Name	Date started	Target end date

WJEC Level 2 Additional Mathematics — Question Pack

Applying the laws of indices — including negative and fractional powers — to evaluate expressions without a calculator.

REVISE
.wales

Indices & powers (non-calculator)

Algebra · Level 2 Certificate (9550) · calculator allowed

Applying the laws of indices — including negative and fractional powers — to evaluate expressions without a calculator.

LEVEL 2 · 9550

Estimated time for entire question pack: ~58 minutes

*At the Additional Maths pace of **~1.2 min/mark** (48 marks across 10 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. It gathers every question on this topic from the 2011–2024 papers.

Questions are ordered by year, newest first.

INSTRUCTIONS

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

A calculator is allowed throughout this qualification.

Indices & powers (non-calculator) — what's examined

WJEC Level 2 Additional Mathematics (9550) · single written paper, calculator allowed.

Index laws Number

- Multiply: add the powers. Divide: subtract.
- Power of a power: multiply.
- Anything to the power 0 is 1.

Negative & fractional Number

- $a^{-n} = 1/a^{n}$.
- a^(1/n) is the n-th root.
- a^(m/n) = (n-th root of a) to the power m.

Evaluating Method

- Deal with the root first, then the power.
- Keep answers exact.
- Show the index manipulation.

Crib sheet »

Indices & powers (non-calculator) in one page

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

The laws

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

Negative power

$$a^{-n} = 1 / a^n$$

Fractional power

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

Worked

$27^{(-2/3)} = 1 / (\sqrt[3]{27})^2 = 1/3^2 =$ **1/9**.

2. Simplify **each** of the following.

(a) $\left(x^{\frac{1}{8}} \times 2x^{\frac{3}{8}}\right)^{10}$ [2]

(b) $x^{-\frac{1}{5}}\left(7x^{\frac{3}{5}} - 6x^{-\frac{4}{5}}\right)$ [2]

3. **Do not use a calculator** to answer this question.

The area of a trapezium is $\left(20+4\sqrt{5}\right)\text{cm}^2$.

The lengths of the parallel sides are $\left(1+\sqrt{5}\right)$cm and $\left(6+2\sqrt{5}\right)$cm.

Calculate the perpendicular height of the trapezium.
Give your answer in the form $a+b\sqrt{5}$, where a and b are integers.

You must show all your working. [6]

3. Simplify **each** of the following.

(a) $3x^{\frac{1}{5}} \times 4x^{\frac{1}{2}}$ [1]

(b) $\left(x^{\frac{1}{4}} \times x^{\frac{3}{4}}\right)^5$ [1]

(c) $x^{-\frac{1}{4}}\left(2x^{\frac{1}{4}} + 5x^{\frac{3}{4}}\right)$ [2]

4. Simplify each of the following.

(a) $2x^{\frac{3}{8}} \times 3x^{\frac{1}{4}}$ [1]

(b) $\left(x^{\frac{4}{5}} \times x^{\frac{1}{5}}\right)^3$ [1]

(c) $x^{-\frac{1}{8}}\left(5x^{\frac{1}{8}} + 7x^{\frac{5}{8}}\right)$ [2]

6. *(a)* **Do not use a calculator** to answer this question.

Simplify $\frac{2}{6+\sqrt{3}}$.

Give your answer in the form $\frac{a+b\sqrt{c}}{d}$ where a, b, c and d are integers.

You **must** show all your working. [3]

(b) Showing all your working, simplify each of the following.

(i) $\frac{y^{-\frac{3}{5}} \times y^{\frac{4}{5}}}{y^{\frac{3}{4}}}$. [2]

(ii) $\frac{x^{\frac{2}{7}} + 6x^{\frac{3}{7}}}{2x^{\frac{2}{7}}}$. [2]

7. *(a)* Find the remainder when $x^3 + 8x^2 - 2x + 6$ is divided by $x - 3$. [2]

(b) (i) Show that $x + 3$ is a factor of $x^3 + x^2 - 41x - 105$. [2]

(ii) **Hence** factorise $x^3 + x^2 - 41x - 105$. [4]

3. **Do not use a calculator** to answer this question.
All working must be shown.

(a) Find the value of $(4^{\frac{1}{4}})^{-12}$.

You must show all your working. [2]

(b) Rationalise the denominator in the following expression.

$$\frac{1}{12-\sqrt{11}}$$

You must show all your working. [2]

4. Simplify each of the following.

(a) $5x^{\frac{3}{5}} \times 6x^{\frac{4}{5}}$ [1]

(b) $(6x^{\frac{4}{5}} \times 6x^{\frac{4}{5}})^{\frac{1}{2}}$ [1]

(c) $\dfrac{6x^{\frac{2}{7}} + 3x^{\frac{4}{7}} + 6x^{\frac{1}{7}}}{6x^{\frac{1}{7}}}$ [2]

16. Without using a calculator, find the value of $(12^{\frac{1}{2}})^4$.
Show all your working. [1]

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6. *(a)* Simplify $\frac{5}{3+\sqrt{2}}$, leaving your answer in surd form.

Do not use a calculator to answer this question.
You must show all your working. [3]

(b) Showing all your working, simplify each of the following.

