

MATH HACKS ²

STRESS LESS + DO BETTER

Vanessa "The Math Guru" Vakharia

Illustrations by Hyein Lee

This book goes out to anyone who has ever faced a problem that feels impossible to figure out. This book is a reminder to YOU that the best part about solving a problem isn't the actual solution, but all of the cool stuff you learn about yourself in the process!

This book would not exist if it weren't for all of the very special humans who made it happen! Huge, huge thanks to: Ewa Kasinska, Erin O'Connor, Yvonne Lam, Erin Haggett, Hyein Lee, and Maral Maclagan. And of course, extra love to my parents, sister, and every student, parent, and tutor that has been part of The Math Guru community and who make my math-world spin round and round so magically!

— Vanessa Vakharia

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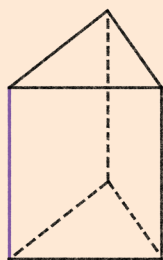
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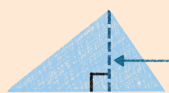


what?

It's a good idea to work with your triangular prism base-side down when you're figuring out how this formula works. The height is ALWAYS the distance between the bases, no matter which way your prism is sitting.

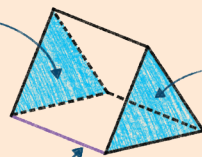


3-D shape height.



Base 2-D shape height.

Still the base.



Still the base.

Still the height.

And remember there are two different height measurements to deal with. The height OF the 3-D object AND the height of the 2-D triangle base.

VOLUME OF LIQUIDS

What even is it!? When we're using volume to talk about liquids, we're talking about the amount of stuff we can FILL a 3-D shape with! Sometimes this is called its **capacity**.

How do we measure volume of liquids? In Canada, volume is measured in metric units. There are lots of units in the metric system, but here are the ones you'll be dealing with most.

Millilitres: Use this to measure small quantities of liquid, like a glass of water. One millilitre is actually the exact amount of water that would fill a 1 cm x 1 cm x 1 cm cube. You'd need 5 mL of water to fill up a teaspoon. A juice box is about 200 mL!

Litres: Use this unit for measuring larger quantities of liquid, like the amount needed to fill a giant fish tank. One litre is about the same amount of liquid as there is in a tall carton of chocolate milk.

CONVERTING BETWEEN UNITS OF VOLUME

It's super easy to switch between our units of volume — thanks, metric system! To convert litres into millilitres, we multiply by 1000. To convert from millilitres to litres, we divide by 1000!

From BIG units to SMALLER units

LITRES to MILLILITRES

×1000

1L

1000 mL

MILLILITRES to LITRES

÷1000

From SMALL units to BIGGER units

SHORT FORMS!

These super-fast short forms are used a lot.

millilitres → mL (or ml!)

litres → L

Think Of It
THIS Way!



Why do we care about converting from one unit to another? Well, because to compare amounts, or add things together, or do ANY calculation, the measurements HAVE to be in the same unit. Think about it: Would you rather have 1 L of chocolate milk to share with your BFF or 900 mL? Nine hundred sounds like more than 1 — but is it? How do you even know unless you compare using the same unit?

DOING ACTUAL MATH WITH VOLUME

What do we even do with volume? Well, we can compare, add and subtract different volumes, just like we've been doing with other numbers. But first you HAVE to convert those units.

Q: Would you rather have 900 mL or 1 L of chocolate milk to share with your BFF?

Big unit (litres) to small unit (millilitres)

$$1 \times 1000 = 1000$$

1000 mL is more than 900 mL

or

Small unit (millilitres) to big unit (litres)

$$900 \div 1000 = 0.9$$

0.9 L is still less than 1 L!

A: You totally want 1 L for maximum chocolatey goodness.



Is it supposed to be ml or mL? Both are correct, but sometimes it's good to use mL so the pesky I doesn't get confused for a 1. That's why we're going to do that here. But you should **TOTALLY** check with your teacher for which way they prefer.

LET'S TRY IT!

Q: You want to make a sparkling punch. Your pitcher has a capacity of 3 L. Is it big enough to hold 2 L of ginger ale and 750 mL of fruit juice? What volume of punch will that make?



All you have to do is add the volumes of the liquids together and compare that to the volume the pitcher holds. But WAIT! You need to make sure all of our units are the same before comparing or calculating them.



Step 1: First, pick the unit you want everything to be measured in. Let's go with litres because that's the capacity of the pitcher. The ginger ale is already in litres, so cool. You need to figure out how many litres the juice is, so that you can calculate the amount of fruit punch in the same units.

To change millilitres into litres, just divide the number of millilitres you have by 1000.

$$750 \div 1000 = 0.75 \text{ L}$$

Step 2: Now all you have to do is add the two amounts together!

$$2 + 0.75 = 2.75 \text{ L}$$

A: There is a total of 2.75 L of fruit punch. Since the pitcher has a capacity of 3 L, and $3 > 2.75$, you can use it for your punch. There's even room for ice!