

Name

Class



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# Standard form

(9 – 1) Topic booklet

## Higher

These questions have been collated from previous years GCSE Mathematics papers.

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1H** question you are not allowed to use a calculator.
- If the question is a **2H** or a **3H** question, you may use a calculator to help you answer.

### Information

- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

**Answer ALL questions**  
**Write your answers in the space provided.**  
**You must write down all the stages in your working.**



**1** (a) Write 468 000 in standard form.

.....  
(1)

(b) Write  $5.037 \times 10^{-4}$  as an ordinary number.

.....  
(1)

November 2023 – Paper 3H

**(Total for Question 1 is 2 marks)**

2 (a) (i) Write  $5.3 \times 10^4$  as an ordinary number.

.....  
(1)

(ii) Write  $7.4 \times 10^{-5}$  as an ordinary number.

.....  
(1)

(b) Calculate the value of  $9.7 \times 10^6 + 2.45 \times 10^7$   
Give your answer in standard form.

.....  
(2)

- 3 (a) Write  $4.5 \times 10^5$  as an ordinary number.



.....  
(1)

- (b) Write 0.007 in standard form.

.....  
(1)

- (c) Work out  $4.2 \times 10^3 + 5.3 \times 10^2$   
Give your answer in standard form.

.....  
(2)

4 (a) Write  $1.63 \times 10^{-3}$  as an ordinary number.

.....  
(1)

(b) Write 438 000 in standard form.

.....  
(1)

(c) Work out  $(4 \times 10^3) \times (6 \times 10^{-5})$   
Give your answer in standard form.

.....  
(2)

June 2022 – Paper 1H

(Total for Question 4 is 4 marks)

7 Work out  $(3.42 \times 10^{-7}) \div (7.5 \times 10^{-6})$   
Give your answer in standard form.



November 2019 – Paper 2H

.....  
(Total for Question 7 is 2 marks)

7 (a) Write 32 460 000 in standard form.



.....  
(1)

(b) Write  $4.96 \times 10^{-3}$  as an ordinary number.

.....  
(1)

Asma was asked to compare the following two numbers.

$$A = 6.212 \times 10^8 \quad \text{and} \quad B = 4.73 \times 10^9$$

She says,

“6.212 is bigger than 4.73 so  $A$  is bigger than  $B$ .”

(c) Is Asma correct?

You must give a reason for your answer.

.....  
.....  
.....  
(1)

7 (a) Write the number 0.000 086 23 in standard form.



.....  
(1)

(b) Work out  $\frac{3.2 \times 10^3 + 5.1 \times 10^{-2}}{4.3 \times 10^{-4}}$

Give your answer in standard form, correct to 3 significant figures.

.....  
(2)

November 2018 – Paper 2H

**(Total for Question 7 is 3 marks)**

7 Work out  $(13.8 \times 10^7) \times (5.4 \times 10^{-12})$   
Give your answer as an ordinary number.



November 2017 – Paper 3H

.....  
**(Total for Question 7 is 2 marks)**



8 (a) Write 0.00562 in standard form.

.....  
(1)

(b) Write  $1.452 \times 10^3$  as an ordinary number.

.....  
(1)

June 2019 – Paper 2H

(Total for Question 8 is 2 marks)

8 (a) Write  $7.97 \times 10^{-6}$  as an ordinary number.

.....  
(1)

(b) Work out the value of  $(2.52 \times 10^5) \div (4 \times 10^{-3})$   
Give your answer in standard form.

.....  
(2)

May 2017 – Paper 1H

(Total for Question 8 is 3 marks)



- 8 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.

..... kg  
 (3)

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

.....  
 .....  
 (1)

Specimen 1 – Paper 1H (Total for Question 8 is 4 marks)

- 8 Write 0.000068 in standard form.



Sample 1 – Paper 3H (Total for Question 8 is 1 mark)

- 9 Work out the value of  $(9 \times 10^{-4}) \times (3 \times 10^7)$   
 Give your answer in standard form.

