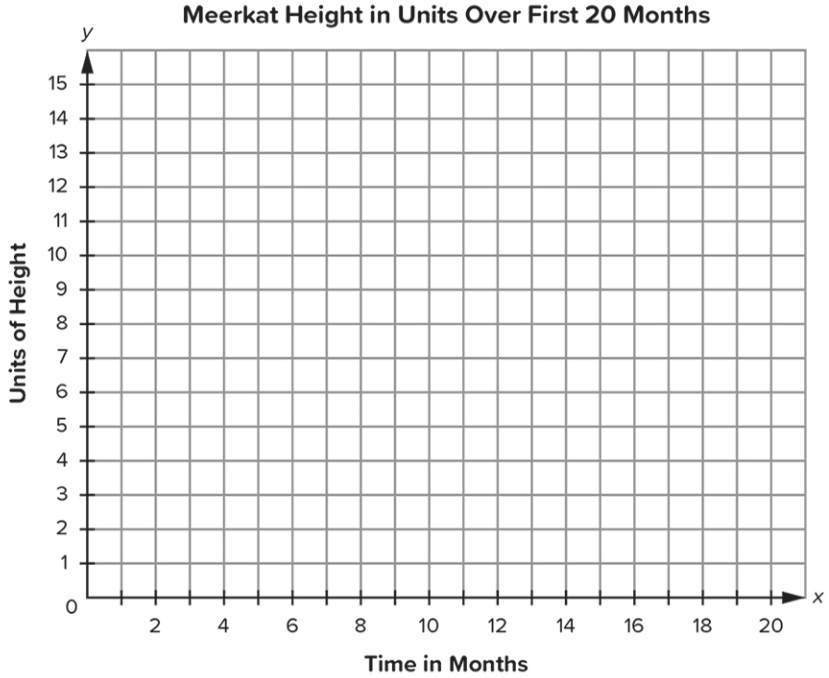


Photo Credit: Medolka / Shutterstock.com

a) What does the point $(0 \text{ months}, 3 \text{ units})$ mean for a typical meerkat's height?

b) How tall do you think a typical meerkat gets? Why do you think so?

c) At what age do meerkats reach their full height? How do you know from this graph?

a) If this graph were about a human instead of a meerkat, at what age do you think the height would stop increasing?

CONNECT

Construction in Cairo Developers in cities need permits to construct buildings. A developer in downtown Cairo is trying to decide whether he should build an office building with 8 offices per floor or 12 offices per floor.

How could the developer use the table and a coordinate plane to help him analyze data and make decisions about the height of the building he will construct? Use words and numbers to support your thinking.



Construction

Photo Credit: Medolka / Shutterstock.com

Number of floors	8 offices per floor	12 offices per floor
0		
1		
2		
3		
4		

Check Your Understanding
Follow your teacher's instructions to complete this activity.

UNIT 11

Unit 11 Volume



Measuring Water

Unit Video Questions

The Unit 11 Opener Video, Measuring Water, explores math around Egypt through volume. In this unit, you will explore three-dimensional figures and learn about volume. You will calculate volume of rectangular prisms.

Quick Code egm5245

- ☐ How did volume help the students make sense of the world around them?
- ☐ What did the students discover about measuring volume?

LESSON 1

Geometric Shapes Around Us

Learning Targets

- I can name three-dimensional figures.
- I can identify attributes of three-dimensional figures.
- I can define **volume** and **capacity**.

ACCESS

Buildings around the World Look at the images of buildings around the world. Match the name of each building's shape to the building.

1. La Géode—Paris



A. Cube
B. Cone
C. Cylinder
D. Sphere
E. Rectangular prism
F. Square pyramid

2. Dashur Pyramids—Egypt



A. Cube
B. Cone
C. Cylinder
D. Sphere
E. Rectangular prism
F. Square pyramid

Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

3. El Gezira tower (also known as Borg El Qahera)—Egypt



A. Cube
B. Cone
C. Cylinder
D. Sphere
E. Rectangular prism
F. Square pyramid

4. Modern Building—Australia



A. Cube
B. Cone
C. Cylinder
D. Sphere
E. Rectangular prism
F. Square pyramid

5. The Red Chapel of Hatshepsut—Egypt



A. Cube
B. Cone
C. Cylinder
D. Sphere
E. Rectangular prism
F. Square pyramid

6. Stuttgart City Library—Germany



A. Cube
B. Cone
C. Cylinder
D. Sphere
E. Rectangular prism
F. Square pyramid

Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

7. The Ministry of Foreign Affairs—Egypt

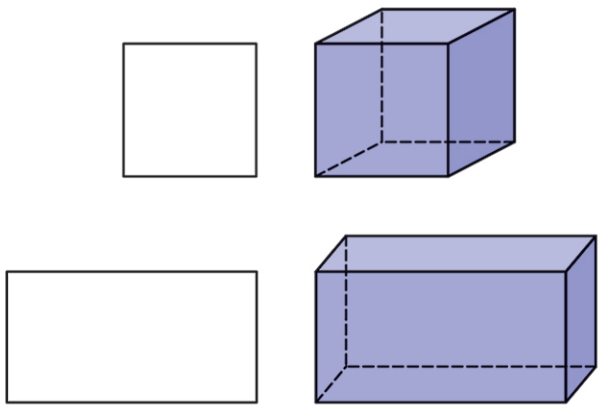


A. Cube
B. Cone
C. Cylinder
D. Sphere
E. Rectangular prism
F. Square pyramid

8. Which of the shapes do you think is the most efficient for a building? What attributes did you consider when making your choice?

BUILD

Similar and Different Look at the 2D and 3D shapes and discuss with a partner how they are similar and different. Be prepared to share your thinking with the class.



Volume: _____

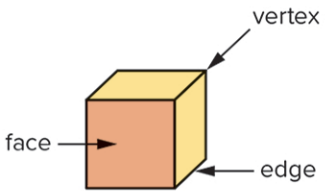
_____

Capacity: _____

_____

Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

Edges, Faces, and Vertices Work with your teacher to fill in the first row. Then, complete the rest of the table.



Attributes of Three-Dimensional Shapes

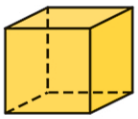
	Name	Picture	Face/ Base Shape(s)	Number of Faces/ Bases	Number of Edges	Number of Vertices
1	Cube					
2	Cone					
3	Cylinder					
4	Rectangular Prism					
5	Sphere					
6	Square Pyramid					

Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

Photo Credit: Cipolina / Shutterstock.com



CONNECT

Why Use a Pyramid? Work with your teacher to read the passage. Then, answer the questions.

Pyramids were built in many countries around the world, from South America to Sudan. Egypt, however, contains the most famous of the ancient pyramids. Why did the ancient Egyptians use the pyramid shape and not a rectangular prism or a cube?

Egyptologists have a few theories. One is that the pyramids were modeled after a sacred pointed stone called the Benben, believed to be the first model for obelisks. Others believe the shape represented the rays of the sun, and that the sloping sides of a pyramid allowed the dead pharaoh to symbolically climb to the sky and live forever.

From a structural standpoint, the shape of a pyramid allows the weight to be distributed evenly. Most of the weight in a pyramid is on the bottom and decreases as you go up. This allows tall, large structures to be built.

Capacity is the amount a three-dimensional shape can hold. Seif said that maybe the ancient Egyptians used a pyramid instead of a rectangular prism for their tombs because if they are the same height and have the same base, the pyramid would have a greater capacity. Do you agree or disagree with Seif and why?

Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 2

Measuring Volume

Learning Targets

- I can find the volume of **The Cuboid** in unit **cubes**.
- I can use unit cubes to measure the volume of rectangular prisms.

ACCESS

Volume Use what you have learned about volume to answer the questions.

1. What is the number of cubes in the rectangular prism.



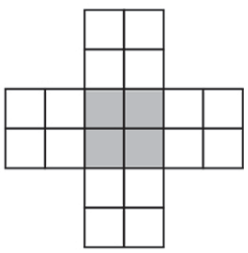
2. Use the centimeter cubes to create the prism in Problem 1. Then, record its volume in cubic centimeters.

