

Solving Multistep Percent Problems with Tax, Tips and Discounts

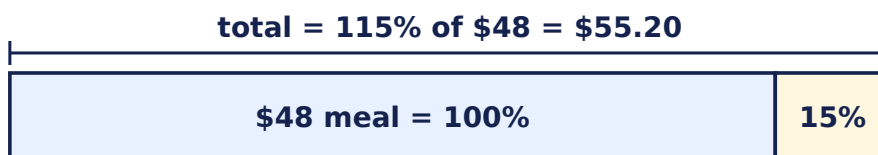
Grade 7 math · Lesson · Standards: 7.RP.A.3

Quick answer: A multistep percent problem combines steps such as tax, tip, markup, discount, commission, fees and simple interest. Convert each percent to a decimal, add charges with a multiplier like 1.075, subtract discounts with a multiplier like 0.65, and use $I = Prt$ for simple interest.

Standards: 7.RP.A.3 · **Level:** Grade 7

How do you find a percent of an amount?

Change the percent to a decimal and multiply. Fifteen percent of \$48 is $0.15 \times 48 = \$7.20$. Nearly every money problem with tax, tips, discounts or fees starts with this one step.



A 15% tip adds 15 parts to the 100 parts of the meal, so the total is 115% of \$48.

When do you add the percent and when do you subtract it?

Add for charges that go on top of a price: sales tax, tips, markups and fees. Subtract for amounts that come off: discounts and markdowns. A multiplier does both jobs in one step.

Percent toolkit

Situation	Amount of change	Final amount
Tax, tip, markup	rate $\times$ price	price $\times$ (1 + rate)
Discount, markdown	rate $\times$ price	price $\times$ (1 – rate)
Commission	rate $\times$ sales	pay = base + commission
Simple interest	$I = Prt$	balance = $P + I$

Method: multistep percent problems

1. Write the starting amount and each percent as a decimal.
2. Decide for each percent: does it add or subtract?

3. Apply the steps in the order the story gives them, using a multiplier such as 0.65 or 1.075.
4. Round money to the nearest cent only at the end.
5. Check that the answer is bigger or smaller than the start, as expected.

Worked example

Hiking boots cost \$120. They are 35% off, and then 7.5% sales tax is charged on the sale price.

Sale price: $120 \times 0.65 = \$78.00$. Total: $78 \times 1.075 = \mathbf{\$83.85}$.



Multipliers chain together: discount first, then tax.

How does simple interest work?

Simple interest is earned only on the original amount, called the principal P . With annual rate r (as a decimal) and time t in years, the interest is $I = Prt$. Eight hundred dollars at 4% for 3 years earns $800 \times 0.04 \times 3 = \$96$.

Year	Interest earned	Balance
1	\$32	\$832
2	\$32	\$864
3	\$32	\$896

Simple interest adds the same amount every year: $I = 800 \times 0.04 \times 3 = \$96$.

Common mistake

Taking 20% off and then 10% off does not equal 30% off. The second percent applies to the smaller sale price, so the final price is $0.80 \times 0.90 = 72\%$ of the original.

Mathbot's tip

Ask: "Will the answer be bigger or smaller?" Tax and tips make it bigger (multiply by more than 1); discounts make it smaller (multiply by less than 1).

Key points to remember

- Percent of an amount: change the percent to a decimal and multiply.
- Tax, tips and markups multiply by 1 plus the rate; discounts multiply by 1 minus the rate.
- Commission equals the commission rate times the sales.
- Simple interest is $I = Prt$, with r as a decimal and t in years.
- Successive discounts multiply; they do not add.

Solving Multistep Percent Problems with Tax, Tips and Discounts: frequently asked questions

How do I calculate sales tax and the total price?

Multiply the price by the tax rate as a decimal to get the tax, then add it to the price. Or multiply once by 1 plus the rate; for 7.5% tax, multiply by 1.075.

What is the difference between a markup and a markdown?

A markup raises a price, such as a store adding 40% to its cost. A markdown lowers a price, such as a 25% sale. Both are a percent of the starting price.

What does $I = Prt$ mean?

Interest I equals the principal P times the annual rate r (as a decimal) times the time t in years. The rate must match the time unit.

Why are two successive discounts not added together?

The second discount is taken from the already reduced price. A 20% discount followed by 10% is 0.8 times 0.9 , which is 0.72 , so the total discount is 28%.

How is commission different from a tip?

Both are a percent of an amount. Commission is a percent of what a salesperson sells and is paid by the employer; a tip is a percent of a bill and is paid by the customer.