Leave blank

2. (a) Express $\sqrt{108}$ in the form $a\sqrt{3}$, where a is an integer.

(1)

(b) Express $(2-\sqrt{3})^2$ in the form $b + c\sqrt{3}$, where b and c are integers to be found.

(3)

$3\overline{)108}$ = 36

a) $\sqrt{108} = \sqrt{36} \times \sqrt{3}$
$= 6\sqrt{3}$

b) $(2-\sqrt{3})(2-\sqrt{3})$

$= 4 - 2\sqrt{3} - 2\sqrt{3} + 3$
$= 7 - 4\sqrt{3}$

(where $b = 7$
$c = 4$)

YORKSHIRE MATHS TUTOR

Q2

(Total 4 marks)

Leave blank

6. (a) Show that $(4+3\sqrt{x})^2$ can be written as $16+k\sqrt{x}+9x$, where k is a constant to be found.

(2)

(b) Find $\int(4+3\sqrt{x})^2\,dx$.

(3)

a) $(4+3\sqrt{x})(4+3\sqrt{x})$

$= 16+12\sqrt{x}+12\sqrt{x}+9x$

$= 16+24\sqrt{x}+9x$

(where $k=24$)

b) $\int (4+3\sqrt{x})^2\,dx$

$= \int (16+24x^{\frac{1}{2}}+9x)\,dx$

$= 16x + \dfrac{24x^{\frac{3}{2}}}{\frac{3}{2}} + \dfrac{9x^2}{2} + c$

$= 16x + \dfrac{2}{\cancel{3}_1}\times \cancel{24}^{8}x^{\frac{3}{2}} + \dfrac{9x^2}{2} + c$

$= 16x + 16x^{\frac{3}{2}} + \dfrac{9x^2}{2} + c$

Q6

(Total 5 marks)

Leave blank

2. (a) Write down the value of $16^{\frac{1}{4}}$.

for power $\frac{3}{4}$
(1)

(b) Simplify $(16x^{12})^{\frac{3}{4}}$.

- fourth root
- then cube

(2)

a) $16^{\frac{1}{4}} = 2$

b) $(16x^{12})^{\frac{3}{4}} = (2x^3)^3$
$= 8x^9$

Q2

(Total 3 marks)

Leave blank

1. (a) Write down the value of $125^{\frac{1}{3}}$.

(1)

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

(2)

a) 5

b) $125^{-\frac{2}{3}} = \frac{1}{(\sqrt[3]{125})^2} = \frac{1}{5^2}$

$= \frac{1}{25}$

Q1

(Total 3 marks)

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

(2)

$(\sqrt{7} + 2)(\sqrt{7} - 2)$

$= 7 - 2\sqrt{7} + 2\sqrt{7} - 4$

$= 3$

(Total 2 marks)

Leave blank

Q3

C1 JAN 2011

Leave blank

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

(2)

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

(2)

a) $16^{-\frac{1}{4}} = \frac{1}{16^{\frac{1}{4}}} = \frac{1}{2}$

b) $x(2x^{-\frac{1}{4}})^4$

$= x \times 2^4 \times (x^{-\frac{1}{4}})^4$

$= x \times 16 \times x^{-1}$

$= 16$

Q1

(Total 4 marks)

Leave blank

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)

$$\frac{(5-2\sqrt{3})}{(\sqrt{3}-1)} \times \frac{(\sqrt{3}+1)}{(\sqrt{3}+1)}$$

$$= \frac{5\sqrt{3}+5-2\sqrt{3}\times\sqrt{3}-2\sqrt{3}}{3-1-\sqrt{3}+\sqrt{3}}$$

$$= \frac{5\sqrt{3}+5-6-2\sqrt{3}}{2}$$

$$= \frac{3\sqrt{3}-1}{2}$$

$$= -\frac{1}{2}+\frac{3}{2}\sqrt{3}$$

(in form $p+q\sqrt{3}$)

C1 Jan 2012

Leave blank

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)

a) $\sqrt{32}+\sqrt{18} = \sqrt{16}\times\sqrt{2} + \sqrt{9}\times\sqrt{2}$

$= 4\sqrt{2} + 3\sqrt{2}$

$= 7\sqrt{2}$

b) $\dfrac{\sqrt{32}+\sqrt{18}}{3+\sqrt{2}} = \dfrac{7\sqrt{2}}{(3+\sqrt{2})} \times \dfrac{(3-\sqrt{2})}{(3-\sqrt{2})}$

$= \dfrac{21\sqrt{2}-14}{9-3\sqrt{2}+3\sqrt{2}-2} = \dfrac{21\sqrt{2}-14}{7}$

$= 3\sqrt{2}-2$

in form $b\sqrt{2}+c$

$b = 3$

$c = -2$

Leave blank

1. Simplify $(3+\sqrt{5})(3-\sqrt{5})$. **(2)**

F L

F
O
I
L

$(3+\sqrt{5})(3-\sqrt{5})$

I

O

$= 9 - 3\sqrt{5} + 3\sqrt{5} - 5$

$= 4$

Q1

(Total 2 marks)

Leave blank

2. (a) Find the value of $8^{\frac{4}{3}}$.

(2)

(b) Simplify $\dfrac{15x^{\frac{4}{3}}}{3x}$.