BUILD

How Many Cubes? Work with your team to complete the steps for each figure.

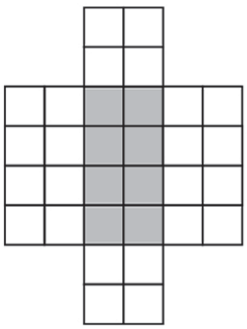
1. Copy the given figure onto your grid paper. (The images on the page are smaller than they will be on your grid paper.)
2. Cut out the image.
3. Fold the shape so the shaded section is the base of the shape.
4. Tape the shape together to form a box.
5. What is the number of cubes in each 3D shape?
6. Use the centimeter cubes to measure the volume.

1.



volume: _____ cubic centimeters

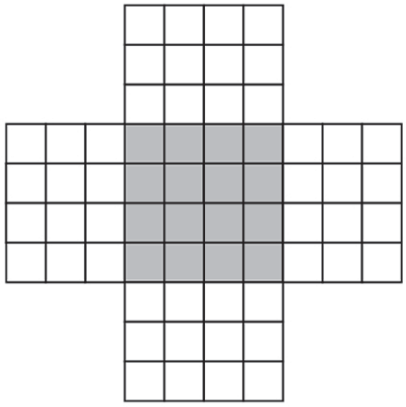
2.



volume: _____ cubic centimeters

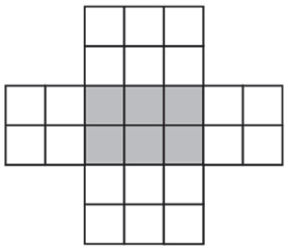
Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

1.



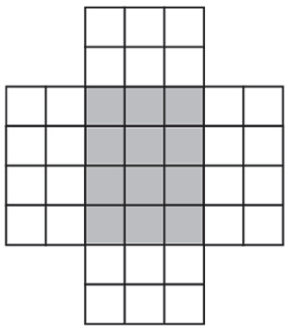
volume: _____ cubic centimeters

2.



volume: _____ cubic centimeters

3.



volume: _____ cubic centimeters

CONNECT

The Step Pyramid at Saqaara

Egypt's first step pyramid was constructed at Saqqara about 4,700 years ago. The Step Pyramid was built in the third dynasty to house the burial chambers of King Djoser and his family.



Step Pyramid at Saqqara

The pyramid began as a *mastaba* (meaning "bench" in Arabic) tomb. A mastaba tomb is a flat-roofed structure with sloping sides. As construction continued, it grew to a 60-meter-high pyramid composed of 6 layers built one on top of the other.

Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

The Step Pyramid of Djoser was made of 330,400 cubic meters of stone. The labyrinth of tunnels that lead to chambers and galleries inside the Step Pyramid of Djoser are close to 6 kilometers in length. Inside there is a central shaft that is 7 meters long and 7 m wide.

Doha drew this representation of the central shaft:

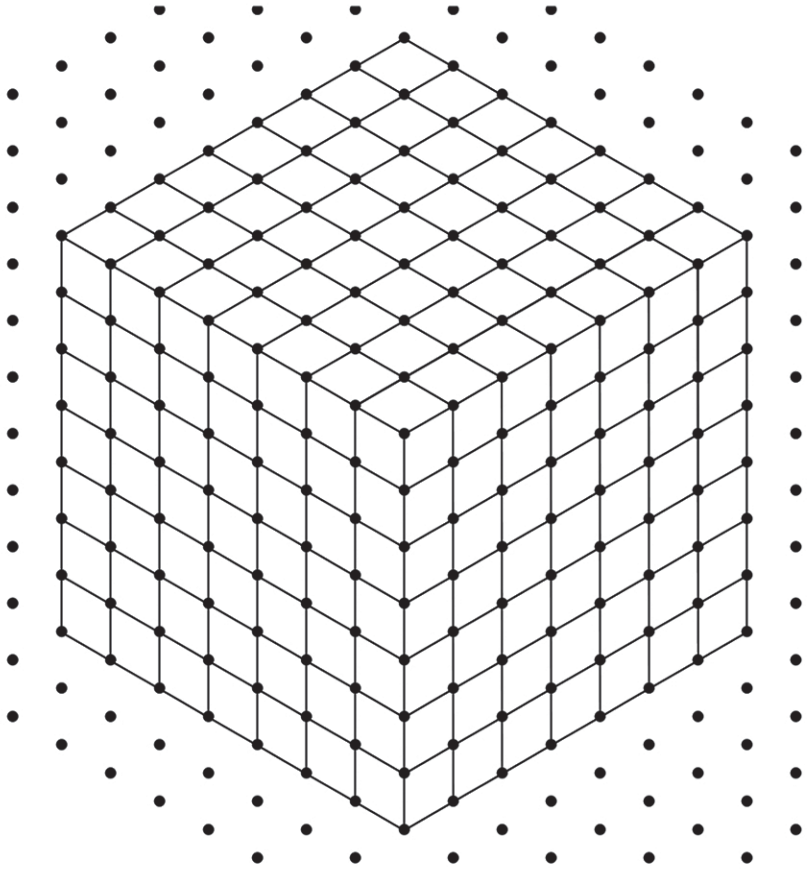


Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

1. If the central shaft has a length and width of 7 cubes, how many cubes are in the first layer of the shaft?
2. How many cubes would you predict could fit in the central shaft if there were 7 layers as seen in Doha's drawing?

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 3

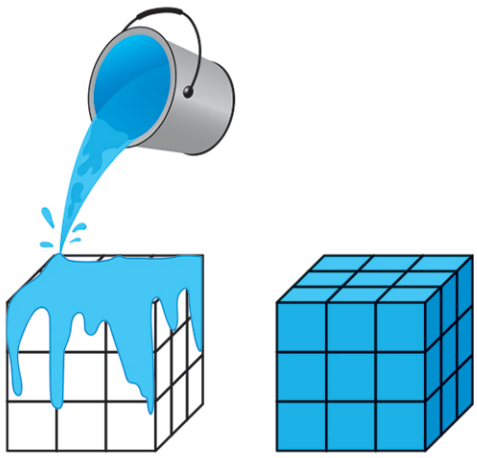
Same Volume, Different Shape

Learning Target

- I can use unit cubes and models to create right rectangular prisms with a given volume.

ACCESS

Painting the Cube Imagine you put blue paint on every side of the cube shown, including the base. Answer the questions. You can use your cubes and the dot paper to help you if you get stuck.



1. How many of the small cubes have 3 blue faces?

2. How many have 2 blue faces?

3. How many have 1 blue face?

4. How many have not been painted at all?

Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

BUILD

Layers and Slices Follow your teacher's directions to complete the problems.

1. Use isometric dot paper or the Whiteboard: Isometric Dots to sketch a rectangular prism with a width of 4 cubes and a height of 7 cubes.

   Draw lines to decompose the figure into 7 layers. Record how many cubes are in each layer.

2. Complete the table with your class.

Number of Layers	Cubes in Each Layer	Volume of the Prism

3. Sketch the same rectangular prism. This time, draw vertical lines to decompose the figure into 4 slices. Record how many cubes are in each slice.

4. Complete the table.

Number of Slices	Cubes in Each Slice	Volume of the Prism

5. Work with your partner to build the rectangular prism using your centimeter cubes. Decompose the shape into layers (horizontal) or slices (vertical) in three different ways. Then, draw your layers and slices in the given blank models or in the Whiteboard: Layers and Slices.

