Year 11 Mathematics Advanced

Topic: Working with Functions (1 of 12)
Review Questions: Algebraic Techniques
Term 3, 2026

How to use this review set

These are real past-paper questions, grouped by question pattern. The grey label on each question shows where it is from and its marks.

- The questions are grouped by the pattern that keeps coming up in exams, a few of each in a row, running from the plainer patterns into the harder ones near the end. Work through them and you will meet every type an exam can throw at you.
- This set **is your diagnostic**. Working through it shows you exactly which patterns are solid and which need work. Attempt every question properly in your own book, and go back to your notes to help you work through tough questions if needed.
- Every question you get wrong, need help with or struggle with goes in your **Mistakes Log**, which you should be working on daily to get you exam-ready.

Contents

Indices, expanding and factorising

1. Index laws (positive, negative, zero and fractional indices)
2. Expand and factorise algebraic expressions
3. Simplify algebraic fractions

Surds

4. Expand and simplify surds (exact values)
5. Rationalise the denominator (conjugates)

Indices, expanding and factorising

1. Index laws (positive, negative, zero and fractional indices)

Q1 Knox 2021 Trial Q1 · **1 mark**

Simplify $\dfrac{(2p)^3}{\sqrt{p}}$.

(A) $8\sqrt{p^5}$

(B) $8\sqrt[5]{p^2}$

(C) $6\sqrt{p^5}$

(D) $6\sqrt[5]{p^2}$

Q2 Killara 2023 Prelim Q11 · **2 marks**

Simplify $(q^2)^3 \times \left(\dfrac{q^5}{q}\right)^2$ using the index laws.

Q3 Knox 2023 Prelim Q1 · **1 mark**

Which expression is equivalent to $\sqrt[6]{64x^{12}y^3}$?

(A) $2x^{72}y^{36}$

(B) $2x^6\sqrt{y}$

(C) $4x^2y^{\frac{3}{2}}$

(D) $2x^2\sqrt{y}$

Q4 Girraween 2021 Prelim Q1(a)(i) · **2 marks**

Simplify $\left(\dfrac{64x^{-3}}{y^6}\right)^{\frac{1}{3}}$.

Q5 North Sydney Boys 2024 Prelim Q7 · **2 marks**

Simplify $\dfrac{12^x \times 18^x}{3^x \times 2^x}$.

Q6 Girraween 2022 Prelim Q11(a) · **3 marks**

Simplify $\left(\dfrac{12x^{-3}y^2}{xyz^{\frac{1}{2}}}\right)^2 \div \dfrac{6x^2y^3}{z^{-4}}$.

2. Expand and factorise algebraic expressions

Q7 Killara 2023 Prelim Q1 · **1 mark**

Factorise the expression $x^2 - 2x - 3$.

(A) $(x-3)(x-1)$

(B) $(x-3)(x+1)$

(C) $(x+3)(x+1)$

(D) $(x+3)(x-1)$

Q8 Ascham 2022 Trial Q11 · **1 mark**

Factorise $4x^2 - (w+y)^2$.

Q9 Sydney Boys 2020 Trial Q11 · **1 mark**

Factorise $8x^3 + 125$.

Q10 Baulkham Hills 2024 Prelim Q1 · **1 mark**

Which of the following is equivalent to $5x - (x+3)(2x-1)$?

(A) $3 - 2x^2$

(B) $-2x^2 + 10x + 3$

(C) $2x^2 - 3$

(D) $2x^2 - 10x - 3$

Q11 James Ruse 2022 Trial Q12 · **1 mark**

Factorise $2x^2 + 3x - 2xy - 3y$.

Q12 Baulkham Hills 2024 Prelim Q12(a) · **2 marks**

Fully factorise $4x^3 - x^5$.

3. Simplify algebraic fractions

Q13 Kambala 2024 Prelim Q4 · 1 mark

Which of the following fractions is equivalent to $\frac{3x-1}{2} - \frac{x-3}{4}$?

(A) $\frac{5x-5}{4}$

(B) $\frac{5x+1}{4}$

(C) $\frac{10x-10}{4}$

(D) $\frac{10x+2}{4}$

Q14 Sydney Grammar 2021 Prelim Q9(d) · 2 marks

Simplify $\frac{y^2+3y}{y^2-9}$.

Q15 Baulkham Hills 2024 Trial Q11 · 2 marks

Simplify $\frac{2}{x-1} - \frac{6}{(x-1)(2x+1)}$.

Q16 Killara 2024 Prelim Q11 · 2 marks

Fully simplify the following expression.

$$\frac{a^2-3a}{2ax} \times \frac{4a^2x}{2ax-6x}$$

Q17 Abbotsleigh 2024 Prelim Q13 · 2 marks

Simplify fully $\frac{5}{x^2-3x+2} - \frac{3}{x-1}$.

Q18 Girraween 2023 Prelim Q6(c) · 3 marks

Factorise the denominators and simplify.

$$\frac{3}{x^2-5x+6} - \frac{2}{x^2+2x-8}$$

Surds

4. Expand and simplify surds (exact values)

Q19 Sydney Grammar 2022 Prelim Q9(c) · **1 mark**

Simplify $\sqrt{8} - \sqrt{2}$.

Q20 Barker 2021 Prelim Q2 · **1 mark**

Which of the following is the expansion of $\left(5 - 2\sqrt{3}\right)^2$?

(A) -11

(B) $25 - 4\sqrt{3}$

(C) 37

(D) $37 - 20\sqrt{3}$

Q21 St George Girls 2023 Prelim Q7 · **2 marks**

If $11\sqrt{3} - 2\sqrt{27} = p\sqrt{3}$, find the value of p.

Q22 Sydney Grammar 2023 Prelim Q10(c) · **2 marks**

Find the values of p and q if $\left(2\sqrt{3} - 1\right)\left(5 - 3\sqrt{3}\right) = p + q\sqrt{3}$.

Q23 Hurlstone 2024 Prelim Q12 · **2 marks**

A rectangle has an area of 12 cm^2 and length of $\left(2 + \sqrt{7}\right)$ cm. Find its width in the form $a + b\sqrt{7}$, where a and b are integers.

Q24 James Ruse 2020 Trial Q12 · **2 marks**

For x and y rational numbers, $\left(\sqrt{x} + \sqrt{y}\right)^2 = x + y + 2\sqrt{xy}$. Write $\sqrt{16 + 2\sqrt{55}}$ in the form $\sqrt{x} + \sqrt{y}$.

5. Rationalise the denominator (conjugates)

Q25 Killara 2023 Prelim Q12(a) · **1 mark**

Rationalise the denominator of $\dfrac{6}{\sqrt{3}}$, leaving your answer in simplest form.

Q26 Sydney Grammar 2021 Prelim Q9(b) · **1 mark**

Rationalise the denominator of $\dfrac{3}{\sqrt{5}-2}$.

Q27 Moriah 2021 Prelim Q11(b) · **2 marks**

If $x = \dfrac{\sqrt{5}-2}{\sqrt{5}}$, express x with a rational denominator.

Q28 Fort St 2021 Prelim Q1(a) · **2 marks**

Rationalise the denominator of $\dfrac{4+\sqrt{2}}{4-\sqrt{2}}$, simplifying your answer.

Q29 Sydney Grammar 2022 Prelim Q10(d) · **2 marks**

By rationalising the denominator or otherwise, show that $\dfrac{2}{5-\sqrt{2}} + \dfrac{2}{5+\sqrt{2}}$ is rational.