Name	Date started	Target end date

REVISE
.wales

2.03 — Indices & standard form

Spec 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.5 — Unit 2 (no calculator)

Index laws (multiplication, division, powers of powers), zero/negative/fractional indices, and standard form ($A \times 10^n$) including addition, subtraction, multiplication and division. Sourced from legacy WJEC GCSE Mathematics Higher non-calculator papers, organised for revision under the 2025 spec.

2025 SPECIFICATION

Estimated time for entire question pack: ~3 hours 14 minutes

*Derived from the GCSE Higher pace of **~1.5 min/mark** (129 marks across 51 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **focused single-topic practice pack**, not a single mock paper. Questions are organised against the 2025 specification. Questions are ordered chronologically by sitting, with custom-written and SAM questions at the end.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

*A calculator is **not** permitted on any question in this pack (Unit 2 is the non-calculator paper).*

Indices & standard form — what the new spec asks

WJEC GCSE Mathematics (first teaching 2025) · Unit 2: non-calculator.

Index laws 1.3.1

- $a^m \times a^n = a^{m+n}$
- $a^m \div a^n = a^{m-n}$
- $(a^m)^n = a^{mn}$

Zero, negative & fractional 1.3.2

- $a^0 = 1$ for any non-zero a.
- $a^{-n} = \dfrac{1}{a^n}$
- $a^{1/n} = \sqrt[n]{a}$, $a^{m/n} = (\sqrt[n]{a})^m$.

Standard form 1.3.3

- $A \times 10^n$ with $1 \leq A < 10$.
- Positive n: big numbers; negative n: small numbers.
- Convert to/from ordinary numbers by sliding the decimal point.

Calculations in standard form 1.3.4

- Add/subtract: convert to a common power of 10 first.
- Multiply: multiply the A's, add the indices.
- Divide: divide the A's, subtract the indices.
- Always re-normalise so $1 \leq A < 10$.

Crib sheet »

Indices & standard form in one page

Quick-reference notes — revisit before each question. Don't use during the questions.

Multiplying powers

$$a^m \times a^n = a^{m+n}$$

$6p^6 \times 3p^3 = 18p^9$.

Same base ⇒ add indices.

Dividing powers

$$a^m \div a^n = a^{m-n}$$

$3{\cdot}4g^8 \div 13{\cdot}6g^2 = 0{\cdot}25g^6$.

Subtract indices.

Power of a power

$$(a^m)^n = a^{mn}$$

$(\sqrt{7})^4 = 7^{4/2} = 7^2 = 49$.

Zero, negative, fractional

$a^0 = 1$ for any non-zero a.

$a^{-n} = \dfrac{1}{a^n}$.

$a^{1/n} = \sqrt[n]{a}$, e.g. $8^{1/3} = 2$.

$a^{m/n} = (\sqrt[n]{a})^m$.

Standard form

$$A \times 10^n, \text{ with } 1 \leq A < 10$$

$0{\cdot}00042 = 4{\cdot}2 \times 10^{-4}$.

$5{\cdot}41 \times 10^5 = 541\,000$.

Adding standard form

Convert to the same power of 10 first.

$(2{\cdot}3 \times 10^3) + (6{\cdot}4 \times 10^4)$

$= (0{\cdot}23 + 6{\cdot}4) \times 10^4 = 6{\cdot}63 \times 10^4$.

Multiplying standard form

$(2 \times 10^{-4}) \times (7{\cdot}8 \times 10^9)$

$= 15{\cdot}6 \times 10^5 = 1{\cdot}56 \times 10^6$.

Multiply the A's, add the indices, then re-normalise so $1 \leq A < 10$.

Solving for the index

$4 \times 2^{28} = 2^2 \times 2^{28} = 2^{30}$, so $n = 30$.

Re-express both sides as powers of the same base.

Common traps

- $a^0 = 1$ — *not* 0.
- Standard form needs $1 \leq A < 10$ — $15{\cdot}6 \times 10^5$ is not in standard form.
- Adding standard form: line up the powers of 10 first.

Examiner only

4. *(a)* Make m the subject of the formula $y = 6m + 7$. [2]

(b) Factorise $6x^2 - 12x$. [2]

5. Find, in standard form, the value of each of the following.

(a) $\dfrac{7{\cdot}5 \times 10^6}{5000}$ [2]

(b) $(2{\cdot}3 \times 10^3) + (6{\cdot}4 \times 10^4)$ [2]

Examiner only

9. Circle the correct answer for each of the following statements.

(a) $9^{-\frac{1}{2}}$ is equal to

-3 $-\frac{1}{3}$ $\frac{1}{4\frac{1}{2}}$ $-4\frac{1}{2}$ $\frac{1}{3}$ [1]

(b) $8^{\frac{2}{3}}$ is equal to

$5\frac{1}{3}$ 4 6 $8\frac{2}{3}$ $\frac{16}{24}$ [1]

10. The radius of a hemisphere and the radius of a cylinder are equal.
The hemisphere and cylinder have equal volumes.

Calculate the ratio of the height of the cylinder to the radius of the cylinder. [3]

height of cylinder : radius of cylinder

= ..... : .....

Examiner only

(c) Draw the line $y = -3$ on the graph paper.

Write down the values of x where the line $y = -3$ cuts the curve $y = x^2 - 5x + 2$.
Give your answers correct to 1 decimal place. [2]

Values of x are ..... and .....

3. (a) Express 700 as a product of its prime factors in index form. [3]

(b) The number 33 554 432 is equal to 2^{25}.