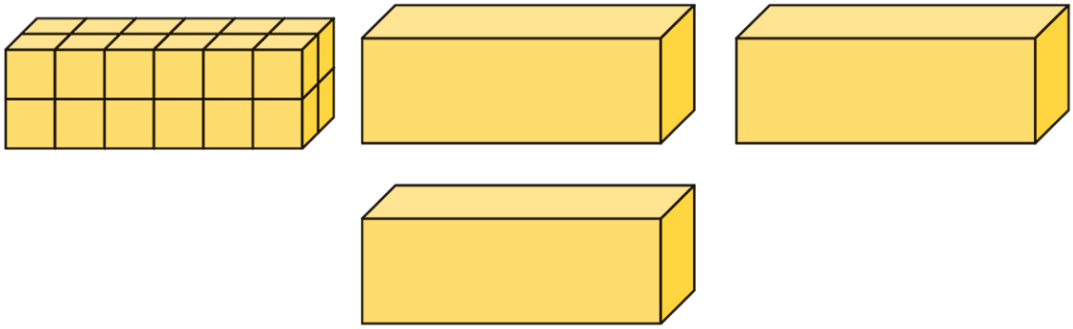
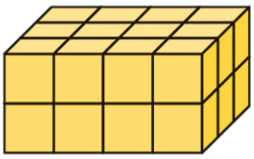


Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

6. Complete the table for the models you created in Problem 5.

Number of Layers/ Slices	Cubes in Each Layer/Slice	Volume of the Prism

7. Use unit cubes to build the figure shown, if needed, and then fill in the missing information.



Number of horizontal layers: _____

Number of cubes in each horizontal layer: _____

Volume: _____ cm^3

8. Use unit cubes to build the figure shown, if needed, and then fill in the missing information.

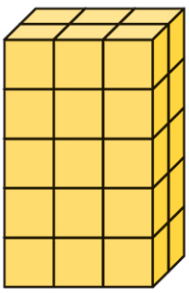


Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

Number of vertical slices: _____

Number of cubes in each vertical slice: _____

Volume: _____ cm^3

Creating Prisms with a Given Volume Work with your partner to create as many rectangular prisms having a volume of 12 cubic centimeters as possible.

Sketch your models and explain how many layers or slices each prism has and how many cubes are in each layer or slice.

Photo Credit: ELAKSHI CREATIVE BUSINESS / Shutterstock.com

CONNECT

The Rhind Papyrus One of the oldest mathematical documents is the Rhind Papyrus, named after the Scottish archaeologist Henry Rhind. The Rhind Papyrus is thought to date from 1550 BC. It is 200 centimeters long and 32 cm wide. It is also known as the Ahmos Papyrus after the scribe who copied it. It is thought this papyrus was a mathematics textbook containing problems to help others learn math.

The papyrus has 84 problems written on it. The problems involve multiplication, division, fractions, geometry, and other topics. There are even problems on the papyrus to figure out the capacity of ancient granaries.

Like the ancient Egyptians, modern-day math students use workbooks and technology to learn math. Instead of asking her students to copy a papyrus scroll, Mrs. Manal has ordered a box of textbooks for her math students. The box has a volume of 27 cubic units.

If each layer of the box is composed of 9 cubic units of textbooks, how many layers of textbooks are in the box?



Making Papyrus

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 4

Finding a Formula

Learning Targets

- I can identify a **formula** for calculating the volume of right rectangular prisms.
- I can use a formula to calculate the volume of right rectangular prisms.

ACCESS

The Game of Senet Work with your teacher to read the passage. Then, respond to the prompt.

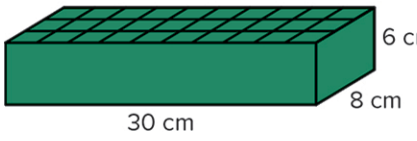


Photo Credit: Mariusz Bugno / Shutterstock.com

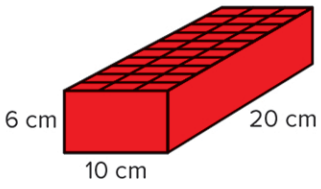
Board games were a favorite pastime of ancient Egyptians. One of the most popular games was Senet. *Senet* means "passing," and the aim of each player is to move their pieces around the board and avoid hazards. It is played by two players.

The board itself has 30 squares laid out in 3 rows of 10 on the top of a rectangular prism that has drawers to hold game pieces. Many boards have survived intact, along with their counters and throw sticks. However, the exact rules of the ancient game are not fully understood, so there are variations in game play.

Abdallah and Doha each have a Senet game board. Abdallah says that the volume of both boards is the same because they both have 30 squares on top.



Abdallah's game



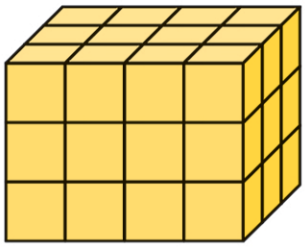
Doha's game

Do you agree or disagree based on what you have learned about volume and cubic units? Explain your reasoning.

BUILD

Find a Formula Answer each item.

1. Label the dimensions of the rectangular prism. Each cube is 1 centimeter on all sides.

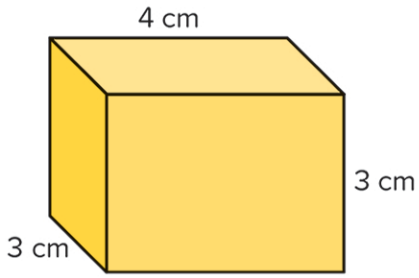


Length: _____ cm

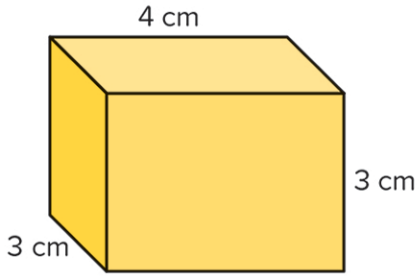
Width: _____ cm

Height: _____ cm

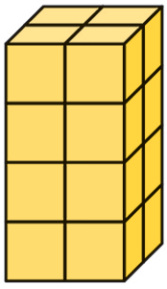
2. Work with your teacher to decompose the rectangular prism in the previous task into layers.



3. Work with your teacher to decompose the same rectangular prism into slices.



4. Record the dimensions of the given rectangular prism and then find the volume.



Length: _____ cm

Width: _____ cm

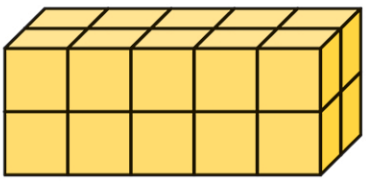
Height: _____ cm

Volume: _____ cm^3

Photo Credit: Mariusz Bugno / Shutterstock.com

5. Using the dimensions of the rectangular prism in the previous task, write a multiplication expression that generates the given volume. Then, find the product. Be sure to include units.

6. Record the dimensions of the rectangular prism and then find the volume.



Length: _____ cm

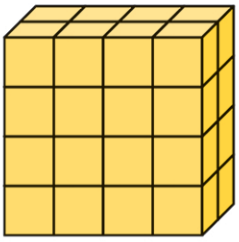
Width: _____ cm

Height: _____ cm

Volume: _____ cm^3

7. Using the dimensions of the rectangular prism in the previous task, write a multiplication expression that generates the given volume. Then, find the product. Be sure to include units.

8. Record the dimensions of the rectangular prism and then find the volume.



Length: _____ cm

Width: _____ cm

Height: _____ cm

Volume: _____ cm^3

9. Using the dimensions of the rectangular prism in the previous task, write a multiplication expression that generates the given volume. Then, find the product. Be sure to include units.

10. Consider the dimensions of the rectangular prism. Which of the following expressions would give the volume of the rectangular prism?

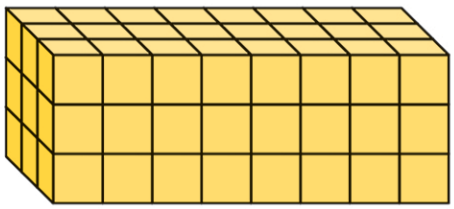


Photo Credit: Mariusz Bugno / Shutterstock.com

A. $11 + 3$ because the area of the prism's base is $8 + 3 = 11$ cubic units, and the height is 3 cubic units

B. 11×3 because the area of the prism's base is $8 + 3 = 11$ cubic units, and the height is 3 cubic units

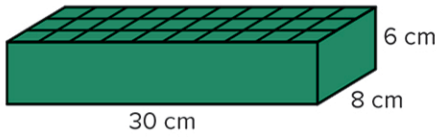
C. $24 + 3$ because the area of the prism's base is $8 \times 3 = 24$ cubic units, and the height is 3 cubic units

D. 24×3 because the area of the prism's base is $8 \times 3 = 24$ cubic units and the height is 3 cubic units

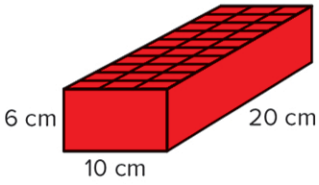
CONNECT

Senet Board Volume

1. Look again at Abdallah's Senet board from ACCESS.



Abdallah's game



Doha's game

Which equation could be used to find the volume, V?

