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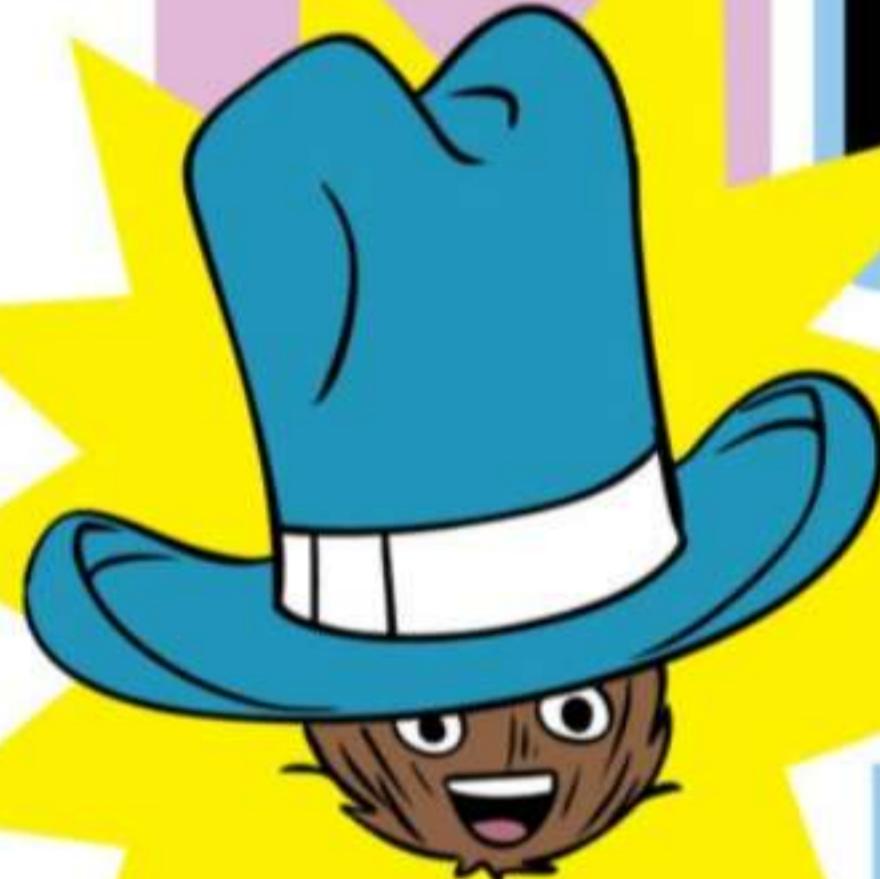
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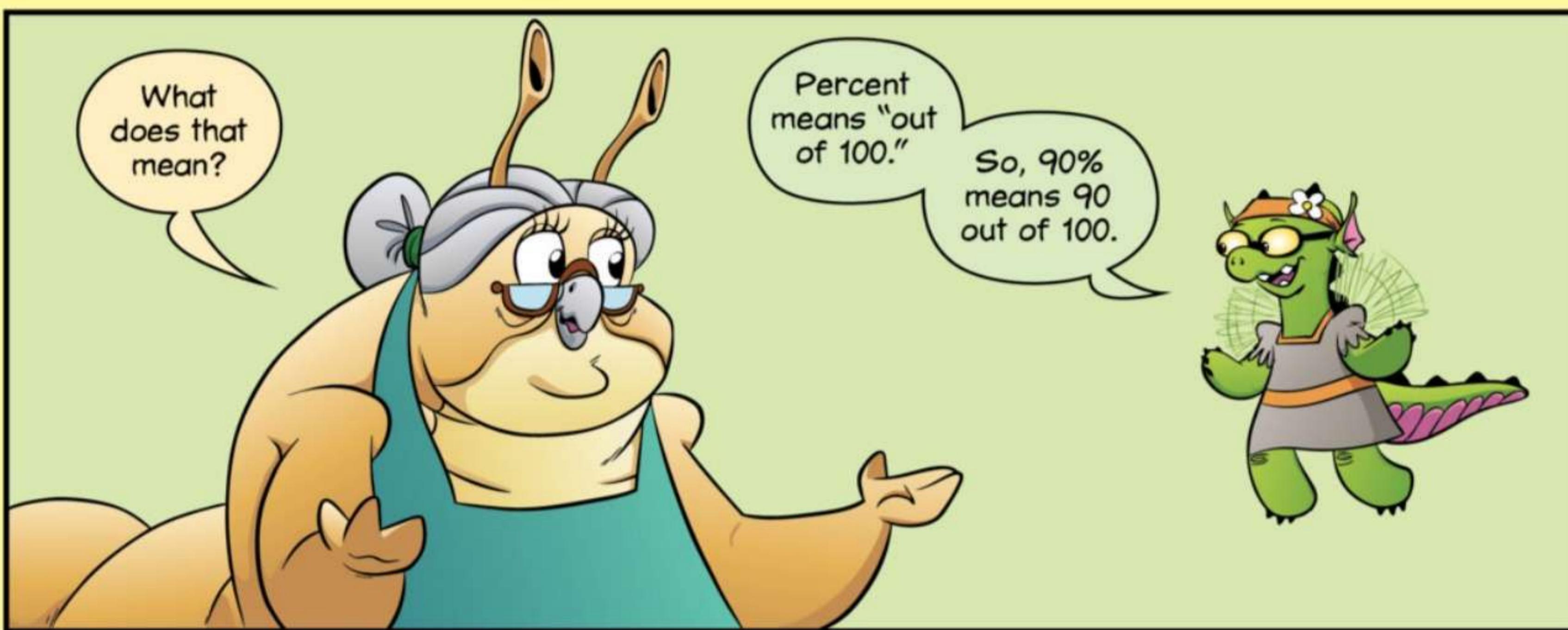
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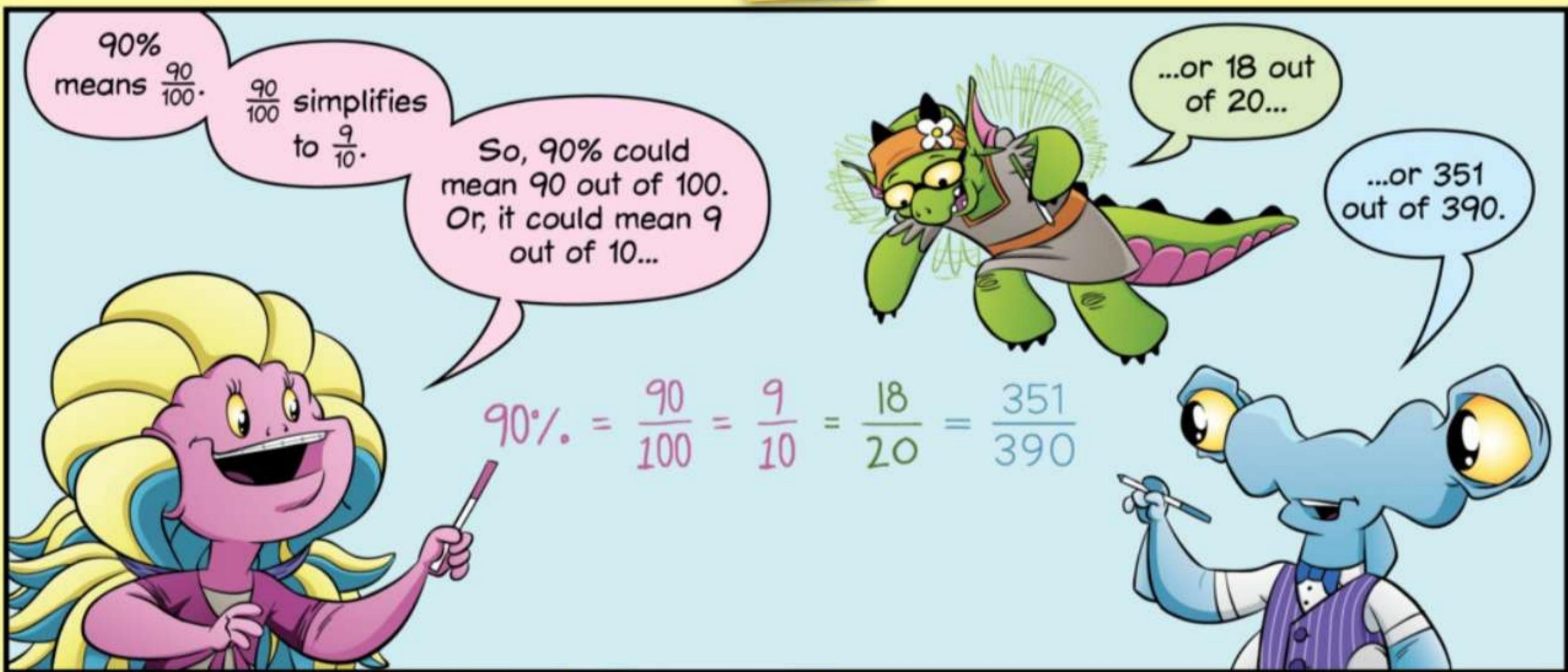
