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

GCSE Maths - Standard Form, Indices and Surds - Foundation - 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/foundation/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: 6×10^7 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 £3.6×10^{6} in 2020 and £5.2×10^{6} in 2021. Work out the total it earned over the two years.

> **Answer:** £8.8×10^{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 $10 \times 10^{7} = 1 \times 10^{8}$.

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 km^2 and a population of 6.7×10^7. Work out the population density (people per km^2) to 3 significant figures in standard form.

Answer: 2.79×10^2 people per km^2

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

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