

# Standard Form (H)

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	Mel@JustMaths
Total Marks:	

1. (a) Write  $6.8 \times 10^4$  in decimal notation.

[1]

68000

- (b) Write in standard form the value of 0.0000853.

[1]

$8.53 \times 10^{-5}$

- (c) Find in standard form the value of  $(3 \times 10^2) \times (5 \times 10^6)$ .

[2]

$15 \times 10^8$

$1.5 \times 10^9$

2. (a) During an experiment, a scientist notices that the number of bacteria halves every second.

There were  $2.3 \times 10^{30}$  bacteria at the start of the experiment.

Calculate how many bacteria were left after 5 seconds.

Give your answer in standard form correct to two significant figures.

$$\frac{2.3 \times 10^{30}}{2^5} = \frac{2.3 \times 10^{30}}{32}$$

$$2.3 \div 32 = 0.071875$$

$$\text{to 2 sf} = 0.072$$

$$0.072 \times 10^{30} = 7.2 \times 10^{28}$$

[3]

- (b) In a different experiment the number of bacteria is reduced by a quarter each second. On this occasion the number of bacteria initially was  $x$ .

Write a formula to calculate the number of bacteria,  $r$ , remaining after  $t$  seconds.

$$r = \frac{x}{4^t}$$

[3]

3.  $a \times 10^4 + a \times 10^2 = 24\,240$  where  $a$  is a number.

Work out  $a \times 10^4 - a \times 10^2$

Give your answer in standard form.

$$\begin{array}{r} 24000 \\ 240 \\ \hline 23760 \end{array} \quad \begin{array}{l} 2.4 \times 10^4 \checkmark \\ 2.4 \times 10^2 \checkmark \end{array} \quad \therefore a = 2.4$$

$$24000 - 240 = 23760 \Rightarrow 2.3760 \times 10^4 \quad [2]$$

4. Work out the value of  $(9 \times 10^{-4}) \times (3 \times 10^7)$

Give your answer in standard form.

$$\begin{array}{l} 9 \times 3 \times 10^{-4} \times 10^7 \\ 27 \times 10^{3\uparrow} \\ 2.7 \times 10^4 \end{array} \quad [2]$$

5. One uranium atom has a mass of  $3.95 \times 10^{-22}$  grams.

(a) Work out an estimate for the number of uranium atoms in 1kg of uranium.

$$\begin{array}{l} 1 \text{ atom} = 3.95 \times 10^{-22} \text{ grams} \\ 1 \text{ atom} \approx 4 \times 10^{-22} \text{ grams} \\ 1000 \text{ grams} \times 2.5 \times 10^{24} \\ 2.5 \times 10^{24} \end{array} \quad \dots\dots 2.5 \times 10^{24} \quad [3]$$

(b) Is your answer to (a) an underestimate or an overestimate?

Give a reason for your answer.

underestimate, because I rounded up the mass to  $4 \times 10^{-22}$  [1]

6.  $R = \frac{x^2}{y}$

$$x = 3.6 \times 10^5$$

$$y = 7.5 \times 10^4$$

$$\frac{(3.6 \times 10^5)^2}{7.5 \times 10^4}$$

Work out the value of  $R$ .

Give your answer in standard form to an appropriate degree of accuracy.

$$\begin{array}{l} = \frac{1.296 \times 10^{11}}{7.5 \times 10^4} = 1728000 \\ = 1730000 = 1.73 \times 10^6 \quad (3.s.f.) \end{array} \quad [3]$$

7. Write 0.000068 in standard form.

$$6.8 \times 10^{-5}$$

[1]

8. The table shows data for the UK about its population and the total amount of money spent on healthcare in 2002, 2007 and 2012.

Year	Population	Total spent on healthcare (£)
2002	$5.94 \times 10^7$	$8.14 \times 10^{10}$
2007	$6.13 \times 10^7$	$1.20 \times 10^{11}$
2012	$6.37 \times 10^7$	$1.45 \times 10^{11}$

a) How much more was spent on healthcare in 2007 than in 2002?

Give your answer in millions of pounds.

$$\begin{array}{r} 1.200 \times 10^{11} \\ - 0.814 \times 10^{11} \\ \hline 0.386 \times 10^{11} \end{array}$$

$$0.386 \times 10^{11}$$

a) £  $3.86 \times 10^9$  million [3]

b) Marcia says

The amount spent on healthcare per person in the UK doubled in 10 years.

Use the information in the table to comment on whether Marcia is correct.

$$2002 = \text{£/person} = \frac{8.14 \times 10^{10}}{5.94 \times 10^7} = \text{£}1370.370$$

$$2012 = \frac{1.45 \times 10^{11}}{6.37 \times 10^7} = 2276.295..$$

$$\begin{array}{r} 1370.37 \\ \times 2 \\ \hline 2740.74 \end{array}$$

Marcia is incorrect  $2276.30 < 2740.74$  [4]

9. The mass of Jupiter is  $1.899 \times 10^{27}$  kg.

The mass of Saturn is 0.3 times the mass of Jupiter.

