

1.1 PERCENTS (and RATIOS)

What you'd get out of 100

Percents is figuring out what you'd get out of 100

"Percent" just means $\frac{X}{100}$

If you got 50 out of 100 on a test, you got 50%

$$\frac{50}{100} = 0.5 \quad (\text{x 100 to turn it into a percent}) = 50\%$$

50% is technically a "pass", but it's not really that good.

In my apprenticeship days, 75% was a pass. If I scored 13/17 on my "Transmissions" test, what is my percent?

$$\frac{13}{17} = 0.765 \quad (\text{x 100 to turn it into a percent}) = 76.5\%$$

What if I scored 16/17? What is my percent?

$$\frac{16}{17} = 0.941 \quad (\text{x 100 to turn it into a percent}) = 94.1\%$$

What if I scored 9/17? What is my percent?

$$\frac{9}{17} = 0.529 \quad (\text{x 100 to turn it into a percent}) = 52.9\%$$

In this case I DO NOT pass, because a pass in that program is 75%

In my shop classes, students need to get at least 80% to pass a safety quiz. That means 80% safe, 20% Band-Aids. If my safety test has 29 questions, what do they need to pass?

A better way to ask this question is "What is 80% of 29?" (A well-worded question makes for an easy equation)

WHAT IS 80% OF 29

$$X = \frac{80}{100} \times 29 \quad \lll 80/100 \text{ makes "\%" a useable number}$$

$$X = 0.80 \times 29$$

$X = 23.2$

You need 24 correct answers to pass Mr. Wellwood's safety test.

OK. What if I get paid \$25 per hour, and I get a 5% raise?

WHAT IS 5% OF 25

$$X = \frac{5}{100} \times 25 \quad \lll 5/100 \text{ makes "\%" a useable number}$$

$$X = 0.05 \times 25$$

$$X = 1.25$$

$\$25 + \$1.25 = \$26.25$

I cannot think of a “real-life” situation where you would actually have to solve THIS one:

40 IS 50% OF WHAT NUMBER?

$$40 = \frac{50}{100} \times n$$

$$\frac{40}{0.50} = \frac{0.50}{0.50} \times n$$

<<< Get the 0.50 off the n by dividing

80	=	n
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No, wait. I thought of one - mixing chemicals; I legit did this:

Automotive paint is often mixed 4:1:1 – four parts paint, one part reducer, one part hardener. That works out to 66% paint, 17% reducer, and 17% hardener. Normally you pour out the volume of paint you need and add the other components in the ratio to match.

One time I only had a small amount of hardener – I needed to make sure I only poured enough paint for the hardener I actually had.

Let’s say I had 73g of hardener:

73 IS 17% OF WHAT NUMBER?

$$73 = \frac{17}{100} \times n$$

$$\frac{73}{0.17} = \frac{0.17}{0.17} \times n$$

<<< Get the 0.17 off the n by dividing

429.4	=	n
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This means I can pour in 73g of hardener, 73g of reducer, and then add enough paint to equal 429.4g

1.1 (PERCENTS and) RATIOS

A Way of Comparing Things

Using Ratios is a good way of comparing two equations.

One side has to be the same RATIO as the other side.

“A is to B as C is to D”

$$\frac{A}{B} = \frac{C}{D}$$

Example 1:

When my two boys were little, they could eat half a six-inch Pizza sub each. How much would I need to eat to be comparable?

If a 45lb boy eats HALF a six inch sub, how much should a 160lb old man have to eat?

$$\frac{\text{FOOD}}{\text{KID}} = \frac{\text{FOOD}}{\text{ADULT}}$$

$$\frac{0.5 \text{ sub}}{45 \text{ lb}} = \frac{n}{160 \text{ lb}}$$

$$160 \times 0.111 = \frac{n \times \cancel{160}}{\cancel{160}}$$

1.78	=	n
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I need to eat 1.78 6" subs, or one foot long and 78% of another 6"!

Example 2:

"Three relates to four, like WHAT relates to 20?"

"Three is to four - LIKE - x is to 20"

^^^ *this is what I say in my head to remember this*

$$\frac{3}{4} = \frac{X}{20}$$

$$\cancel{20x} \frac{3}{4} = \frac{X}{\cancel{20}} \times \cancel{20}$$

$$\frac{60}{4} = X$$

$$\boxed{15 = X}$$

Example 3:

In this example, we have the X (unknown) on the bottom. Ugh.

You can use Algebra to move the X up top, but if you want an easy cheat, just Ninja Flip both sides.

Trust me, it works.

But you **HAVE TO FLIP BOTH SIDES!**

$$\frac{8}{X} = \frac{20}{30}$$

X on the bottom?

BLECH!

FLIP BOTH

$$\cancel{8x} \frac{X}{8} = \frac{30}{20} \times 8$$

$$X = \frac{30 \times 8}{20}$$

$$X = \frac{240}{20}$$

$$\boxed{X = 12}$$



So what if I flip it? It's still two men shaking hands. Nothing has changed. Sweet Pink Floyd Album, too.



Example 4:

In this example, the unknown is NOT on its own; you have an equation with it (X-4)

No worries, just get the equation on its own, and it will work.

$$\begin{aligned}\frac{6}{10} &= \frac{X-4}{35} \\ 35 \times \frac{6}{10} &= \frac{X-4}{35} \times 35 \\ \frac{210}{10} &= X-4 \\ 4+ \quad 21 &= X-4+4 \\ \boxed{84} &= X\end{aligned}$$

Example 5:

Uh-oh. Here's that nasty "Unknown on the Bottom" issue. Probably need to Ninja Flip it!

Tips with Algebra:

- The only way to get good at math is to just do math.
- Everything is done just one step at a time.
- It's just a number puzzle that you can solve.
- Whatever you do to one side of the equation, you HAVE to do it to the other side (just like punching Siamese Twins, you're really hitting both).
- Two people shaking hands are still two people shaking hands, even in Australia.

$$\begin{aligned}\frac{12}{3X+5} &= \frac{20}{32} \\ \text{FLIP BOTH} \\ \frac{3X+5}{12} &= \frac{32}{20} \quad \times 12 \\ 3X+5 &= \frac{384}{20} \\ 3X+5 &= 19.2 \\ -5 \quad -5 \\ 3X &= 14.2 \\ \div 3 \quad \div 3 \\ \boxed{X} &= 4.7\bar{3}\end{aligned}$$