

## Introduction to the mole – numeracy worksheet

### Education in Chemistry

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### Chemical equations are like recipes, and moles tell us about the ratio of the ingredients

The mole is a unit of measurement in chemistry used to ensure that the appropriate ratio of reacting particles can be used for any particular reaction. Moles can also be used to work out how much product will be generated by any reaction.

This is very similar to cooking, where recipes are used to mix ingredients in the right ratios to make the correct quantities of food. The 'cup' is used in American cooking as a standard measurement. You can think of the elements from the periodic table as the ingredients in a recipe and the cup as equivalent to the chemistry unit of the mole. In this analogy, the mass of each cup represents the atomic mass of an element.

### Try it yourself

This table shows approximate weights for a cup of different ingredients. Use the table to answer the questions below, and don't forget to show your working.

Ingredient number (atomic number)	Ingredient (element)	Ingredient symbol (element symbol)	Mass of 1 cup (g) (gram formula mass)
1	cocoa	C	75
2	oats	O	85
3	flour	F	128
4	brown sugar	Sb	150
5	granulated sugar	Sg	200
6	butter	B	227
7	honey	H	300

1. A cake shop owner likes to use American recipes for cooking. These recipes use 'cups' as a measure of ingredients. For example, 1 cup of flour weighs 128 g, which means they can convert American recipes into British weights.

How many cups of the following ingredients do they have?

- a) 256 g flour \_\_\_\_\_
- b) 450 g granulated sugar \_\_\_\_\_
- c) 75 g of brown sugar \_\_\_\_\_

2. An amateur baker is practising for the BBC Bake Off competition. They are making a cake. The recipe is written out below:

3 cups of flour + 2 eggs + 1 cup of sugar → 1 cake

- a) The baker is very flustered as they need to make eight cakes, enough for all their friends. How many cups of flour should they use if they want to make 8 cakes?

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- b) If they have 6 eggs, how many cakes can they make?

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- c) If they have 6 cups of flour, 2 eggs and 2 cups of sugar, how many cakes could they make?

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3. A TikTok influencer is making flapjacks – their favourite high-energy food for when they are making their extreme sports videos. The recipe (taken from Nigella Lawson's website) is written out below:

3 cups of oats + 1 cup honey + 1 cup of brown sugar → 1 tray of flapjacks

- a) What mass of oats do they need to make one tray of flapjacks? (1 tray = 6 flapjacks)

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- b) They get their ingredients ready, only to find that while they have 3 cups of oats, they only have  $\frac{1}{2}$  cup of honey. How many cups of flapjacks can they make?

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- c) If they have 50 g of honey and plenty of oats and sugar, how many flapjacks can they make?

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4. A Nigella Lawson fan loves to write down their favourite Nigella recipes, but they don't like writing the recipes out in full because they are quite long.

- a) Can you help them write out the recipe for making flapjacks using the symbols for each ingredient? You'll have to create a 'formula' for the flapjacks yourself.

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- b) If they use 150g of honey, how many cups of flapjacks are they intending to make?

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- c) How much does one cup of flapjack weigh?

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