A. $(30 + 8) \times 6 = V$

B. $(6 + 8) + 30 = V$

C. $(30 \times 8) \times 6 = V$

D. $(6 \times 8) + 30 = V$

2. Based on your answer to the previous question, what is the formula for calculating the volume of a rectangular prism?

Photo Credit: Mariusz Bugno / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 5

Using a Formula to Find Volume

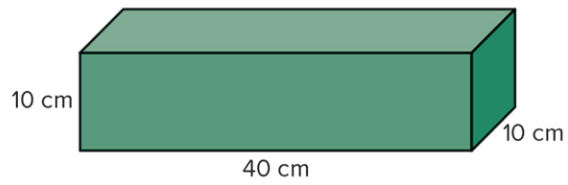
Learning Target

- I can apply a formula to calculate the volume of right rectangular prisms.

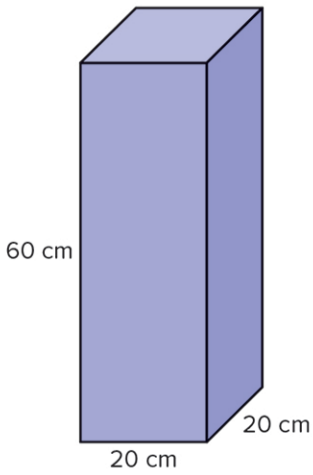
ACCESS

Which Box Will Work? Hanaa wants to send a jewelry box to her sister. The jewelry box has a volume of 16,000 cm^3. Which box can Hanaa use to send the jewelry box? Explain how you know.

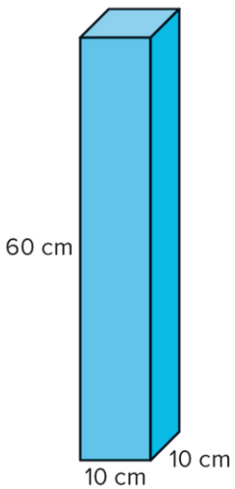
A.



C.



B.



D.

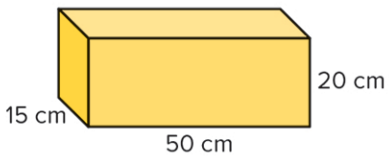


Photo Credit: Mariusz Bugno / Shutterstock.com

BUILD

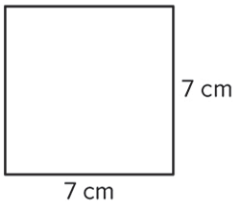
Applying the Formula Use the formula $A = l \times w$ (Area = length × width) to find the area of each quadrilateral.

Be sure to use units in your answer. Complete each task independently. When finished, check your answers with a partner.

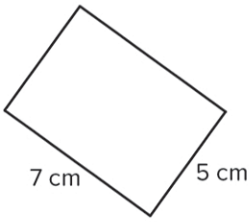
1.



2.

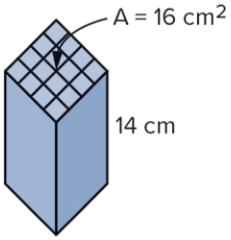


3.

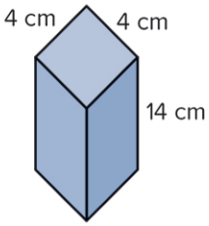


3. Look at the images and record what you observe. Be prepared to discuss your observations.

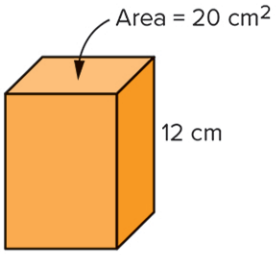
A.



B.



4. Radwa says that more information is needed to find the volume of the prism. Do you agree or disagree? Talk to a partner and then record your thinking.



5. The volume of the rectangular prism is 630 m^3. Talk to a partner about how you could find the missing dimension. Record your thinking.

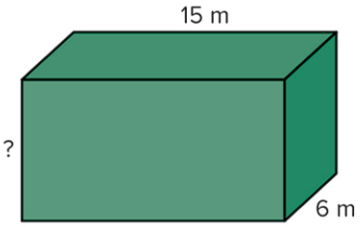
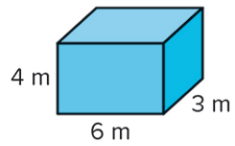


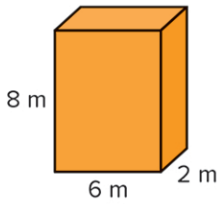
Photo Credit: Mariusz Bugno / Shutterstock.com

6. Compare the dimensions of the rectangular prisms. Which two prisms have the same volume? Explain how you know.

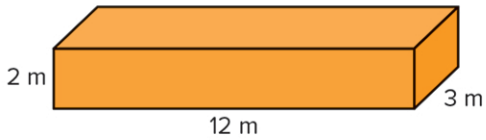
A.



B.



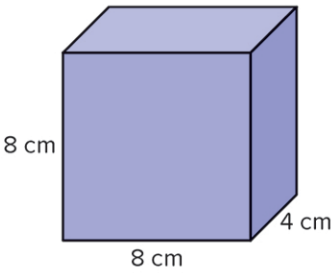
C.



7. Multiply to find the volume of the prism. Record your equation and the total volume. Be sure to include units.

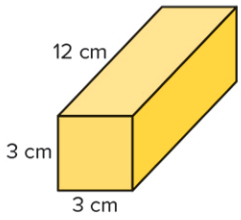
Equation: _____

Volume: _____

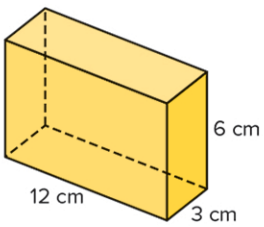


8. Eman says that prism B has the greatest volume because it has the greatest height. Do you agree or disagree? Explain your thinking.

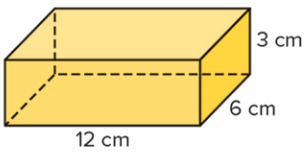
A.



B.



C.



9. The volume of the rectangular prism shown is 400 cubic centimeters. Adham says the missing dimension is 350 cm. Amira says the missing dimension is 8 cm. Which student is correct and why?

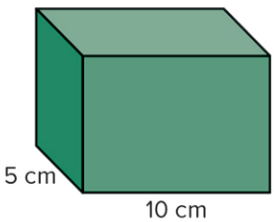


Photo Credit: Mariusz Bugno / Shutterstock.com

CONNECT

Inside the Great Pyramid The Giza pyramid complex includes the Great Pyramid of Khufu, the Pyramid of Khafre, the Pyramid of Menkaure, and the Sphinx. The pyramids are believed to have been royal tombs for the pharaohs who had them built. The complex also includes the Queen's Pyramids and other temples for offerings. However, what is inside the Great Pyramid, the most famous pyramid in Giza?

The Great Pyramid has little open space inside. To reach and enter the King's Chamber, you must travel through a very tight ascending passageway, climb a steep walkway inside the Grand Gallery (a tall but narrow open space), and crawl through a tunnel.



Ascending Passageway

Photo Credit: Mariusz Bugno / Shutterstock.com

The King's Chamber measures about 10.5 meters by 5 m, and it is about 6 m high. This room is made entirely of pink granite with hieroglyphic text carved into the walls and a giant sarcophagus that once held the king's mummy. The chamber is a great feat of architecture with only a small crack in the ceiling after 4,000 years.

What is the approximate volume of the King's Chamber?