Explain how this tells you that 33 554 432 is not a square number. [1]

Examiner only

7. *(a)* A standard piece of A4 paper is usually 0·08 mm thick.
What is 0.08 mm written in **metres** in standard form?
Circle your answer. [1]

8×10^{4} 8×10^{-4} 8×10^{-3} 8×10^{3} 8×10^{-5}

(b) A piece of card is 1 mm thick.
A stack of these pieces of card is 3×10^{-2} metres high.

(i) Calculate how many pieces of card there are in the stack. [2]

(ii) What assumption have you made in answering *(b)*(i)? [1]

Examiner only

(c) In 2012 it was recorded that

- the total mass of the paper used for printing newspapers, in the world, was $2{\cdot}88 \times 10^7$ **tonnes**,
- the world population was approximately $7{\cdot}2 \times 10^9$ people.

Use this information to calculate the mass of paper per person used to print newspapers in 2012.
Give your answer in **kg per person**. [4]

Mass of paper: ..... kg per person

Examiner only

9. Calculate the value of $(5{\cdot}41 \times 10^5) + (2{\cdot}3 \times 10^4)$.
Give your answer in standard form. [2]

10. *In this question, you will be assessed on the quality of your linguistic and mathematical accuracy in writing.*

Rashid owned n sheep.
Eifion had exactly 4 times as many sheep as Rashid.

Rashid buys 17 extra sheep.
Eifion sells 8 of his sheep.

Eifion still has more sheep than Rashid.

Form an inequality, in terms of n.
Solve the inequality to find the **least** value of n.
You must show all your working. [5 + 1 W]

Examiner only

17. Circle the expression that is equivalent to $w^{-\frac{3}{5}}$. [1]

$-\left(\sqrt[3]{w}\right)^5$ $-\frac{3}{5}w$ $-\left(\sqrt[5]{w}\right)^3$ $\frac{1}{\left(\sqrt[5]{w}\right)^3}$ $\frac{1}{\left(\sqrt[3]{w}\right)^5}$

18. Solve the equation $x = \frac{7}{5x-3}$.

Give your answers correct to 2 decimal places. [5]

Examiner only

1. Simplify each of the following and circle the correct answer in each case.

(a) $6p^6 \times 3p^3$ [1]

$9p^9$ $9p^{18}$ $18p^{18}$ $18p^2$ $18p^9$

(b) $3{\cdot}4g^8 \div 13{\cdot}6g^2$ [1]

$\frac{g^4}{4}$ $\frac{g^6}{4}$ $4g^4$ $4g^6$ $0{\cdot}4g^6$

(c) $\frac{m^3 \times m^6}{m^9}$ [1]

1 m m^2 m^4 4

Examiner only

5. *(a)* Express 0·00042 in standard form. [1]

.....

(b) Calculate the value of $\frac{7{\cdot}2 \times 10^{6}}{2 \times 10^{-2}}$.

Give your answer in standard form. [1]

.....

.....

(c) Calculate the value of $(4{\cdot}7 \times 10^{5}) - (6{\cdot}2 \times 10^{4})$.

Give your answer in standard form. [2]

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Examiner only

15. *(a)* Express $0\cdot6\dot{4}\dot{2}$ as a fraction. [2]

(b) Evaluate $\left(\frac{1}{36}\right)^{-\frac{1}{2}}$. [2]

Examiner only

16. You are given that $p = \sqrt{40}$ and $q = \sqrt{10}$.
Circle the correct answer in each of the following:

(a) p is equal to [1]

$10\sqrt{4}$ $4\sqrt{10}$ $10\sqrt{2}$ $2\sqrt{10}$ 20

(b) pq is equal to [1]

$10\sqrt{40}$ $40\sqrt{10}$ 400 200 20

(c) q^5 is equal to [1]

$100\sqrt{10}$ $5\sqrt{10}$ $\sqrt{50}$ 625 $10\sqrt{100}$

Examiner only

5. *(a)* Calculate the value of $(2 \times 10^{-4}) \times (7{\cdot}8 \times 10^{9})$.
Give your answer in standard form. [2]

(b) Calculate the value of $\dfrac{3{\cdot}9 \times 10^{8}}{3000}$.
Give your answer in standard form. [2]

6. Factorise $12x^2 + 3xy$. [2]

Examiner only

10. Astronomers use astronomical units (AU) to describe distances in our solar system.
The distance between the Sun and the Earth is 1 AU.
1 AU is $1{\cdot}496 \times 10^8$ km, correct to 4 significant figures.

(a) The distance of Pluto from the Sun is $5{\cdot}913 \times 10^9$ km, correct to 4 significant figures.

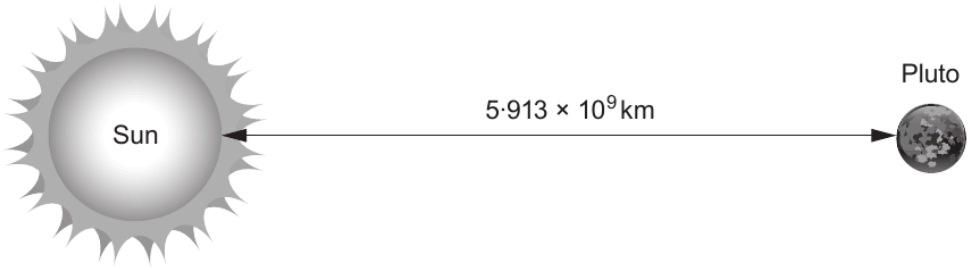

Diagram not drawn to scale

Siôn says that the distance of Pluto from the Sun is less than 50 AU.

Using **suitable** approximations, estimate the distance of Pluto from the Sun, in AU, to show that Siôn is correct.
You must show all your working. [2]

(b) A light year is the distance light travels in one year.

1 light year is approximately 63 000 AU.