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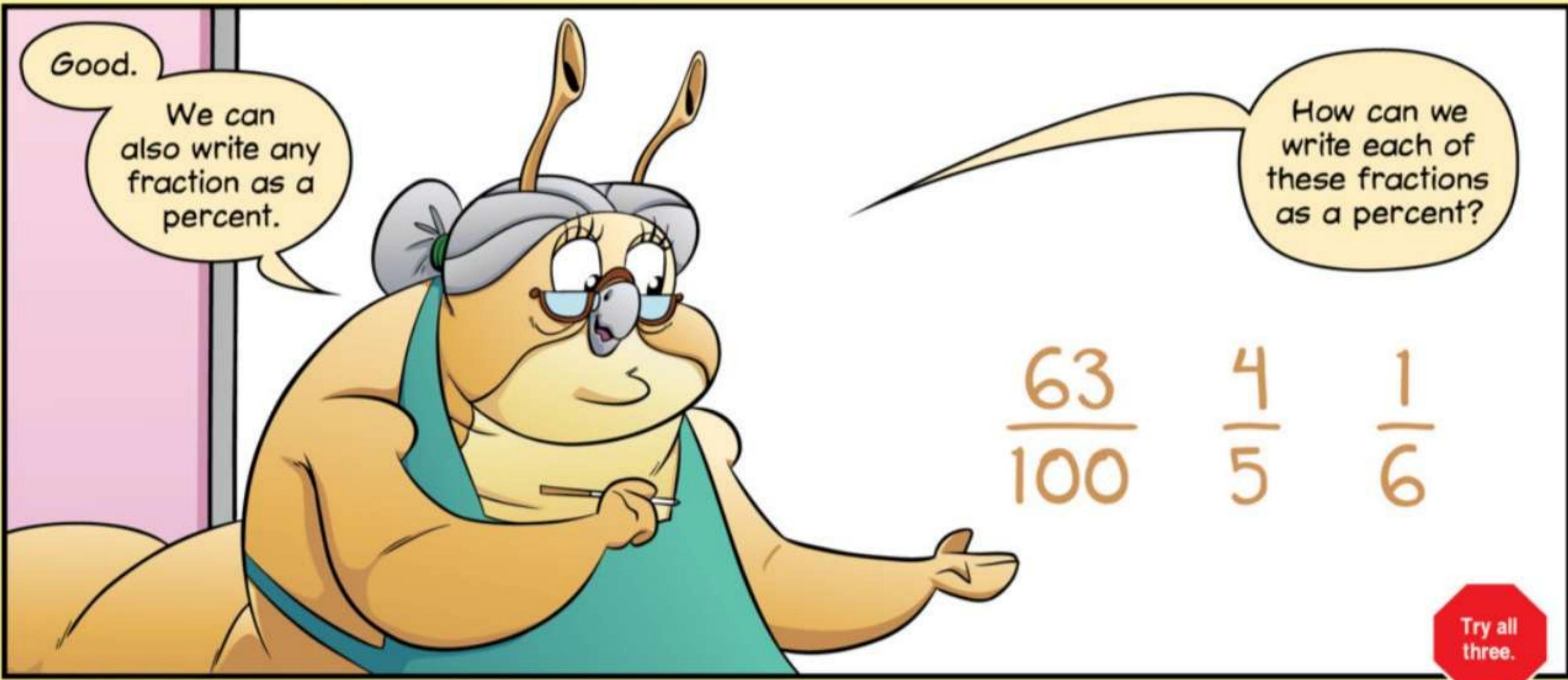
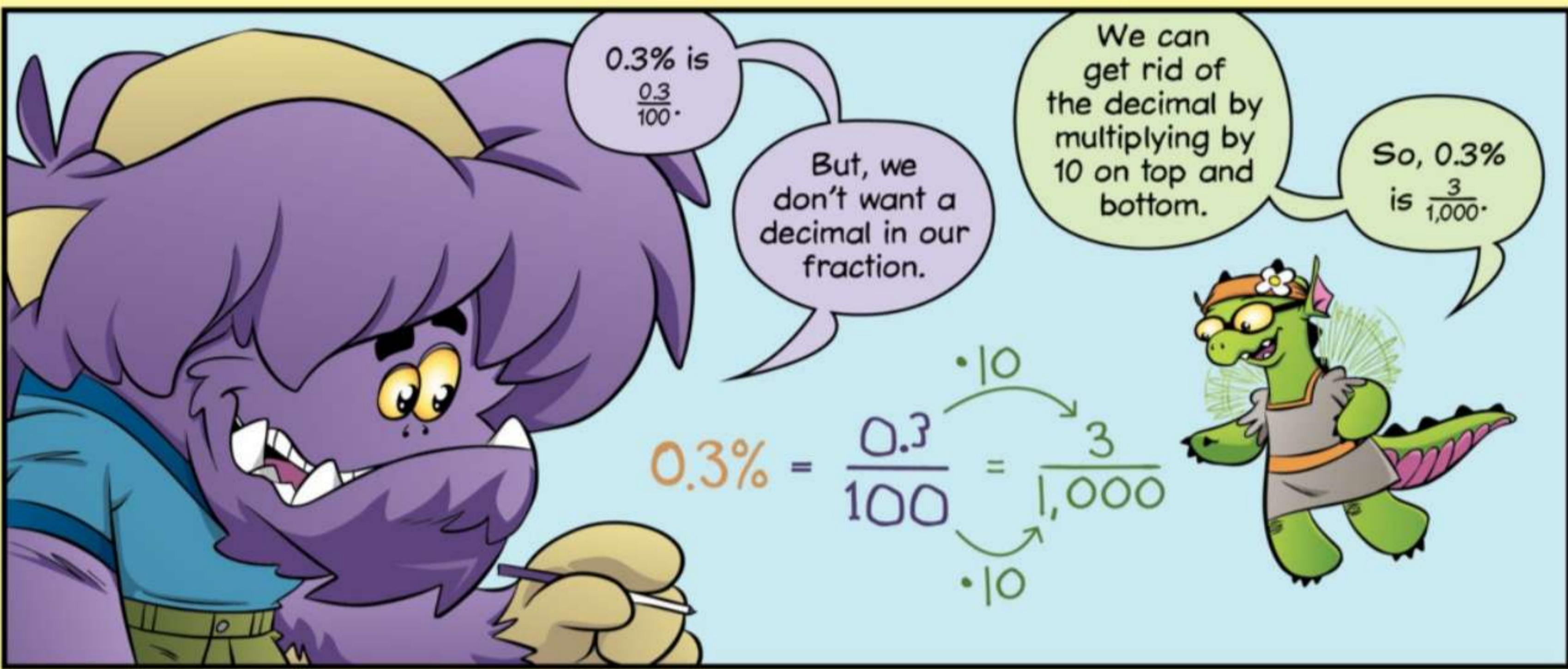
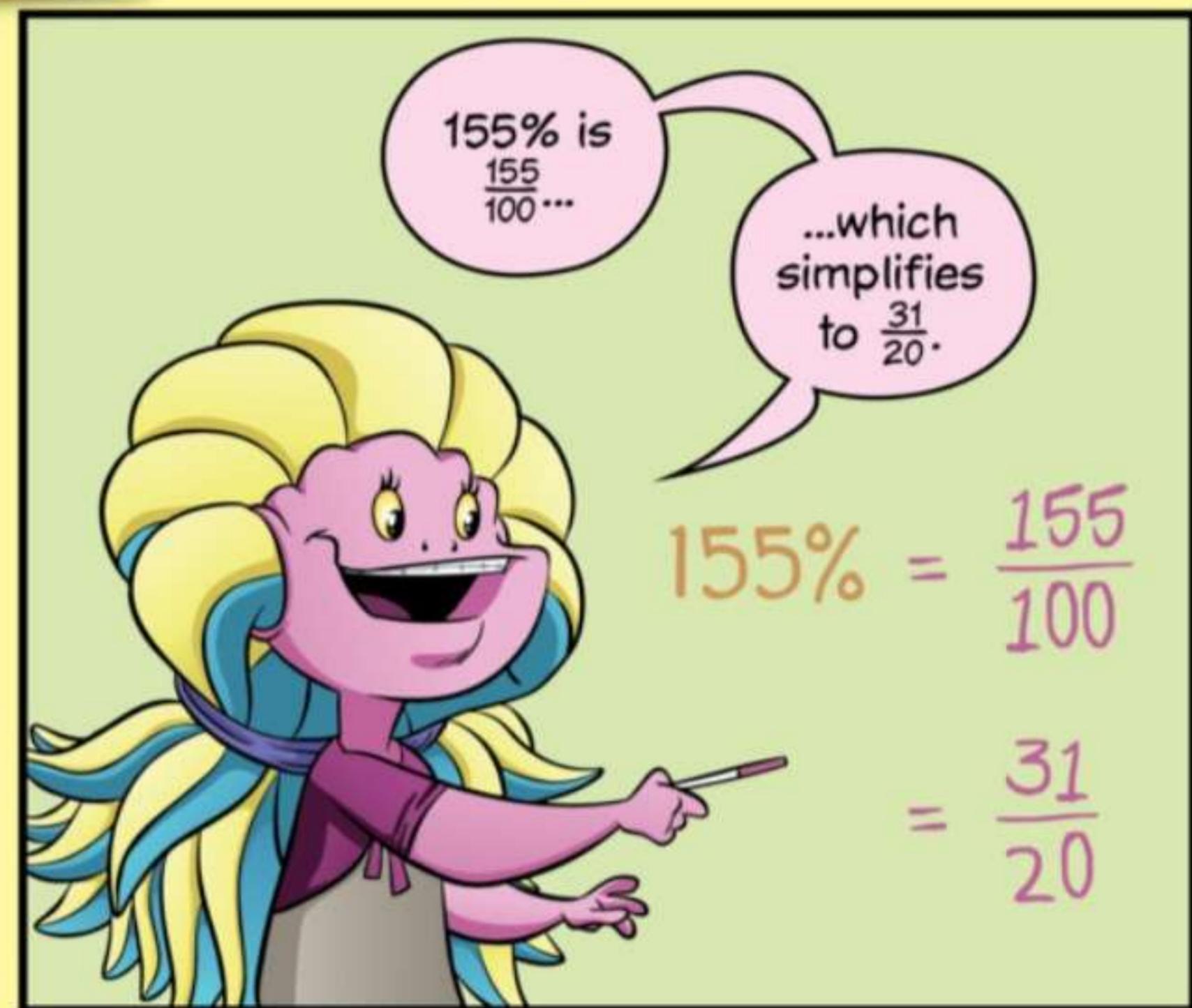
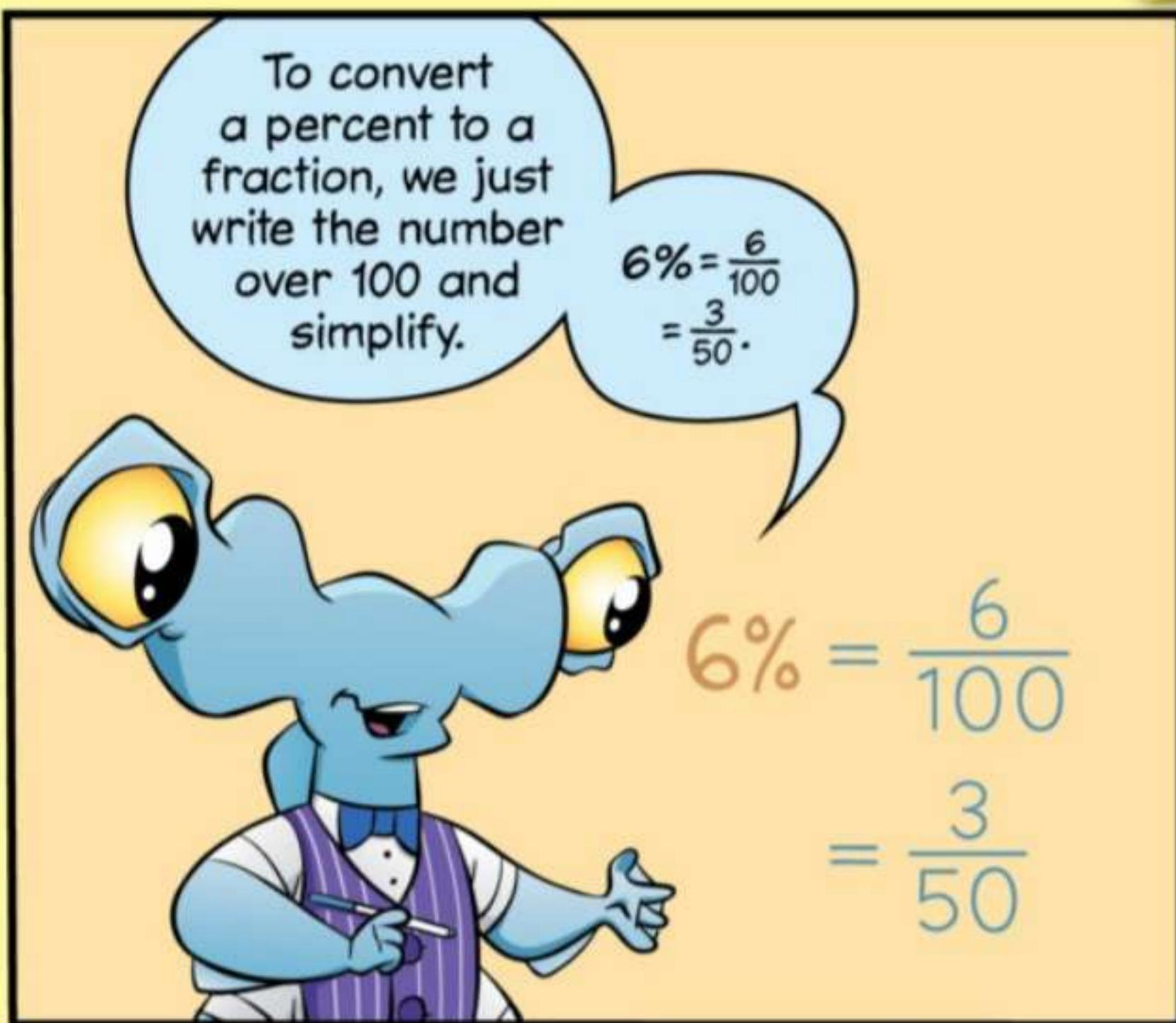
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Ms. Q. Percents & Fractions