(i) $\frac{3x^{-\frac{7}{4}} \times 2x^{\frac{17}{4}}}{x^{\frac{3}{2}}}$ [2]

(ii) $\frac{28x^{\frac{1}{7}} + 7x^{\frac{2}{7}}}{7x^{\frac{1}{7}}}$ [2]

7. The coordinates of the points *D* and *E* are (–1, 13) and (5, 5) respectively.

(a) Calculate the length of the line *DE*. [2]

(b) Find the gradient of the straight line that passes through points *D* and *E*. [2]

(c) Find the equation of the straight line that passes through points *D* and *E*.
Express your answer in the form $ax + by = c$, where a, b and c are whole numbers. [4]

14. *(a)* Showing all your working, find the value of $(50^{\frac{1}{2}})^4$.

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[1]

(b) Showing all your working, simplify each of the following.

(i) $\dfrac{3x^{-\frac{5}{4}} \times 4x^{\frac{7}{4}}}{x^{\frac{3}{2}}}$

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[2]

(ii) $\dfrac{12x^{\frac{1}{6}} + 4x^{\frac{2}{6}}}{4x^{\frac{1}{6}}}$

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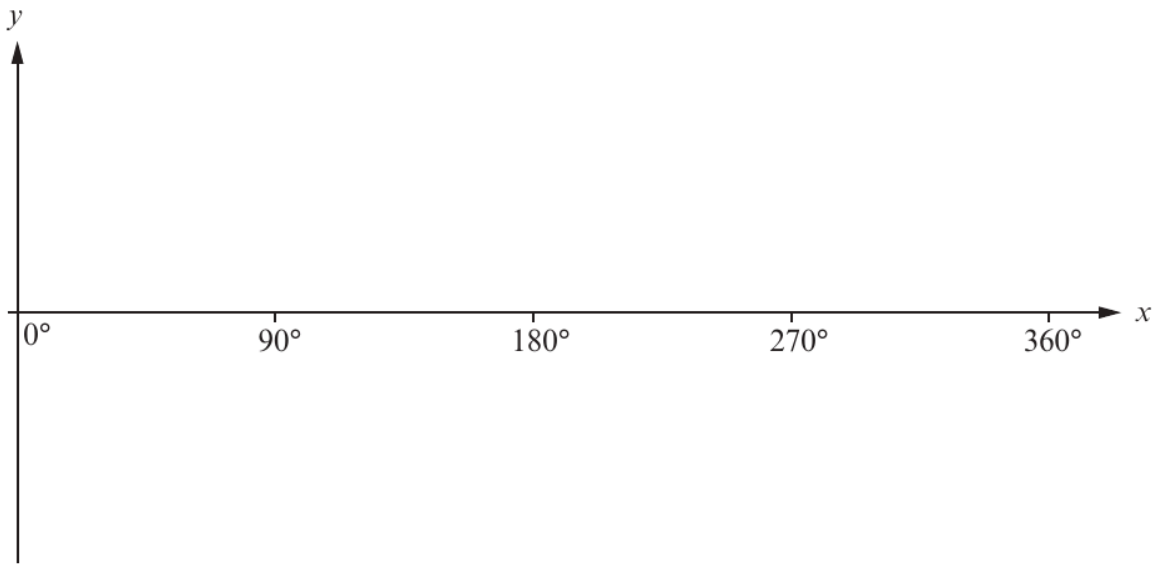
[2]

15. *(a)* On the axes below, sketch the graph of $y = 4\sin x$ for values of x from 0° to 360°.



[2]

(b) Find all the solutions of the equation $4\sin x = 0$ for values of x from 0° to 360°.

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[1]

END OF PAPER

1. *(a)* Showing all your working, find the value of each of the following.

(i) $64^{-\frac{1}{2}} \times 36^{\frac{3}{2}}$

[2]

(ii) $\left(100^{\frac{1}{2}}\right)^4$

[1]

(b) Showing all your working, simplify each of the following.

(i) $\dfrac{5x^{-\frac{5}{4}} \times 4x^{\frac{13}{4}}}{x^{\frac{3}{2}}}$

[2]

(ii) $\dfrac{18x^{\frac{1}{5}} + 6x^{\frac{2}{5}}}{6x^{\frac{1}{5}}}$

[2]

2. Express as a single fraction in its simplest form.

$$1 - \frac{3x - y}{x + 2y}$$

[3]

3. Find $\frac{dy}{dx}$ for each of the following.

(a) $y = 8x^7 + 2x - 23$

[3]

(b) $y = x^{-8}$

[1]

(c) $y = x^{\frac{3}{2}}$

[1]

11. *(a)* Showing all your working, find the value of **each** of the following.

(i) $36^{-\frac{1}{2}} \times 125^{\frac{1}{3}}$

[2]

(ii) $\left(49^{\frac{1}{2}}\right)^{-2}$

[1]

(b) Simplify **each** of the following.

(i) $\dfrac{6x^{\frac{3}{2}} \times 5x^{\frac{1}{4}}}{\left(x^5\right)^{\frac{1}{4}}}$

[2]

(ii) $\dfrac{3y^{\frac{1}{5}} + 2y^{\frac{6}{5}}}{5y^{\frac{1}{5}}}$

[2]

End of question pack