BRAIN TEASERS

SIX CLASSIC BRAIN TEASERS FROM 1917, WITH ANSWERS

EASY TO HARD | 6 PUZZLES | ANSWERS INCLUDED

Six puzzles that have been catching people out since 1917, starting easy and finishing hard. They come from Amusements in Mathematics by Henry Ernest Dudeney, in his own words.

NO. 1 · EASY

A FAMILY PARTY

A certain family party consisted of 1 grandfather, 1 grandmother, 2 fathers, 2 mothers, 4 children, 3 grandchildren, 1 brother, 2 sisters, 2 sons, 2 daughters, 1 father-in-law, 1 mother-in-law, and 1 daughter-in-law. Twenty-three people, you will say. No; there were only seven persons present. Can you show how this might be?

Three generations of one family: Grandpa and Grandma, their son and his wife, and the couple's three children, two girls and a boy.

Picture the family first, and give them names so they are easy to keep track of. At the top are Grandpa and Grandma. In the middle is their son, Tom, and his wife, Anna. At the bottom are Tom and Anna's three children: two girls and a boy. That is 7 people.

Now go down Dudeney's list and find someone for every line. Most people fill two or three lines at once.

1. **1 grandfather:** Grandpa.
2. **1 grandmother:** Grandma.
3. **2 fathers:** Grandpa, who is Tom's father, and Tom, who is the children's father.
4. **2 mothers:** Grandma and Anna.
5. **4 children:** Tom, who is Grandpa and Grandma's child, and his 3 children.
6. **3 grandchildren:** the three children.
7. **1 brother:** the boy.
8. **2 sisters:** the two girls.
9. **2 sons:** Tom and the boy.
10. **2 daughters:** the two girls.
11. **1 father-in-law and 1 mother-in-law:** Grandpa and Grandma, to Anna.
12. **1 daughter-in-law:** Anna, to Grandpa and Grandma.

Every line on the list is filled, and nobody else is needed. Twenty-three roles, seven people.

NO. 2 · EASY

PAINTING THE LAMP-POSTS

Tim Murphy and Pat Donovan were engaged by the local authorities to paint the lamp-posts in a certain street. Tim, who was an early riser, arrived first on the job, and had painted three on the south side when Pat turned up and pointed out that Tim's contract was for the north side. So Tim started afresh on the north side and Pat continued on the south. When Pat had finished his side he went across the street and painted six posts for Tim, and then the job was finished. As there was an equal number of lamp-posts on each side of the street, the simple question is: Which man painted the more lamp-posts, and just how many more?

Pat painted 6 more than Tim, however long the street is.

Dudeney never says how many posts there are, so pick a number and follow the job through. Say 20 on each side. The running totals are in brackets.

1. Tim paints 3 posts on the south side by mistake. **(Tim 3, Pat 0)**
2. That leaves 17 on the south side, and Pat paints all of them. **(Tim 3, Pat 17)**
3. Pat crosses over and paints 6 of the 20 posts on the north side. **(Tim 3, Pat 23)**
4. Tim paints the other 14 on the north side. **(Tim 17, Pat 23)**

Pat 23, Tim 17. Pat painted 6 more.

Try it with 50 posts a side, or 100, and the gap is still 6. Here is why. If each man had painted only his own side, they would have painted the same number. Tim painted 3 of Pat's posts, so Pat had 3 fewer to do. But Pat painted 6 of Tim's, so Tim had 6 fewer to do. Pat ends up 3 above an even split and Tim 3 below it, which is a gap of 6.

NO. 3 · EASY, WITH A TRAP

AVERAGE SPEED

In a recent motor ride it was found that we had gone at the rate of ten miles an hour, but we did the return journey over the same route, owing to the roads being more clear of traffic, at fifteen miles an hour. What was our average speed? Do not be too hasty in your answer to this simple little question, or it is pretty certain that you will be wrong.

12 miles an hour, not 12½.

The trap is to add 10 and 15 and halve it. That would only be right if the car spent the same amount of time at each speed, and it does not. Work it out with a real distance instead. Any distance works, but 60 miles divides neatly by both speeds.

1. Going out, 60 miles at 10 miles an hour takes **6 hours**.
2. Coming back, 60 miles at 15 miles an hour takes **4 hours**.
3. The whole trip is 60 + 60 = **120 miles**, in 6 + 4 = **10 hours**.
4. 120 miles in 10 hours is **12 miles an hour**.

