Dear Family,

This week your student is learning how to use percents to solve problems.

Similar strategies can be used to solve two types of problems:

- A shirt costs $20 and is marked 40% off. How much money will you save?
- A shirt is on sale for 40% off. You will save $8. What was the original price?

Your student will be learning to solve problems like the one below.

> At an aquarium, 30% of the fish are freshwater fish. There are 120 freshwater fish. How many fish are at the aquarium?

➤ **ONE WAY** to find a whole amount when you know a part and the percent is to use a double number line.

You know that 120 is 30% of the whole. First, **divide by 3** to find 10%. Then, **multiply by 10** to find 100%.
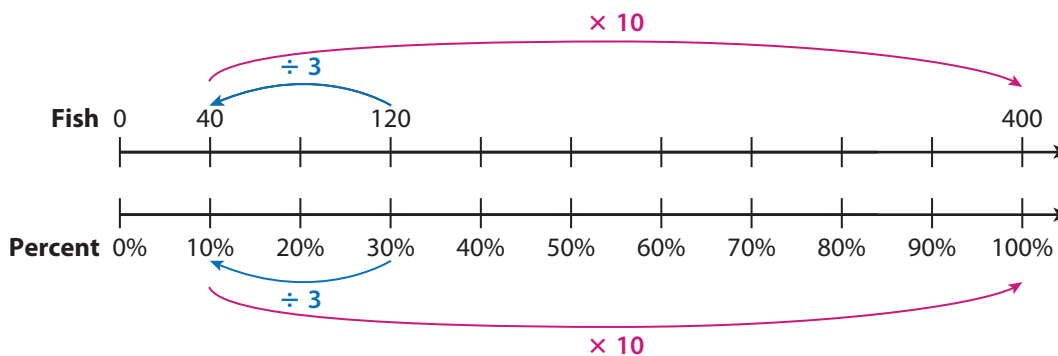
➤ **ANOTHER WAY** is to make a table of equivalent ratios.

Fish	120	40	400
Percent (%)	30	10	100

Using either method, there are 400 fish at the aquarium.

Use the next page to start a conversation about percents.

Activity Thinking About Percents Around You

➤ **Do this activity together to investigate percents in the real world.**

Do you ever read the sports page or listen to the news and wonder how they figure out the standings for the teams? They use percents!

Percents can help you compare the teams, especially if they have not played the same number of games.

SPORTS NEWS
BASEBALL STANDINGS

Number of games won
Number of games lost
Percent of games won

	W	L	PCT
Clippers	11	9	.550
Generals	13	12	.520
Sox	10	10	.500

? Where else do you see percents in the world around you?

Explore Percent Problems

Previously, you learned about representing percents. In this lesson, you will learn about solving problems with percents.

➤ **Use what you know to try to solve the problem below.**

Carolina and Aniyah are playing in an Oware tournament. Who has the better winning record so far?

Wins

Carolina
19
out of
25 games

Aniyah
17
out of
20 games

TRY IT

🖊 **Math Toolkit** double number lines, grid paper, hundredths grids

DISCUSS IT

Ask: How did you decide which player has the better winning record?

Share: At first, I thought . . .

◎ **Learning Targets** SMP 1, SMP 2, SMP 3, SMP 4, SMP 5, SMP 6
Use ratio and rate reasoning to solve real-world and mathematical problems.
• Find a percent of a quantity as a rate per 100; solve problems involving finding the whole, given a part and the percent.

CONNECT IT

1 **Look Back** Does Carolina or Aniyah have the better winning record? Explain how you know.

2 **Look Ahead** Carolina, Aniyah, and their friend Keith keep track of how many Oware games they play and how many games they win during one month. They can use percents to compare their winning records.

a. Carolina wins 77 out of 100 games. What percent of her games does she win? Explain how you know.

b. Kyle wins 14 out of 20 games.

$\frac{14}{20} = \frac{\square}{100}$, so Kyle wins _____ % of his games.

c. Aniyah wins 32 out of 40 games. Complete the table of equivalent ratios.

$\div 4$ $\times 10$

Part	32		
Whole	40	10	100

$\div 4$ $\times 10$

What is 32 out of 40 games expressed as a percent?

d. Who has the best winning record? Explain how you know.

3 **Reflect** How can writing ratios as percents help you compare the ratios?

