GCSE · Edexcel · Maths

3 hours 54 questions

Exam Questions

Powers, Roots & Standard Form

Powers & Roots / Laws of Indices / Converting to & from Standard Form / Operations with Standard Form

Easy (20 questions)	/41
Medium (18 questions)	/60
Hard (16 questions)	/52
Total Marks	**/153**

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Easy Questions

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

5^{-1}	0.5	-5	5^{0}

(2 marks)

2 Write down the value of $125^{\frac{2}{3}}$.

(1 mark)

3 Evaluate 3^{-2}.

(1 mark)

4 (a) Write 7.8×10^{-4} as an ordinary number.

(1 mark)

(b) Write $95\,600\,000$ as a number in standard form.

(1 mark)

5 Work out the value of $(7.5 \times 10^{4}) \times (2.5 \times 10^{3})$
Give your answer in standard form.

(2 marks)

6 Write 0.000068 in standard form.

(1 mark)

7 (a) Write 0.000423 in standard form.

(1 mark)

(b) Write 4.5×10^4 as an ordinary number.

(1 mark)

8 (a) Write 0.00562 in standard form.

(1 mark)

(b) Write 1.452×10^3 as an ordinary number.

(1 mark)

9 Write down the reciprocal of 5.

(1 mark)

10 (a) Write down the value of m, given that $3^4 \times 3^5 = 3^m$

$m =$ .....

(1 mark)

(b) Write down the value of n, given that $(5^3)^7 = 5^n$

$n =$ .....

(1 mark)

(c) Find the value of p, given that $\frac{7^8 \times 7^2}{7^p} = 7^6$

$p =$ .....

(2 marks)

11 Write $5^{17} \times 5^2$ as a single power of 5.

(1 mark)

12 (a) Write 2.46×10^6 as an ordinary number.

(1 mark)

(b) Write $0.000\ 74$ in standard form.

(1 mark)

13 Which one of these is a square number **and** a cube number?

A. 100

B. 1 000

C. 10 000

D. 1 000 000

(1 mark)

14 Choose the number that is written in standard form.

A. 0.9×10^{-3}

B. $6 \times 10^{0.5}$

C. 5.2×10^{-4}

D. 12×10^{7}

(1 mark)

15 (a) Write these numbers in standard form.

i) 6500

[1]

ii) 0.0584

[1]

(2 marks)

(b) Work out $(4.2 \times 10^5) \times (1.8 \times 10^{-2})$ giving your answer in standard form.

(1 mark)

16 Work out $(2 \times 10^3) \times (4 \times 10^4)$, giving your answer in standard form.

(2 marks)

17 Evaluate.

$8^{\frac{1}{3}}$

(1 mark)

18 (a) A grain of salt weighs 6.48×10^{-5} kg on average.

A packet contains 0.35 kg of salt.

Use this information to calculate the number of grains of salt in the packet.

(2 marks)

(b) Explain why your answer to part (a) is unlikely to be the actual number of grains of salt in the packet.

(1 mark)

19 Tom researches the weights of plant seeds.

- One poppy seed weighs 3×10^{-4} grams
- 250 pumpkin seeds weigh 21 grams.
- One sesame seed weighs 3.64×10^{-6} kilograms.

Write the three types of seed in order according to the weight of one seed.
Write the lightest type of seed first.
You must show how you decide.

(4 marks)

20 A newborn baby has an approximate mass of 3.5 kilograms.

A human cell has an approximate mass of 2.7×10^{-11} grams.

Use these values to estimate the number of human cells in a newborn baby.
Give your answer in standard form, correct to 2 significant figures.

(5 marks)

Medium Questions

1 One sheet of paper is 9×10^{-3}cm thick.

Mark wants to put 500 sheets of paper into the paper tray of his printer.
The paper tray is 4 cm deep.

Is the paper tray deep enough for 500 sheets of paper?
You must explain your answer.

(3 marks)

2 Write the following numbers in order of size.
Start with the smallest number.

0.038×10^{2}	3800×10^{-4}	380	0.38×10^{-1}

(2 marks)

3 (a) Write down the value of 10^{0}.

(1 mark)

(b) Write down the value of 10^{-2}.

(1 mark)

(c) Write these numbers in order of size. Start with the smallest number.

2.73×10^{3}	27.3×10^{-3}	273×10^{2}	0.00273

(2 marks)

4 (a) Write down the value of $100^{\frac{1}{2}}$.

(1 mark)

(b) Find the value of $125^{\frac{2}{3}}$.

(2 marks)

5 (a) Write down the value of $36^{\frac{1}{2}}$.

(1 mark)

(b) Write down the value of 23^0.

(1 mark)

(c) Work out the value of $27^{-\frac{2}{3}}$.

(2 marks)

6 (a) The table shows some information about eight planets.

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

Write down the name of the planet with the greatest mass.

(1 mark)

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

(1 mark)

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

Is Nishat right?
You must show how you get your answer.

(2 marks)

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

(2 marks)

8 (a) Write down the value of 10^0.

(1 mark)

(b) Write 6.7 x 10^{-5} as an ordinary number.

(1 mark)

(c) Work out the value of $(3 \times 10^7) \times (9 \times 10^6)$.
Give your answer in standard form.

(2 marks)

9 Calculate $9 \times 10^4 \times 3 \times 10^3$.
Give your answer in standard form.

(2 marks)

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

(2 marks)

11 (a) Work out the value of 25^{-3}.

(1 mark)

(b) Work out the value of 350^{3}.
Give your answer in standard form.

(2 marks)

12 Patrick has to work out the exact value of $64^{\frac{1}{4}}$
Patrick says,

$$\text{"}\frac{1}{4}\text{ of }64\text{ is }16\text{ so }64^{\frac{1}{4}}=16\text{"}$$

Explain what is wrong with what Patrick says.

