



1 Here is a list of numbers.

6 8 9 16 21 27 28 49 125

From the list, write down

- a. the square numbers
- b. the cube numbers
- c. the triangle numbers

(3 marks)

a) Square numbers

1, 4, 9, 16, 25, 36, 49, ...

9, 16, 49

b) Cube numbers

1, 8, 27, 64, 125

8, 27, 125

c) Triangle numbers: add 2, then 3, then 4, ...

1, 3, 6, 10, 15, 21, 28, 36

6, 21, 28

2 Write down the square number that is between 30 and 45

(1 mark)

The square numbers are 1, 4, 9, 16, 25, 36, 49, ..

The only one between 30 and 45 is 36

36

3

- a. Write $5 \times 5 \times 5 \times 5$ using index notation.
 b. Work out the value of 3^4
 c. Ruby says, " $2^3 = 6$ ". Explain why Ruby is wrong.

(3 marks)

a) Four 5s multiplied together

$$5^4$$

b)

$$\begin{aligned} 3^4 &= 3 \times 3 \times 3 \times 3 \\ &= 9 \times 9 \\ &= 81 \end{aligned}$$

$$81$$

c)

$$\begin{aligned} 2^3 &= 2 \times 2 \times 2 \\ &= 8 \end{aligned}$$

$$2^3 = 8, \text{ Ruby did } 2 \times 3$$

4

Work out the value of $\sqrt[3]{64}$

(1 mark)

The cube root of 64 is the number that gives 64 when cubed

$$4 \times 4 \times 4 = 64, \text{ so the cube root of 64 is 4}$$

$$4$$

- 5 You are told that $17^2 = 289$ and $6^3 = 216$

Write down the value of

a. $\sqrt{289}$

b. $\sqrt[3]{216}$

c. $\sqrt{2.89}$

(3 marks)

a) $\sqrt{\quad}$ undoes squaring

$$17^2 = 289 \text{ so } \sqrt{289} = 17$$

17

b) Cube root undoes cubing

$$6^3 = 216$$

6

c) $17 \times 17 = 289$, so $1.7 \times 1.7 = 2.89$

1.7

- 6 Use your calculator to work out the value of 4.6^3

(1 mark)

$$4.6^3 = 4.6 \times 4.6 \times 4.6$$

$$4.6 \times 4.6 = 21.16$$

$$21.16 \times 4.6 = 97.336$$

97.336

- 7 Use your calculator to work out

$$(2.4^2 + 1.8) \div 0.5^3$$

Write down all the figures on your calculator display.

(2 marks)

$$2.4^2 = 5.76, \text{ so the numerator is } 5.76 + 1.8 = 7.56$$

$$0.5^3 = 0.125$$

$$7.56 \div 0.125 = 60.48$$

60.48

8

- a. Write $7^4 \times 7^3$ as a single power of 7
 b. Write $12^9 \div 12^4$ as a single power of 12

(2 marks)

a) When multiplying powers of the same base, add the indices

$$4 + 3 = 7, \text{ so the answer is } 7^7$$

b) When dividing powers of the same base, subtract the indices: $9 - 4 = 5$, so the answer is 12^5

The first product contains four factors of 7 followed by three more: seven altogether. For division, cancel four of the nine factors of 12, leaving five

9

- a. Write $2^3 \times 2^4$ as a single power of 2
 b. Jamal says, " $2^3 + 2^4 = 2^7$ ".
 Show that Jamal is wrong.

(3 marks)

a) Same base, $\times$ means add the powers

$$\begin{aligned} 2^3 \times 2^4 &= 2^{3+4} \\ &= 2^7 \end{aligned}$$

$$2^7$$

b) Work out each side

$$\begin{aligned} 2^3 + 2^4 &= 8 + 16 \\ &= 24 \\ 2^7 &= 128 \end{aligned}$$

$24 \neq 128$, adding powers does not add the indices

Jamal is wrong

10

Simplify

a. $x^4 \times x^6$

b. $y^9 \div y^3$

c. $(m^2)^5$

(3 marks)

a) $\times$ means add the powers

$$x^4 \times x^6 = x^{4+6}$$

$$= x^{10}$$

$$\boxed{x^{10}}$$

b) $\div$ means subtract the powers

$$y^9 \div y^3 = y^{9-3}$$

$$= y^6$$

$$\boxed{y^6}$$

c) Power of a power means multiply

$$(m^2)^5 = m^{2 \times 5}$$

$$= m^{10}$$

$$\boxed{m^{10}}$$

11

Write down the value of

a. 5^0

b. 4^{-1}

c. $9^{\frac{1}{2}}$

(3 marks)

a) Power 0 always gives 1

$$\boxed{1}$$

b) Power -1 means reciprocal

$$4^{-1} = \frac{1}{4}$$

$$\boxed{\frac{1}{4}}$$

c) Power $\frac{1}{2}$ means square root

$$9^{\frac{1}{2}} = \sqrt{9}$$

$$= 3$$

$$\boxed{3}$$

12

$$\frac{2^6 \times 2^k}{2^3} = 2^{11}$$

Find the value of k .

(3 marks)

Using the index laws, the left-hand side is $2^{(6+k-3)} = 2^{(k+3)}$

$$\text{So } k + 3 = 11$$

$$k = 8$$

8