Try all three.

Since $\frac{63}{100}$ already has 100 in its denominator, it's easy to write as a percent.

$\frac{63}{100}$ equals 63%.



We can convert $\frac{4}{5}$ into a fraction with denominator 100.

$\frac{4}{5} = \frac{80}{100}$, which is 80%.



$$\frac{4}{5} = \frac{4 \cdot 20}{5 \cdot 20} = \frac{80}{100} = 80\%$$

Turning $\frac{1}{6}$ into a fraction with denominator 100 is harder.

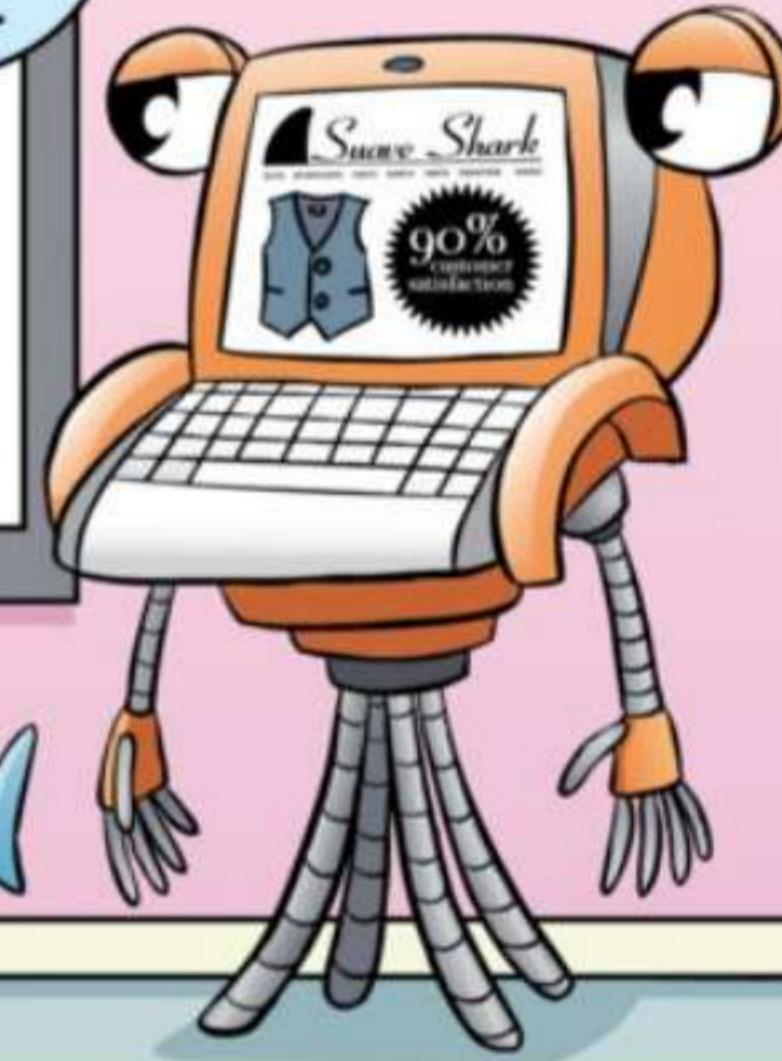
There isn't an integer we can multiply 6 by to get 100.



$$\frac{1}{6} = \frac{x}{100}$$



But, we can set up an equation and solve for x .



To solve for x , we multiply both sides of the equation by 100.

$$\frac{1}{6} \cdot 100 = \frac{x}{100} \cdot 100$$

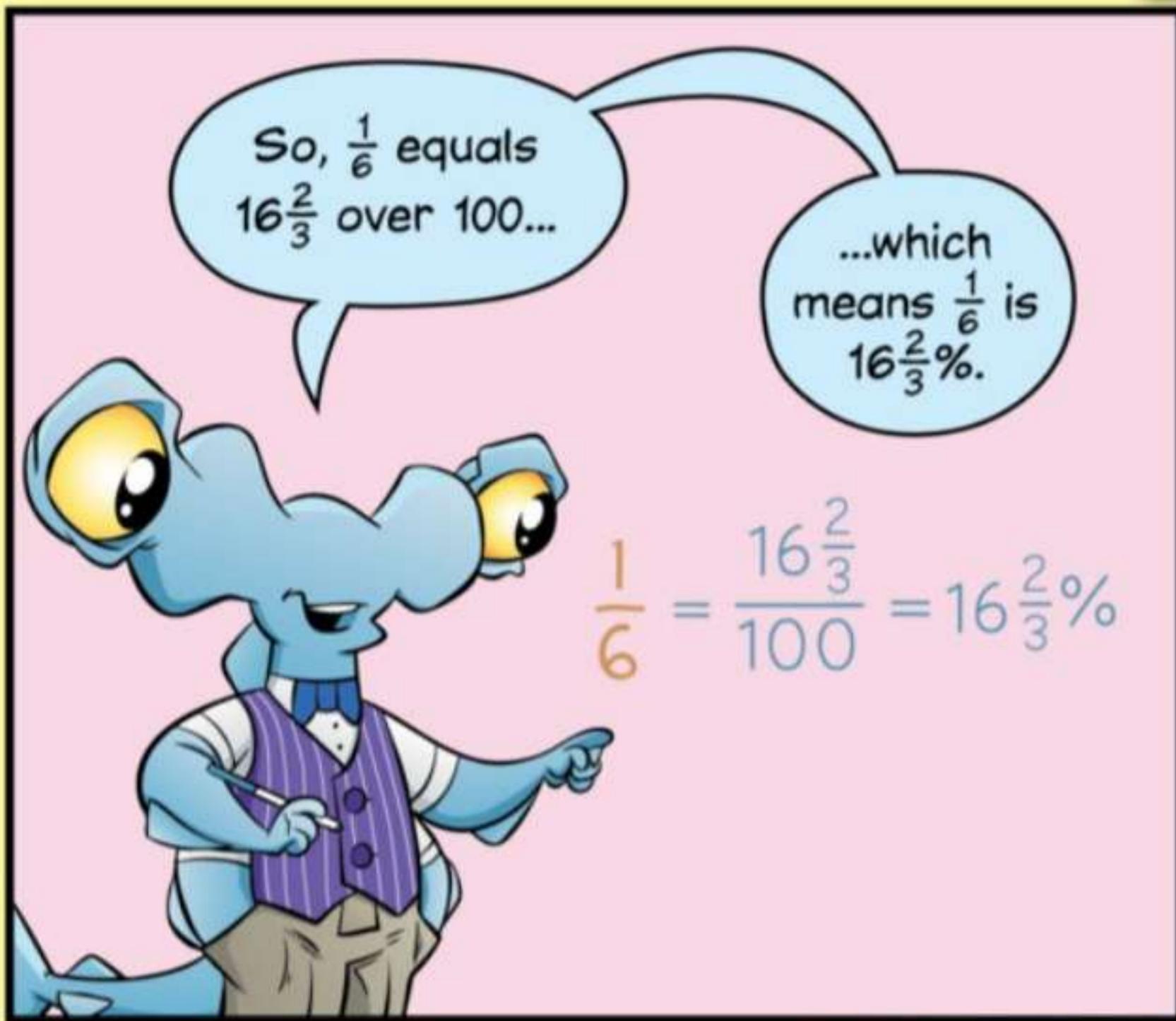
$$\frac{100}{6} = x$$

$$16\frac{2}{3} = x$$

$$\frac{100}{6} = x$$

As a mixed number, $\frac{100}{6} = \frac{50}{3}$, or $16\frac{2}{3}$.





