# MATH AT WORK

CONNECTING MATH TO 21ST CENTURY CAREERS

From the Webisode: **Math Meets Entrepreneurship**
featuring the cast of ***Shark Tank***

**Lesson 3**

# Charting Expenses

In this lesson, students will create a circle chart to model business expenses.

**TEACHER**



## GRADES 6–7 INSTRUCTIONAL FOCUS

- Use proportional relationships to solve multi-step ratio and percent problems.
- Find a percent of a quantity as a rate per 100, and solve problems using it.
- Convert a rational number to a decimal using long division.
- Display numerical data as a circle chart.

## LANGUAGE SUPPORT

### Math Terms

**circle chart**
a circle representing one whole that is divided into sections that each represent a part of the whole; also known as a pie graph.

### Academic Language

**expense**
money spent by a person or business.

**monthly fixed expense**
an expense that is the same every month.

**domain**
a portion of the Internet that a person or business controls, often ending in .com.

## SET UP

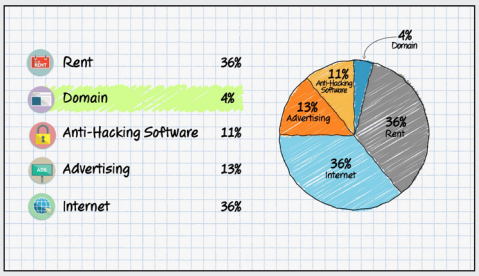
### Introduce Chapter 4 from *Math Meets Entrepreneurship.*

Introduce Lesson 3 by asking questions about how graphs can be used to represent different types of data.

For example: ***What types of graphs can we use to display information?*** (bar graph, scatter plot, line graph, circle graph, box-and-whisker plot.)
***Which graph is best for comparing expenses?*** (circle chart.)

Explain that circle charts show parts of a whole.
***Today, we'll create a circle chart to help investors and employees visualize the total monthly expenses of Timothy and Mauro's business.***

### Play Chapter 4: Charting Expenses




[Pause at 14:10]

## PLAN

### Create a plan to solve the problem.

Timothy and Mauro have listed all the fixed monthly costs of their business:

- Rent ($100)
- Advertising ($35)
- Internet ($100)
- Domain ($10)
- Anti-hacking software ($30)

Draw a circle chart that compares these costs.

### Read the problem aloud to students.

Ask students to analyze the quantities. Then, guide students in a discussion about how they will solve the problem.

For example: ***How can you find what portion of the total each monthly expense is?*** (Find the total monthly expense, then write a fraction for each individual expense.)
***How can you convert each portion of the total to a portion of a circle?*** (Write it as a fraction, decimal, or percent; write each portion as a fraction out of 360.)

Provide protractors to help students draw their circle charts.

# Lesson 3 Charting Expenses (continued)



## Mathematical Thinking: Model with Mathematics

Students use a graph to model the relationships of a list of real-world values.

## SOLVE

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

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

#### Support

Ask questions based about benchmark numbers to support students in creating their models.

- ***What does 0.363... round to? How can you express that value as a percent?***
- ***What would 50% look like on the circle chart? What about 25%?***
- ***What benchmark fraction is 36% close to? How can you use that information to draw this section?***

#### Extend

Ask questions to encourage students to expand their thinking.

- ***What is the sum of the percentages?***
- ***Will the sum of percentages in a circle chart always equal 100%? Why or why not?***
- ***Pretend you're an investor. What questions might you have after reviewing the circle chart?***

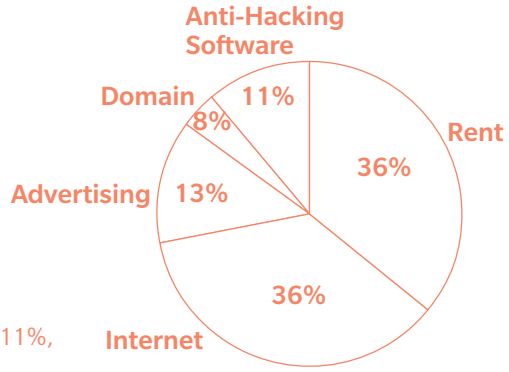
## SHARE

### Have students present their solutions.

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

POSSIBLE STUDENT WORK:

100 + 35 + 100 + 10 + 30 = 275
Rent: 100/275 = 0.363... ≈ 36%,
which is close to 1/3
Internet: 100/275 = 0.363... ≈ 36%,
which is close to 1/3
Advertising: 35/275 = 0.127... ≈ 13%,
which is close to 1/10
Domain: 10/275 = 0.036... ≈ 4%,
which is 1/25
Anti-hacking software: 30/275 = 0.109... ≈ 11%,
which is close to 1/10




**Play the Chapter 4 Solution from *Math Meets Entrepreneurship*.**

## PRACTICE

Have students complete the Practice and Reflect sections on Student Page 2 in class or as a homework assignment.

