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CCLS: 7.RP.3

Solving More Problems with Proportional Relationships

PART 1 Introduction

Sometimes using percents and proportions involves more than one step. Read a problem carefully to determine what information is given and what you are to find.

Joyce puts $200 into a savings account. The money invested is called the *principal.* The account pays 3% simple interest each year on the principal. What will be the total amount of money in the account after one year?

Interest is a fee paid for the use of money. You earn interest on investments. You pay interest on loans.

First, use a proportion to find the amount of interest on the principal.

$$\frac{n}{200} = \frac{3}{100};\ 100n = 3 \times 200 = 600;\ \frac{100n}{100} = \frac{600}{100},\ \text{so } n = 6$$

The interest on $200 is $6.

The total amount of money in the account is the principal plus the interest. Joyce has $200 principal and $6 interest, so she has $206 in the account.

Percents and proportions are also helpful when you shop.

A bracelet that originally cost $150 is on sale for 35% off. What is the sale price?

Use a proportion to find the amount of the discount. Then subtract the discount from the original price to find the sale price.

$$\frac{n}{150} = \frac{35}{100};\ 100n = 150 \times 35 = 5{,}250,\ \text{so } n = 52.5$$

The sale price is $150 − 52.50 = $97.50.

To find a **percent increase** or **decrease** between two amounts, find the difference between the two amounts. Write a ratio of the difference to the original amount. Set up a proportion and solve.

The price of a dozen eggs increases from $1.40 to $1.65. What is the percent increase?

$$\frac{(1.65 - 1.40)}{1.40} = \frac{0.25}{1.40} = \frac{n}{100}$$

$$1.40n = 0.25 \times 100,\ \text{so } n = 17.8\%$$

The percent increase is 17.8%.

SAMPLE

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Think About It

Explain how you might find your total cost if you buy a shirt for $20 and there is 6% sales tax on your purchase.

_____

_____

PART 2 Focused Instruction

Use proportions to solve percent problems with multiple steps.

➤ Faila went out to eat with a friend. Her food and beverage cost a total of $12.00. She paid 6% tax on her food and beverage cost and also left an 18% tip. Find the total amount she paid.

Tax and tip are both paid on the amount of food and beverage only.

What proportion will you use to find the amount of tax Faila paid?

_____

What equation is the result of cross multiplying the proportion?

_____

Solve for the variable representing the tax she paid. _____

In dollars, what is the amount of tax? _____

What proportion will you use to find the amount of the tip?

_____

What equation is the result of cross multiplying the proportion?

_____

Solve for the variable representing the tip. _____

In dollars, what is the amount of the tip? _____

What operation will you use to find the total amount Faila paid?

_____

Show how you find the total amount she paid. _____

What is the total she paid? _____

SAMPLE

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Percent error expresses the difference between a measured value and an exact value as a percentage. It is calculated like percent increase or decrease.

The proportion for **percent error** is $\frac{(\text{measured} - \text{actual})}{\text{actual}} = \frac{\text{percent error}}{100}$.

➤ Marcus sets his oven for 400°. The oven is not accurate and the actual temperature is 375°. What is the percent error of the oven's temperature?

What is the measured temperature? _____

What is the actual temperature? _____

What expression shows the difference between the measured temperature and the actual temperature? _____

What ratio expresses the difference to the actual amount? _____

What proportion will you use to find the percent error?

_____

What equation is the result of cross multiplying the proportion?

_____

Solve for the variable representing the percent error. Show your work.

_____

What is the percent error in the oven's temperature? _____

Use what you know about percents to answer these questions.

1 Nada's electric bill included a charge of $162 for the electricity used and an additional 5% fee for delivery. What was the total amount of her electric bill?

_____

2 Kyle bought a pair of socks for $6. Last month, his friend bought the same socks for $5. What is the percent increase in the price of the socks?

_____

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Solve the following problems.

1 The customer price for books at a bookstore is 40% higher than the price the bookstore owner pays. The bookstore owner pays $12 for a book. What is the customer price for that book? Show your work.

A markup is the opposite of a discount. Add instead of subtracting.

Answer $_____

2 Lorenzo earned $20 an hour to mow a yard. Now Lorenzo is supposed to trim around the edges of the yard as well, and he makes $25 an hour. What is the percent increase in the amount Lorenzo earns?

A percent increase is based on the original amount earned.

Answer _____%

3 Mrs. Bell has a rain gauge outside. On a very rainy day, the gauge measured 2.5 inches. The actual amount of rain that fell was 2.3 inches. To the nearest tenth, what is the percent error in Mrs. Bell's measurement? Show your work.

If the measured amount is less than the actual amount, the percent error will be negative.

Answer _____%

SAMPLE

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Solve the following problems.

1 A sweater is discounted by 20%. The original price of the sweater is $35. What is the discounted price of the sweater?

A $7

B $21

C $28

D $42

2 Judith puts $600 into an account that pays 2.5% simple interest per year. Choose an option in each set to correctly complete the statement.

The account will earn [$15, $25, $150] in interest in one year, and the value of the account will be [$615, $625, $750] in one year.

3 Lance paid 6% sales tax on a $30 game. What total amount did Lance pay?

Answer $_____

SAMPLE

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4 Last year, the police academy had 240 graduates. This year, the class was 15% larger.

Part A How many more graduates were in this year's class than last year's?

Answer _____ graduates

Part B How many graduates were in this year's class?

Answer _____ graduates

5 An airline charges an additional fee for all suitcases that weigh 50 pounds or more. Lukja weighed her suitcase at home in order to avoid the fee and found it weighed 48.6 pounds. At the airport's official scale, however, it weighed 50.2 pounds. What was the percent error of Lukja's measurement? Show your work.

Answer _____ %

SAMPLE

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6 Vito raises green beans to sell. Last year, he raised 250 pounds of beans. The weather was better this year, and his crop increased by 12%. How many pounds of beans did he raise this year?

Answer _____ pounds

7 Planners for Center City know that people there are moving to the suburbs. They expect an 8% loss in the number of people who live in the city over the next 10 years. They expect 25,000 people to live in the city 10 years from now.

Part A Let *n* represent the number of people who live in the city now. Write an expression for the difference between the number of people who live there now and the number of people expected to live there in 10 years.

Answer _____

Part B What is this expression for a difference equal to?

Answer _____

Part C Write a proportion you could use to solve this problem.

Answer _____

Part D How many people currently live in the city? Round your answer to the nearest whole number.

Answer _____ people

SAMPLE

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