(1 mark)

13 (a) The table shows information about the surface area of each of the world's oceans.

Ocean	Surface area in square kilometres
Pacific	1.56×10^{8}
Indian	6.86×10^{7}
Southern	2.03×10^{7}
Arctic	1.41×10^{7}
Atlantic	1.06×10^{8}

Work out the difference, in square kilometres, between the surface area of the Atlantic Ocean and the surface area of the Indian Ocean.
Give your answer in standard form.

.....square kilometres

(2 marks)

(b) The surface area of the Pacific Ocean is k times the surface area of the Arctic Ocean.

Work out the value of k.
Give your answer correct to the nearest whole number.

k = ...

(1 mark)

14 Write $\left(\sqrt[4]{8}\right)^5$ as a power of 2.

(3 marks)

15 You are given that $177147 = 3^{11}$

$3^n = 177147 \times 9^5$

Find the value of n.

(3 marks)

16 (a) Work out.

$\sqrt[3]{64} \times 2^{-1}$

(2 marks)

(b) $4.3 \times 10^5 + 3.8 \times 10^4$

Give your answer in standard form.

(3 marks)

17 Carol says that $64^{-\frac{1}{2}} = \frac{1}{32}$

Explain her error and give the correct value of $64^{-\frac{1}{2}}$ in the form $\frac{p}{q}$.

(3 marks)

18 (a) A company makes sweets.
The sweets are put into packets.

Here are some facts:

- 1.47×10^7 sweets are made every day
- 3.5×10^5 packets of sweets are produced every day

Calculate the mean number of sweets in one packet.

(2 marks)

(b) Sweets are made on 288 days each year.

Calculate the number of sweets made each year.
Give your answer in standard form.

(3 marks)

(c) The company has 152 machines making the sweets.
Each machine operates for 15 hours each day.

i) Calculate the number of sweets made by one machine each hour.
Give your answer as an ordinary number correct to the nearest 10.

[3]

ii) State one assumption you have made in part **(c)(i)**.

[1]

(4 marks)

Hard Questions

1 (a) Find the value of 2^{-3}.

(1 mark)

(b) $5\sqrt{5}$ can be written in the form 5^{k}.

Find the value of k.

(1 mark)

2 (a) Find the value of $81^{-\frac{1}{2}}$.

(2 marks)

(b) Find the value of $\left(\frac{64}{125}\right)^{\frac{2}{3}}$.

(2 marks)

3 (a) Write down the value of $64^{\frac{1}{2}}$.

(1 mark)

(b) Find the value of $\left(\frac{8}{125}\right)^{-\frac{2}{3}}$.

(2 marks)

4 (a) Find the value of $\sqrt[3]{8 \times 10^6}$.

(1 mark)

(b) Find the value of $144^{\frac{1}{2}} \times 64^{-\frac{1}{3}}$.

(2 marks)

(c) Solve $3^{2x} = \frac{1}{81}$.

(2 marks)

5 (a) Write $640\ 000\ 000$ in standard form.

(1 mark)

(b) Work out $(3 \times 10^7) \div (6 \times 10^4)$
Give your answer in standard form.

(2 marks)

6 (a) Write $5\,400\,000$ as a number in standard form.

(1 mark)

(b) Write 3.2×10^{-4} as an ordinary number.

(1 mark)

(c) The mass of the Sun is 2×10^{30} kg.
The mass of the largest known star is 315 times the mass of the Sun.

Work out the mass of this star.
Give your answer in kg in standard form.

(2 marks)

7 (a) Write 7.97×10^{-6} as an ordinary number.

(1 mark)

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

(2 marks)

8

$$p^2 = \frac{x - y}{xy}$$

$x = 8.5 \times 10^{9}$
$y = 4 \times 10^{8}$

Find the value of p.
Give your answer in standard form correct to 2 significant figures.

(3 marks)

9 (a)

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

$w = 5.6 \times 10^{-5}$
$d = 1.4 \times 10^{-4}$

Work out the value of T.
Give your answer in standard form correct to 3 significant figures.

(2 marks)

(b) 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."

Lottie is wrong.
Explain why.

(2 marks)

10 (a) Write 8.2×10^5 as an ordinary number.

(1 mark)

(b) Write 0.000 376 in standard form.

(1 mark)

(c) Work out the value of $(2.3 \times 10^{12}) \div (4.6 \times 10^3)$
Give your answer in standard form.

(2 marks)

11 Work out the value of $(3.5 \times 10^6) \div (5 \times 10^{-3})$.
Give your answer in standard form.

(2 marks)

12 Simplify $8^2 \times \sqrt[3]{4^6}$.

Give your answer in the form 2^a where a is an integer.

Show each stage of your working clearly.

(3 marks)

13 $a = 25 \times 10^{14n}$ where n is an integer.

Find an expression, in terms of n, for $a^{\frac{3}{2}}$

Give your answer in standard form.

(3 marks)

14 There are two errors in Sam's method for finding the value of $64^{-\frac{2}{3}}$ shown below.

Find the cube root of 64 and then multiply by 2.
The cube root of 64 is 4 and then $4 \times 2 = 8$.
The negative power makes the answer negative so answer equals -8.

Describe these errors and then give the correct value of $64^{-\frac{2}{3}}$.

Correct value .....

(3 marks)

15 Show that $\frac{\sqrt[3]{81}}{3}$ can be written as $3^{\frac{1}{3}}$.

(3 marks)

16 Work out the value of $64^{\frac{2}{3}} - \left(\frac{1}{3}\right)^{-2}$

(3 marks)