Prepare for Using Percents to Solve Problems

1 Think about what you know about percents. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

In My Own Words	Illustration

percent

Examples	Non-Examples
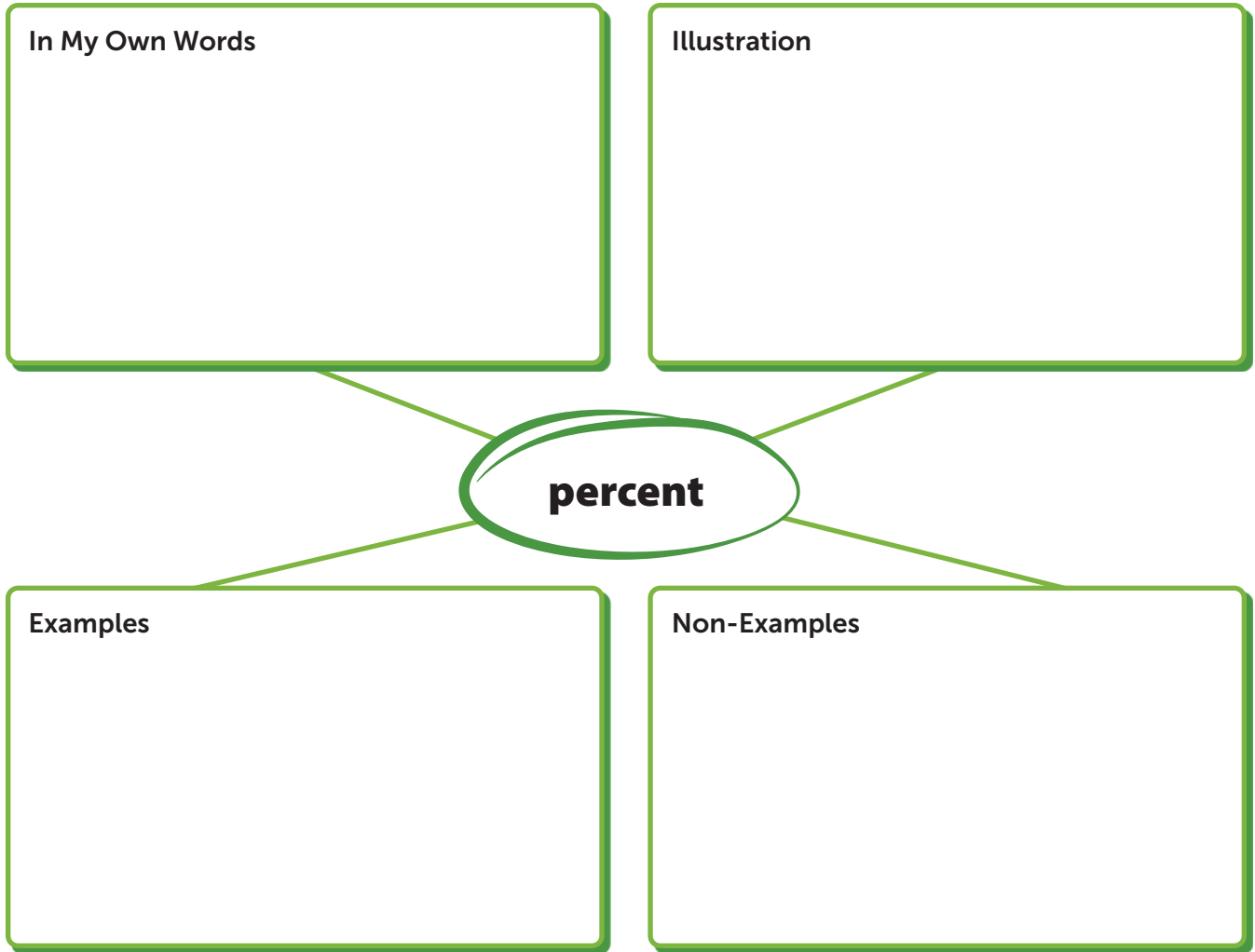
2 Explain how the model shows 80%.
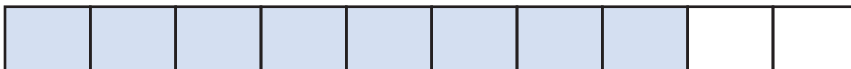
3 In a survey, 13 out of 20 teachers respond *yes* to a proposal for a new after-school club. In the same survey, 37 out of 50 students respond *yes*.

a. Which group is more in favor of the new after-school club, *teachers* or *students*? Show your work.