Estimate the length of a light year in km.
Give your answer in standard form. [3]

Examiner only

14. Circle the correct answer for each of the following statements.

(a) $9^{\frac{3}{2}}$ is equal to [1]

6 $\frac{21}{2}$ $\frac{27}{2}$ 27 $\frac{729}{2}$

(b) $10000^{-\frac{1}{4}}$ is equal to [1]

-10000 -2500 $\frac{1}{2500}$ $\frac{1}{100}$ $\frac{1}{10}$

Examiner only

4. *(a)* *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Luned's tent is in the shape of a triangular prism.
The cross-section of her tent is an isosceles triangle.

She noted a few measurements on a diagram of her tent, as shown below.

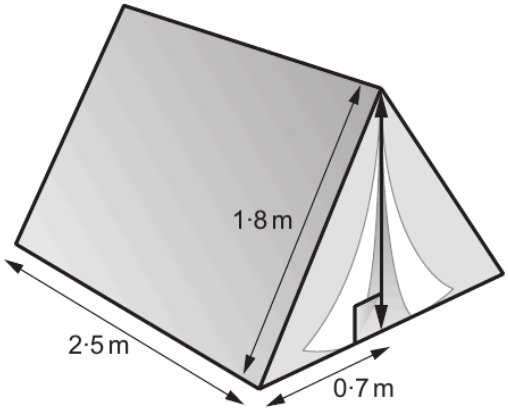

Diagram not drawn to scale

Calculate the volume of Luned's tent.
Give your answer in m^3.
You must show all your working. [5 + 2 OCW]

Volume of Luned's tent is ..... m^3

(b) Which of the following is equal to $0{\cdot}2\,m^3$?
Circle your answer. [1]

$20\,cm^3$ $200\,cm^3$ $2000\,cm^3$ $200\,000\,cm^3$ $2\,000\,000\,cm^3$

Examiner only

6. *(a)* Circle the correct answer for each of the following statements.

(i) $\left(\sqrt{7}\right)^4$ is equal to [1]

$\sqrt{28}$ 28 $\sqrt{14}$ 14 49

(ii) 12^0 is equal to [1]

0 1 1·2 12 120

(iii) $\sqrt{3^2 \times 5^2}$ is equal to [1]

35^2 15^2 15 35 15^4

(iv) 3^{-4} is equal to [1]

-12 $\frac{1}{81}$ -81 $\frac{1}{12}$ $\frac{3}{4}$

(b) 4×2^{28} can be written as 2^n.
What is the value of n? [2]

$n =$ .....

3300U501
07

Examiner only

8. Heledd is the captain of a cargo ship. She is planning her next voyage.

(a) Heledd has been employed to deliver 3×10^5 tonnes of sand.

Heledd needs to know the volume of the sand before the sand can be loaded on to the ship.
She has been given the following information about the sand:

Mass of a grain of sand	Volume of a grain of sand
$1{\cdot}2 \times 10^{-3}$ grams	$0{\cdot}32\,\text{mm}^3$

(i) Calculate the number of grains of sand in 3×10^5 tonnes of sand.
Give your answer in standard form. [3]

.....

.....

.....

.....

(ii) Calculate the volume of the 3×10^5 tonnes of sand in $\mathbf{m^3}$. [3]

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..... m^3

Examiner only

(b) Heledd has been given the following instructions for her voyage:

- From port *A*, sail 200 km due south to port *B*.
- From port *B*, sail due east to port *C*.
- From port *C*, sail on a bearing of 318° back to port *A*.

Use the space below to draw a sketch of the ship's voyage.

Calculate the distance from port *C* directly back to port *A*. [4]

Examiner only

(c) The last time the cargo ship was unloading sand in port *B*, it took 3 cranes 45 hours to unload 250 000 tonnes of sand.

Port *B* now has 5 cranes.
Calculate the time it will take 5 cranes to unload 300 000 tonnes of sand.

You can assume that all cranes unload sand at the same rate, and that all other conditions remain the same.

Give your answer in **hours** and **minutes**.
You must show all your working.

[4]

Time it will take is ..... hours and ..... minutes

Examiner only

10. A googol is the number 1×10^{100}.
Circle the value that is 90% of a googol. [1]

1×9^{100} 1×10^{90} 1×9^{90} 9×10^{90} 9×10^{99}

.....