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 6

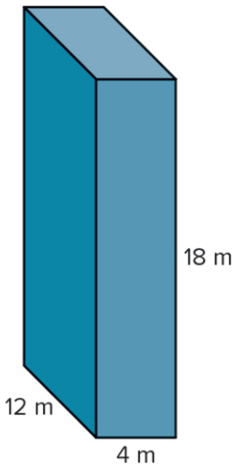
Finding the Volume of Compound Shapes

Learning Target

- I can find the total volume of two or more cuboids.

ACCESS

Error Analysis Ali completed the task shown.



Ali's work: $\begin{array}{r} {}^{1}18 \\ +4 \\ \hline 22 \end{array}$ $\begin{array}{r} 22 \\ +12 \\ \hline 34 \end{array}$ The volume of the cuboid is 34 m^3.

Analyze what Ali did correctly and incorrectly and then find the correct solution.

1. What did Ali do correctly?
2. What did Ali do incorrectly? Why do you think he made this error?
3. Find the correct solution.

Photo Credit: Mariusz Bugno / Shutterstock.com

BUILD

Combining Cubes to Create New Structures Work with your partner to solve the problems.

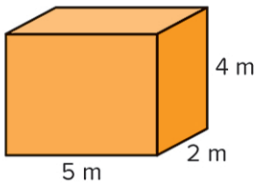
1. What is the volume of a rectangular prism with dimensions 3 cm × 2 cm × 2 cm?

2. What is the volume of a rectangular prism that measures 2 centimeters on each side?

3. What is the total volume when the prisms in the previous two questions are combined?

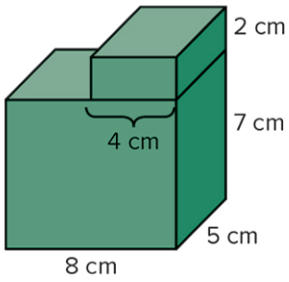
Composing and Decomposing Rectangular Prisms Answer each question.

1. What is the volume of the rectangular prism shown? Be sure to use units in your answer.



2. What would be the total volume of the prism in the previous question if you stacked two of these cubes one on top of the other?

Refer to the solid figure to answer questions 3 to 5.



3. What is the volume of the larger prism on the bottom of the compound shape?

4. What is the volume of the smaller prism on the top of the compound shape?

5. What is the total volume of the compound shape?

6. What is the volume of the given compound shape?

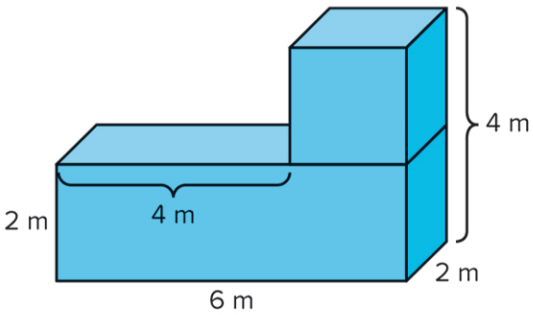
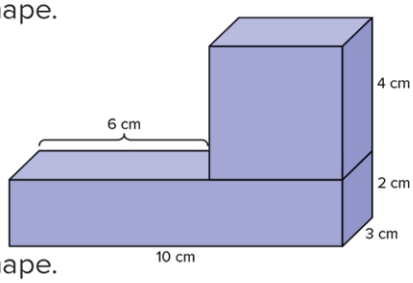
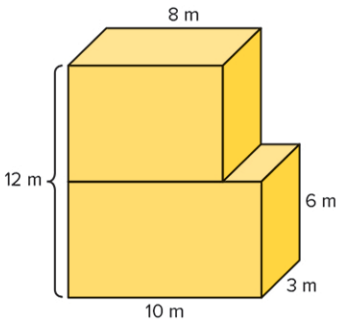


Photo Credit: Mariusz Bugno / Shutterstock.com

7. Determine the volume of the given compound shape.



8. Determine the volume of the given compound shape.



CONNECT

Post-and-Lintel Work with your teacher to read the passage. Then, answer the questions.

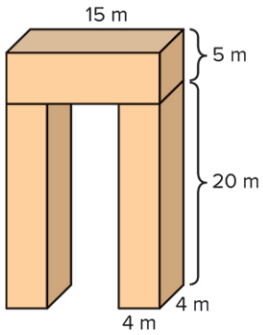
Many ancient civilizations used post-and-lintel architecture. It is an architectural form in which two vertical elements support a horizontal element that spans the space between.

The vertical elements are called posts (or columns) and the horizontal elements are called lintels (or beams). The image shows an example of post-and-lintel architecture from the Luxor Temple, which was built over 2,000 years ago.


Luxor Temple

Photo Credit: Mariusz Bugno / Shutterstock.com

1. Shown is a sketch for a model of the temple at Karnak. What is the volume of the compound shape? Note: The dimensions of the lintels are equivalent.



2. Why might ancient architects and builders have wanted to know the volume of their building materials?

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 7

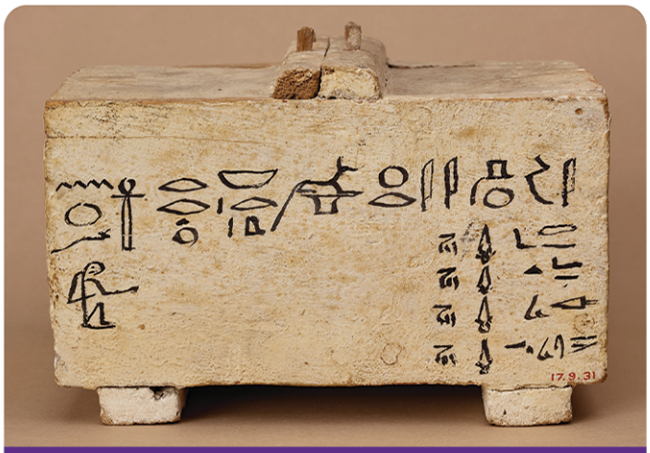
Solving Real-World Volume Story Problems

Learning Target

- I can solve real-world story problems involving volume.

ACCESS

The Carpenter's Chest
Work with your teacher to read the passage. Then, turn to a partner and discuss a story problem involving volume that could be written about this chest. Be prepared to share.



Ancient Egyptian Carpenter's Chest

Photo Credit: Mariusz Bugno / Shutterstock.com

The wooden box shown has a sliding lid and is inscribed with hieroglyphics. It was found in Ankhef's tomb in the Khashaba excavations. The box also has a list of what was supposed to be inside, which led archeologists to believe it was a carpenter's chest.

The list on the box includes 6 axes, 6 adzes, 6 chisels, and 6 other bladed tools, such as saws. However, the list and what was found differed. The box contained one more each of an adze and an axe and no chisels or saws.

BUILD

Think Like a Mathematician Read the problems and be prepared to discuss the following questions:

- What is the problem asking you to find?
- How could you model this problem?
- What could you draw to represent this problem?
- What is important to remember when solving story problems?



1. Osman built a planter box for his backyard. The length of the planter box was 150 centimeters. The width was 90 cm, and the height of the box was 120 cm. Osman poured soil into the box up to the 100 cm height line. What is the volume of the planter box? What is the volume of the soil?

2. Fares built a small planter box for his window. He planned to fill it to the top with 12,000 cubic centimeters of soil. The base of the planter box measured 40 cm long and 15 cm wide. What should the height of the box be to hold all the soil?

3. Nahla also decided to build planter boxes. She wanted two boxes with different dimensions, but the same volume of 20,000 cubic centimeters.
   a. Show two ways she could build these planters.
   b. Record equations to match each prism.

4. Mouataz built a model of a sarcophagus from cardboard. The model was 30 centimeters long, 10 cm wide, and 8 cm tall. Is it possible for Mouataz to fit a rectangular canopic chest with an interior volume of 3,000 cm^3 inside? Support your thinking with a drawing and an equation.

5. Rami wanted to build a new shed. He had a spot outside his house that had an area of 4 meters long by 3 m wide. He needed the new shed to have a volume of 72 m^3. How tall will the shed need to be? How do you know? Support your thinking with a drawing and an equation.