SOLUTION _____

b. Check your answer to problem 3a. Show your work.
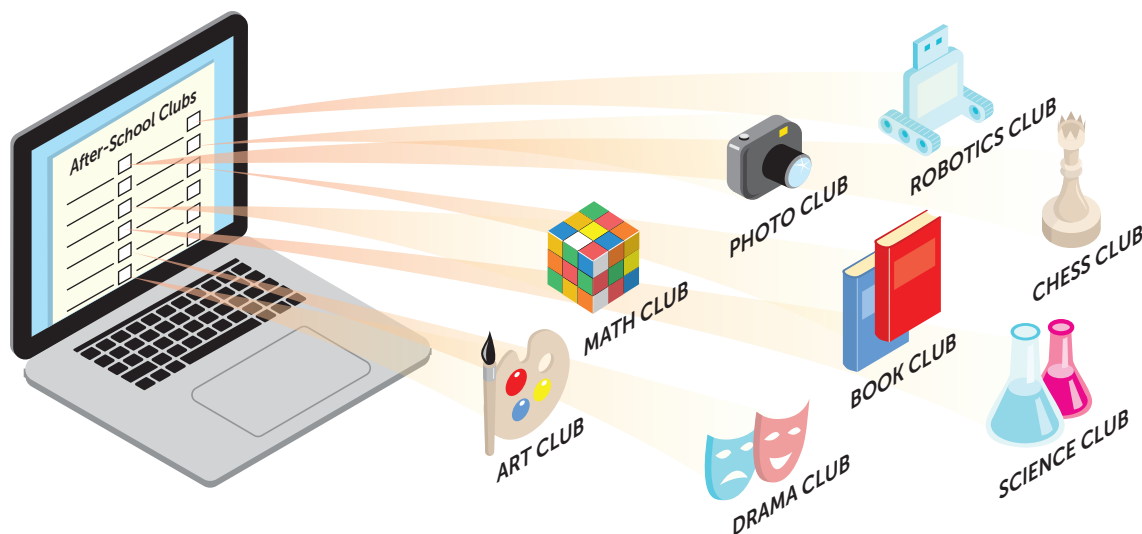
Develop Finding a Percent of a Quantity

➤ **Read and try to solve the problem below.**

At Gordon Middle School, 75% of the 800 students participate in the music program. How many students participate in the music program?

75% of **800** students

TRY IT

Math Toolkit base-ten grid paper, double number lines, fraction bars, hundredths grids

DISCUSS IT

Ask: How does your model show 75%?

Share: My model shows 75% by . . .

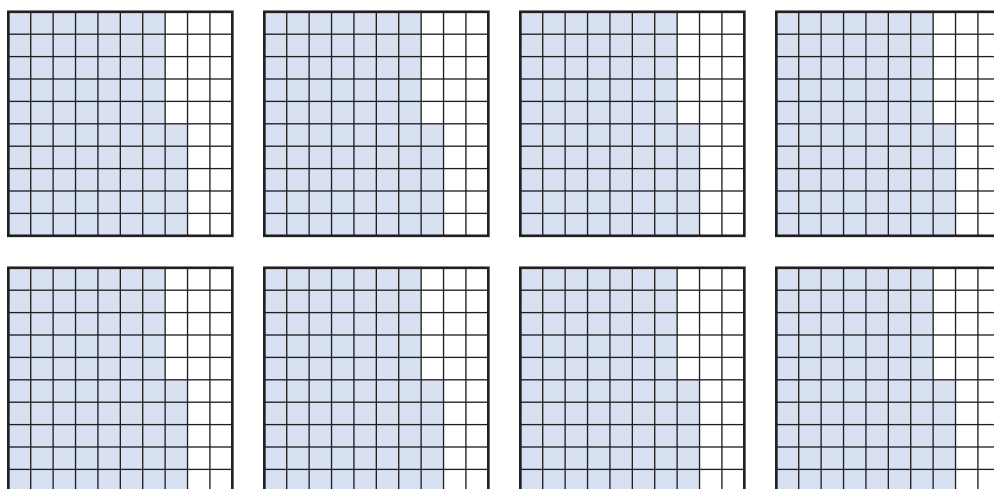➤ **Explore different ways to understand finding a percent of a quantity.**

At Gordon Middle School, 75% of the 800 students participate in the music program. How many students participate in the music program?

Picture It

You can use hundredths grids to show a percent of a number.

75% means 75 out of every 100, and there are 8 hundreds in 800.

Model It

You can write a multiplication expression to find a percent of a number.

Write the percent as a fraction.