The car spent 6 hours going slowly and only 4 going fast, so the slow speed pulls the average down to 12.

NO. 4 · MEDIUM

A TIME PUZZLE

How many minutes is it until six o'clock if fifty minutes ago it was four times as many minutes past three o'clock?

In plain English: It is now some number of minutes before six. Fifty minutes ago, the time past three was four times that number. What is the number?

26 minutes.

The easiest way in is to count everything as minutes after three o'clock. Six o'clock is 180 minutes after three.

1. Call the number of minutes until six our mystery number.
2. Right now, the time is 180 minus the mystery number, counted in minutes after three.
3. Fifty minutes ago it was 50 less than that: 130 minus the mystery number.
4. The puzzle says that time was four times the mystery number. So 130 minus the number equals 4 times the number.
5. Add the number to both sides: 130 equals 5 times the number. So the number is 130 ÷ 5 = **26**.

Check it on a clock. 26 minutes before six is **5:34**. Fifty minutes before that is **4:44**, which is 104 minutes after three. And 104 is exactly 4 × 26.

NO. 5 · MEDIUM

THEIR AGES

"My husband's age," remarked a lady the other day, "is represented by the figures of my own age reversed. He is my senior, and the difference between our ages is one-eleventh of their sum."

In plain English: Her husband's age is her age with the two digits swapped. He is older. How old are they?

He is 54 and she is 45.

Two things are always true when you swap the digits of a two-digit number, and between them they crack this.

1. **The difference is 9 for every step between the two digits.** 54 and 45 are 9 apart, because 5 and 4 are 1 apart. 63 and 36 are 27 apart, because 6 and 3 are 3 apart.
2. **The sum is 11 times the two digits added together.** 54 + 45 = 99, which is 11 × 9, and 5 + 4 = 9.
3. So "the difference is one-eleventh of the sum" means: **9 × the gap between the digits = the two digits added together.**
4. If the digits are 1 apart, they must add up to 9. The only pair is **5 and 4**.
5. If they were 2 apart, they would have to add up to 18. That needs 10 and 8, and 10 is not a digit. Any bigger gap is even further out of reach.

So the husband is 54 and his wife is 45. Check: the difference is 9, the sum is 99, and 99 ÷ 11 = 9.

NO. 6 · HARD

CATCHING THE THIEF

"Now, constable," said the defendant's counsel in cross-examination, "you say that the prisoner was exactly twenty-seven steps ahead of you when you started to run after him?"

"Yes, sir."

"And you swear that he takes eight steps to your five?"

"That is so."

"Then I ask you, constable, as an intelligent man, to explain how you ever caught him, if that is the case?"

"Well, you see, I have got a longer stride. In fact, two of my steps are equal in length to five of the prisoner's. If you work it out, you will find that the number of steps I required would bring me exactly to the spot where I captured him."

Here the foreman of the jury asked for a few minutes to figure out the number of steps the constable must have taken. Can you also say how many steps the officer needed to catch the thief?

In plain English: The thief starts 27 of his own steps ahead. He takes 8 steps while the officer takes 5, but each of the officer's steps is as long as two and a half of his. How many steps does the officer take?

> **30 steps.**

> Measure every distance in the thief's steps, so both runners use the same ruler. Two officer steps equal five thief steps, so one officer step is 2½ thief steps.

> Now follow the chase in rounds. In each round the officer takes 5 steps and the thief takes 8. The officer covers 5 × 2½ = 12½, and the thief covers 8, so the officer gains 4½ every round. The brackets show how far each has gone from where the officer started.

> 1. Start. **(Officer 0, thief 27)**
> 2. After 5 officer steps. **(Officer 12½, thief 35)**
> 3. After 10. **(Officer 25, thief 43)**
> 4. After 15. **(Officer 37½, thief 51)**
> 5. After 20. **(Officer 50, thief 59)**
> 6. After 25. **(Officer 62½, thief 67)**
> 7. After 30. **(Officer 75, thief 75)** Caught.

> The gap started at 27 and closed by 4½ every round. 27 ÷ 4½ = 6 rounds, and 6 rounds of 5 steps is 30 steps.

All six are from Amusements in Mathematics (1917), which is in the public domain. The worked answers are our own.