*Students break circles into benchmark fractions and label the portions with equivalent percentages. Next, they use the benchmark fractions to help them draw circle charts.*

# MATH AT WORK

CONNECTING MATH TO 21ST CENTURY CAREERS

Name: _____

**Lesson 3**

## Charting Expenses

**STUDENT**



### Math Terms

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a circle representing one whole that is divided into sections that each represent a part of the whole; also known as a pie graph.

**Problem:** Timothy and Mauro have listed all the fixed monthly costs of their business:

- Rent ($100)
- Advertising ($35)
- Internet ($100)
- Domain ($10)
- Anti-hacking software ($30)

**Draw a circle chart that compares these costs.**

## PLAN

**Create a plan to solve the problem with your partner.**

POSSIBLE STUDENT PLAN:

First convert each cost into a percent of the total. Then multiply each percent by 360° to find the angle for each portion of a circle. Then, use a protractor to draw each angle.

## SOLVE

**Use your plan to solve the problem.**

POSSIBLE STUDENT WORK:

100 + 35 + 100 + 10 + 30 = $275 total

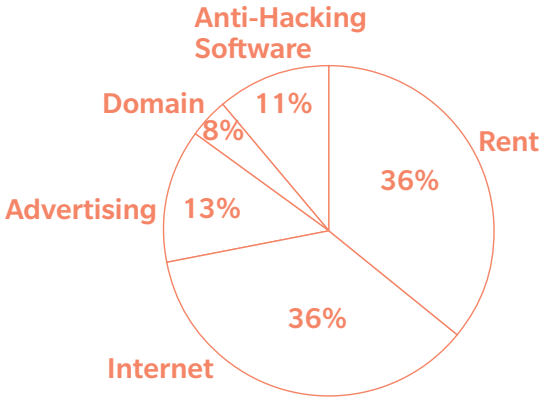
Rent: $\frac{100}{275} \approx 0.363$; $0.363 \times 360° \approx 131°$

Internet: $\frac{100}{275} \approx 0.363$; $0.363 \times 360° \approx 131°$

Advertising: $\frac{35}{275} \approx 0.127$; $0.127 \times 360° \approx 46°$

Domain: $\frac{10}{275} \approx 0.036$; $0.036 \times 360° \approx 13°$

Anti-Hacking Software: $\frac{30}{275} \approx 0.109$; $0.109 \times 360° \approx 40°$



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**Draw a circle chart that compares these costs.**

### PLAN

**Create a plan to solve the problem with your partner.**

### SOLVE

**Use your plan to solve the problem.**

Name: _____

Lesson 3

# Charting Expenses (continued)

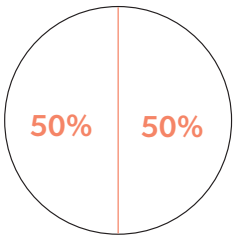
STUDENT

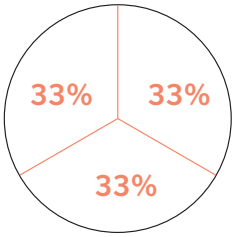


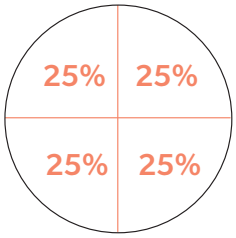
## PRACTICE

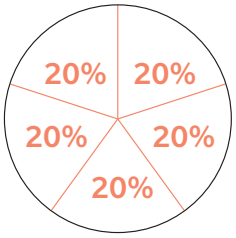
### Apply your skills to solve another problem.

Divide the circles into halves, thirds, fourths and fifths, and label them with the equivalent percentages.