75%   of   800 students
↓   ↓   ↓
$\frac{75}{100}$ ×   800

CONNECT IT

➤ **Use the problem from the previous page to help you understand how to find a percent of a quantity.**

1 Look at **Picture It**. Why can you use 8 hundredths grids to show the school's 800 students? How many students does each grid square represent?

2 You can also use a single hundredths grid to represent the school's 800 students. How many students does each grid square represent now? What percent of 800 students does each grid square represent? Explain.
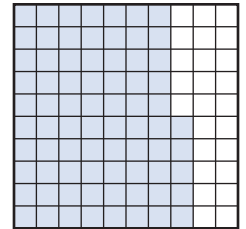
3 How many students participate in the music program? Explain why you can use the expression 75×8 to find 75% of 800.

4 Look at **Model It**. How does the hundredths grid in problem 2 represent the expression $\frac{75}{100} \times 800$? Show that the expression is equivalent to 75×8.

5 One way to find p% of a number is to multiply the number by the percent written as the fraction $\frac{p}{100}$. Why does this give the same result as first finding 1% of the number and then multiplying by p?

6 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to solve the **Try It** problem.

Apply It

➤ **Use what you learned to solve these problems.**

7 Bruno is setting up a school garden. His budget is $400. He spends 5% of the budget on gardening tools. He spends 95% of the budget on plants. How much money does Bruno spend on each? Show your work.

SOLUTION _____

8 To pass a test in a water safety course, a student must get 80% of the questions correct. There are 90 questions on the test. How many questions must a student answer correctly to pass the test?

A 64 questions

B 72 questions

C 80 questions

D 81 questions

9 A school will have a fall festival if at least 40% of the 450 students plan to attend. How many students must plan to attend in order for the school to have the festival? Show your work.
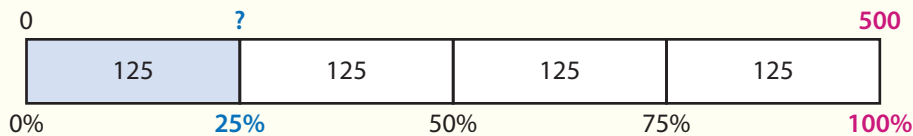
SOLUTION _____

Practice Finding a Percent of a Quantity

➤ **Study the Example showing how to find a percent of a quantity. Then solve problems 1–5.**

Example

There are 500 students who participate in an after-school sports program. Of these students, 25% play field hockey. How many students play field hockey?

You can use a model to find 25% of 500.

0	?			500
125	125	125	125	
0%	25%	50%	75%	100%

The model shows **500** divided into 4 groups of 125. Each group of 125 represents 25% of 500. This means that 25% of 500 is 125.

There are 125 students who play field hockey.

1 a. What is 25% written as a fraction?

b. What is 25% written as a decimal?

c. Write and evaluate a multiplication expression that represents 25% of 500.

d. Compare your answer to problem 1c to the answer in the Example.

2 How could you use the bar model in the Example to find 75% of 500?

3 Suppose 30% of 500 students play an instrument. Describe one way to find 30% of 500.

Vocabulary

percent

per 100. A percent is a rate per 100. A percent can be written using the percent symbol (%) and represented as a fraction or decimal. For example, 15% can be represented as $\frac{15}{100}$ or as 0.15.

4 The results of a survey show that 40% of 300 students choose recycling as the top priority for their generation.

**a.** How many students choose recycling? Show your work.

SOLUTION _____

b. Suppose 20% of 300 students choose recycling. How many students choose recycling? Explain how you found your answer.

5 There are 20 puzzles in Magdalena's puzzle book. Magdalena completes 55% of the puzzles. How many puzzles does Magdalena have left to complete? Show your work.

SOLUTION _____

Develop Finding the Whole

➤ **Read and try to solve the problem below.**

40% of race completed

24 miles completed

Akira is checking his progress in a bike race.
How many miles is the race?
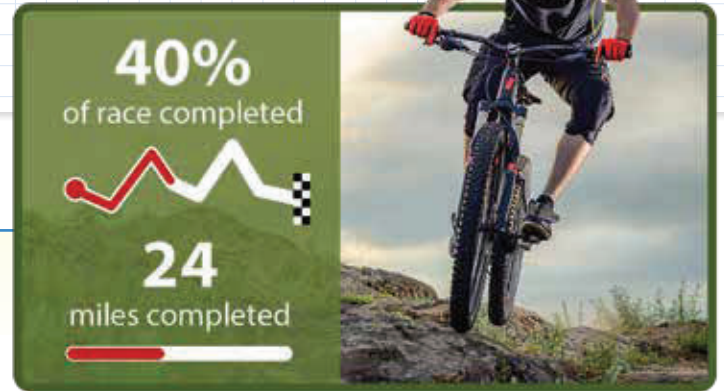
TRY IT

