TEST YOURSELF

How is your arithmetic without the aid of a calculator? Try these 10 questions. There is no time pressure, and you're allowed to use pencil and paper if you want. As you do these questions, you might want to think about *how* you do them. Are you recalling facts you've memorised? Do you use a pencil-and-paper method?

(a) $17 + 8$
(b) $62 - 13$
(c) $2{,}020 - 1{,}998$
(d) 9×4
(e) 8×7
(f) 40×30
(g) 3.2×5
(h) One-quarter of 120
(i) What is 75% as a fraction?
(j) What is 10% of 94?

Find out how other people do these calculations on page 185.

I can still remember the thrill when I first got a calculator of my own. It was made by Commodore, and had red LED digits and buttons that made a satisfying click when you pressed them. It was a Christmas present, and I was 16 years old. I was captivated. Just being able to enter a number like 123456

ANSWERS AND TIPS

ENVELOPES VERSUS CALCULATORS (PAGE 8)

(a) $17 + 8 = 25$ The vast majority of adults and teenagers in my survey answered this in their head, but even for a straightforward addition like this, there is a range of ways that people use to get there. The three common approaches were:

- $7 + 8 = 15$, then add 10 to get 25.
- Split 8 into $3 + 5$; then add $17 + 3 = 20$; then add 5 to get 25 (splitting a number up in this way is referred to as partitioning in primary schools).
- 8 is two less than 10 . . . $17 + 10 = 27$, then take away 2 to get 25.

(b) $62 - 13 = 49$ Almost everyone uses two steps here. Those who do it mentally either do 'take away 10 = 52, then take away three = 49' or 'take away three = 59, then take away 10 = 49'. Those who use a written method will typically work from the right: '3 from 2 . . . borrow 10 . . . , etc.

(c) $2,020 - 1,998 = 22$ Viewed as a regular subtraction, 2,020 – 1,998 requires careful carrying over of tens and hundreds. But if the problem had been: 'Amy was born in 1998. How old will she be in 2020?' most people solve this

by counting up, rather than by subtracting: 'two years from 1998 to 2000, add 20 years up to 2020, equals 22 years'.

(d) $4 \times 9 = 36$ Those who do calculations frequently will remember their times tables, and regurgitate 'four nines are thirty-six' without having to think. But it's interesting to observe how those who are rusty with their times tables work it out. The quickest way is to calculate 10×4 (= 40) and then subtract 4.

(e) $8 \times 7 = 56$ Aside from instant recall, approaches that adults shared with me included:

- $7 \times 7 = 49$, add $7 = 56$
- $2 \times 7 = 14$, double it $= 28$, double that $= 56$
- $5 \times 7 = 35$, add 7, add 7, add $7 = 56$.

(f) $40 \times 30 = 1{,}200$ People generally know, or very quickly work out, $4 \times 3 = 12$. But change it to 40×30, and the addition of those zeroes can make this calculation much more of a struggle. A common approach is to do it in two steps: reduce one of the numbers to a single digit (e.g. $40 \times 3 = 120$), then multiply by 10 to give $40 \times 30 =$ 1,200. There are others, however, who just guess. The answer 12,000 is not uncommon. (See also the 'count the zeroes' rule on page 52.)

(g) $3.2 \times 5 = 16$ Of the calculations so far in the quiz, this is the first for which almost everybody uses a written method. Most common is: $5 \times 3 = 15$; $5 \times 0.2 = 1$; $15 + 1 = 16$. Some shortcuts for multiplying by 5 can be found on page 42.

(h) $120 \div 4 = 30$ There are two common strategies for dividing by four. The first is to halve the number and then halve it again ($120 \div 2 = 60$, and $60 \div 2 = 30$). The other is to do mental short division: 'four into 12 goes 3, so the answer is 30'.

(i) Three-quarters 75% is such a commonly used quantity that many people are familiar that it is three-quarters without needing any thought. Some figure it out by starting at 25% (one-quarter) and multiplying it by three.

(j) 10% of 94 = 9.4 The most common approach that adults use is to shift the decimal place one to the left, so that the hundreds become tens, tens become units etc.