G*Y*M

PERCENTS & DECIMALS

Let's go, polliwogs!

In just two months, you will be traveling to take part in the World Math Olympiad Championships.

I will not have you embarrass my beloved Academy by failing to perform the most basic of conversions.

We know how to convert percents to fractions.

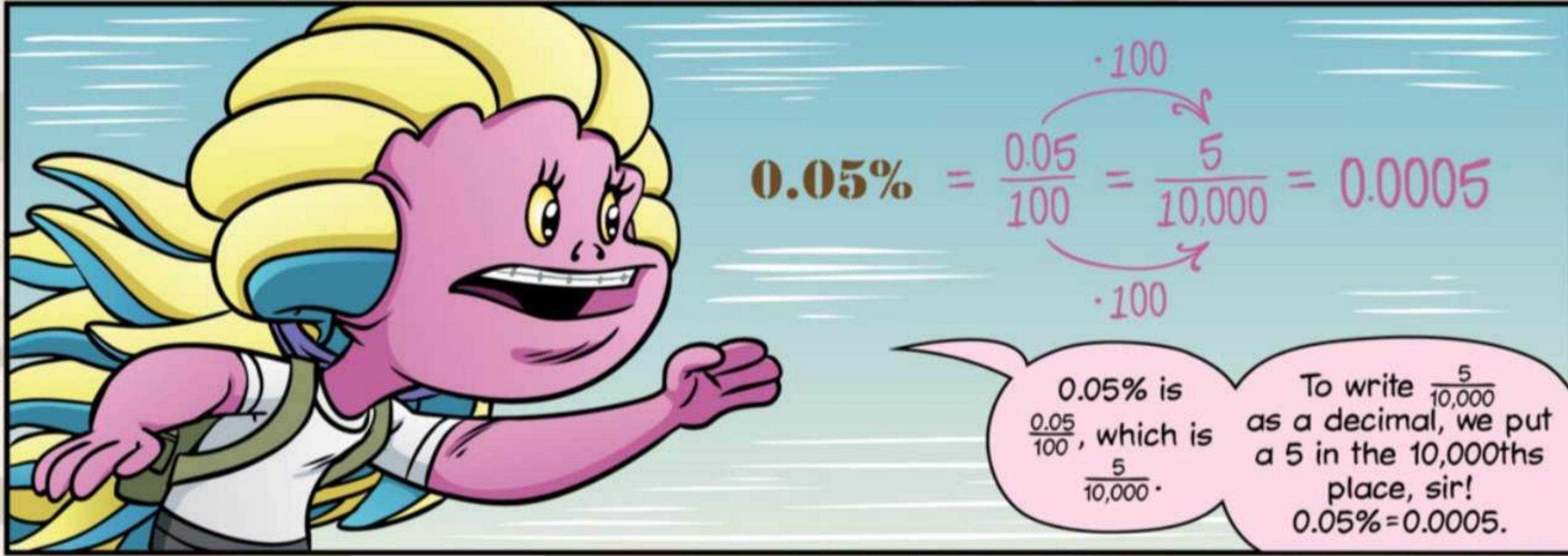
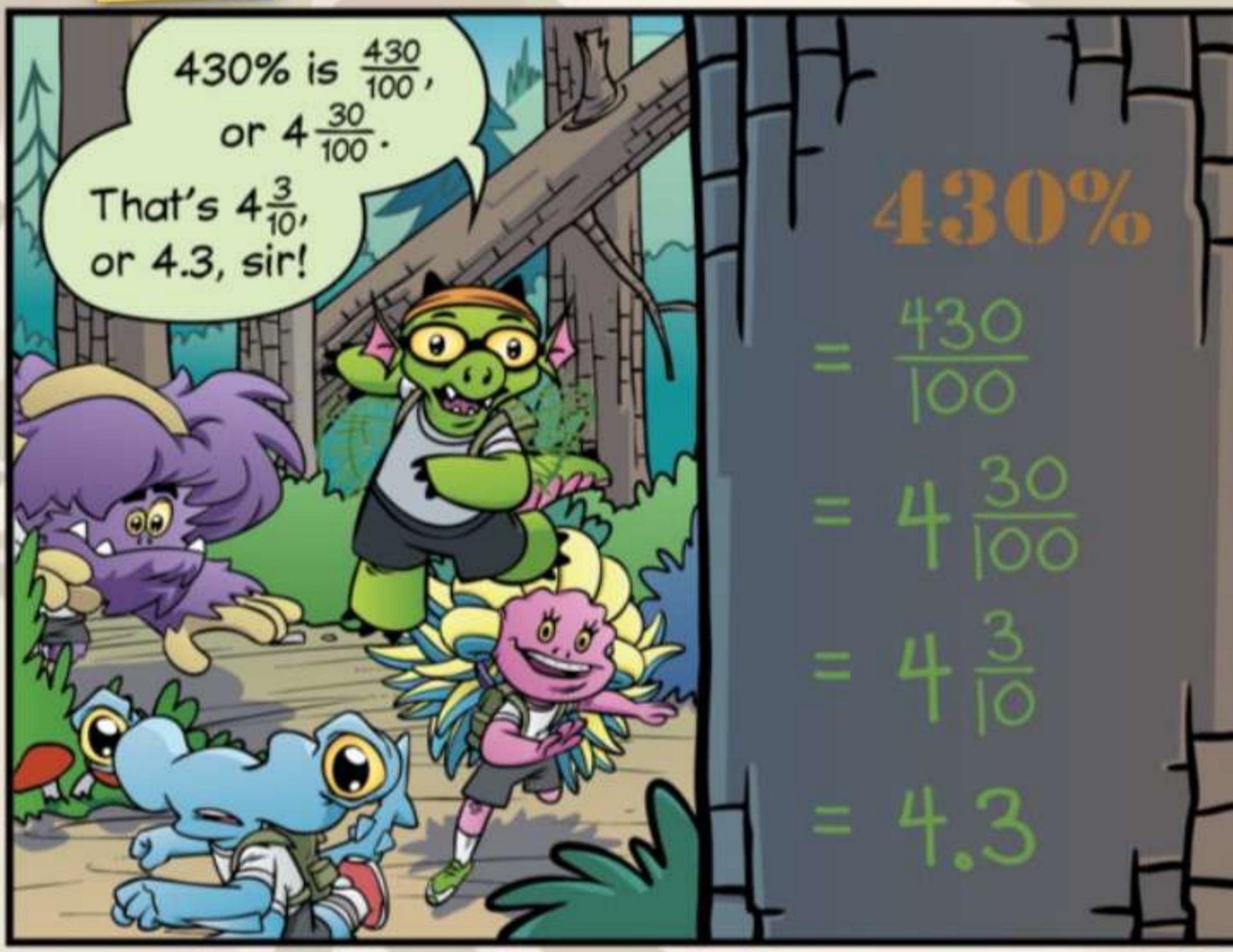
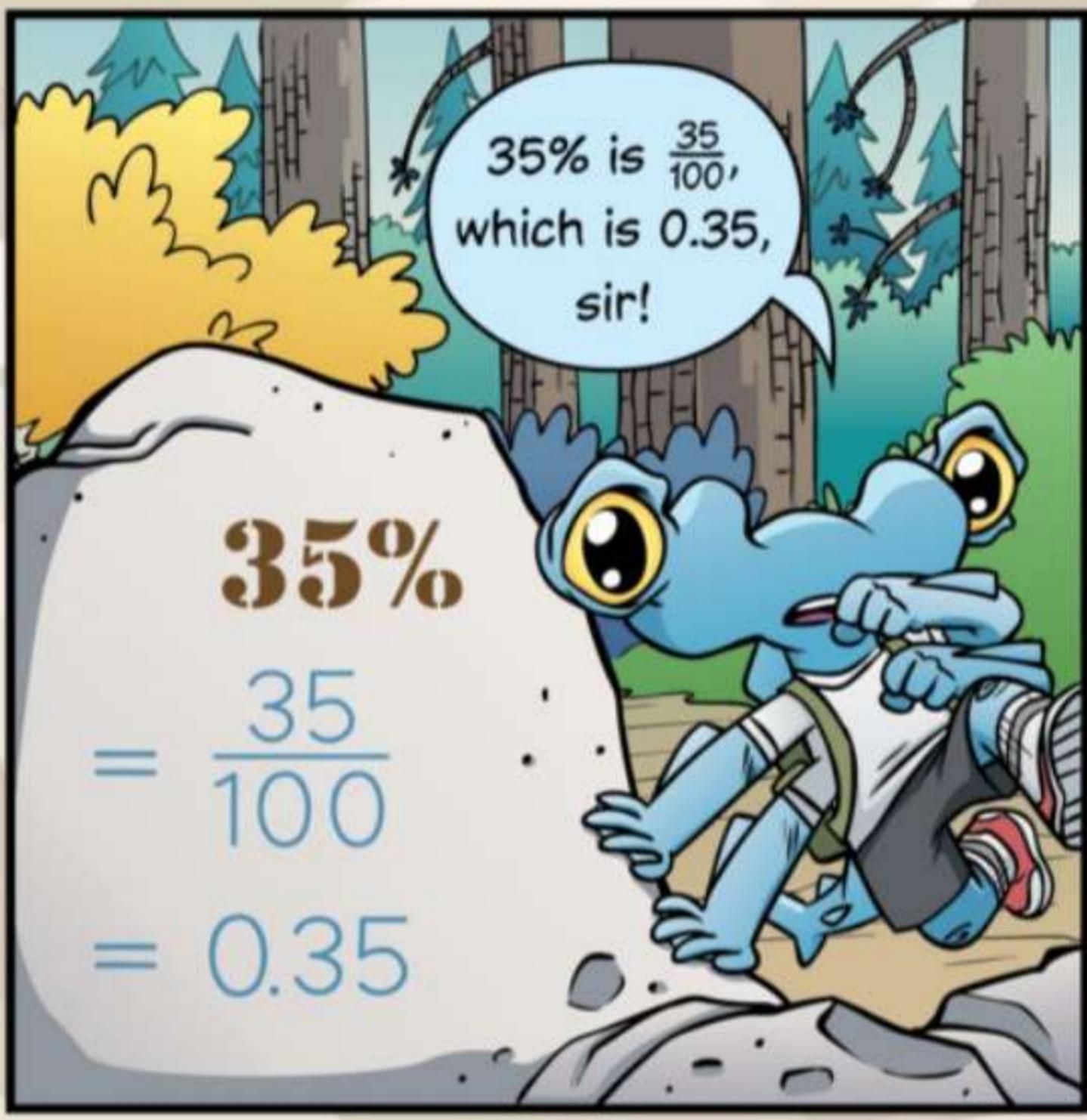
And we know how to convert fractions to decimals.