Photo Credit: Mariusz Bugno / Shutterstock.com

6. Amany built a tower using centimeter cubes. The area of the base of her tower is 16 square centimeters. The tower is 15 cm tall.

   a. What could her tower look like? Draw and label a model.

   b. How many centimeter cubes did Amany use? Record an equation.

CONNECT

Canopic Chest Work with your teacher to read the passage and answer the questions.



Canopic Vases

Individuals all over the world have long been fascinated by the mummification process of ancient Egyptians and the artifacts found relating to their burial ritual. Many of these artifacts are works of art themselves. In particular, canopic jars, as well as canopic chests, were often decorated and elaborately carved with hieroglyphics.

The image shows the canopic chest and jars of Tutankhamun. The chest and jars were carved from Egyptian alabaster. The box is engraved with goddesses and hieroglyphics meant to protect the pharoah.

The oldest canopic chest ever found was that of Hetepherese, mother of King Khufu. The chest measures about 54 centimeters long, 49 cm wide, and 35 cm tall.

What is the volume of the chest?

Photo Credit: Mariusz Bugno / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

UNIT

12

Theme 4 | Applications of Geometry and Measurement

Unit 12 Pie Charts and Applying Mathematical Learning



Dancing with Pie Charts

Unit Video Questions

Quick Code
egm5267

The Unit 12 Opener Video, Dancing with Pie Charts, explores math around Egypt through data. In this unit, you will discover how pie charts display data. You will interpret pie charts to solve problems.

- ☐ How did the students use data to make sense of the world around them?
- ☐ What did the students discover about using pie charts to display data?

MINISTRY OF EDUCATION AND TECHNICAL EDUCATION
وزارة التربية والتعليم والتعليم الفني

LESSON 1

Exploring Pie Charts

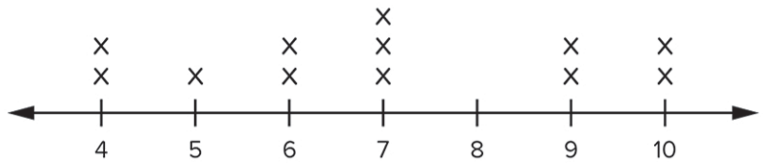
Learning Targets

- I can define the elements of a **pie chart**.
- I can identify connections between pie charts, **fractions**, and degrees of a circle.

ACCESS

Graph Review Record the letter of the graph that best displays the given data. You may use each letter once.

A. Line plot



B. Bar graph

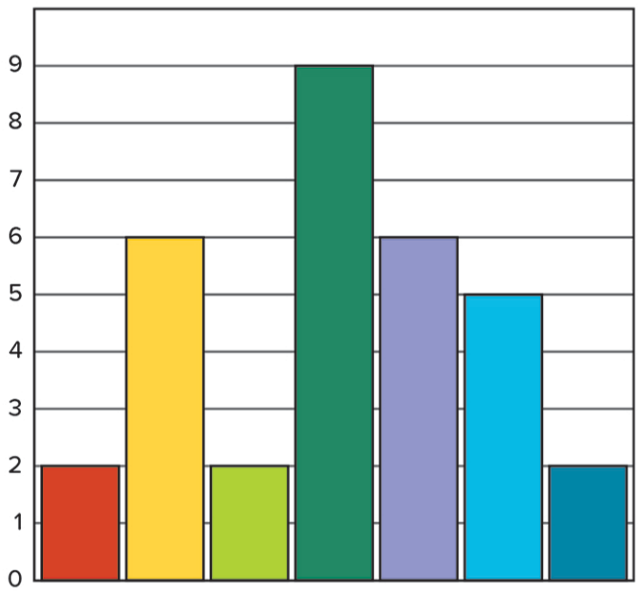
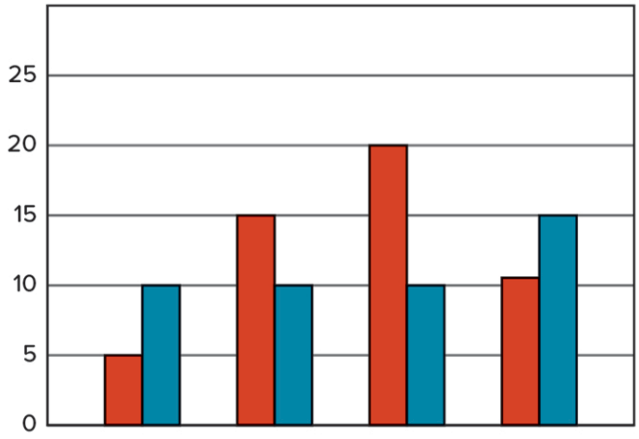


Photo Credit: actistudio / Shutterstock.com

C. Double bar graph



D. Line graph

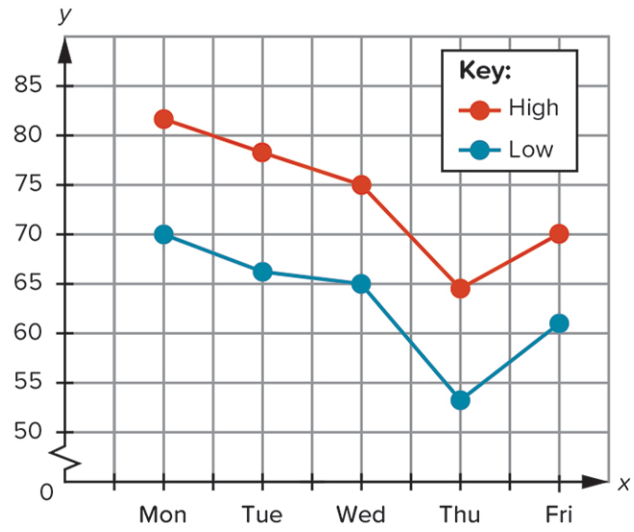


Photo Credit: actistudio / Shutterstock.com

1. The best graph to represent the number of students who liked different types of foods.
2. The best graph to compare numerical data, such as temperature over a span of time.
3. The best graph to show the shoe sizes of students in Primary 5.
4. The best graph to compare the number of boys versus girls who preferred a certain sport.

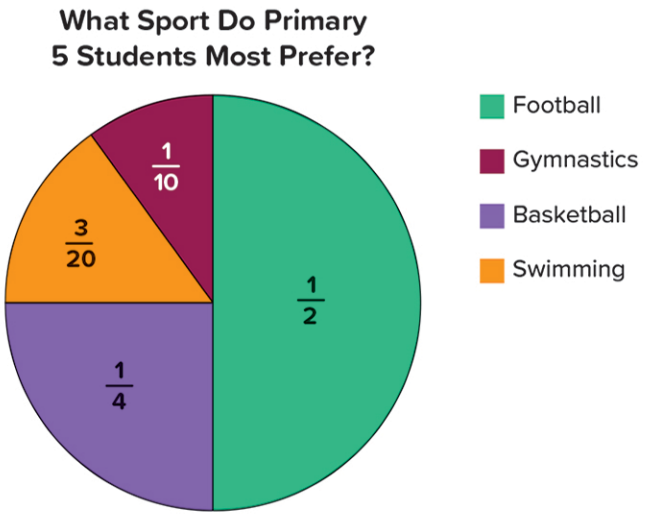
BUILD

Pie Charts and Fractions The results of the survey, "What sport do Primary 5 students most prefer?" are shown in the table. Look at the pie chart and talk to a partner about what you notice.



