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Unit 7.4, Family Resource

Unit 4 Summary

Prior Learning	Grade 7, Unit 4	Later in Grade 7	Grade 8 & HS
Grades 3–5 • Fraction operations Grade 6 • Equivalent ratios • Unit rates Grade 7, Unit 2 • Proportional relationships	• Percentages as proportional relationships • Applying percentages	• Operations with negative numbers • Solving equations	• Exponential functions

Percentages as Proportional Relationships

This unit continues the study of proportional relationships, now incorporating fractional quantities and percentages.

A 4-by-6 photograph can be scaled and printed to be many different sizes.

In this example, each value in the second column is $\frac{3}{2}$ times the length of the value in the first column.

Height (in.)	Width (in.)
4	6
$1\frac{1}{2}$	$2\frac{1}{4}$
5	$7\frac{1}{2}$

Increasing or decreasing an original amount by a percentage is another example of a proportional relationship. The original amount is always represented by 100% or 1.

Three runners training for a race agree that they will each run 10% further next week than they ran this week.

Each value in the second column is 10% greater than the value in the first column. The constant of proportionality is 1.10.

This is an example of a **percentage increase**.

Miles Ran This Week	Miles to Run Next Week
5	5.5
11	12.1
6.5	7.15

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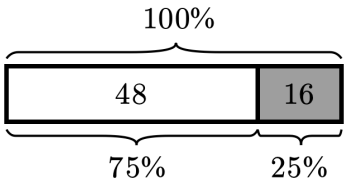
Here is an example of a **percentage decrease.**

The computer club had 64 students. Then, they lost 16 students.



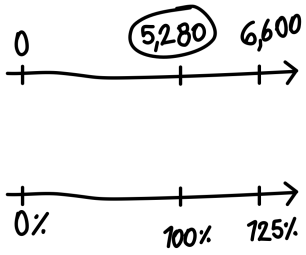
This is a 25% decrease because $\frac{16}{64} = 0.25$.

The club now has 48 students, which is 75% of the starting amount: $0.75 \cdot 64 = 48$.

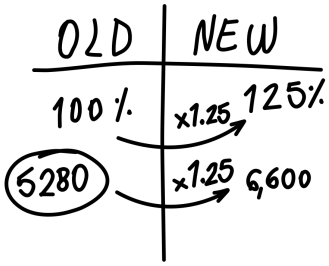
Sometimes problems require us to work backwards. The population of Boom Town has increased by 25% since last year. The population is now $6\,600$. What was the population last year?

We can use a variety of representations to solve the problem:

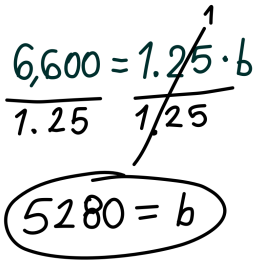
Double Number Line



Table



Equation



Applying Percentages to Solve Problems

Percentages are useful in a variety of real-world situations.

A customer buys an item that costs $\$20$. The customer has an 18% off coupon, and then pays a sales tax of 7.5%.

82% of the bill remains after the 18% off coupon, and 82% of $\$20$ is $20 \cdot 0.82 = 16.40$.

For the total after tax, you can calculate $16.40 \cdot 1.075 = 17.63$.

The customer will pay a total of $\$17.63$.

Original Cost	$20.00
18% Off Coupon	$
Subtotal	$
7.5% Tax	$
Total	$?.??

We can also use **percent change** to analyze statistics about the larger society in which we live.

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Try This at Home

Percentages as Proportional Relationships

A supermarket offers some food by the pound. A customer orders $1\frac{1}{2}$ pounds of potato salad for $\$9$ and $1\frac{3}{4}$ pounds of coleslaw for $\$11.20$.

1.1 How much would 5 pounds of potato salad cost?

1.2 Which food is more expensive per pound?

2. A car dealership pays $\$8350$ for a car. They sell it for 17% more than they paid. How much does the dealership sell the car for?

3. On Tuesday, the high temperature was $54°$ Fahrenheit. This was 10% lower than the high temperature on Monday. What was the high temperature on Monday?

Applying Percentages to Solve Problems

4. A restaurant bill before tip was $\$18.75$. If you paid $\$22$, what percent tip did you leave for the server?

The price tag on a backpack is $\$34.20$.

5.1 The store has a 15% off sale. What is the new price of the backpack?

5.2 The sales tax in this city is 5%. How much would a customer pay after the sale and the tax?

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Solutions:

1.1 $\$30$. One approach is to divide the cost by the weight to find the cost per pound. $9 \div 1\ \frac{1}{2} = 6$ dollars per pound. 5 pounds at that rate is $\$30$.

1.2 Coleslaw is more expensive. One approach is to divide each cost by each weight.

Potato salad: $9 \div 1\ \frac{1}{2} = 6$ dollars per pound

Coleslaw: $11.20 \div 1\ \frac{3}{4} = 6.40$ per pound

2. $\$9\ 769.50$. One approach is to multiply $8350 \cdot 1.17 = 9769.5$.

3. $60°$. One approach is to write and solve an equation, where 90% of some number is $54°$:

$0.9x = 54 \rightarrow x = \frac{54}{0.9} = 60$.

4. About 17.3%. One approach is write and solve an equation, where 18.75 multiplied by an unknown number is 22. $18.75x = 22 \rightarrow x = \frac{22}{18.75}\ 1.17333...$. The 1 that comes before the decimal represents the original 100%, while the rest of the decimal number is the growth. When written as a rounded percent, $.17333$ is 17.3%.

5.1 $\$29.07$. One approach is to calculate $34.20 \cdot 0.85$, which is 29.07.

5.2 $\$30.52$. One approach is to multiply the answer from the previous problem, 29.07, by 1.05.