✏️ **Math Toolkit** base-ten grid paper, double number lines, fraction bars, hundredths grids

DISCUSS IT

Ask: How is your strategy similar to mine? How is it different?
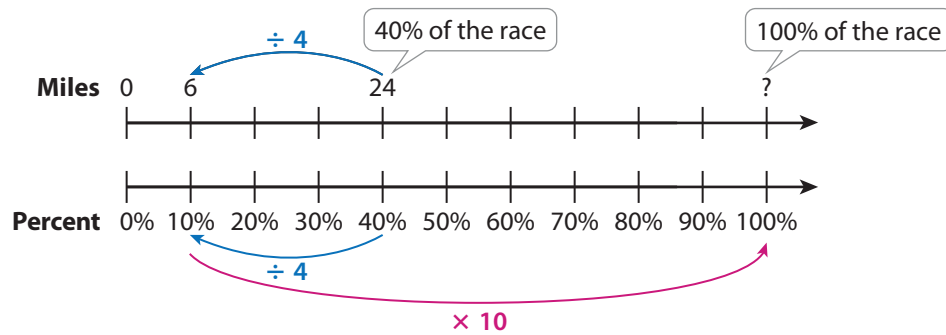
Share: My model shows . . .

➤ **Explore different ways to understand finding the whole when a part and the percent are given.**

Akira is checking his progress in a bike race. He has biked 24 mi so far, and that is 40% of the race. How many miles is the race?

Model It

You can use a double number line to find the whole when a part and the percent are given.

Model It

You can make a table of equivalent ratios to find the whole when a part and the percent are given.

Start with the ratio 24 : 40.

Miles	Percent (%)
24	40
6	10
?	100

÷ 4   × 10   ÷ 4   × 10

CONNECT IT

➤ **Use the problem from the previous page to help you understand how to find the whole when a part and the percent are given.**

1 Look at the double number line and the table in the **Model Its**. How do both models use the relationship between 40% and 10%?

2 How many miles make up 10% of the race? Explain how you know.

3 Suppose Akira completes 100% of the race. How many miles does he bike? Explain how you know.

4 Mavis used another method. First, she divided 24 mi by 8 to get 3 mi. Then, she multiplied 3 mi by 20 to get 60 mi. What percent of the whole race is 3 mi? Why did Mavis multiply 3 mi by 20?

5 How can you find the whole when you know a part and the percent?

6 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you understand finding the whole when you know the part and the percent.

Apply It

➤ **Use what you learned to solve these problems.**

7 At Shaw Middle School, 150 students take part in cleaning up the school. This is 30% of the students that attend the school. How many students attend Shaw Middle School? Show your work.

SOLUTION _____

8 At a basketball game, the home team scores 60% of the points. The home team scores 45 points. How many points are scored in all?

A 27 points

B 70 points

C 75 points

D 225 points

9 Lamont spends $120 on groceries. This is 25% of the money he earns this week. How much money does Lamont earn? Show your work.
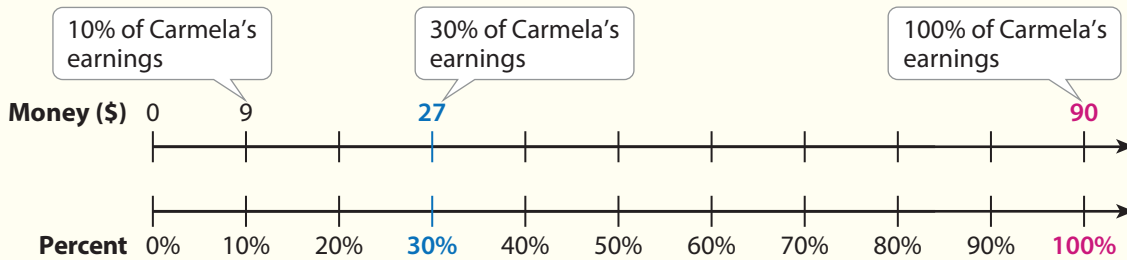
SOLUTION _____

Practice Finding the Whole

➤ **Study the Example showing how to find the whole when a part and the percent are given. Then solve problems 1–5.**

Example

Carmela saves $27. This is 30% of the money she earns. How much does Carmela earn?