So, we can write the percents as fractions...

...then change the fractions into decimals!

Get to it then, tadpoles!

Try all three.



0.08

$$= \frac{8}{100}$$

$$= 8\%$$

0.08 is $\frac{8}{100}$, which is 8%, sir!

0.4 is 0.40, or $\frac{40}{100}$.

0.40

$$= \frac{40}{100}$$

$$= 40\%.$$

That's 40%, sir!

Next, we need to find out what number over 100 equals 0.00246.

$$0.00246 = \frac{x}{100}$$

We can write an equation.

$$0.00246 \cdot 100 = \frac{x}{100} \cdot 100$$

$$0.246 = x$$

Multiplying both sides of the equation by 100, we get $x=0.246$.

$$0.00246 = \frac{0.246}{100} = 0.246\%$$

So, 0.00246 equals 0.246 over 100...
...which means 0.00246 is 0.246%, sir.

Good work, hammerhead. Who sees a pattern in these conversions?



Notice any patterns?

When we converted 0.08, 0.4, and 0.00246 to percents...

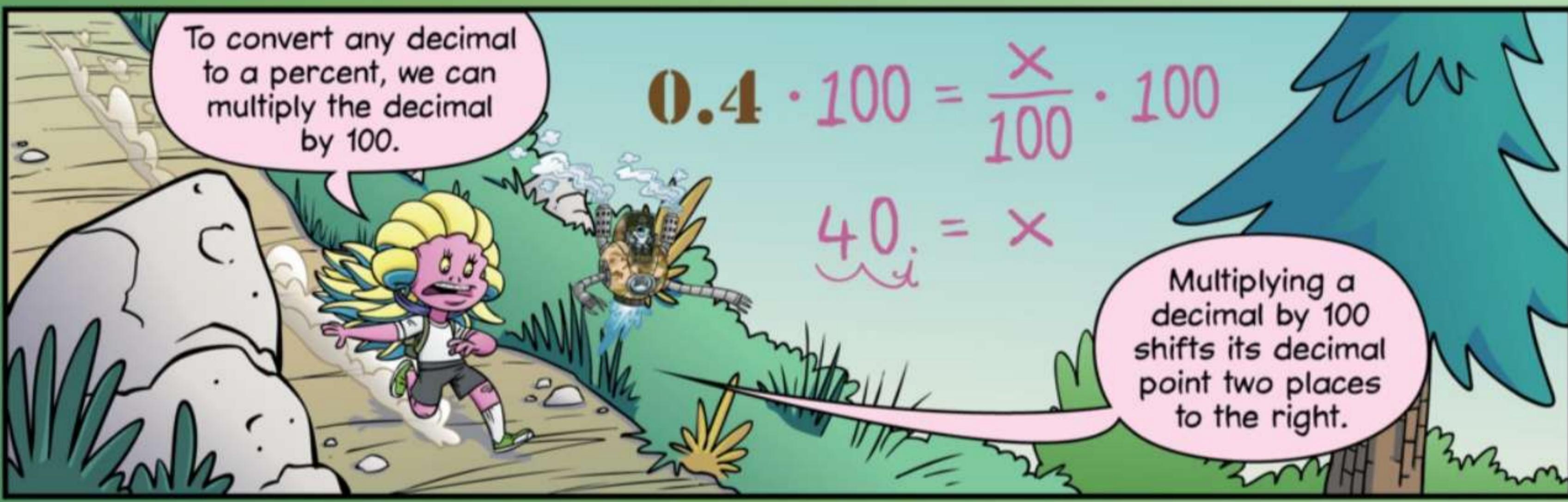
...we got 8%, 40%, and 0.246%.

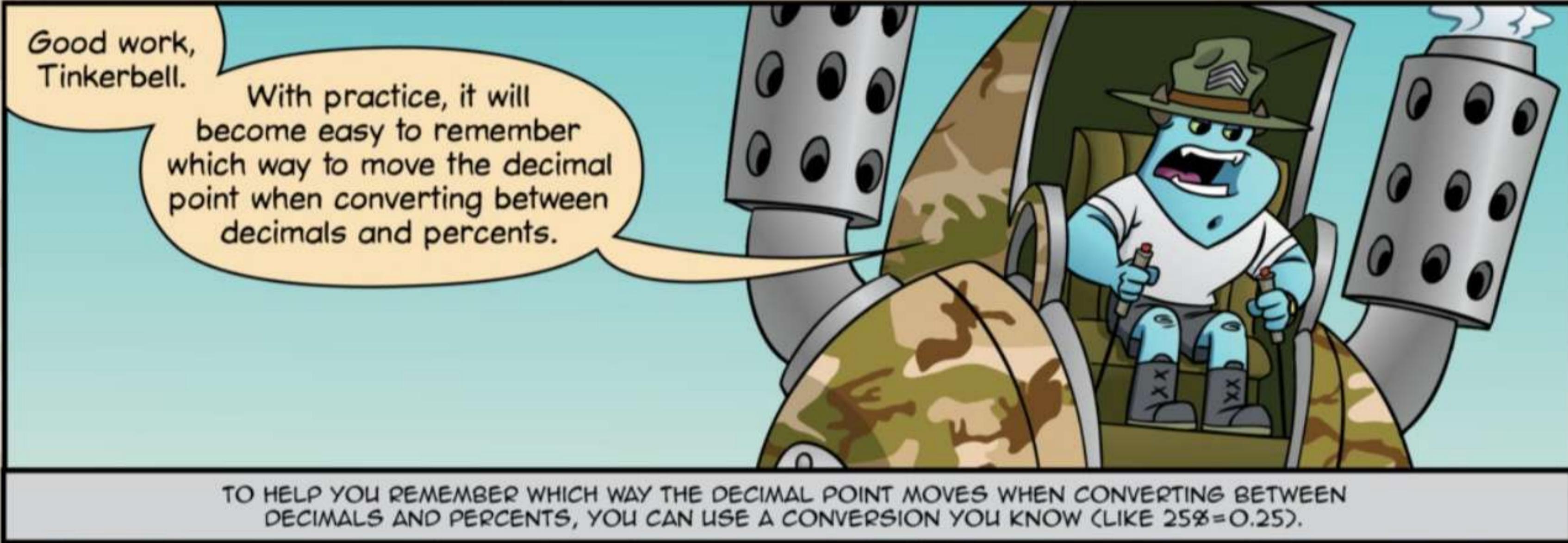
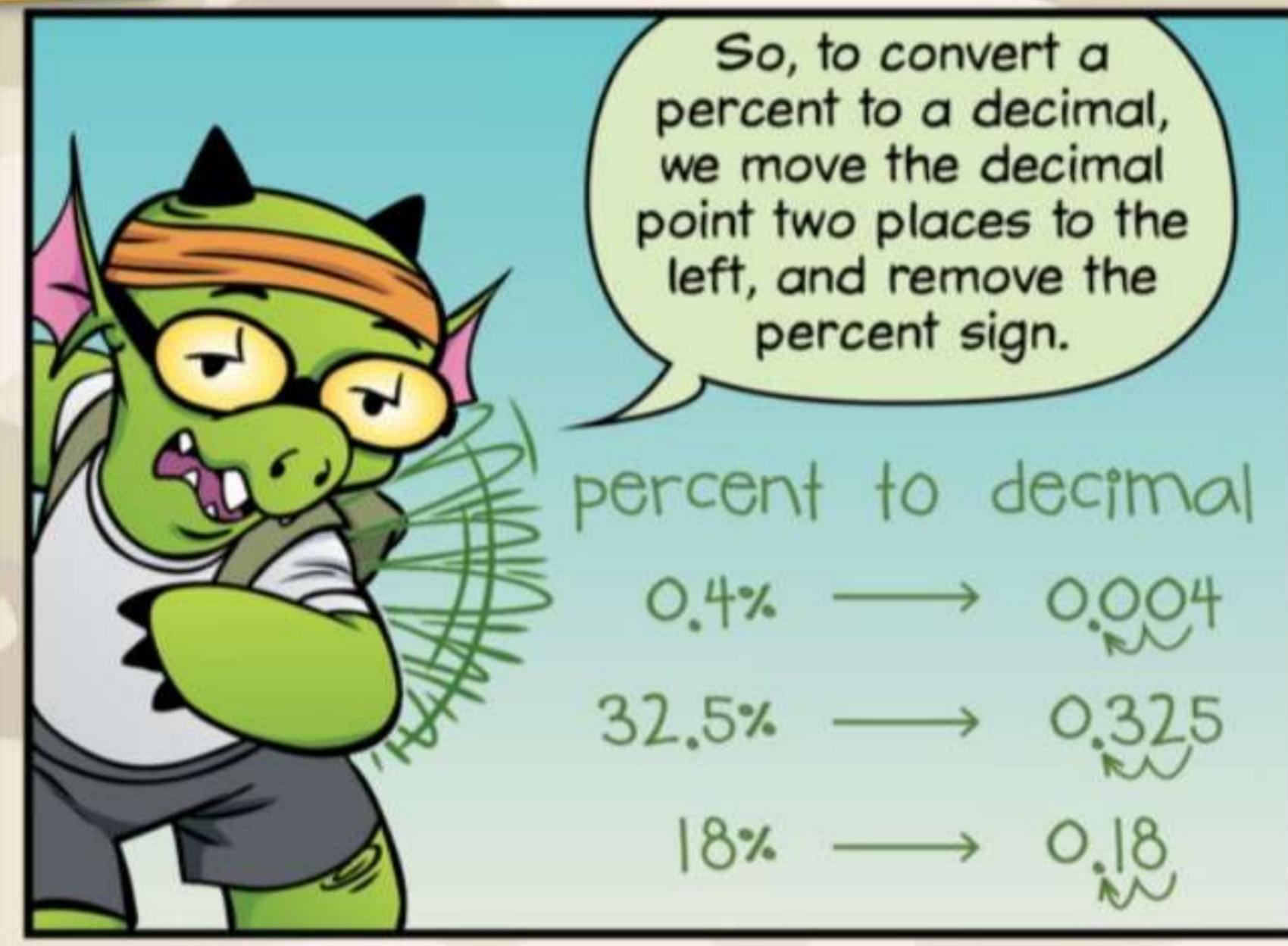
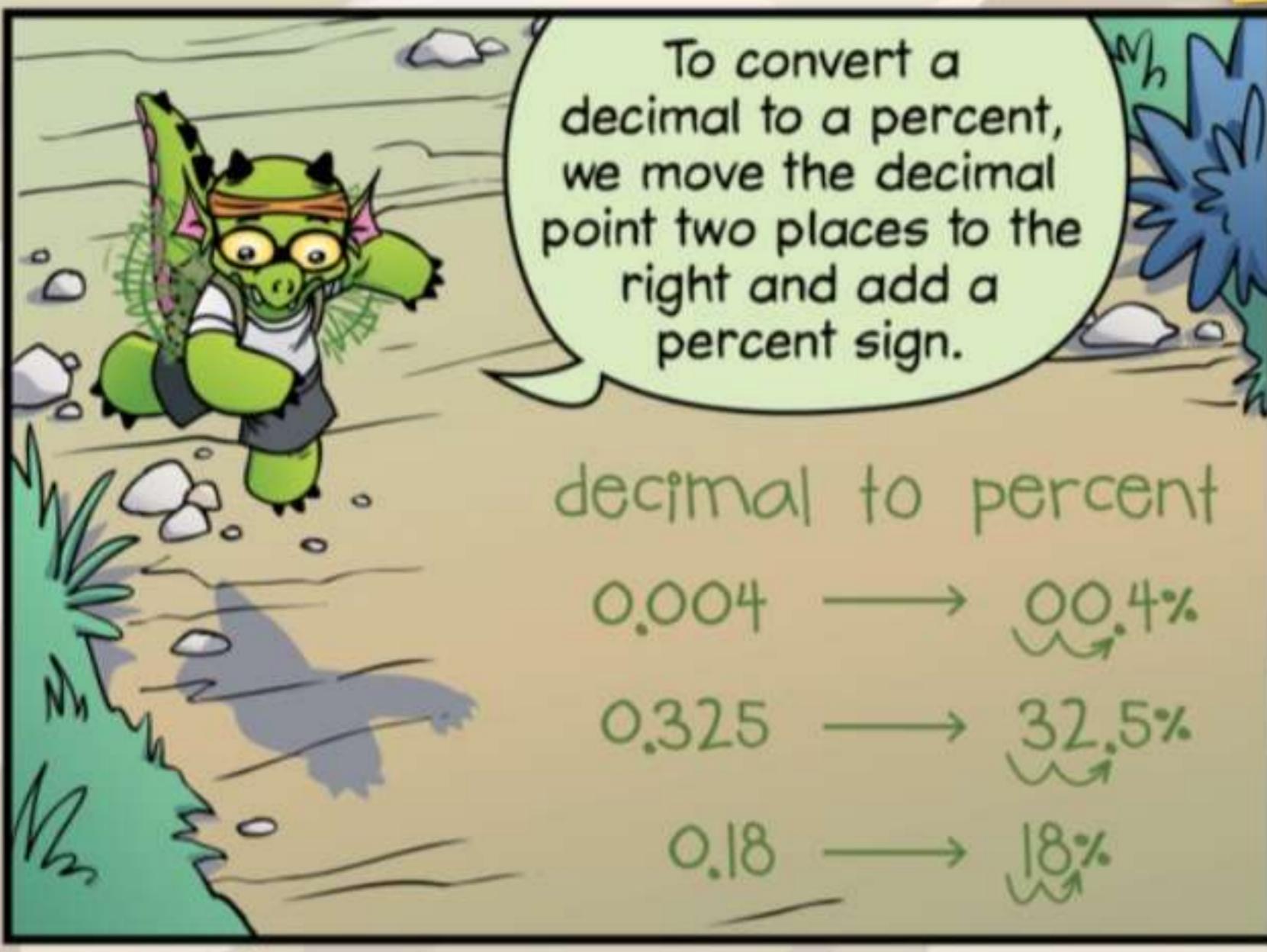
We just moved the decimal point two places to the right and added a percent sign, sir.

