Challenge '25
Year 8 or below

Illustrations by Kira Wadeson

Rules
1) Challenge '25 should be attempted at home during February half term.
2) Your entry must be your own work, though of course you may ask for help on how to get started or for the meanings of unfamiliar words.
3) Entries without any working out at all or written on this sheet **will not be marked**.
4) It is possible to win a prize or certificate even if you have not completed all of the questions, so hand in your entry even if it is not quite finished.
5) Please make sure that you staple your pages together and you must write **your name and school neatly on every page.**

Either you or your maths teacher needs to return your entry by 7th March to this address:
Challenge '25 Entries,
School of Mathematics, Statistics and Physics
Newcastle University
Newcastle upon Tyne
NE1 7RU

A Prize-Giving Evening will be held at Newcastle University on the 7th May.
We hope that you enjoy the questions.

1. Jelly Babies

Susha is trying to divide a packet of jelly babies between her 4 children. Firstly, she gives some to the eldest; the second gets a third of what is left; the third gets 5/8 of what's left; and the youngest receives the rest of the packet, which is 2/5 of their eldest sibling's share. Each child receives fewer than 20 jelly babies. How many are in the packet and what number does each child get?
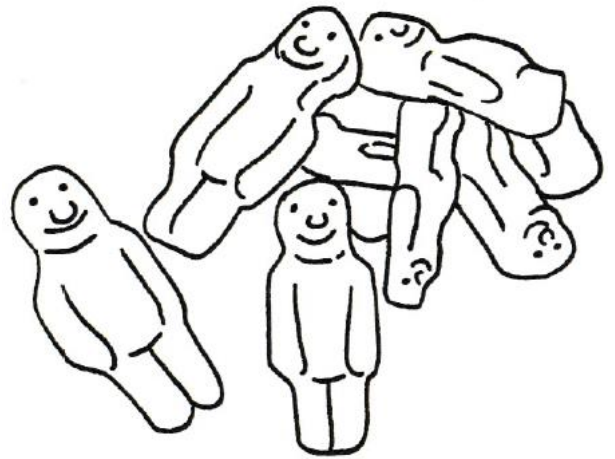
2. Clean Break

Ellie's bar of chocolate has four rows of six squares. She wants to divide it into individual squares using clean straight breaks, where each break makes two pieces out of one. What is the minimum number of breaks she needs to do?
Her husband, Charlie, has a larger bar, with 8 rows of 6 squares. The top-left and top-right squares both contain a nut. Neither Charlie nor Ellie likes nuts and each of them wants to avoid getting one. Starting with Charlie, they take it in turns to snap the bar into 2 pieces along a line between 2 rows or 2 columns, eating 1 of the 2 pieces produced. Who can guarantee not to eat a nut? Is this true for any size of bar?

3. Imperial Volunteers

Pat, Sharon and Helen are litter picking along the canal with 7 volunteers. They have 35 mint imperials. Pat eats 1, Sharon eats 2 and Helen eats 3. They leave the rest for the volunteers. All of them are eaten. Show that at least one volunteer ate at least 5 mint imperials.
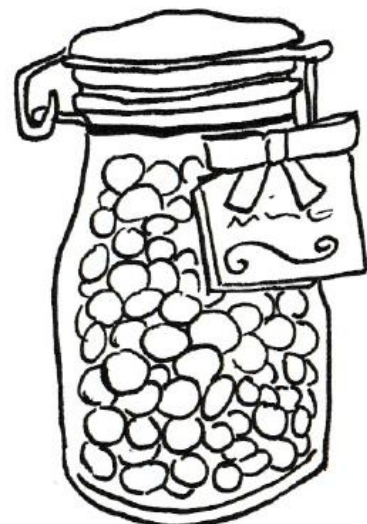
4. Wonky Wine Gums

Something has gone wrong at the factory. The five wine gum colours and flavours are mismatched so that all are wrong. Sarah eats a red and thinks it could be orange, lemon or lime-flavoured.

Sue eats a yellow and is sure it is also one of the three citrus flavours.

Martin tries a green and says it's either strawberry or blackcurrant.

Michael tries an orange-coloured one and a purple one at the same time and can taste both blackcurrant and something else that's not lemon or lime.

