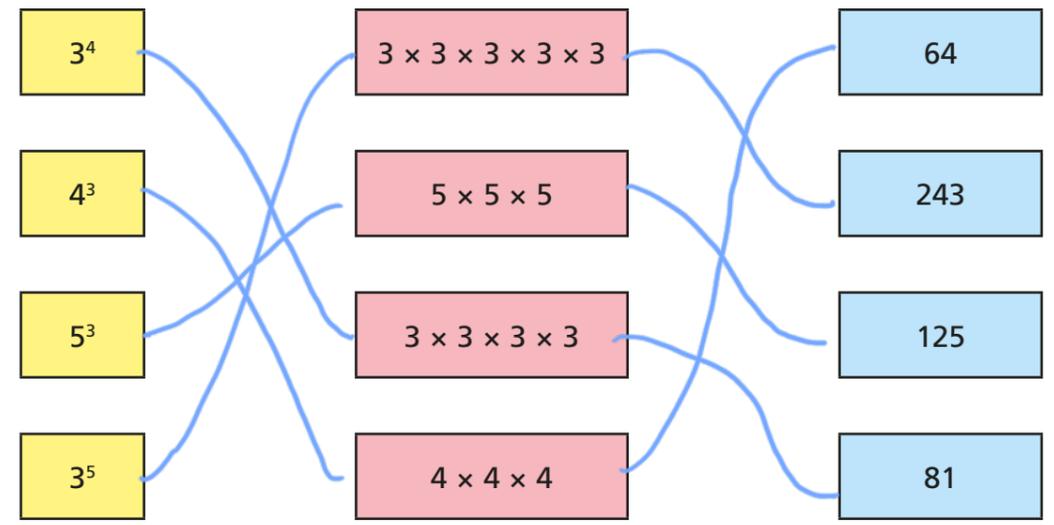


# Explore higher powers and roots

H



1 Match the calculations and answers.



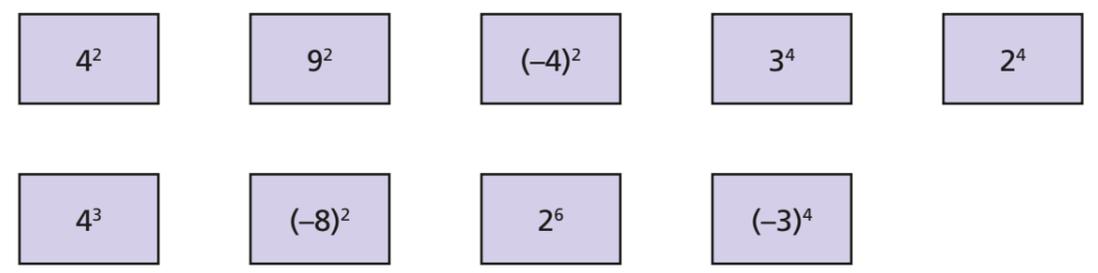
2 Without using a calculator, evaluate the values.

- a)  $4^3 = 64$
- b)  $6^2 = 36$
- c)  $1^{10} = 1$
- d)  $(-11)^2 = 121$
- e)  $5^3 = 125$
- f)  $(-5)^3 = -125$
- g)  $3^6 = 729$
- h)  $10^1 = 10$

3 Work out the values.

- The cube of 8 = 512
- The cube root of 8 = 2
- The cube root of -8 = -2

4 Write the calculations in the correct columns.



| Answer of 16               | Answer of 64               | Answer of 81               |
|----------------------------|----------------------------|----------------------------|
| $4^2$<br>$(-4)^2$<br>$2^4$ | $4^3$<br>$(-8)^2$<br>$2^6$ | $9^2$<br>$3^4$<br>$(-3)^4$ |

5 Fill in possible missing numbers to make the number sentences correct.

Use a calculator to help you.

- a)  $\boxed{2}^8 = 256$        $\boxed{16}^2 = 256$        $\boxed{4}^4 = 256$
- b)  $\boxed{9}^{\boxed{2}} = 81$        $\boxed{3}^{\boxed{4}} = 81$
- c)  $\boxed{8}^{\boxed{2}} = 64$        $\boxed{64}^{\boxed{1}} = 64$   
 $\boxed{2}^{\boxed{6}} = 64$

Can you find any other numbers that have more than one calculation involving a power?



6 a) Use a calculator to complete the tables.

|       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|
| $3^0$ | $3^1$ | $3^2$ | $3^3$ | $3^4$ | $3^5$ | $3^6$ | $3^7$ |
| 1     | 3     | 9     | 27    | 81    | 243   | 729   | 2,187 |

|          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|
| $(-3)^0$ | $(-3)^1$ | $(-3)^2$ | $(-3)^3$ | $(-3)^4$ | $(-3)^5$ | $(-3)^6$ | $(-3)^7$ |
| 1        | -3       | 9        | -27      | 81       | -243     | 729      | -2,187   |

b) What patterns do you notice between the tables?

The numbers are the same but in the second table every other value is negative.

c) How do you know that  $(-2.5)^8$  will be positive?

The power is even.

7 Circle all the calculations that will have a negative answer.

- $5^7$        $(-4)^7$        $(-5)^4$        $(-6)^3$   
 $(-3)^6$        $(-11.8)^{15}$        $(-7)^{80}$        $17^{39}$

Compare answers with a partner.

What do you notice?

8 Work out the calculations.

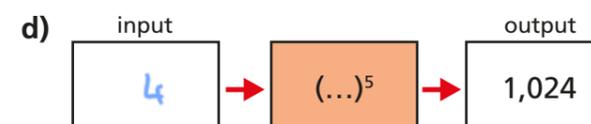
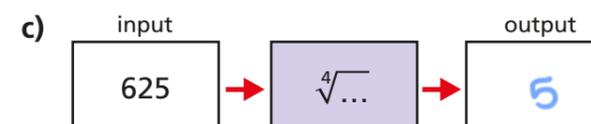
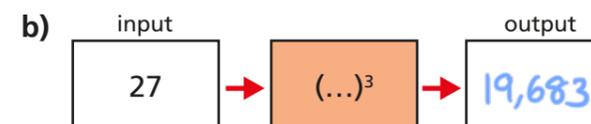
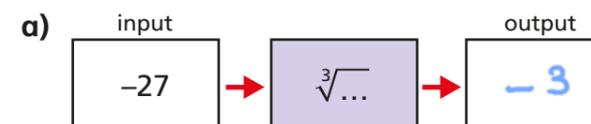
Use a calculator to help you.

- a)  $\sqrt[3]{27} = 3$       c)  $\sqrt[5]{32} = 2$   
 b)  $\sqrt[4]{1,296} = 6$       d)  $\sqrt[5]{3,125} = 5$

Is there more than one possible solution for any of the questions?

9 Complete the function machines.

Use a calculator to help you.



10 Tommy and Rosie think of the same number.

Tommy squares the number.

Rosie cubes the number.

Tommy's answer is greater than Rosie's.

What number could Tommy and Rosie be thinking of?

$-2$

How many different solutions can you find?