(a) Work out an estimate for the mass of Saturn.

Give your answer in standard form.

$$1.899 \times 10^{27} \approx 2 \times 10^{27}$$

$$\begin{array}{r} J \quad S \\ 1.899 \times 10^{27} \quad 0.3 \times \\ \hline 6 \times 10^{26} \end{array}$$

..... kg [3]

$$S = 2 \times 10^{27} \times 0.3 = 0.6 \times 10^{27}$$

b) Give evidence to show whether your answer to (a) is an underestimate or an overestimate.

it is an overestimate because I rounded up the mass of Jupiter [1]

10. Which of these is not a square number?

Circle your answer.

$4 \times 10^2$

$4 \times 10^6$

$9 \times 10^3$

$9 \times 10^4$

$(2 \times 10)^2$

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

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

[1]

11. (a) Write 0.000 423 in standard form.

$4.23 \times 10^{-4}$

[1]

b) Write  $4.5 \times 10^4$  as an ordinary number.

$45000$

[1]

12. The surface gravity of a planet can be worked out using the formula

$$g = \frac{6.67 \times 10^{-11} m}{r^2}$$

where

$m$  kilograms is the mass of the planet

$r$  metres is the radius of the planet

For the Earth and Jupiter here are the values of  $m$  and  $r$ .

EARTH.

$$g = \frac{6.67 \times 10^{-11} \times 5.98 \times 10^{24}}{(6.378 \times 10^6)^2} = 9.8052346$$

JUPITER

$$g = \frac{6.67 \times 10^{-11} \times 1.9 \times 10^{27}}{(7.149 \times 10^7)^2} = 24.796412$$

Earth
$m = 5.98 \times 10^{24}$
$r = 6.378 \times 10^6$

Jupiter
$m = 1.90 \times 10^{27}$
$r = 7.149 \times 10^7$

Work out the ratio of the surface gravity of Earth to the surface gravity of Jupiter.

Write your answer in the form 1:  $n$

$$\begin{array}{ccc} E & : & J \\ 9.8052346 & : & 24.796412 \\ \div 9.8052346 & & \div 9.8052346 \\ 1 & : & 2.528895 \dots \\ \boxed{1 : 2.53} \end{array}$$

[3]

13.  $(6 \times 10^a) + (6 \times 10^b) + (6 \times 10^c) = 6006.6$

Write down a possible set of values of a, b and c.

6000  $6 \times 10^3$   
6.  $6 \times 10^0$   
0.6  $6 \times 10^{-1}$

a = .....3.....  
b = .....0.....  
c = .....-1..... [3]

14. Which of these has the greatest value? Circle your answer.

$6.15 \times 10^4$   
61500

61 499

$6.2 \times 10^3$   
6200

$61.6 \times 10^3$   
61600 [1]

15. A teacher asks Amy and Jack to convert 101 376 into standard form.

a) Amy writes  $10.1376 \times 10^4$

$1.01376 \times 10^5$

Criticise Amy's answer.

she hasn't used 'standard form' the first part should be 1 or more but less than 10 [1]

b) Jack writes  $1.01376 \times 10^{-5}$  Criticise Jack's answer.

it is not a negative power. It should be  $1.01376 \times 10^5$

[1]

## CREDITS AND NOTES

Q	Awarding Body	Q	Awarding Body	Q	Awarding Body
1	WJEC Eduqas	8	OCR	15	AQA
2	WJEC Eduqas	9	Pearson Edexcel		
3	AQA	10	AQA		
4	Pearson Edexcel	11	Pearson Edexcel		
5	Pearson Edexcel	12	Pearson Edexcel		
6	AQA	13	AQA		
7	Pearson Edexcel	14	AQA		

### Notes:

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board s (similarly any errors I have corrected from the originals are also my corrections and not theirs!).

Please also note that the layout in terms of fonts, answer lines and space given to each question does not reflect the actual papers to save space.

These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics "could" be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won't appear in the "live" papers from a specific exam board or that examination of a topic will be as shown in these questions.



### Links:

AQA <http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300>

OCR <http://ocr.org.uk/gcsemaths>

Pearson Edexcel <http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html>

WJEC Eduqas <http://www.eduqas.co.uk/qualifications/mathematics/gcse/>

### Contents:

This version contains questions from:

AQA – Sample Assessment Material, Practice set 1 and Practice set 2

OCR – Sample Assessment Material and Practice set 1

Pearson Edexcel – Sample Assessment Material, Specimen set 1 and Specimen set 2

WJEC Eduqas – Sample Assessment Material