

Percent Applications: math lesson, Grade 7 – download the PDF

Percents show up every time you shop, eat out, save money, or measure something. A store says “30% off,” a menu suggests an 18% tip, a bank pays 4% interest, and a scientist reports a 3% error. In this chapter you will use one simple idea, **percent means “per 100,”** to solve all of these real-world problems with confidence.

1. Finding a percent of a quantity

D Definition

A **percent** is a ratio that compares a number to 100. The symbol % means “out of 100,” so $35\% = \frac{35}{100} = 0.35$.

To find a percent of a quantity, change the percent to a decimal (or fraction) and multiply. The word “of” in a percent problem usually signals multiplication.

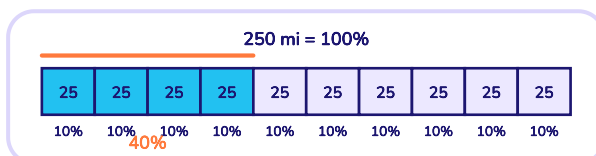
M Method: percent of a quantity

1. Write the percent as a decimal by moving the decimal point two places to the left.
2. Multiply the decimal by the quantity.
3. Write the answer with the right unit.

E **Example 1** A school has 240 students and 35% of them ride the bus. How many ride the bus?

$35\% = 0.35$ and $0.35 \times 240 = 84$. So **84 students** ride the bus.

A bar model makes this idea visible. Cut the whole into ten equal parts: each part is 10% of the whole. Below, the whole is a 250-mile road trip, so each part is 25 miles, and 4 parts (40%) make 100 miles.



Check: $0.40 \times 250 = 100$ miles. The bar model and the multiplication agree.

2. Percent increase and decrease

When a quantity changes, we often describe the change as a percent of the *original* amount.

P Percent change

$$\text{percent change} = \frac{\text{amount of change}}{\text{original amount}} \times 100\%$$

If the new value is larger, it is a **percent increase**. If it is smaller, it is a **percent decrease**. The amount of change is the difference between the new and original values, written as a positive number.

E **Example 2** A video game costs 48 dollars in March and 60 dollars in April. What is the percent increase?

Change: $60 - 48 = 12$. Percent change: $\frac{12}{48} = 0.25 = 25\%$. The price went up by **25%**.

Now suppose a game drops from 80 dollars to 68 dollars. Change: $80 - 68 = 12$, and $\frac{12}{80} = 0.15$. The price fell by **15%**.

You can also go the other way. To increase a number by $r\%$, multiply by $1 + \frac{r}{100}$. To decrease it by $r\%$, multiply by $1 - \frac{r}{100}$. For instance, an 8% increase means multiplying by 1.08, and a 12% decrease means multiplying by 0.88.



Watch out Always divide by the *original* amount, not the new one. Also, a 50% increase followed by a 50% decrease does *not* bring you back to the start: 100 becomes 150, and 50% of 150 is 75, which leaves 75.

3. Markups and discounts



Definitions

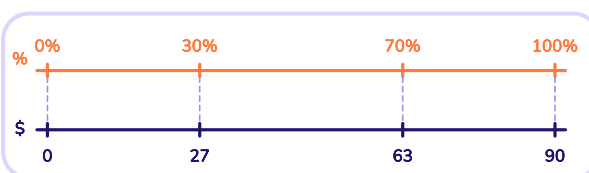
A **markup** is the amount a store adds to its cost to set a selling price. A **discount** is the amount subtracted from the original price during a sale. Both are usually given as a percent of a starting price: the markup is a percent of the store's cost, and the discount is a percent of the regular price.



Example 3 A jacket regularly costs 90 dollars and is 30% off.

Discount: $0.30 \times 90 = 27$ dollars. Sale price: $90 - 27 = 63$ dollars.

Shortcut: paying 70% of the price means $0.70 \times 90 = 63$. The double number line shows both views.



Example 4 A shop pays 32 dollars for a skateboard deck and uses a 50% markup.

Markup: $0.50 \times 32 = 16$ dollars. Selling price: $32 + 16 = 48$ dollars.

4. Sales tax and tips

Sales tax is a percent of the price that is added at the register. A **tip** (or gratuity) is a percent of the bill that you add to thank the person who served you. Both work like a markup: the total is the

original amount plus the percent of it.

M

Method: tax or tip

1. Convert the rate to a decimal.
2. Multiply by the price (or bill) to get the tax (or tip).
3. Add it to the price to get the total, or multiply once by $1 + \text{rate}$.

E

Example 5 Headphones cost 36.00 dollars and the sales tax rate is 7.5%.

Tax: $0.075 \times 36 = 2.70$. Total: $36 + 2.70 = 38.70$ dollars.