$$0.08 = 8\%$$

$$0.4 = 40\%$$

$$0.00246 = 0.246\%$$









15% is $\frac{15}{100}$.

So, 15% of \$6,000 is $\frac{15}{100} \cdot 6,000$ dollars.

$$\begin{aligned} 15\% \text{ of } \$6,000 &= \frac{15}{100} \times 6,000 \\ &= \frac{15 \times 6,000}{100} \\ &= 15 \times \frac{6,000}{100} \\ &= 15 \times 60 \\ &= 900 \end{aligned}$$

That's \$900.

You could also start by changing the percent to a decimal, then multiplying.

$15\% \text{ of } \$6,000$

$$\begin{aligned} &= 0.15 \times 6,000 \\ &= (15 \times 0.01) \times (6 \times 1,000) \\ &= (15 \times 6) \times (0.01 \times 1,000) \\ &= 90 \times 10 \\ &= 900 \end{aligned}$$

15% is 0.15.
So, 15% of \$6,000 is $0.15 \cdot 6,000$ dollars.
Still \$900.

15% of \$6,000 is easy enough to compute in my head.

How'd you do it, lass?



6% is $\frac{6}{100}$.

So, 6% of \$1,050
is $\frac{6}{100} \cdot 1,050$ dollars.

$$\begin{aligned} & \frac{6}{100} \times 1,050 \\ &= \frac{6 \times 1,050}{100} \\ &= \frac{6,300}{100} \\ &= 63 \end{aligned}$$



I converted 6%
to a decimal and
multiplied.

$$\begin{aligned} & 1,050 \times 0.06 \\ &= 1,050 \times 6 \times 0.01 \\ &= 6,300 \times 0.01 \\ &= 63 \end{aligned}$$



I figured
that 6% of
\$100 is \$6.

So, 6% of
\$1,000 is \$60,
and 6% of \$50
is \$3.

$$\begin{aligned} 6\% \text{ OF } \$100 &= \$6 \\ 6\% \text{ OF } \$1,000 &= \$60 \\ 6\% \text{ OF } \$50 &= \$3 \\ 6\% \text{ OF } \$1,050 &= \$63 \end{aligned}$$



I found 6%
of \$1,050 in my
head, too.

First, I found 1% of
\$1,050. Then, I multiplied
by 6 to find 6% of
\$1,050.

1% of 1,050 is
 $0.01 \cdot \$1,050 = \10.50 ,
so 6% of \$1,050 is
 $6 \cdot \$10.50 = \63 .

$$1\% \text{ OF } \$1,050 = \$10.50$$

$$6\% \text{ OF } \$1,050 = 6 \times \$10.50 = \$63$$

Well done,
little buccaneers.

Computin' the
percents be the
easy part.

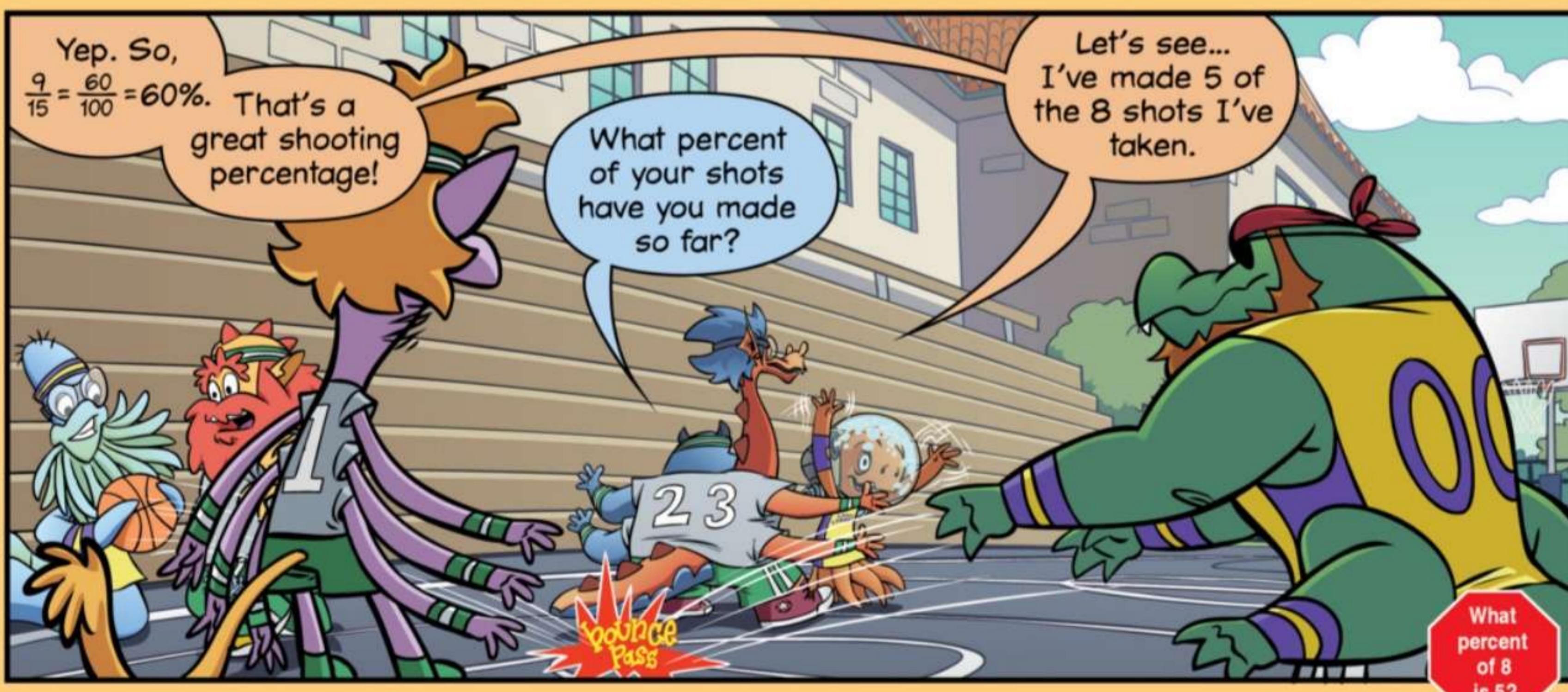
It's all these
forms that
be givin' me
headaches.



