Algebraic Expressions- Questions

May 2019 Mathematics Advanced Paper 1: Pure Mathematics 1

1.

Find, using algebra, all real solutions to the equation

(i) $16a^2 = 2\sqrt{a}$

(4)

(ii) $b^4 + 7b^2 - 18 = 0$

(4)

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2.

(a) Given $y = 2^x$, show that

$$2^{2x+1} - 17(2^x) + 8 = 0$$

can be written in the form

$$2y^2 - 17y + 8 = 0$$

(2)

(b) Hence solve

$$2^{2x+1} - 17(2^x) + 8 = 0$$

(4)

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3.

Express 9^{3x+1} in the form 3^y, giving y in the form $ax + b$, where a and b are constants.

(2)

4.

(a) Simplify

$$\sqrt{50} - \sqrt{18}$$

giving your answer in the form $a\sqrt{2}$, where a is an integer.

(2)

(b) Hence, or otherwise, simplify

$$\frac{12\sqrt{3}}{\sqrt{50} - \sqrt{18}}$$

giving your answer in the form $b\sqrt{c}$, where b and c are integers and $b \neq 1$.

(3)

5.

Simplify

(a) $(2\sqrt{5})^2$,

(1)

(b) $\dfrac{\sqrt{2}}{2\sqrt{5} - 3\sqrt{2}}$, giving your answer in the form $a + \sqrt{b}$, where a and b are integers.

(4)

6.

Given that $y = 2^x$,

(a) express 4^x in terms of y.

(1)

(b) Hence, or otherwise, solve

$$8(4^x) - 9(2^x) + 1 = 0.$$

(4)

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7.

(a) Write down the value of $32^{\frac{1}{5}}$.

(1)

(b) Simplify fully $(32x^5)^{-\frac{2}{5}}$.

(3)

8.
(a) Write $\sqrt{80}$ in the form $c\sqrt{5}$, where c is a positive constant.

(1)

A rectangle R has a length of $(1 + \sqrt{5})$ cm and an area of $\sqrt{80}$ cm².

(b) Calculate the width of R in cm. Express your answer in the form $p + q\sqrt{5}$, where p and q are integers to be found.

(4)

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9.

Simplify

$$\frac{7+\sqrt{5}}{\sqrt{5}-1},$$

giving your answer in the form $a + b\sqrt{5}$, where a and b are integers.

(4)

10.

(a) Find the value of $8^{\frac{5}{3}}$.

(2)

(b) Simplify fully $\dfrac{(2x^{\frac{1}{2}})^3}{4x^2}$.

(3)

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11.

2.   Express 8^{2x+3} in the form 2^y, stating y in terms of x.

(2)

12.

3. (i) Express

$$(5 - \sqrt{8})(1 + \sqrt{2})$$

in the form $a + b\sqrt{2}$, where a and b are integers.

(3)

(ii) Express

$$\sqrt{80} + \frac{30}{\sqrt{5}}$$

in the form $c\sqrt{5}$, where c is an integer.

(3)

May 2012 Mathematics Advanced Paper 1: Pure Mathematics 1

13.

2. (a) Evaluate $(32)^{\frac{3}{5}}$, giving your answer as an integer.

(2)

(b) Simplify fully $\left(\frac{25x^4}{4} \right)^{-\frac{1}{2}}$.

(2)

14.

3. Show that $\dfrac{2}{\sqrt{12} - \sqrt{8}}$ can be written in the form $\sqrt{a} + \sqrt{b}$, where a and b are integers.

(5)

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15.

2. (a) Simplify

$$\sqrt{32} + \sqrt{18},$$

giving your answer in the form $a\sqrt{2}$, where a is an integer.

(2)

(b) Simplify

$$\frac{\sqrt{32} + \sqrt{18}}{3 + \sqrt{2}},$$

giving your answer in the form $b\sqrt{2} + c$, where b and c are integers.

(4)

May 2011 Mathematics Advanced Paper 1: Pure Mathematics 1

16.

1. Find the value of

(a) $25^{\frac{1}{2}}$,

(1)

(b) $25^{-\frac{3}{2}}$.

(2)

Jan 2011 Mathematics Advanced Paper 1: Pure Mathematics 1

17.

1. (a) Find the value of $16^{-\frac{1}{4}}$.

(2)

(b) Simplify $x\left(2x^{-\frac{1}{4}}\right)^4$.

(2)

18.

3. Simplify

$$\frac{5-2\sqrt{3}}{\sqrt{3}-1},$$

giving your answer in the form $p + q\sqrt{3}$, where p and q are rational numbers.

(4)

May 2010 Mathematics Advanced Paper 1: Pure Mathematics 1

19.

1. Write

$$\sqrt{(75)} - \sqrt{(27)}$$

in the form $k\sqrt{x}$, where k and x are integers.

(2)

Jan 2010 Mathematics Advanced Paper 1: Pure Mathematics 1

20.

2. (*a*) Expand and simplify $(7 + \sqrt{5})(3 - \sqrt{5})$.

(3)

(*b*) Express $\dfrac{7+\sqrt{5}}{3+\sqrt{5}}$ in the form $a + b\sqrt{5}$, where a and b are integers.

(3)

Jan 2011 Mathematics Advanced Paper 1: Pure Mathematics 2

21.

8. (*a*) Sketch the graph of $y = 7^x$, $x \in \mathbb{R}$, showing the coordinates of any points at which the graph crosses the axes.

(2)

(*b*) Solve the equation

$$7^{2x} - 4(7^x) + 3 = 0,$$

giving your answers to 2 decimal places where appropriate.

(6)