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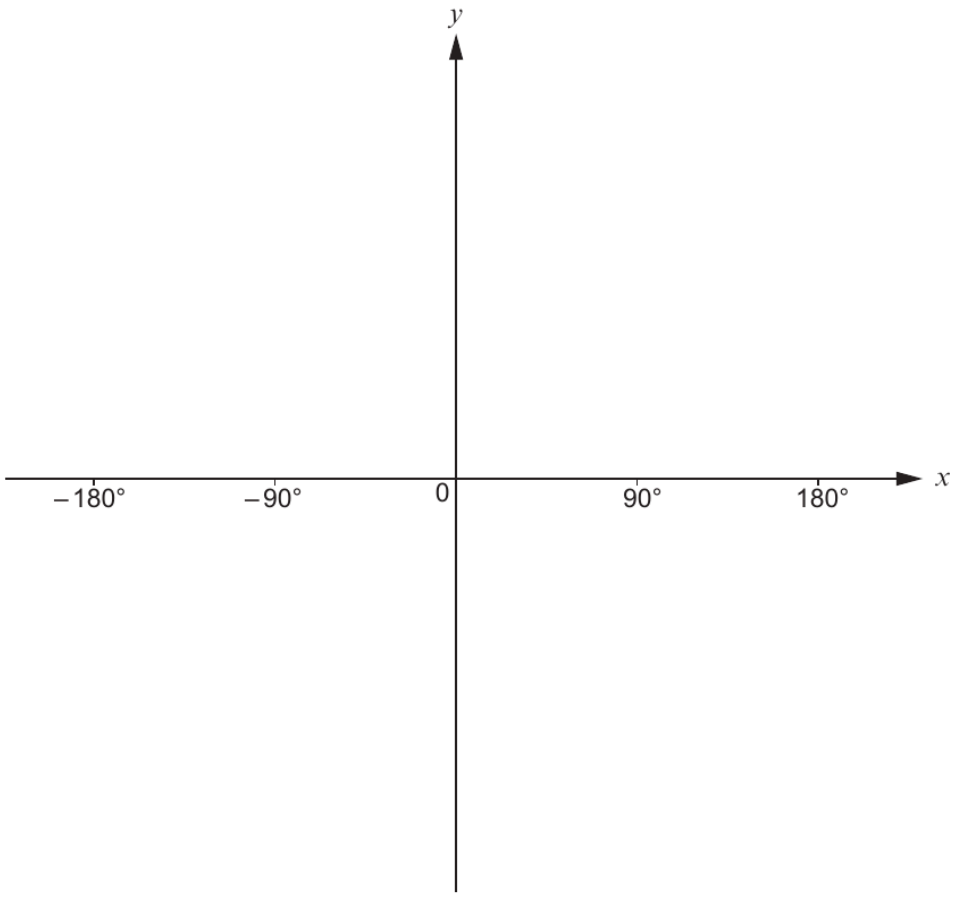
.....

11. Sketch the curve $y = \tan x$, for values of x in the range $x = -180°$ to $x = 180°$. [2]



Examiner only

5. You are given that:
1 gigalitre = 1 000 000 m^3
1 megalitre = 1 million litres

Lake Vyrnwy is a reservoir in mid Wales.

(a) Lake Vyrnwy can release between 25 and 45 megalitres of water per day from the dam.

The lake also supplies water through underground pipes to another reservoir at a rate of 230 000 m^3 per day.

(i) How many litres are there in 25 megalitres?
Circle your answer. [1]

25×10^8 25×10^{-6} 25×10^7 $2{\cdot}5 \times 10^6$ $2{\cdot}5 \times 10^7$

(ii) Which is the best estimate for the volume of water passing through the underground pipes **per hour**?
Circle your answer. [1]

8500 m^3 9600 m^3 10 040 m^3 10 400 m^3 11 000 m^3

Examiner only

(b) Lake Vyrnwy has a surface area of approximately 4 540 000 m^2.
Lake Vyrnwy contains 59·7 gigalitres of water.

Calculate an estimate of the average depth of the lake.
Give your answer in metres.

[3]

Estimate of average depth is ..... m

Examiner only

7. *(a)* (i) A mass is written as 430 kg, correct to the nearest 10 kg.
Circle the **least** possible value of this mass. [1]

420 kg 425 kg 429·5 kg 426 kg 424·9 kg

(ii) A time period is written as 22 seconds, correct to the nearest second.
Circle the **least** possible value of this time period. [1]

22 s 20 s 21 s 21·5 s 21·4 s

(iii) A population is written as 85 people, correct to the nearest five people.
Circle the **least** possible value of this population. [1]

83 people 81 people 84 people 82 people 80 people

(b) Calculate $(3{\cdot}4 \times 10^{-5}) \times 700$.
Give your answer in standard form. [2]

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Examiner only

13. *(a)* Express $0\dot{2}4\dot{8}$ as a fraction. [2]

(b) Evaluate $\left(\frac{1}{27}\right)^{-\frac{2}{3}}$. [2]

Examiner only

4. Circle the correct answer for each of the following.

(a) $81 =$ [1]

3^3 9^3 9^4 18^2 3^4

.....

.....

(b) $2{\cdot}1^5 =$ [1]

32·5 10·5 40·84101 30·84101 32·1

.....

.....

(c) $(12{\cdot}96)^{\frac{1}{2}} =$ [1]

6·48 3·6 4·32 3·3 2·16

.....

.....

Examiner only

14. *(a)* Express $0\dot{4}\dot{7}\dot{5}$ as a fraction. [2]

(b) Circle the correct answer for the following statement. [1]

$16^{-\frac{3}{4}}$ is equal to

-12 $\frac{1}{8}$ -8 $\frac{1}{12}$ $-16{\cdot}75$

Examiner only

7. Calculate the value of $(3{\cdot}2 \times 10^{7}) \times (8{\cdot}3 \times 10^{-2})$.
Give your answer in standard form. [2]

8. The lengths of the sides of a rectangle are given as 24 cm and 15 cm.
Each measurement is given correct to the nearest centimetre.

Calculate the difference between the greatest possible perimeter of the rectangle and the least possible perimeter of the rectangle. [3]

Examiner only

11. Write 16^{100} in the form 2^n. [2]

12. Calculate the perpendicular height of a cone with a volume of $5533\,\text{cm}^3$ and a base area of $825\,\text{cm}^2$. [3]

Examiner only

11. *(a)* Circle the expression which is equivalent to $m^{\frac{2}{3}}$. [1]

$\frac{1}{3}m^2$ $2m^{\frac{1}{3}}$ $\frac{2}{3}m$ $\left(\sqrt[3]{m}\right)^2$ $\left(\sqrt{m}\right)^3$

(b) Circle the expression which is equivalent to $p^{\frac{3}{4}} \times p^{-\frac{1}{4}} \div p^{\frac{1}{4}}$. [1]

$p^{-\frac{1}{4}}$ $p^{-\frac{3}{64}}$ $p^{\frac{5}{4}}$ $p^{\frac{3}{4}}$ $p^{\frac{1}{4}}$

12. Express the following as a single fraction in its simplest form. [3]

$$\frac{6}{3x-5} - \frac{4}{2x+1}$$

Examiner only

5. *(a)* Rearrange the following formula to make k the subject.

$$p = 3k + 2$$ [2]

(b) Does the midpoint of the straight line joining points (3, 15) and (7, 19) lie on the line $y = 3x + 2$?
You must show all your working. [3]

6. *(a)* Express 0·0058 in standard form. [1]

(b) Calculate the value of $\dfrac{1{\cdot}4 \times 10^9}{2 \times 10^3}$.
Give your answer in standard form. [2]

Examiner only

14. *(a)* Evaluate $4^{-\frac{3}{2}}$. [2]

(b) Evaluate $\frac{1}{3} + 0{\cdot}0\dot{2}$.