Scooch over.
I've been helping
my parents prepare
their taxes since I
was 6!







We can write another equation.

$$\frac{5}{8} = \frac{x}{100}$$

Multiplying both sides by 100 gives us $x = \frac{500}{8}$, which is $62\frac{1}{2}$.

$$\frac{5}{8} = \frac{x}{100}$$

$$\frac{500}{8} = x$$

$$62\frac{1}{2} = x$$

$$\text{So, } \frac{5}{8} = 62\frac{1}{2}\%.$$

Whoa! You've shot $62\frac{1}{2}\%$?

$$\frac{5}{8} = 62\frac{1}{2}\%$$

Your percentage is even higher than mine!

I've made a higher percentage of my shots.

But, you've made almost twice as many baskets.

$$\frac{9}{15} = 60\%$$

$$\frac{5}{8} = 62\frac{1}{2}\%$$

WHEN FRACTIONS ARE WRITTEN AS PERCENTS, IT MAKES THEM EASY TO COMPARE.

Can we always use an equation to find what percent one number is of another number?

Yep.

Try finding each of these percents.

3 out of 40 is what percent?

7 is what percent of 8?

What percent of 4 is 5?

Try all three.

We can write equations for all three.

The first question is the same as asking, "If you make 3 out of 40 shots, what percent did you make?"

Solving
 $\frac{3}{40} = \frac{x}{100} \dots$

3 out of 40 is what percent?

$$\frac{3}{40} = \frac{x}{100}$$

$$\frac{300}{40} = x$$

$$7\frac{1}{2} = x$$

...we get
 $\frac{3}{40} = 7\frac{1}{2}\%$. That means 3 out of 40 is $7\frac{1}{2}\%$.



The second question is the same as asking, "If you make 7 out of 8 shots, what percent did you make?"

Solving
 $\frac{7}{8} = \frac{x}{100} \dots$

7 is what percent of 8?

$$\frac{7}{8} = \frac{x}{100}$$

$$\frac{700}{8} = x$$

$$87\frac{1}{2} = x$$

So, $\frac{7}{8} = 87\frac{1}{2}\%$. That means 7 is $87\frac{1}{2}\%$ of 8.



The last one is a little confusing. "What percent of 4 is 5?"

That's the same as asking, "If you take 4 shots and make 5, what percent did you make?"

You can't make 5 out of 4 shots!

No, but you can find $\frac{5}{4}$ as a percent.

What percent of 4 is 5?



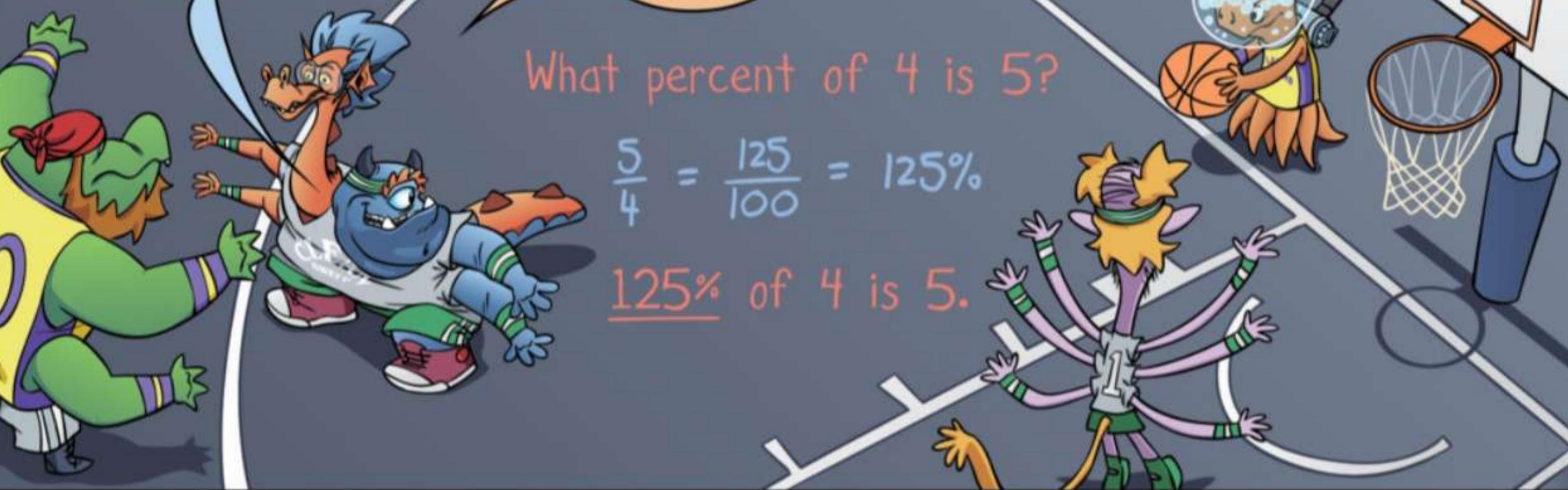
$\frac{5}{4} = \frac{125}{100}$, which is 125%.

That's right.
So, 125% of 4 is 5.

What percent of 4 is 5?

$$\frac{5}{4} = \frac{125}{100} = 125\%$$

125% of 4 is 5.



That makes sense.

Since 5 is larger than 4, 5 is more than 100% of 4.

But, I thought percents couldn't be greater than 100%.

A percent is just another way to write a fraction.

So, any fraction greater than 1 is greater than 100%.



Better call the national weather service.

Swoosh!

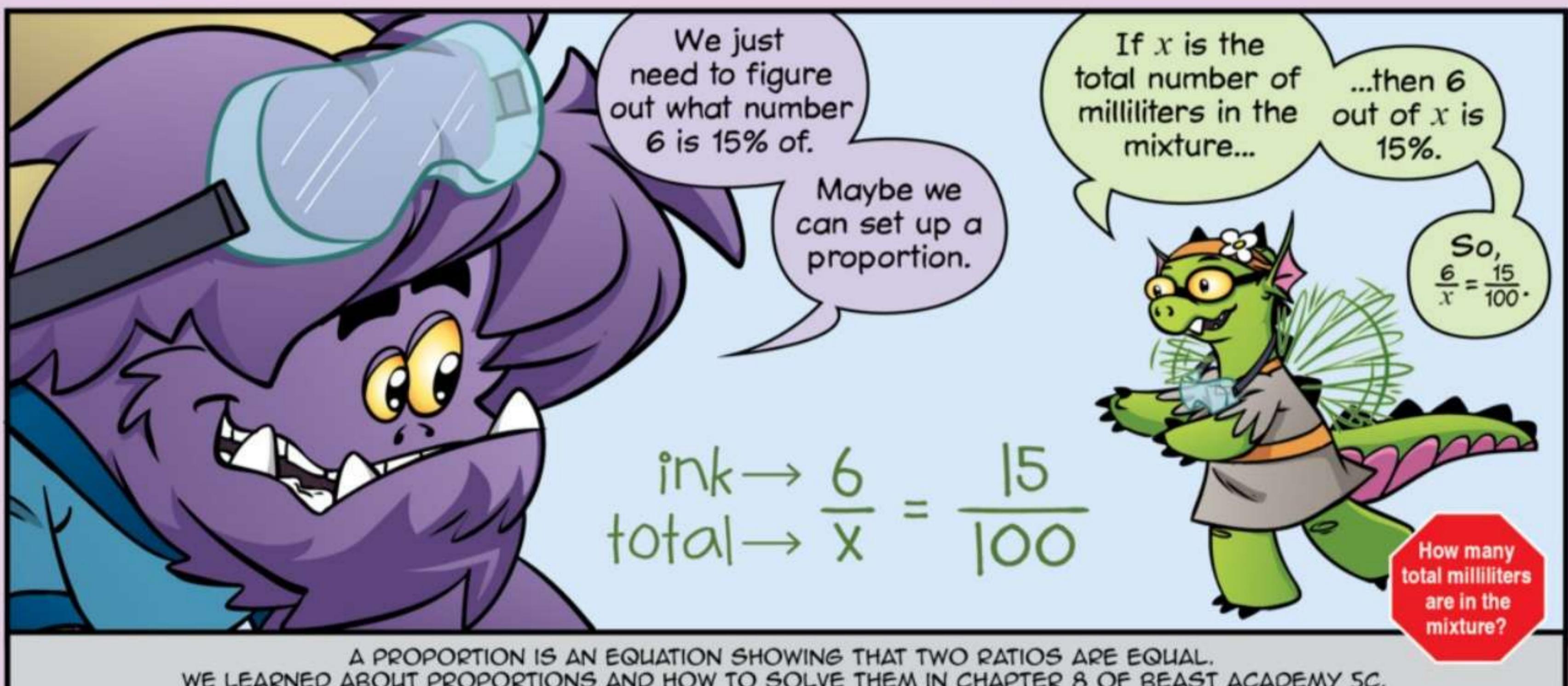
Huh?

It's raining 3's!



THE LAB

PROPORTIONS!



A PROPORTION IS AN EQUATION SHOWING THAT TWO RATIOS ARE EQUAL.
WE LEARNED ABOUT PROPORTIONS AND HOW TO SOLVE THEM IN CHAPTER 8 OF BEAST ACADEMY SC.

There are lots of ways to solve for x .

I simplified $\frac{15}{100}$ to $\frac{3}{20}$. Then, I noticed that $\frac{3}{20} = \frac{6}{40}$. So, $x = 40$.

