

GCSE Maths: Comparing and calculating with standard form (Higher): answers

GCSE Maths - Standard Form, Indices and Surds - Higher - Lesson 6.5

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/higher/comparing-and-calculating-with-standard-form/

Exercise 6K Comparing and ordering standard form Non-calculator

1 Write down the larger number in each pair.

(a) 3.2×10^5 and 9.9×10^4

Answer: 3.2×10^5

(b) 4.5×10^{-3} and 4.5×10^{-5}

Answer: 4.5×10^{-3}

(c) 6.1×10^7 and 6.8×10^7

Answer: 6.8×10^7

(d) 2×10^{-6} and 9×10^{-7}

Answer: 2×10^{-6}

(e) 1.2×10^{10} and 9.9×10^9

Answer: 1.2×10^{10}

2 Put < or > between each pair.

(a) 7.5×10^3 ? 2.1×10^6

Answer: <

(b) 3.3×10^{-2} ? 1.9×10^{-4}

Answer: >

(c) 5.6×10^8 ? 5.1×10^8

Answer: >

(d) 9×10^{-5} ? 1×10^{-4}

Answer: <

3 Write each list in order, **smallest first**.

(a) 2.5×10^4 , 7.1×10^{-3} , 2.1×10^4 , 9×10^3

Answer: 7.1×10^{-3} , 9×10^3 , 2.1×10^4 , 2.5×10^4

(b) 5.2×10^{-6} , 4.9×10^{-5} , 1.1×10^{-5} , 8×10^{-7}

Answer: 8×10^{-7} , 5.2×10^{-6} , 1.1×10^{-5} , 4.9×10^{-5}

- 4 Write this list in order, **largest first**: 6×10^8 , 6×10^{-8} , 5.9×10^8 , 1×10^9 .

Answer: 1×10^9 , 6×10^8 , 5.9×10^8 , 6×10^{-8}

- 5 The distances of four planets from the Sun, in km, are: Mercury 5.79×10^7 , Venus 1.08×10^8 , Earth 1.5×10^8 , Mars 2.28×10^8 . Write the planets in order, closest to the Sun first.

Answer: Mercury, Venus, Earth, Mars

- 6 The mass of an electron is 9.11×10^{-31} kg. The mass of a proton is 1.67×10^{-27} kg. Which has the smaller mass?

Answer: The electron

- 7 Explain why 9.9×10^2 is less than 1.1×10^5 , even though 9.9 is bigger than 1.1.

Answer: $9.9 \times 10^2 = 990$ and $1.1 \times 10^5 = 110,000$. The power of 10 matters more than the front number.

- 8 Write down a number in standard form that is bigger than 3×10^4 and smaller than 3×10^5 .

Answer: For example 1.2×10^5

- 9 True or false: $5 \times 10^{-3} > 5 \times 10^{-2}$? Explain.

Answer: False. $0.005 < 0.05$.

Exercise 6L Calculating with standard form (no calculator)

Non-calculator

- 1 Work out each multiplication. Give your answers in standard form.

(a) $(2 \times 10^3) \times (3 \times 10^4)$

Answer: 6×10^7

(b) $(4 \times 10^5) \times (2 \times 10^{-2})$

Answer: 8×10^3

(c) $(1.5 \times 10^6) \times (4 \times 10^3)$

Answer: 6×10^9

(d) $(2.5 \times 10^{-3}) \times (4 \times 10^{-2})$

Answer: 1×10^{-4}

(e) $(3 \times 10^8) \times (3 \times 10^{-5})$

Answer: 9×10^3

- 2 Work out each division. Give your answers in standard form.

(a) $(8 \times 10^9) \div (2 \times 10^4)$

Answer: 4×10^5

(b) $(6 \times 10^7) \div (3 \times 10^{-2})$

Answer: 2×10^9

(c) $(9 \times 10^5) \div (4 \times 10^2)$

Answer: 2.25×10^3

(d) $(3 \times 10^5) \div (5 \times 10^{-2})$

Answer: 6×10^6

(e) $(4.5 \times 10^{-3}) \div (1.5 \times 10^2)$

Answer: 3×10^{-5}

(f) $(1.2 \times 10^6) \div (4 \times 10^{-2})$

Answer: 3×10^7

3 Work out each. Give your answers in standard form.

(a) $(3.2 \times 10^4) + (8.5 \times 10^3)$

Answer: 4.05×10^4

(b) $(5.2 \times 10^6) + (4.1 \times 10^6)$

Answer: 9.3×10^6

(c) $(6 \times 10^5) - (2.5 \times 10^4)$

Answer: 5.75×10^5

(d) $(7.2 \times 10^{-3}) - (3.1 \times 10^{-3})$

Answer: 4.1×10^{-3}

(e) $(9.5 \times 10^7) + (7.5 \times 10^6)$

Answer: 1.025×10^8

(f) $(5.2 \times 10^4) - (4.9 \times 10^4)$

Answer: 3×10^3

4 A rectangular field is 3×10^4 m long and 2×10^3 m wide. Work out its area in standard form.

Answer: $6 \times 10^7 \text{ m}^2$

5 A printer prints 4×10^3 pages every hour. How many pages does it print in 5×10^2 hours?

Answer: 2×10^6 pages

- 6 A grain of sand has a mass of 2.5×10^{-5} kg. How many grains of sand are in 1 kg? Give your answer in standard form.