Express your answer as a fraction. [3]

Examiner only

14. Triangle ABC is shown below.

The length of AC is $(x - 1)$ cm.
The length of BC is $(2x + 3)$ cm.
The size of $\hat{ACB}$ is 30°.

The area of triangle ABC is 6 cm^2.

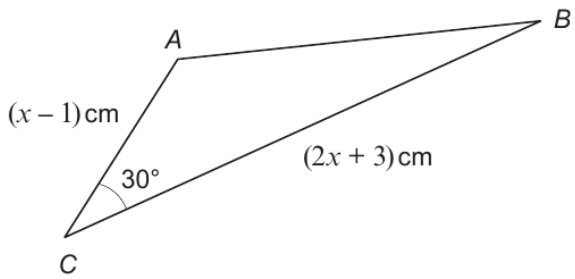


Diagram not drawn to scale

(a) Show that [3]

$$2x^2 + x - 27 = 0.$$

Examiner only

(b) Solve the equation

$$2x^2 + x - 27 = 0.$$

You must use an algebraic method and show all your working.
Give your answers correct to 2 decimal places. [3]

(c) Evaluate the length of *AC*.
You must justify any decision that you make. [2]

Examiner only

16. You are given that $c = \sqrt{18}$, $d = \sqrt{12}$ and $e = \sqrt{3}$.
Circle the correct answer in each of the following:

(a) c is equal to [1]

$2\sqrt{3}$ $3\sqrt{2}$ 4·5 9 $9\sqrt{2}$

(b) $\frac{d}{e}$ is equal to [1]

$\frac{1}{2}$ $\sqrt{2}$ 2 $\sqrt{6}$ 4

(c) e^5 is equal to [1]

$\sqrt{15}$ 5 $5\sqrt{3}$ $9\sqrt{3}$ 15

Examiner only

5. (a) Factorise $8x^2 + 6xy$. [2]

(b) (i) Factorise $x^2 + 13x + 40$. [2]

(ii) Explain how you can check that your answer to part (i) is correct. [1]

6. Calculate $5{\cdot}7 \times 10^5 \times 6{\cdot}4 \times 10^{-2}$.
Circle the correct answer. [1]

$3{\cdot}648 \times 10^8$ $3{\cdot}648 \times 10^4$ $-3{\cdot}648 \times 10^6$ $3{\cdot}648 \times 10^3$ $3{\cdot}648 \times 10^6$

Examiner only

7. Circle the correct answer for each of the following statements.

(a) $7{\cdot}2\,m^3$ is equal to [1]

$720\,cm^3$ $72\,000\,cm^3$ $7{\cdot}2 \times 10^5\,cm^3$ $7{\cdot}2 \times 10^3\,cm^3$ $7{\cdot}2 \times 10^6\,cm^3$

(b) $36^{\frac{1}{2}}$ is equal to [1]

18 6 $\frac{1}{18}$ $\frac{1}{6}$ $\frac{1}{36}$

8. Find the value of $\frac{\square\square\square\square\square}{\square\square \times \square\square^{\square}}$.

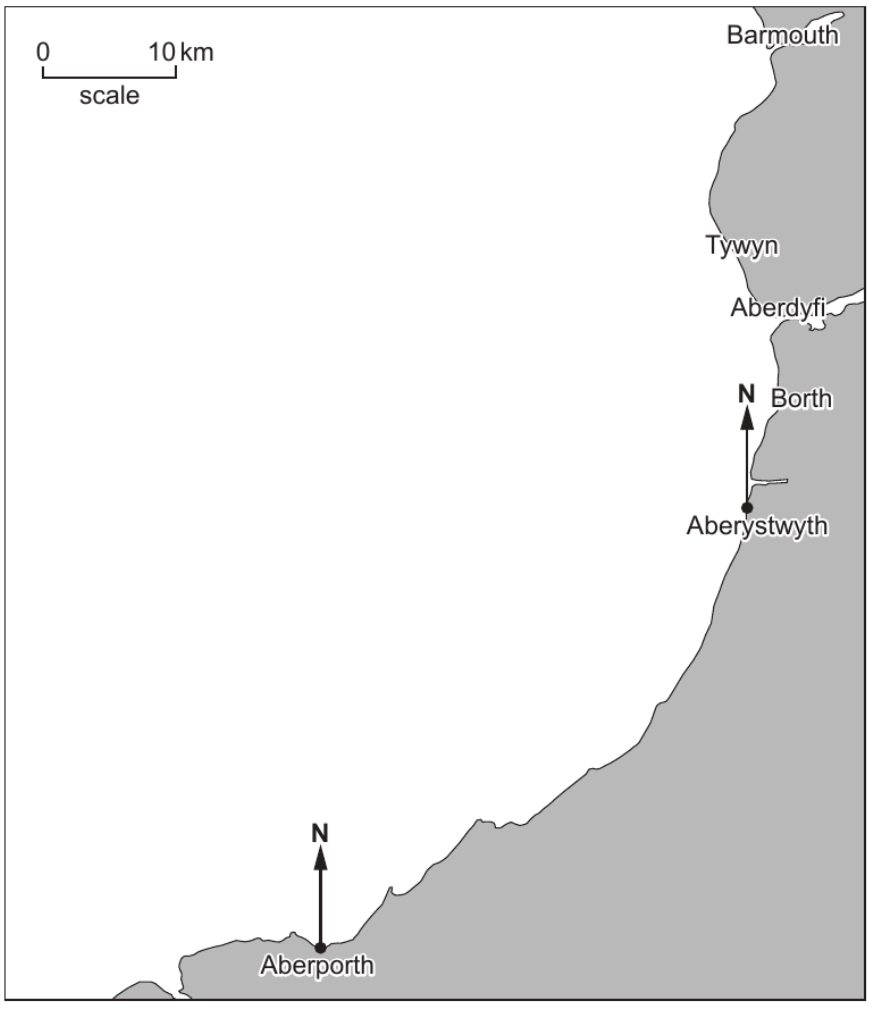
Write your answer as a decimal. [2]