A diner's bill is 42.50 dollars and the diner leaves an 18% tip: $0.18 \times 42.50 = 7.65$ dollars.

!

Zyro's trick On my home planet we do tips in our heads! Move the decimal point one place left to get 10%. Double that for 20%, or halve it and add for 15%. On a 40-dollar bill, 10% is 4 dollars, 20% is 8 dollars, and 15% is 6 dollars.

5. Simple interest

When you deposit money in a savings account, the bank pays you **interest**. When you borrow money, you pay interest. With **simple interest**, the interest is always figured on the original amount.

P

Simple interest formula

$$I = P \times r \times t$$

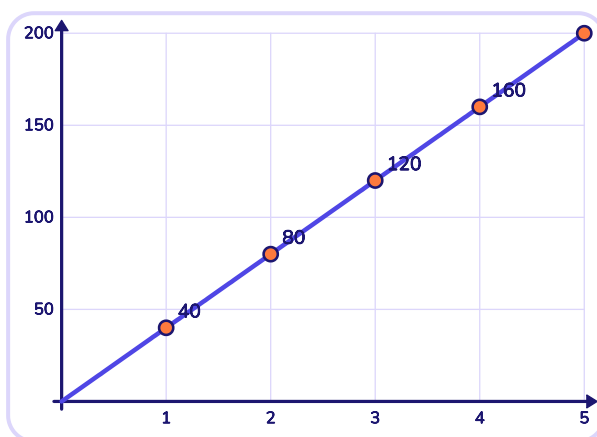
Here I is the interest, P is the **principal** (the starting amount), r is the annual interest rate written as a decimal, and t is the time in **years**. The final amount is $P + I$.



Example 6 You deposit 1,500 dollars at 4% simple interest for 3 years.

$I = 1500 \times 0.04 \times 3 = 180$ dollars. The account holds $1500 + 180 = 1680$ dollars.

Because the interest is the same every year, the graph of interest versus time is a straight line through the origin. This is a proportional relationship. The graph below shows 800 dollars at 5%: that is 40 dollars of interest each year.



Watch out Use the rate as a decimal (5% becomes 0.05) and the time in years. Eighteen months is 1.5 years, and 9 months is 0.75 year.

6. Commissions and fees

A **commission** is pay that equals a percent of the sales a person makes. A **fee** is a charge for a service, and it can be a flat amount, a percent, or both.



Example 7 A furniture salesperson sells 12,500 dollars of furniture in a month and earns a 6% commission.

Commission: $0.06 \times 12500 = 750$ dollars. If the agent also has a 1,800 dollar base salary, total pay is $1800 + 750 = 2550$ dollars.

A payment app charges a 3% fee on an 80 dollar payment: $0.03 \times 80 = 2.40$ dollars.

7. Percent error

No measurement is perfect. **Percent error** tells you how far a measured value is from the true (actual) value, compared with the true value.



Percent error

$$\text{percent error} = \frac{|\text{measured} - \text{actual}|}{\text{actual}} \times 100\%$$

The absolute value bars mean the error is always positive. A smaller percent error means a more accurate measurement.



Example 8 A board is actually 50 centimeters long, but you measure 48.5 centimeters.

Error: $|48.5 - 50| = 1.5$. Percent error: $\frac{1.5}{50} = 0.03 = 3\%$. The same idea works in U.S. units: measuring a 20-inch shelf as 19 inches gives $\frac{1}{20} = 5\%$ error.

Key takeaways

- Percent means per 100: $35\% = 0.35$. To find a percent of a number, multiply.
- Percent change = $\frac{\text{change}}{\text{original}} \times 100\%$. Always divide by the original amount.
- Discount: subtract the percent of the price. Markup, tax, and tip: add the percent of the amount.
- Simple interest: $I = Prt$, with the rate as a decimal and the time in years.
- Commission and fees are percents of an amount of sales or money.
- Percent error = $\frac{|\text{measured} - \text{actual}|}{\text{actual}} \times 100\%$.



Test yourself: quick challenge for Grade 7

[Change level](#)

Level : **Grade 7**

6 random questions, instant feedback.

 **Start the challenge**

 **Speed drill for Grade 7: how many in 60 seconds?**

 **Keep exploring with Zyro**

 **Math practice**

Percent Applications: math practice,
Grade 7

 **Math tests**

Percent Applications: math test, Grade 7

 Math quizzes

Percent Applications: math quiz, Grade 7

 Math practice

Adding and Subtracting Integers: math practice, Grade 7

 Math practice

Multiplying and Dividing Rational Numbers: math practice, Grade 7

 Math tests

Adding and Subtracting Integers: math test, Grade 7

Zyro takes you to our partner sites

Blast off to other planets of knowledge and their apps.

Lift off