Topic Check In - 3.02 Standard form

1. Write the number three million in standard form.

2. Write the number 0.000045 in standard form.

3. Write 7.13×10^{3} as an ordinary number.

4. Write 2.5×10^{-6} as an ordinary number.

5. Write the numbers 3.2, 45×10^{-3}, 2400, 1.56×10^{-2} from smallest to largest, giving them all in standard form.

6. Malin is asked to calculate $2 \times 10^{5} \times 6 \times 10^{4}$, giving the answer in standard form. His answer is 12×10^{9}. Is he right? Give a reason for your answer.

7. A sunflower measuring 4×10^{-2} m grows to 2×10^{-1} m over 4 weeks. Explain in words how many times bigger the sunflower is after the 4 weeks.

8. Using the conversion **1 km = 1000 m**, write a rule in your own words for converting a distance in metres written in standard form to a distance in kilometres written in standard form.

9. The mass of one molecule of water is 2.99×10^{-23} g. Estimate how many molecules of water there are in a droplet of water weighing 0.0024 g.

10. The speed of light is 3×10^{8} **metres per second**. The distance from the Earth to the Sun is 1.5×10^{11} **metres**. Find how long it takes a beam of light to travel from the Sun to the Earth.

Extension

The number $n!$ (called n factorial) is the product of the first n whole numbers, so:

$$3! = 1 \times 2 \times 3 = 6.$$

Scientific calculators have a factorial key. Find this on your calculator and use it to calculate, in standard form correct to 3 significant figures:

(a) 10!

(b) 20!

(c) Investigate the largest number n for which your calculator can calculate $n!$.

Answers

1. 3×10^{6}

2. 4.5×10^{-5}

3. 7130

4. 0.0000025

5. 1.56×10^{-2}, 4.5×10^{-2}, 3.2×10^{0}, 2.4×10^{3}

6. No, it should be 1.2×10^{10}.

7. 10^{-2} to 10^{-1} is 10 times bigger

   4 to 2 is 0.5 times bigger

   Overall growth is $10 \times 0.5 = 5$ times bigger oe

8. Subtract 3 from the power of 10

9. $0.0024\,g = 2.4 \times 10^{-3}\,g$

   $2.4 \times 10^{-3} \div 3 \times 10^{-23}$

   $\approx 0.8 \times 10^{20}$

   $\approx 8 \times 10^{19}$ molecules

10. $\dfrac{15 \times 10^{10}}{3 \times 10^{8}} = 5 \times 10^{2} = 500$ seconds (or 8 minutes and 20 seconds)

Extension

(a) $10! = 3.63 \times 10^{6}$

(b) $20! = 2.43 \times 10^{18}$

(c) Calculators may vary, but most will get as far as $69! = 1.71 \times 10^{98}$, because 70! is over 10^{100}, which is too big for most calculators to handle.

GCSE (9–1)
MATHEMATICS

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GCSE (9–1) MATHEMATICS

Assessment Objective	Qu.	Topic	R	A	G
AO1	1	Write numbers expressed in words in standard form.			
AO1	2	Write numbers in standard form.			
AO1	3	Convert numbers in standard form to ordinary numbers.			
AO1	4	Convert numbers in standard form to ordinary numbers.			
AO1	5	Write and order numbers in standard form.			
AO2	6	Perform calculations in standard form and recognise that for $a \times 10^n$ a must be between 1 and 10.			
AO2	7	Interpret the size of numbers written in standard form.			
AO2	8	Use standard form for metric units of length.			
AO3	9	Perform real-world calculations involving small numbers using standard form.			
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