Identify which colour is which flavour.
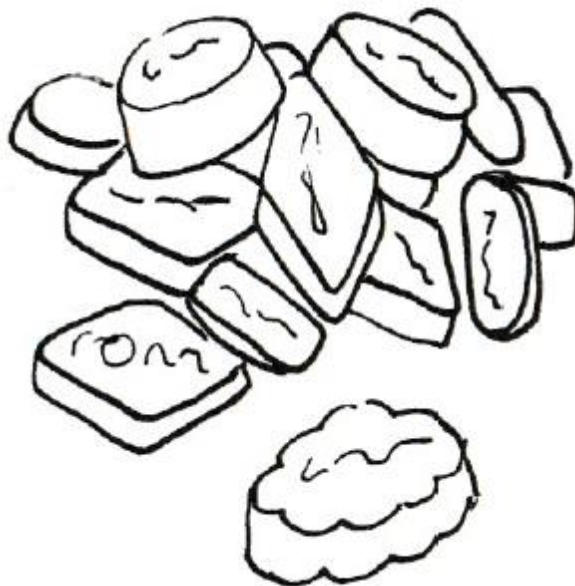
5. Hard Toffee

Barry takes a box of toffees to the Maths staff room to share with the other teachers during breaks. He eats one himself on the first day and hands out 10% of what's left; he eats 2 on the second day, giving away 10% of the remainder; three on the third day, giving away 10% of the remainder; and continues in this way until no toffees are left.

How many were in the box and how many days did they last?

6. Coin Conundrum

Grace stands two chocolate coins from her Christmas stocking on a horizontal table, as shown. The radius, r, of the smaller coin is a quarter of that of the larger coin. How far apart are the coins' points of contact with the table in terms of r?
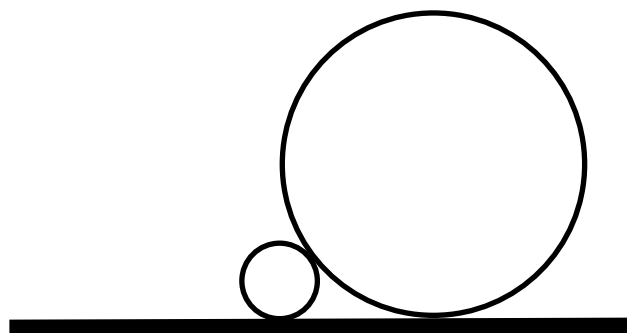
7. Prize Purchasers

Robert and Miriam need sweets as prizes for a quiz. They decide to buy four bags of Fruit Drops, five Liquorice Allsorts packs and five Smarties tubes. However, they don't coordinate their shopping!

Robert buys three bags of Fruit Drops, two Liquorice Allsorts packs and four Smarties tubes for £5.85.

Miriam separately purchases two bags of Fruit Drops, four Liquorice Allsorts packs and three Smarties tubes for £5.60.

They return the excess goodies to the shop, receiving £2.60 back. How much does each item cost?
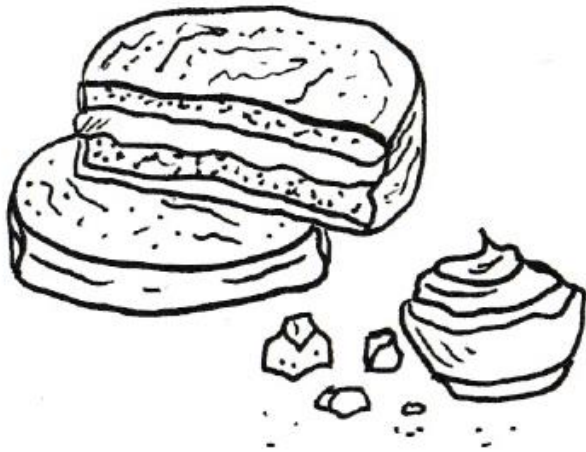
8. Alfajor Arrangements

Alejo's Alfajor Emporium sells expensive imported alfajores (a traditional Hispanic confection) in boxes of 6, with a choice from 8 different recipes. To manage his range well, he insists that each box contains at least 4 different types of alfajor and no more than 2 of the same type. How many different boxes are possible?