Examiner only

2. Whales are sometimes spotted in the Irish Sea, off the west coast of Wales.

A minke whale was spotted on a bearing of:

- 010° from Aberporth
- 280° from Aberystwyth.



(a) Scientists decide to search for other whales in the Irish Sea.
The search area is the region within 20 km of the position where the minke whale was spotted.

Using the scale given, show this search area on the map above. [4]

.....

.....

Examiner only

(b) This minke whale has a length of 20 feet.

Remember: 1 inch ≈ 2·5 cm, 1 foot = 12 inches

Use these facts to complete the following statement. [3]

The minke whale has a length of ..... metres.

(c) The brain of a minke whale has 12·8 billion neocortical neurons.
A female human brain has 19 billion neocortical neurons.

Remember: 1 billion = 1000 million

(i) Calculate an **estimate** for the number of neurons in a minke whale brain expressed as a percentage of the number of neurons in a female human brain.
You must show all your working. [2]

Approximately ..... %

(ii) 10% of all neocortical neurons are lost over a human lifespan.
Calculate the number of neocortical neurons in a female human brain at the end of a lifespan.
Give your answer in standard form. [4]

Examiner only

7. (a) Calculate the value of $(3\times10^{4})\div(6\times10^{-3})$.
Give your answer in standard form. [2]

(b) Calculate the value of $(4\cdot78\times10^{4})+(1\cdot5\times10^{2})$.
Give your answer in standard form. [2]

Examiner only

15. (a) Express $0\cdot\dot{6}\dot{5}\dot{4}$ as a fraction. [2]

(b) Evaluate $27^{-\frac{2}{3}}$. [2]

Examiner only

17. Evaluate the mean of the following three numbers:

$$\sqrt{20} \qquad \left(\sqrt{5}\right)^3 \qquad 11\sqrt{5}$$

Express your answer in the form $a\sqrt{5}$, where a is an integer. [3]

Examiner only

9. (a) Express 0·0076 in standard form. [1]

(b) Calculate the value of $(3 \times 10^{17}) \times (2 \times 10^{-12})$.
Give your answer in standard form. [1]

(c) Calculate the value of $(2{\cdot}3 \times 10^{4}) + (5 \times 10^{3})$.
Give your answer in standard form. [2]

Examiner only

3. Jac is planning to visit the Empire State Building in New York.

(a) Planners had an original budget of $60 million to construct the Empire State Building.
It actually cost $41 000 000 to construct.

Complete the following statement.
Give your answer correct to 2 decimal places. [3]

Constructing the Empire State Building cost ..... % less than the original budget.

(b) More than 4 million people visit the Empire State Building each year.
What is 4 million written in standard form?
Circle your answer. [1]

4×10^{-5} $0\cdot4\times10^{5}$ 4×10^{5} 4×10^{6} 4×10^{7}

Examiner only

(c) *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

The conversion rate at the exchange shop is £1 = $1.25.
The exchange shop only has $10 notes and $50 notes.

Jac has exactly £350.
He wants to exchange as close to £350 as possible for US dollars ($).
He asks for as **few** notes as possible.

Calculate:
- how many $10 notes and how many $50 notes Jac gets
- how much he pays for his currency.

You must show all your working. [6 + 2 OCW]

Examiner only

12. Triangle ABC has sides $AB = 36{\cdot}1$ cm and $AC = 13{\cdot}8$ cm, as shown below.
$B\hat{A}C = 29°$.

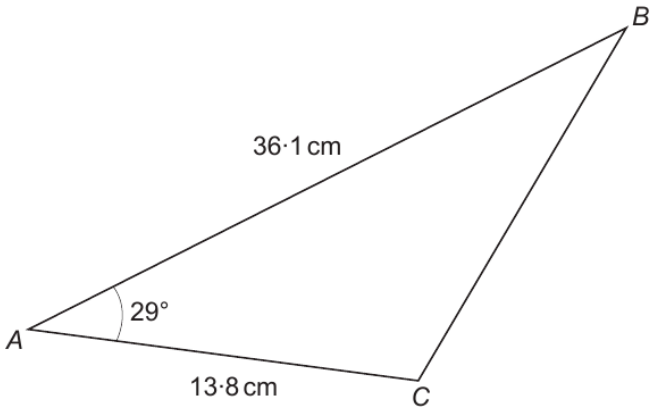


Diagram not drawn to scale

Calculate the length of the side BC. [3]

13. Calculate the cube root of 8×10^{216}.
Circle the correct answer. [1]

2×10^{6} 2×10^{72} 2×10^{216} 8×10^{6} 8×10^{72}

Examiner only

16. (a) Circle the correct answer for each of the following statements.