Football Pitch

Photo Credit: actistudio / Shutterstock.com

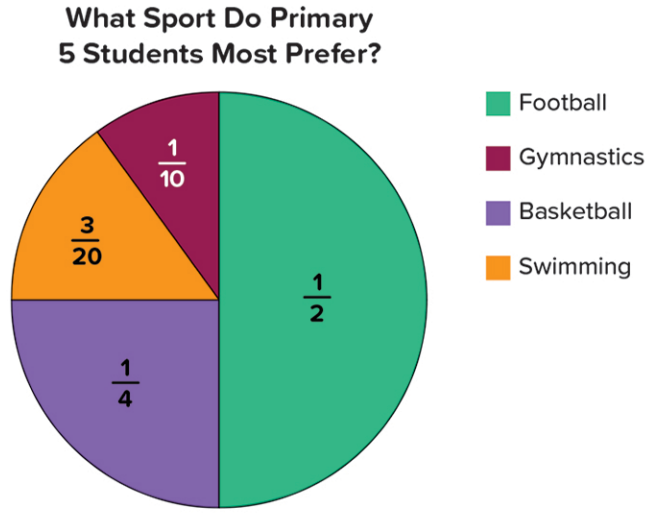


What Sport Do Primary 5 Students Most Prefer?	
Sport	**Number of Students**
Football	50
Basketball	25
Swimming	15
Gymnastics	10
Total	**100**

1. How many students were surveyed? How do you know?

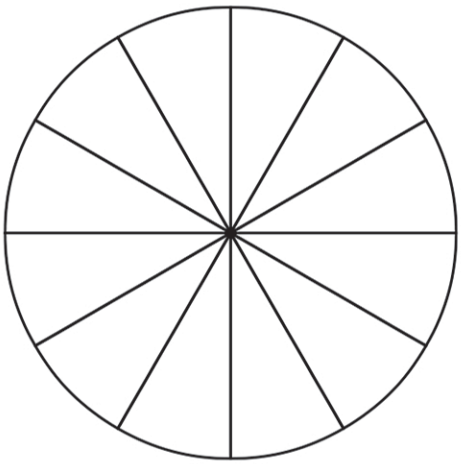
2. Match each decimal to the correct section of the pie chart.

0.5 0.25 0.15 0.1



Pie Charts and fractions This version of the pie chart includes fractions that represent each section of the pie chart. Look at the pie chart and answer your teacher's questions.

3. **a.** Shade $\frac{1}{2}$ of the circle red. Shade $\frac{1}{4}$ of the circle blue. Shade $\frac{1}{12}$ yellow. Shade $\frac{1}{6}$ green.



b. If this pie chart represents 24 students surveyed, how many students does the red section represent?

c. If this pie chart represents 24 students surveyed, how many students does the blue section represent?

d. What decimal of the group is blue?

4. **a.** Shade in $\frac{3}{4}$ of the circle green, $\frac{1}{8}$ of the circle blue, and $\frac{1}{8}$ of the circle red.

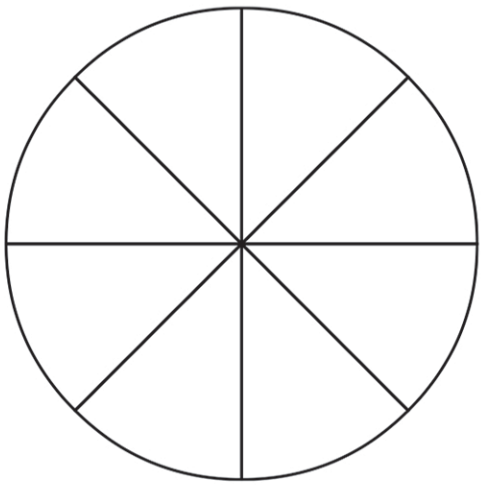


Photo Credit: actistudio / Shutterstock.com

b. If this pie chart represents 40 students surveyed, how many students do the red and blue sections represent?

b. What decimal of the group is green?

Interpret a Pie Chart Analyze the pie chart and answer the questions.

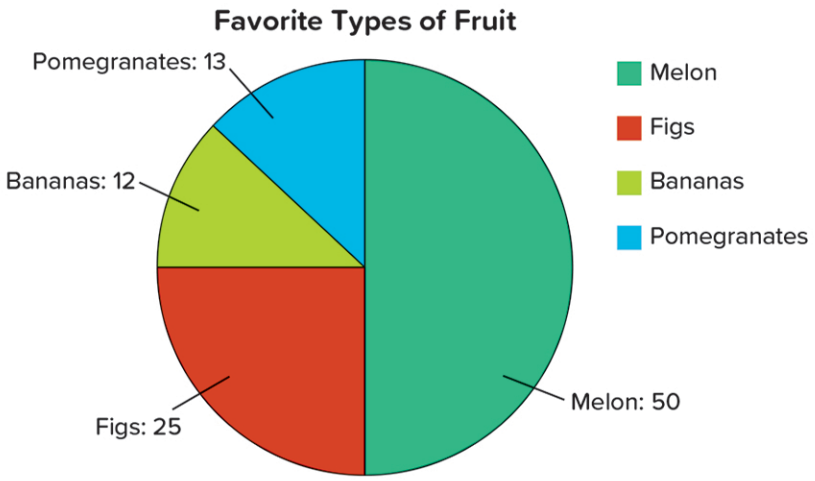


Photo Credit: actistudio / Shutterstock.com

1. What fraction of the people surveyed like melon?
2. What fraction of the people surveyed like figs?
3. How many people were surveyed?
4. Why is it important to label the chart with a title and include a key?



CONNECT

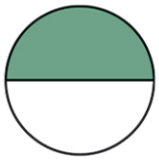
Fractions of a Circle and Circular Degrees For each task, select the circular degrees that match the fraction of the circle that is shaded. A circle has 360 degrees.

1.



A. 180°
B. 45°
C. 60°
D. 90°

2.



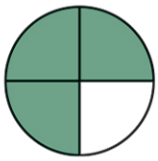
A. 180°
B. 90°
C. 120°
D. 45°

3.



A. 50°
B. 120°
C. 60°
D. 30°

4.



A. 60°
B. 270°
C. 150°
D. 120°

5.



A. 45°
B. 60°
C. 30°
D. 90°

Photo Credit: actistudio / Shutterstock.com

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 2
interpreting data in a pie chart

Learning Target

- I can interpret data in a pie chart.

ACCESS

Piecing the Pie Read the problem and be prepared to discuss your ideas with the class.

This is a pie chart without a title or a key. What could the pie chart represent? Using the colors as a guide, what information can you gather about this pie chart?

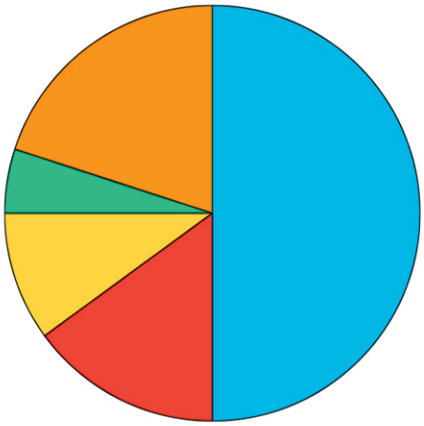
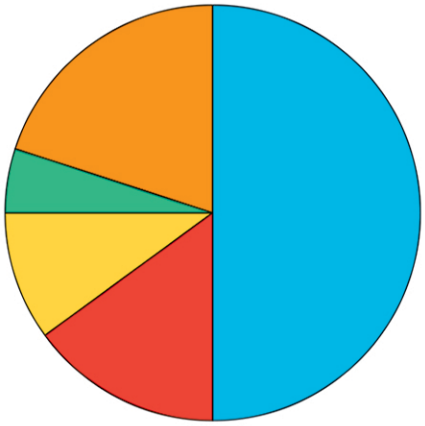


Photo Credit: actistudio / Shutterstock.com

Now, give the pie chart a title and label the key based on the clues listed.

- 100 students were surveyed.
- 50 students selected chocolate ice cream.
- The smallest number of students selected mint ice cream.
- Twice the number of students who selected mint selected pistachio.
- 10 students selected pistachio ice cream.
- The same number of students selected vanilla ice cream as pistachio and mint combined.
- 20 students selected mango ice cream.

