

GCSE Maths Standard Form, Indices and Surds: Zero and negative indices (Foundation): answers

GCSE Maths - Standard Form, Indices and Surds - Foundation - Lesson 6.2

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at websink.site/gcse/maths/ch06-standard-form-indices-surds/foundation/zero-and-negative-indices/

Exercise 6C Zero and negative indices Non-calculator

1 Work out the value of each.

(a) 7^0

Answer: 1

(b) 100^0

Answer: 1

(c) $(-3)^0$

Answer: 1

(d) $2^0 + 3^0$

Answer: 2

(e) 5×4^0

Answer: 5

2 Write each as a fraction.

(a) 2^{-1}

Answer: $\frac{1}{2}$

(b) 3^{-2}

Answer: $\frac{1}{9}$

(c) 10^{-3}

Answer: $\frac{1}{1000}$

(d) 5^{-2}

Answer: $\frac{1}{25}$

(e) 4^{-1}

Answer: $\frac{1}{4}$

(f) 2^{-4}

Answer: $\frac{1}{16}$

3 Write each fraction as a power with a negative index.

(a) $\frac{1}{8}$

Answer: 2^{-3}

(b) $\frac{1}{9}$

Answer: 3^{-2}

(c) $\frac{1}{100}$

Answer: 10^{-2}

(d) $\frac{1}{125}$

Answer: 5^{-3}

(e) $\frac{1}{32}$

Answer: 2^{-5}

4 Work out each. Give your answers as whole numbers or fractions in their simplest form.

(a) $(\frac{1}{2})^{-3}$

Answer: 8

(b) $(\frac{2}{3})^{-2}$

Answer: $\frac{9}{4}$

(c) $(\frac{1}{5})^{-2}$

Answer: 25

(d) $(\frac{3}{4})^{-2}$

Answer: $\frac{16}{9}$

(e) $(\frac{2}{5})^{-1}$

Answer: $\frac{5}{2}$

5 Write each of these as a decimal.

(a) 10^{-1}

Answer: 0.1

(b) 10^{-2}

Answer: 0.01

(c) 10^{-3}

Answer: 0.001

(d) 10^{-4}

Answer: 0.0001

(e) 10^{-5}

Answer: 0.00001

6 Complete the pattern: $10^3 = 1000$, $10^2 = 100$, $10^1 = 10$. Work out the value of the next three powers.

(a) 10^0

Answer: 1

(b) 10^{-1}

Answer: 0.1

(c) 10^{-2}

Answer: 0.01

7 Work out the value of each. Give a whole number or a fraction.

(a) $5^2 \times 5^{-4}$

Answer: $\frac{1}{25}$

(b) $2^3 \div 2^5$

Answer: $\frac{1}{4}$

(c) $(3^2)^{-1}$

Answer: $\frac{1}{9}$

(d) $10^{-3} \times 10^5$

Answer: 100

(e) $7^{-2} \times 7^{-1}$

Answer: $\frac{1}{343}$

8 Simplify each. Write your answer with positive indices.

(a) $x^2 \div x^6$

Answer: $\frac{1}{x^4}$

(b) $y^3 \div y^8$

Answer: $\frac{1}{y^5}$

(c) $a^2 \times a^{-5}$

Answer: $\frac{1}{a^3}$

(d) $3x^{-2} \times 4x^5$

Answer: $12x^3$

- 9 Jack says that $3^{-2} = -9$. Explain his mistake and work out the correct value.

Answer: A negative index means "one over", it does not make the answer negative. $3^{-2} = 1/9$.

- 10 Use the division law to show that $5^0 = 1$.

Answer: $5^3 \div 5^3 = 5^0$, and also $125 \div 125 = 1$. So $5^0 = 1$.

- 11 A virus is about 10^{-7} m long. A bacterial cell is about 10^{-5} m long. How many times longer is the cell than the virus?

Answer: 100

- 12 Which is larger, 2^{-3} or 3^{-2} ? Show your working.

Answer: 2^{-3} is larger ($1/8 > 1/9$)

- 13 A radioactive sample has a mass of 80 g. After n days its mass is 80×2^{-n} grams. Work out the mass after 3 days and after 5 days.

Answer: After 3 days: 10 g. After 5 days: 2.5 g.

- 14 Show that $(2^{-3} \times 2^5) \div 2^{-2} = 16$.

Answer: 16

Exercise 6D Index equations and mixed practice Non-calculator

- 1 Find the value of n in each equation.

(a) $2^n = 32$

Answer: $n = 5$

(b) $3^n = 81$

Answer: $n = 4$

(c) $5^n = 125$

Answer: $n = 3$

(d) $10^n = 1000$

Answer: $n = 3$

(e) $2^n = 128$

Answer: $n = 7$

2 Find the value of n in each equation. (The answers are negative whole numbers.)

(a) $2^n = \frac{1}{8}$

Answer: $n = -3$

(b) $3^n = \frac{1}{9}$

Answer: $n = -2$

(c) $10^n = \frac{1}{100}$

Answer: $n = -2$

(d) $5^n = \frac{1}{5}$

Answer: $n = -1$

(e) $4^n = \frac{1}{16}$

Answer: $n = -2$

3 Find the value of x .

(a) $2^{x+3} = 2^8$

Answer: $x = 5$

(b) $3^{x-1} = 3^4$

Answer: $x = 5$

(c) $5^{x+2} = 5^6$

Answer: $x = 4$

(d) $10^{x-2} = 10^3$

Answer: $x = 5$

4 Work out each. Give your answer as a fraction.

(a) $2^{-1} + 2^{-2}$

Answer: $\frac{3}{4}$

(b) $3^{-1} + 3^{-2}$

Answer: $\frac{4}{9}$

(c) $5^0 + 5^{-1}$

Answer: $\frac{6}{5}$

- 5 Write these numbers in order, smallest first: 2^{-1} , 2^0 , 2^{-3} , 2^2 .

Answer: 2^{-3} , 2^{-1} , 2^0 , 2^2

- 6 Write $\frac{1}{8}$ as a power of 2, and write $8 \times \frac{1}{32}$ as a power of 2.

(a) $\frac{1}{8}$

Answer: 2^{-3}

(b) $8 \times \frac{1}{32}$

Answer: 2^{-2}

- 7 Show that $(\frac{1}{3})^{-2} \times 3^{-4} = \frac{1}{9}$.

Answer: $\frac{1}{9}$