(i) $64^{\frac{2}{3}}$ is equal to [1]

$\frac{128}{3}$ 96 $\frac{194}{3}$ 16 512

(ii) $10000^{-\frac{1}{2}}$ is equal to [1]

$-\frac{1}{100}$ $\frac{1}{100}$ -5000 -100 $\frac{1}{5000}$

(b) Express $0{\cdot}07\dot{1}\dot{4}$ as a fraction. [2]

Examiner only

(c) Simplify $\sqrt{11\frac{1}{4}}$.

Give your answer in the form $\frac{a\sqrt{5}}{b}$, where a and b are integers. [2]

(d) Give an example of an irrational number that lies between 6 and 7. [1]

My example of an irrational number is .....

Examiner only

1. (a) Write the reciprocal of 4 as a decimal. [1]

(b) Estimate the value of $\frac{79{\cdot}34}{40{\cdot}1 \times 0{\cdot}48}$.

You must show all your approximations in your working. [2]

(c) Evaluate

$$1\frac{5}{7} + 2\frac{11}{14}.$$

Give your answer in its simplest form. [3]

Examiner only

7. (a) Express 0·0057 in standard form. [1]

(b) Calculate the value of $\frac{2\times10^{4}}{5\times10^{-3}}$.

Give your answer in standard form. [2]

8. A car travels a distance of x miles in 2 hours.
In the next hour, it travels a further distance of 36 miles.

Its average speed for the whole journey is 42 mph.

Calculate the value of x.
You must show all your working. [3]

Examiner only

8. Factorise $x^2 + 3x - 40$, and hence solve $x^2 + 3x - 40 = 0$. [3]

9. a and b are two numbers, where $b > a$.

The mean of the two numbers is equal to the range of the two numbers.

Show that $3a = b$. [3]

Examiner only

10. Aled and Berwyn share £x in the ratio 2 : 3.

(a) Aled's share of the money is £0·4x.
What is Berwyn's share of the money in terms of x? [1]

(b) Carys and Delyth share the same amount, £x, in the ratio 3 : 7.

Show that one of these four people receives the same amount as the combined total of two of the other people. [3]

11. Write $\frac{1}{4} \times 2^{400}$ in the form 2^n. [1]

Examiner only

14. Factorise $2x^2 - 17x + 30$. [2]

15. (a) Circle the correct answer in each of the following questions:

(i) $\sqrt{20}$ is equal to [1]

$5\sqrt{2}$ $2\sqrt{5}$ 10 $5\sqrt{4}$ $4\sqrt{5}$

(ii) $\sqrt{2} + \sqrt{50}$ is equal to [1]

$\sqrt{52}$ 10 $6\sqrt{2}$ 26 $26\sqrt{2}$

(b) When $q = \sqrt{18}$, which **one** of the following produces a rational number? Circle your answer. [1]

$\sqrt{q}$ $\frac{q}{2}$ $q - 2$ q^4 $18q$

Examiner only

13. Prove that $(8n+1)^2-3$ is always an even number, for all integers n.
You must use an algebraic method. [3]

14. Evaluate $\left(\frac{4}{3}\right)^{-1}+16^{-\frac{3}{4}}$. [3]

Examiner only

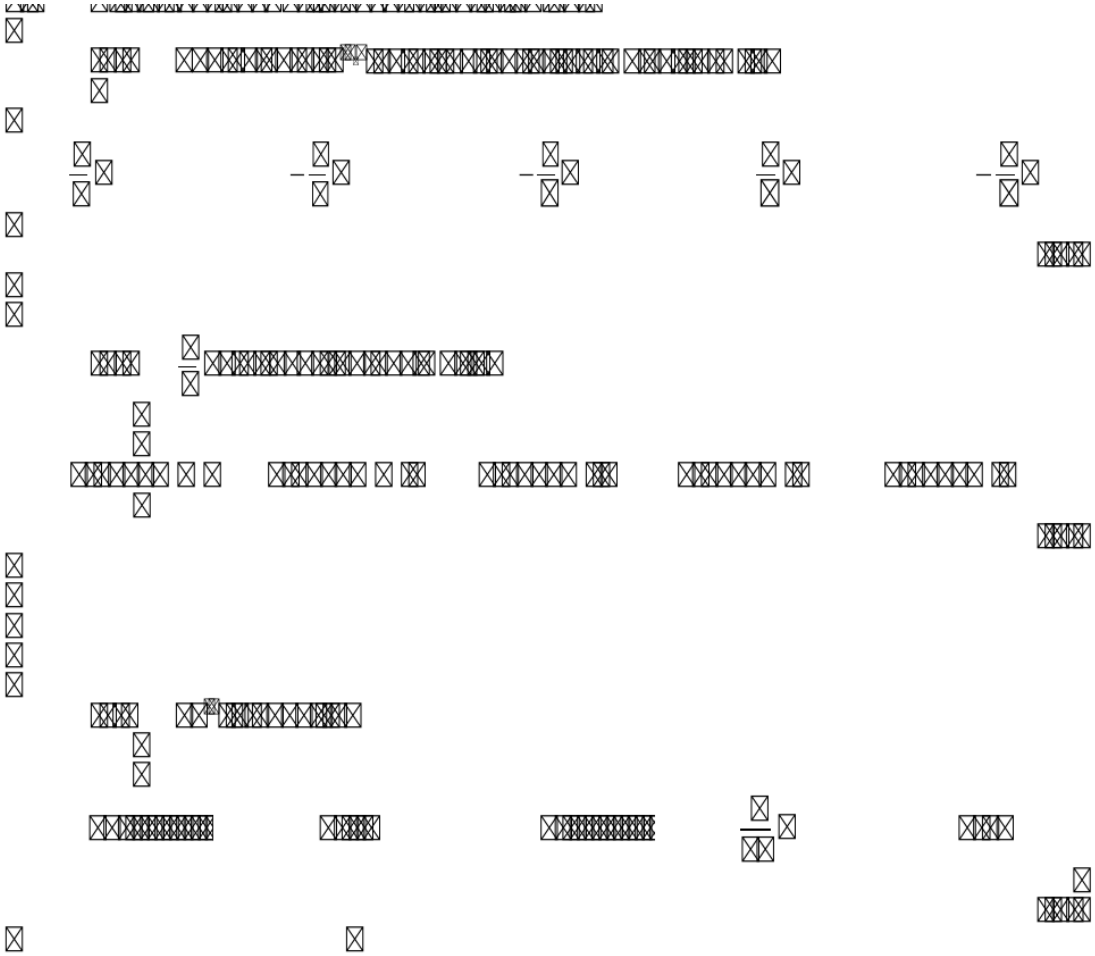
17. Circle the expression that is equivalent to $(m^{64})^{\frac{3}{2}}$. [1]