1. **Title:** _____

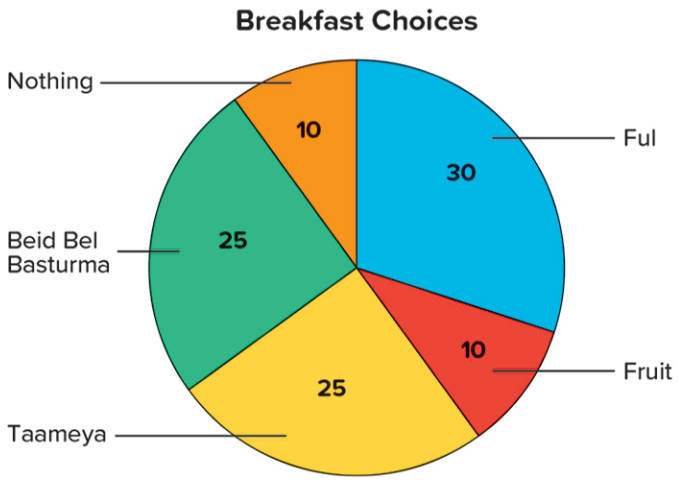


2. **Key:**

Color	Flavor	Number of Students
Blue	(A)	(B)
Orange	(A)	(B)
Green	(A)	(B)
Yellow	(A)	(B)
Red	(A)	(B)

BUILD

Frequency Tables and Pie Charts Use the pie chart to answer your teacher's questions.



1. Use the data from the pie chart to complete the frequency table.

Food	Ful	Fruit	Taameya	Beid Bel Basturma	Nothing
Frequency	A. _____	B. _____	C. _____	D. _____	E. _____

Photo Credit: actistudio / Shutterstock.com

2. Use the frequency to find the decimal for each breakfast option.

Food	Ful	Fruit	Taameya	Beid Bel Basturma	Nothing
decimal	A. _____	B. _____	C. _____	D. _____	E. _____

3. Use the information from the tables in the previous two tasks to find the fractional equivalents for each breakfast option. Simplify the fractions..

Food	Ful	Fruit	Taameya	Beid Bel Basturma	Nothing
Fraction	A. _____	B. _____	C. _____	D. _____	E. _____

4. What was the most frequent breakfast choice?

5. What two breakfast choices were chosen the least often?

6. How many more students chose Beid Bel Basturma over fruit?

7. Which two breakfast choices were chosen by half of the class?

Variability and Sample Size Read the problem and discuss the question with a partner. Be prepared to explain your thinking.

Citizens in a small town (population 2,340) were surveyed to determine where to spend money on education.



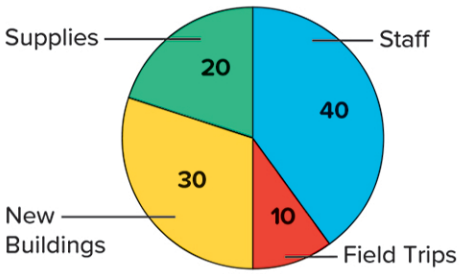
Students on a Field Trip

Photo Credit: actistudio / Shutterstock.com

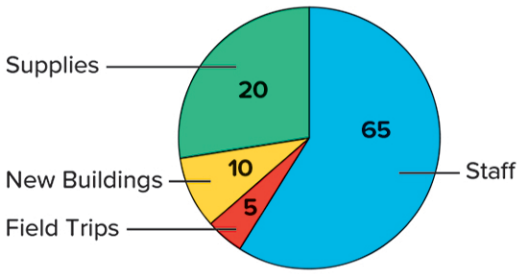
In Pie Chart A, 10 citizens were surveyed. In Pie Chart B, 100 citizens were surveyed, and in Pie Chart C, 1,000 citizens were surveyed.

Which pie chart most accurately represents the opinion of the town? Why?

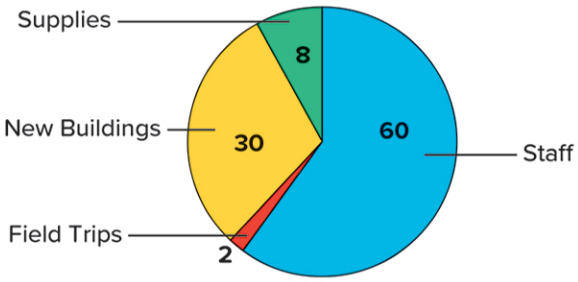
Pie Chart A
Where to Spend Money on Education



Pie Chart B
Where to Spend Money on Education



Pie Chart C
Where to Spend Money on Education



CONNECT

Writing About Math When looking at a pie chart in the real world, what questions would you ask to determine whether the data is reliable?

Check Your Understanding
Follow your teacher's instructions to complete this activity.

LESSON 3

Making Pie Charts

Learning Targets

- I can shade a pie chart to display a set of data.
- I can ask and answer questions about data in a pie chart.

ACCESS

What Type of Building Does the Community Need? The given pie chart represents a group's opinion on what type of building their community needs most.

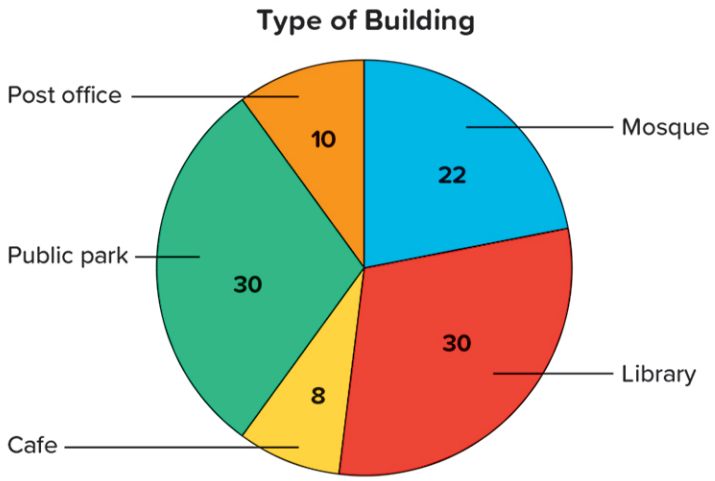


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Work with a partner to write three statements and one question about this data.

BUILD

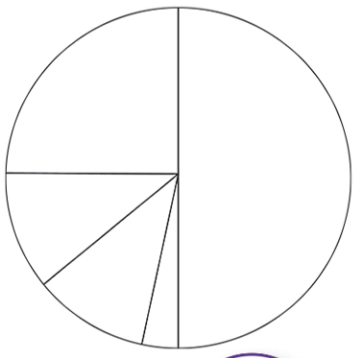
Shading Part of a Pie This frequency table shows the favorite ice cream flavors of a group of 50 children.

1. Fill in the fractions in the simplest form for each flavor.

Flavor	Mango	Vanilla	Mastic	Chocolate	Hazelnut
Frequency	5	25	6	12	2
fractions	A. _____	B. _____	C. _____	D. _____	E. _____

2. Work with your teacher and classmates to shade and label the pie chart using the data from the table. Include a title and a key.
3. What is one question that could be answered by this pie chart?

Title: _____



Key:

Flavor	Frequency	fractions
Mango	5	A. _____
Vanilla	25	B. _____
Mastic	6	C. _____
Chocolate	12	D. _____
Hazelnut	2	E. _____

Photo Credit: actistudio / Shutterstock.com

HANDS-ON ACTIVITY

Creating a Pie Chart

Your teacher will give your group a data set. Work with your group to create a pie chart using the data. Include a title and a key. Then, work together to write three questions that can be answered by your pie chart.

CONNECT

Gallery Walk Walk around the class to see other groups' pie charts. Be prepared to share your observations about how the pie charts are similar and different as well as the questions and answers you read about each pie chart.

Check Your Understanding
Follow your teacher's instructions to complete this activity.

Revised by

Dr. Mohamed Mohyeldin Abdelsalam
Dr. Osama Abdelazim Abdelsalam Mohamed
Mr. Ahmed Ibrahim El-Dosouyky Hashim
Mr. Samir Mohamed Sedawy
Mrs. Sabah abd Elwahed Mohamed

Technical Supervision
Mrs/ Manal Azkoul
Mathematics Consultant.

Supervision

Dr. Akram Hassan Mohamed
The Minister's Assistant for Educational Curricula Development
Supervisor of the Central Administration for Curriculum Development

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