Sample 1 – Paper 1H (Total for Question 9 is 2 marks)

- 9 Write these numbers in order of size.  
Start with the smallest number.

$$6.72 \times 10^5$$

$$67.2 \times 10^{-4}$$

$$672 \times 10^4$$

$$0.000\,672$$

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November 2020 – Paper 1H

(Total for Question 9 is 2 marks)

- 9 (a) Write  $6.75 \times 10^{-4}$  as an ordinary number.



---

(1)

(b) Work out  $\frac{2.56 \times 10^6 \times 4.12 \times 10^{-3}}{1.6 \times 10^{-2}}$

Give your answer in standard form.

---

(2)

---

November 2022 – Paper 3H

(Total for Question 9 is 3 marks)

9  $T = \sqrt{\frac{w}{d^3}}$

$$w = 5.6 \times 10^{-5}$$

$$d = 1.4 \times 10^{-4}$$



(a) Work out the value of  $T$ .

Give your answer in standard form correct to 3 significant figures.

$T = \dots\dots\dots$   
(2)

$w$  is increased by 10%

$d$  is increased by 5%

Lottie says,

“The value of  $T$  will increase because both  $w$  and  $d$  are increased.”

(b) Lottie is wrong.

Explain why.

(2)

- 10** A person's heart beats approximately  $10^5$  times each day.  
A person lives for approximately 81 years.



- (a) Work out an estimate for the number of times a person's heart beats in their lifetime.  
Give your answer in standard form correct to 2 significant figures.

.....  
(2)

$2 \times 10^{12}$  red blood cells have a total mass of 90 grams.

- (b) Work out the average mass of 1 red blood cell.  
Give your answer in standard form.

..... grams  
(2)

10 The table shows some information about eight planets.



Planet	Distance from Earth (km)	Mass (kg)
Earth	0	$5.97 \times 10^{24}$
Jupiter	$6.29 \times 10^8$	$1.898 \times 10^{27}$
Mars	$7.83 \times 10^7$	$6.42 \times 10^{23}$
Mercury	$9.17 \times 10^7$	$3.302 \times 10^{23}$
Neptune	$4.35 \times 10^9$	$1.024 \times 10^{26}$
Saturn	$1.28 \times 10^9$	$5.68 \times 10^{26}$
Uranus	$2.72 \times 10^9$	$8.683 \times 10^{25}$
Venus	$4.14 \times 10^7$	$4.869 \times 10^{24}$

(a) Write down the name of the planet with the greatest mass.

.....  
(1)

(b) Find the difference between the mass of Venus and the mass of Mercury.

..... kg  
(1)

Nishat says that Neptune is over a hundred times further away from Earth than Venus is.

(c) Is Nishat right?

You must show how you get your answer.

.....  
(2)

**10** 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	Jupiter
$m = 5.98 \times 10^{24}$	$m = 1.90 \times 10^{27}$
$r = 6.378 \times 10^6$	$r = 7.149 \times 10^7$

Work out the ratio of the surface gravity of Earth to the surface gravity of Jupiter.  
Write your answer in the form 1:  $n$

11 In May 2019, the distance between Earth and Mars was  $3.9 \times 10^7$  km.



In May 2019, a signal was sent from Earth to Mars.

Assuming that the signal sent from Earth to Mars travelled at a speed of  $3 \times 10^5$  km per second,

(a) how long did the signal take to get to Mars?

..... seconds  
(2)

The speed of the signal sent from Earth to Mars in May 2019 was actually less than  $3 \times 10^5$  km per second.

(b) How will this affect your answer to part (a)?

.....  
.....  
.....  
(1)

**11** 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 1 kg of uranium.

.....  
(3)

(b) Is your answer to (a) an underestimate or an overestimate?  
Give a reason for your answer.

.....  
.....  
(1)

Sample 1 – Paper 1H

**(Total for Question 11 is 4 marks)**



**19** (a) Write 0.000423 in standard form.

.....  
(1)

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

.....  
(1)

Specimen 1 – Paper 3H

**(Total for Question 19 is 2 marks)**