Answer: 4×10^4 grains

- 7 A country has a population of 6×10^7 . Each person uses 1.5×10^2 litres of water a day. How many litres does the whole country use in a day?

Answer: 9×10^9 litres

- 8 A company earned $\text{£}3.6 \times 10^6$ in 2020 and $\text{£}5.2 \times 10^6$ in 2021. Work out the total it earned over the two years.

Answer: $\text{£}8.8 \times 10^6$

- 9 Sam writes: $3 \times 10^4 + 2 \times 10^3 = 5 \times 10^7$. Is he correct? Show the correct answer.

Answer: No. The correct answer is 3.2×10^4 .

- 10 Show that $(2 \times 10^3) \times (5 \times 10^4)$ is 1×10^8 , and explain why you have to change the front number.

Answer: $2 \times 5 = 10$, so the answer is $10 \times 10^7 = 1 \times 10^8$.

- 11 Work out each. Give your answers in standard form.

(a) $(2 \times 10^3)^3$

Answer: 8×10^9

(b) $(4 \times 10^{-3})^2$

Answer: 1.6×10^{-5}

(c) $(5 \times 10^4)^2$

Answer: 2.5×10^9

(d) $\sqrt{9 \times 10^6}$

Answer: 3×10^3

(e) $\sqrt{6.4 \times 10^7}$

Answer: 8×10^3

(f) $\sqrt{2.5 \times 10^{-5}}$

Answer: 5×10^{-3}

(g) $\sqrt{1.6 \times 10^{-3}}$

Answer: 4×10^{-2}

- 12 Find x , giving your answer in standard form: $x \times 4 \times 10^3 = 2.4 \times 10^7$.

Answer: $x = 6 \times 10^3$

- 13 Work out $(3 \times 10^4)^2 \div (9 \times 10^{-3})$. Give your answer in standard form.

Answer: 1×10^{11}

Exercise 6M Calculator questions and context Calculator allowed

1 Use a calculator to work out each. Give your answers in standard form to 3 significant figures.

(a) $(4.5 \times 10^7) \times (2.4 \times 10^{-3})$

Answer: 1.08×10^5

(b) $(5.97 \times 10^{24}) \div (7.35 \times 10^{22})$

Answer: 8.12×10^1

(c) $(3.2 \times 10^5) \times (4.7 \times 10^{-2}) \div (1.6 \times 10^4)$

Answer: 9.40×10^{-1}

(d) $(6.84 \times 10^8) + (3.9 \times 10^9)$

Answer: 4.58×10^9

2 Work out each. Give your answers in standard form to 3 significant figures.

(a) $(2.7 \times 10^4)^2$

Answer: 7.29×10^8

(b) $\sqrt{8.1 \times 10^7}$

Answer: 9.00×10^3

(c) $(9.2 \times 10^{-3}) - (3.7 \times 10^{-4})$

Answer: 8.83×10^{-3}

3 Light travels at 3×10^8 m/s. The Sun is 1.496×10^{11} m from the Earth. How many seconds does light take to reach the Earth? Give your answer to 3 significant figures in standard form.

Answer: 4.99×10^2 s

4 The mass of the Earth is 5.97×10^{24} kg and the mass of the Moon is 7.35×10^{22} kg. How many times heavier is the Earth than the Moon? Give your answer in standard form to 3 significant figures.

Answer: 8.12×10^1

5 A region has an area of 2.4×10^5 km² and a population of 6.7×10^7 . Work out the population density (people per km²) to 3 significant figures in standard form.

Answer: 2.79×10^2 people per km²

6 A memory card holds 2×10^{12} bytes. One photo uses 3.5×10^6 bytes. How many photos fit on the card? Give your answer to 3 significant figures in standard form.

Answer: 5.71×10^5 photos

7 There are 6.02×10^{23} atoms in one mole of a substance. How many atoms are there in 3.5 moles? Give your answer to 3 significant figures in standard form.

Answer: 2.11×10^{24} atoms

- 8 Jupiter has a diameter of 1.43×10^5 km. The Earth has a diameter of 1.27×10^4 km. How much bigger is the diameter of Jupiter? Give your answer to 3 significant figures in standard form.

Answer: 1.30×10^5 km

- 9 The galaxy Andromeda is 2.5×10^6 light-years away. One light-year is 9.46×10^{12} km. How far away is Andromeda in km? Give your answer to 3 significant figures in standard form.

Answer: 2.37×10^{19} km

- 10 Show, by estimating, that $(3.9 \times 10^5) \times (2.1 \times 10^{-2})$ is approximately 8×10^3 .

Answer: $4 \times 2 = 8$ and $10^5 \times 10^{-2} = 10^3$, so about 8×10^3

- 11 Use a calculator to work out $\sqrt{(4.9 \times 10^9 \div 2 \times 10^{-3})}$. Give your answer in standard form to 3 significant figures.

Answer: 1.57×10^6