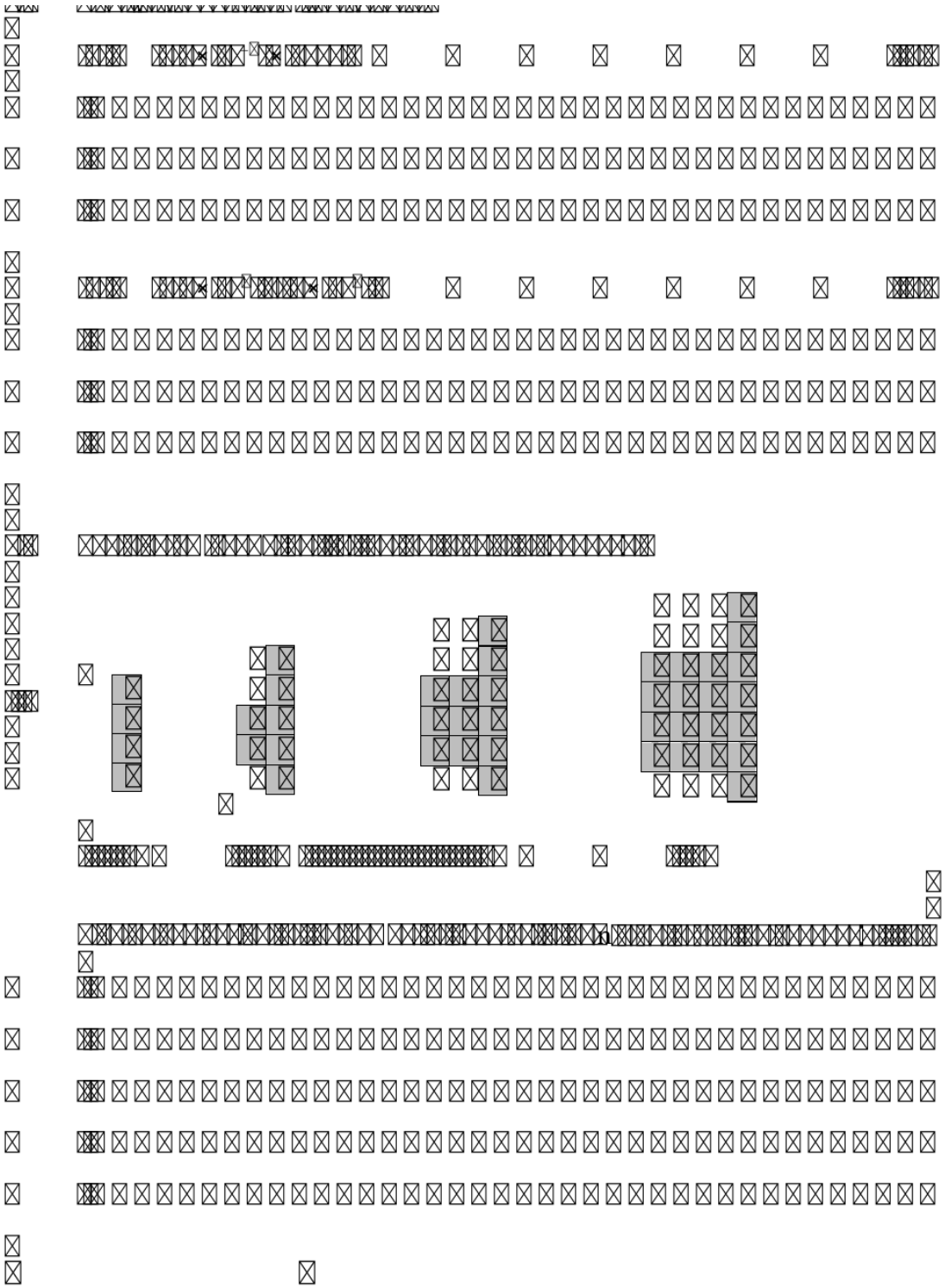
m^{16} $m^{\frac{125}{2}}$ $m^{\frac{131}{2}}$ m^{96} m^{512}

.....

.....

.....





$(2a^3)^4$

$2a^{12}$ $8a^{12}$ $16a^7$ $16a^{12}$ $24a^{34}$

$h^2 = a^2 + b^2$

$h - a$ $\pm\sqrt{(h^2 - a^2)}$ $h^4 - a^4$ $\frac{(h^2 - a^2)}{2}$ $\frac{\pm\sqrt{(h^2 - a^2)}}{2}$

$= a + b\sqrt{}$,