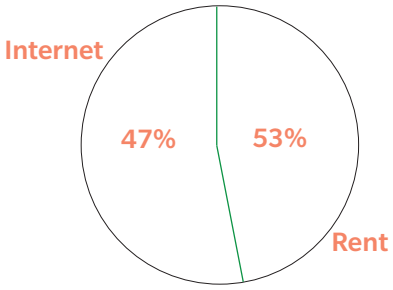
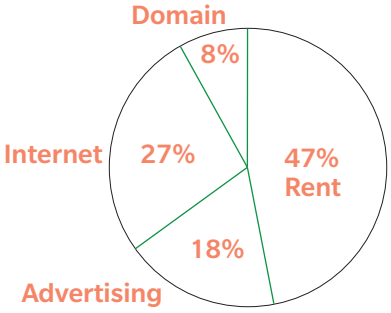
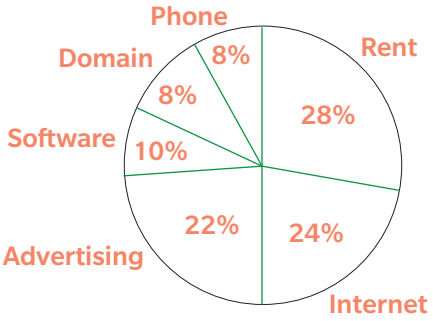



Use the percentages above as benchmarks to create circle charts for the following expenses:

| Challenge 1 | Challenge 2 | Challenge 3 |
|---|---|---|
|   |   |   |
| Rent: 53%<br>Internet: 47% | Rent: 47%<br>Advertising: 18%<br>Internet: 27%<br>Domain: 8% | Rent: 28%<br>Advertising: 22%<br>Internet: 24%<br>Domain: 8%<br>Software: 10%<br>Phone: 8% |

## REFLECT

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

**A) How did benchmark fractions help you determine what portion of the circle to use?**

Benchmark fractions helped me because they gave me something to compare the percentages to. I know that $\frac{1}{2}$ is equal to 50%, so now I know what 50% looks like on a circle chart and that 47% is a little smaller than that.

**B) What strategies did you use to draw the correct portions for each section?**

The strategies I used to draw the correct portions were drawing the sections in order from greatest to least. Also, I realized that 18% and 8% were close to $\frac{2}{3}$ and $\frac{1}{3}$ of the last open space.

Name: _____

Lesson 3

# Charting Expenses (continued)

STUDENT



## PRACTICE

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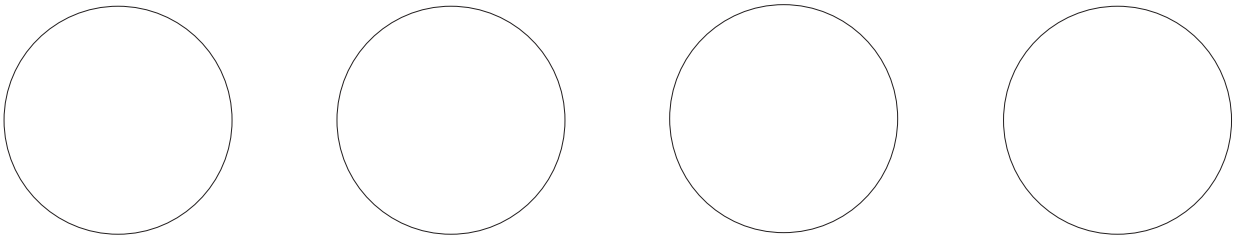

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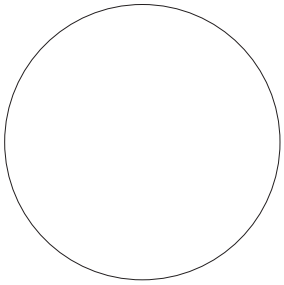
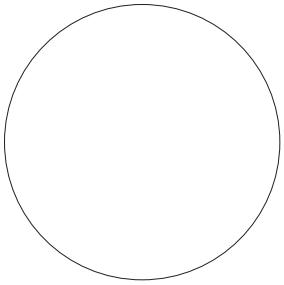
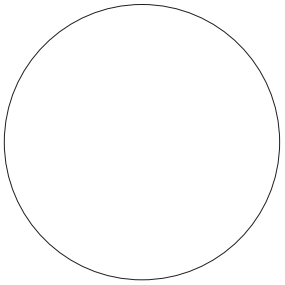
|  |  |  |
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## REFLECT

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**A) How did benchmark fractions help you determine what portion of the circle to use?**

**B) What strategies did you use to draw the correct portions for each section?**