

**YOU & MATHS** Suppose that  $f(x) = ax + b$ , where  $a$  and  $b$  are real numbers. Given that  $f(f(f(x))) = 8x + 21$ , what is the value of  $a + b$ ?

☐ A 2

☐ B 3

☐ C 4

☐ D 5

☐ E 6

To figure out  $a + b$ , let's consider  $f(f(f(x)))$ :

$$f(f(f(x))) =$$

$$f(f(ax + b)) =$$

$$f(a(ax + b) + b) =$$

$$a(a^2x + ab + b) + b =$$

$$a^3x + a^2b + ab + b =$$

$$8x + 21,$$

and find  $a$  and  $b$  such that:

$$a^3x + a^2b + ab + b = 8x + 21.$$

This means:

$$a^3 = 8 \text{ and } a^2b + ab + b = 21,$$

and then

$$a = 2 \text{ and } 4b + 2b + b = 21 \rightarrow 7b = 21, b = 3.$$

Finally we can compute:

$$a + b = 5.$$

The correct answer is D.