

PERCENTAGES

G'Day! This is your math friend James. Today I am answering a question from Alexandra.

WHAT IS A PERCENT?

I am guessing Alexandra heard the mathematics term "percentage" in listening to adults talking around her or on the radio or from looking at advertisements in magazines or in stores. It's a word used a lot in everyday life. What does it mean?

In school, one typically learns about percentages in Grade 6 mathematics and the idea is explored further throughout middle school. But it is good to wonder what people are talking about no matter what grade you are in!

The word **percentage** sounds fancy, and a bit scary. Let's see if I can explain what it means.

About 2,100 years ago, the Romans had an empire, centered in the city of Rome, Italy, but spreading all across Europe and parts of northern Africa and across to the East. It was huge. And the Emperor at the time, Augustus, had a problem. The Empire needed roads and aquifers and buildings and such, and building things costs money!

So Augustus invented the idea of a tax. He said to all Romans that, from now on, whenever they trade money, one coin for each one-hundred coins traded must go to the Empire. For example, if at a market someone buys a bag of wheat for 100 coins, one of those coins goes to the Empire. If one buys a wooden cart for 500 coins (that's five sets of one-hundred), one coin of each hundred—5 coins—goes to the Empire. If an item sold for just 50 coins—that's half of a hundred—the equivalent of half a coin goes to the Empire. (The person selling the items probably sent to the Empire one coin for every two purchases made.)

The Latin for "per one hundred" is **per centum**, which, in English, later become percent.



Did You Know ...?

One of our months of the year is named after Emperor Augustus.

Our sixth month used to be called **Sextilis**, but the Romans renamed it "**August**" in the year 8 BCE. (Later, the calendar changed and this sixth month was bumped up to be the eighth month of the year.)

The Romans also renamed another month to honor another Emperor. Can you guess (or look up) which month that is?

puzzle #1

If a merchant in a market sold loaves of bread for 8 coins a loaf, how many loaves would she need to sell in a day in order to pay the tax of "one part per hundred"? Assume she has to pay with a whole number of coins.

To keep track of taxes, accounts were employed to write and maintain records for all business transactions.

After a while, accountants got tired of writing "per centum" over and over again. So they started writing shorthand notation for it.

Accountants in Italy during the 1400s were thinking "per cento," the Italian version of per centum, and started simply writing a vertical line and a circle for the beginning "p" and a circle for the final "o." Somehow, the order of these marks got switched around and they started writing "o|o," which later changed to %.

And this is the symbol we use today!

Check out [MATHICAL](#) for award-winning math books for middle-schoolers and teens, the YouTube channel [NUMBERPHILE](#) for math videos galore, and [MORE MATH!](#) for even more resources. Wowza!

Some people think 100 is a big number. Check out the book "Really Big Numbers" by Richard Schwartz to see how BIG numbers can get!

Do you have a math question for me to answer, or try to answer?

Write to me [at the website](#). Each week I'll pick a new question and give my thoughts on it!

Also, today, we take "percent" to mean any fraction with denominator equal to one hundred.

For example, 37% means the fraction 37 one hundredths, that is, 37/100.

And 20% means the fraction 20 one hundredths, 20/100. (This is the same as one fifth.)

And to turn a fraction into a percentage, see if you can rewrite the fraction to have denominator 100. For example, this calculation

$$\frac{1}{2} = \frac{1 \times 50}{2 \times 50} = \frac{50}{100}$$

shows that 1/2 is the same as 50%, and this shows

$$\frac{3}{10} = \frac{3 \times 10}{10 \times 10} = \frac{30}{100}$$

that three-tenth is the same as 30%.

puzzle #2

It is not always obvious how to rewrite a fraction as a percentage. Which of the following fractions are easier to convert than the others?

$$\frac{1}{20} \quad \frac{3}{5} \quad \frac{2}{3} \quad \frac{8}{25} \quad \frac{2}{15} \quad \frac{4}{7} \quad \frac{1}{8}$$

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The NMF Weekly is written by mathematician Dr. James Tanton as a resource for friends and fans of the 2021 National Math Festival.

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