You can use a double number line to find the whole when you know a **part** and the **percent**. On the number line, **27** lines up with **30%**. To find the **whole**, find the number that lines up with **100%**.

| 10% of Carmela's earnings | | 30% of Carmela's earnings | | | 100% of Carmela's earnings |

Money ($)　0　　9　　　　　　　27　　　　　　　　　　　　　　　90

Percent　0%　10%　20%　**30%**　40%　50%　60%　70%　80%　90%　**100%**

Divide $27 by 3 to find 10% of Carmela's earnings: $27 ÷ 3 = $9.

Multiply $9 by 10 to find 100% of Carmela's earnings: $9 × 10 = $90.

Carmela earns $90.

1 In the Example, why is it helpful to find 10% of Carmela's earnings before finding 100% of her earnings?

2 Aiden spends $18 on souvenirs during a school trip to New York City. This is 45% of the money he brings on the trip. How much money does Aiden bring on the trip? Show your work.

SOLUTION _____

3 Angel is running for school council president. He receives 300 votes, which is 60% of all the votes. How many students vote in the election? Explain how you found your answer.

4 Students sell 80% of the books at a book sale. They sell 48 books in all. How many books are at the book sale? Show your work.

SOLUTION

5 Aiyana reads 147 pages of a book. She completes 70% of the book. How many pages does Aiyana still have left to read? Show your work.

SOLUTION

Refine Using Percents to Solve Problems

➤ **Complete the Example below. Then solve problems 1–9.**

Example

Alison is driving from Houston to Dallas. She drives 180 mi. This is 75% of the trip. What is the distance from Houston to Dallas?

Look at how you could show your work using a table of equivalent part-to-whole ratios.

75% is 75 parts out of a whole made up of 100 equal parts.

÷ 25   × 60

Part (mi)	75	3	180
Whole (mi)	100	4	?

÷ 25   × 60

SOLUTION _____

CONSIDER THIS . . .
You can find a ratio where the part is 180 and the whole is the distance in miles from Houston to Dallas.

PAIR/SHARE
Explain why you cannot solve the problem by multiplying 180 by $\frac{75}{100}$.

Apply It

1 Tarik turns in his third research report. His teacher says that 20% of his reports for the year are done. How many research reports will Tarik complete during the school year? Show your work.

CONSIDER THIS . . .
How can representing 20% as a unit fraction help you solve the problem?

PAIR/SHARE
Suppose three research reports represent 25% of all the reports for the year. How would your answer change?

SOLUTION _____

2 Rani takes a 40-question test. She answers 5% of the questions incorrectly. How many questions does she answer incorrectly? Show your work.

SOLUTION

3 Two sixth grade classes are raising money. Mrs. Shen's class raises $120. Mr. McClary's class raises 50% of the amount Mrs. Shen's class raises. How much money do the two classes raise in all?

A $60

B $170

C $180

D $240

Jake chose A as the correct answer. How might he have gotten that answer?

4 What percent of 20 is 5?

  A 1%

  B 4%

  C 25%

  D 85%

5 Three basketball players take different numbers of shots during practice. They each record the number of baskets made out of the number of shots taken. The players in order from greatest percent of baskets made to least percent of baskets made are

_____ , _____ , and _____ .

Number of Baskets Made

Diego **21** out of **60** shots
Amare **16** out of **40** shots
Paula **17** out of **50** shots

6 Rosa has a limit to the time she may play video games each day. She plays for 9 min on Monday, which is 30% of the time she can play. How many more minutes can Rosa play on Monday? Show your work.

SOLUTION _____

7 Tell whether each statement is *True* or *False*.

	True	False
a. 80% of 90 is the same as $\frac{8}{9}$ of 90.	○	○
b. 45% of 60 is 27.	○	○
c. 20% of 90 is the same as $\frac{1}{5}$ of 90.	○	○
d. 25 is 35% of 80.	○	○

8 In the seahorse tank at an aquarium, 70% of the male seahorses have eggs in their pouches. There are 20 male seahorses in the tank. Kennedy uses the expression 0.07×20 to find the number of male seahorses with eggs. Explain why Kennedy's expression is incorrect. How many male seahorses have eggs in their pouches?

9 **Math Journal** Choose one of the following percents: 15%, 35%, or 85%. Write and solve a word problem that uses your percent and involves finding the whole.

✓ **End of Lesson Checklist**

☐ **INTERACTIVE GLOSSARY** Find the entry for *percent*. Add two important things you learned about percents in this lesson.

☐ **SELF CHECK** Go back to the Unit 4 Opener and see what you can check off.