So, the whole mixture is 40 milliliters.

$$\frac{6}{x} = \frac{15}{100}$$
$$\frac{6}{x} = \frac{3}{20}$$
$$\frac{6}{40} = \frac{3}{20}$$



If we figure out how many milliliters there are in the **whole** mixture, we can figure out how many milliliters of lemon juice to add.



We just need to figure out what number 15 is 4% of.

$$\text{drool} \rightarrow \frac{15}{y} = \frac{4}{100}$$
$$\text{total} \rightarrow \frac{15}{y} = \frac{4}{100}$$



If y is the total number of milliliters in the mixture...

...then 15 out of y milliliters is 4% of the total mixture. So, we have $\frac{15}{y} = \frac{4}{100}$.

Multiplying both sides of the equation by $100y$ gives us $1,500 = 4y$.



Then, dividing both sides by 4 gives us $375 = y$.

So, the whole mixture is 375 milliliters.

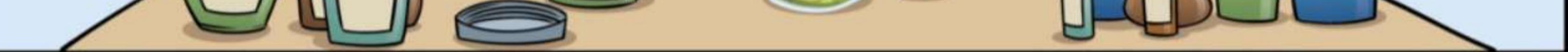
$$\frac{15}{y} \cdot 100y = \frac{4}{100} \cdot 100y$$
$$1,500 = 4y$$
$$375 = y$$

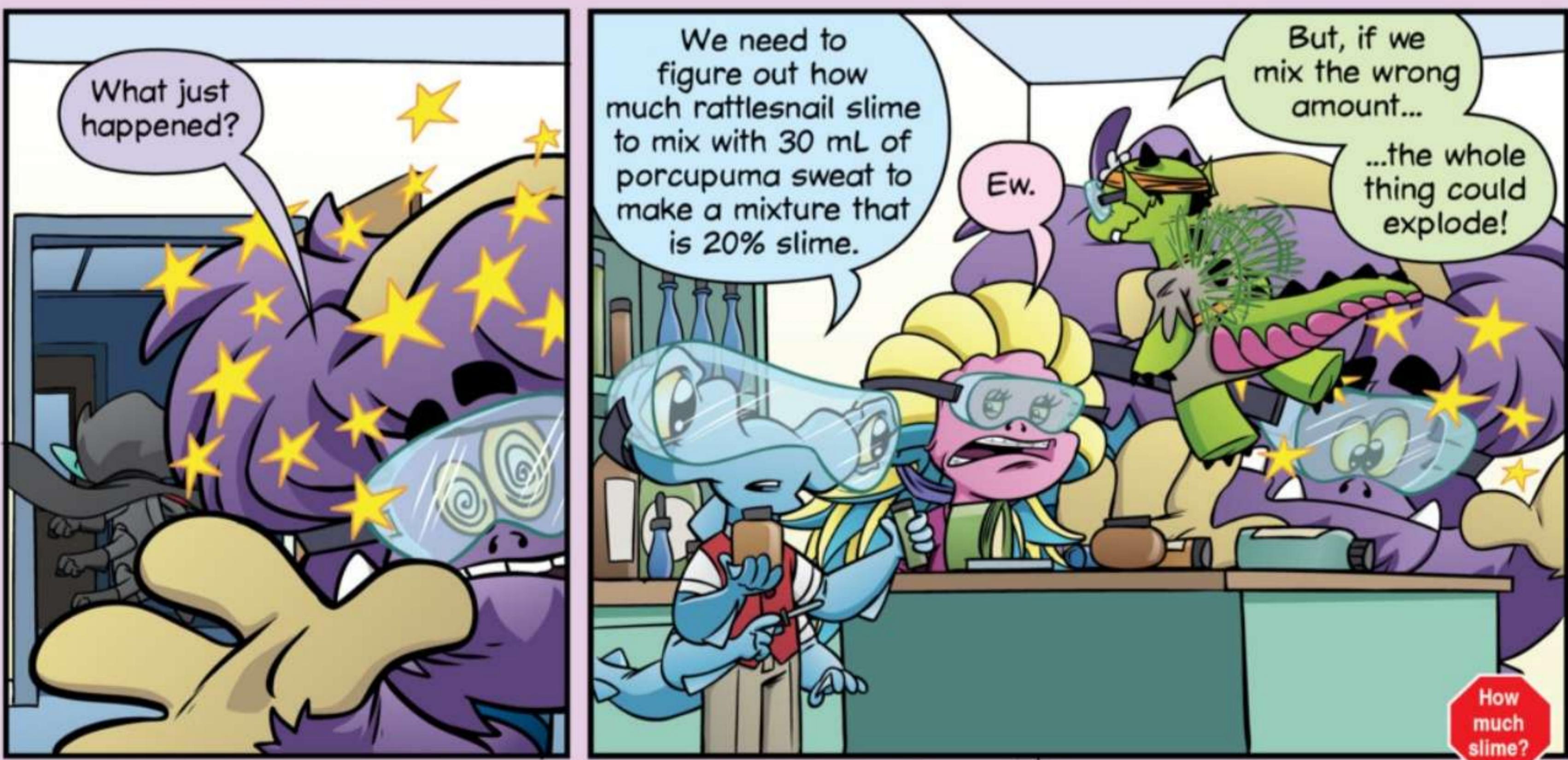


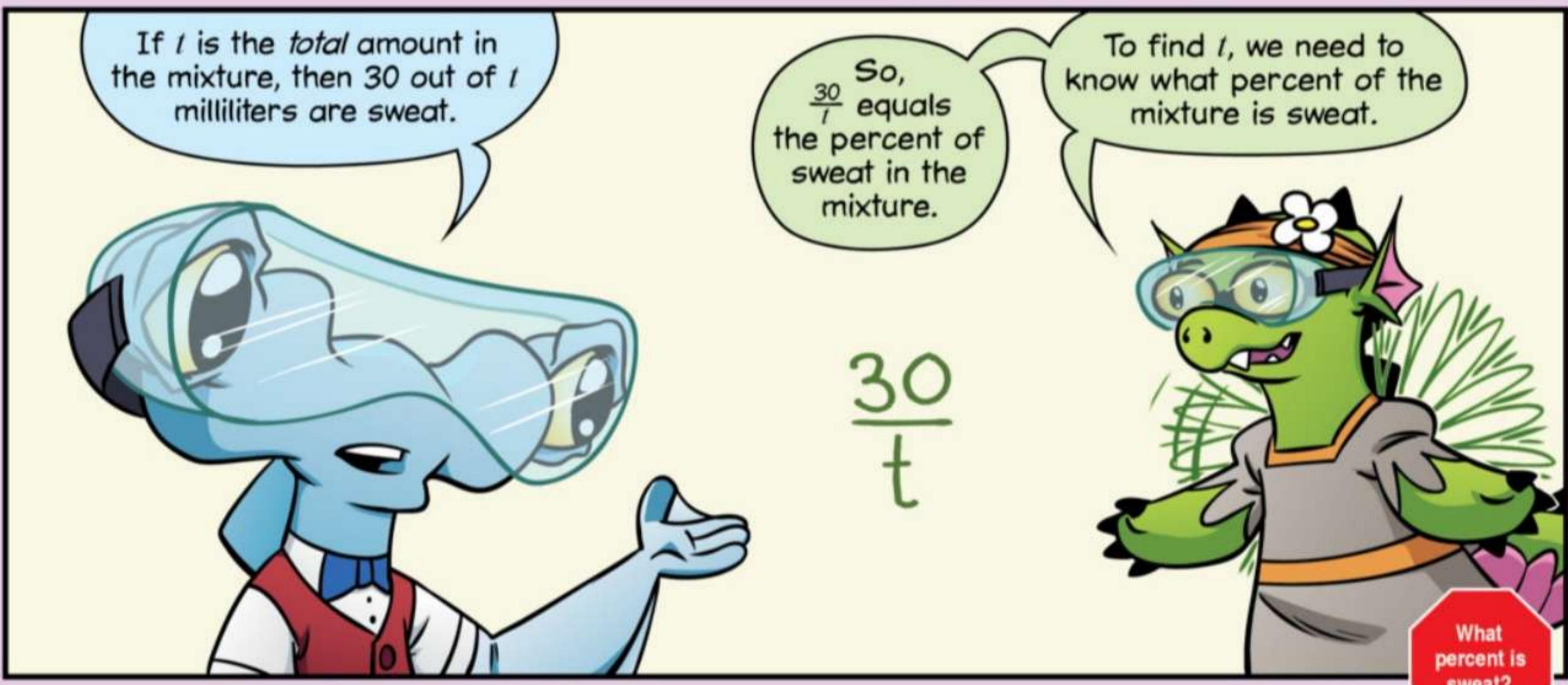
And since there are 15 mL of drool in the mixture, the other $375 - 15 = 360$ mL is lemon juice.



Well done. Watch what happens when we add 360 mL of lemon juice to 15 mL of hippopotamoose drool.







I know!
In a mixture of
slime and sweat, if
20% is slime...

...then
the other
80% is
sweat.

$$80\% = \frac{80}{100}$$

$$\text{So, } \frac{30}{t} = \frac{80}{100}$$

$$\frac{30}{t} = \frac{80}{100}$$



Of course!
Solving for t ,
we get $t = 37\frac{1}{2}$.

So, there
are $37\frac{1}{2}$ mL
in the whole
mixture.

Since 30 mL
of the mix is
sweat...

...the other
 $37\frac{1}{2} - 30 = 7\frac{1}{2}$ mL
is slime.



$$\frac{30}{t} \cdot 100t = \frac{80}{100} \cdot 100t$$

$$3,000 = 80t$$

$$\frac{3,000}{80} = t$$

$$37\frac{1}{2} = t$$



That
makes
sense!

If 80%
of the final
mixture is sweat,
and 20% is
slime...

...then the
ratio of sweat to
slime is 4:1.

$$\begin{aligned}\text{sweat : slime} \\ &= 80\% : 20\% \\ &= 4 : 1 \\ &= 30\text{mL} : 7.5\text{mL}\end{aligned}$$

So, if there are
30 mL of sweat, then
there are $30 \div 4 = 7.5$ mL
of slime.