(2)

a) $8^{\frac{4}{3}} = \left(\sqrt[3]{8}\right)^4$ | $x^{\frac{m}{n}} = \left(\sqrt[n]{x}\right)^m$

$= 2^4$

$= 16$

b) $\dfrac{\cancel{15}^{5} x^{\frac{4}{3}}}{\cancel{3}_{1} x} = 5x^{\frac{1}{3}}$ | $x^{\frac{4}{3}} \div x^1 = x^{\frac{1}{3}}$

Q2

(Total 4 marks)

Leave blank

1. Simplify

(a) $\left(3\sqrt{7}\right)^2$ **(1)**

(b) $\left(8+\sqrt{5}\right)\left(2-\sqrt{5}\right)$ **(3)**

a) $(3\sqrt{7})^2 = 3^2 \times (\sqrt{7})^2 = 9 \times 7 = 63$

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

$= 16 - 8\sqrt{5} + 2\sqrt{5} - 5$

$= 11 - 6\sqrt{5}$

Q1

(Total 4 marks)

Leave blank

2. Given that $32\sqrt{2} = 2^a$, find the value of a.

(3)

$32 \times \sqrt{2}$

$= 2^5 \times 2^{\frac{1}{2}}$

$= 2^{\frac{11}{2}}$

$a = \frac{11}{2}$

Q2

(Total 3 marks)

Leave blank

6. (a) Expand and simplify $(4 + \sqrt{3})(4 - \sqrt{3})$.

(2)

(b) Express $\frac{26}{4+\sqrt{3}}$ in the form $a + b\sqrt{3}$, where a and b are integers.

(2)

a) $(4+\sqrt{3})(4-\sqrt{3})$

$= 16 - 4\sqrt{3} + 4\sqrt{3} - 3$

$= 13$

b) $\frac{26}{4+\sqrt{3}} \times \frac{(4-\sqrt{3})}{(4-\sqrt{3})}$

$= \frac{104 - 26\sqrt{3}}{13} = 8 - 2\sqrt{3}$

in form $a + b\sqrt{3}$

where $a = 8$, $b = -2$

May 2011

Leave blank

1. Find the value of

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

(1)

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

(2)

a) 5

b) $\frac{1}{(25^{\frac{1}{2}})^3} = \frac{1}{5^3} = \frac{1}{125}$

Q1

(Total 3 marks)

C1 MAY 2012

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)

a) $\left(32^{\frac{1}{5}}\right)^3 = 2^3 = 8$

b) $\frac{1}{\left(\frac{25x^4}{4}\right)^{\frac{1}{2}}} = \frac{1}{\frac{5x^2}{2}}$

$= \frac{2}{5x^2}$

Leave blank

Q2

(Total 4 marks)

P 4 0 6 8 4 A 0 3 2 4

Turn over

C1 MAY 2012

Leave blank

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)**

$$\frac{2}{(\sqrt{12}-\sqrt{8})} \times \frac{(\sqrt{12}+\sqrt{8})}{(\sqrt{12}+\sqrt{8})}$$

$$= \frac{2\sqrt{12}+2\sqrt{8}}{12-8}$$

$$= \frac{2\sqrt{12}+2\sqrt{8}}{4}$$

$$= \frac{2\sqrt{4}\sqrt{3}+2\sqrt{4}\sqrt{2}}{4}$$

$$= \frac{4\sqrt{3}+4\sqrt{2}}{4} = \frac{4(\sqrt{3}+\sqrt{2})}{4}$$

$$= \sqrt{3}+\sqrt{2}$$

in form $\sqrt{a}+\sqrt{b}$

C1 Jan 2013

Leave blank

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

(2)

8^{2x+3}

$= (2^3)^{2x+3}$

$= 2^{6x+9}$

so $y = 6x+9$

Q2

(Total 2 marks)

Leave blank

3. (i) Express

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

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)

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

$= 5 + 5\sqrt{2} - \sqrt{8} - \sqrt{16}$
$= 5 + 5\sqrt{2} - \sqrt{4}\sqrt{2} - 4$
$= 5 + 5\sqrt{2} - 2\sqrt{2} - 4$
$= 1 + 3\sqrt{2}$

in form $a + b\sqrt{2}$
where $a = 1$, $b = 3$

(ii) $\sqrt{80} + \frac{30}{\sqrt{5}} = \sqrt{16}\sqrt{5} + \frac{30\sqrt{5}}{\sqrt{5}\sqrt{5}}$

$= 4\sqrt{5} + \frac{30\sqrt{5}}{5}$

$= 4\sqrt{5} + 6\sqrt{5}$
$= 10\sqrt{5}$

C1 MAY 2013

Leave blank

1. 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)

$$\left(\frac{7+\sqrt{5}}{\sqrt{5}-1}\right) \times \left(\frac{\sqrt{5}+1}{\sqrt{5}+1}\right) = \frac{7\sqrt{5}+7+5+\sqrt{5}}{5+\sqrt{5}-\sqrt{5}-1}$$

$$= \frac{8\sqrt{5}+12}{4} = 2\sqrt{5}+3$$

$$= \underline{\underline{3+2\sqrt{5}}}$$

in form $a+b\sqrt{5}$

$(a=3, b=2)$

Q1

(Total 4 marks)

P 4 1 8 0 2 A 0 2 2 8

C1 MAY 2013

Leave blank

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

(2)

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

(3)

a) $\left(8^{\frac{1}{3}}\right)^5 = 2^5 = \underline{\underline{32}}$

b) $\dfrac{\left(2x^{\frac{1}{2}}\right)^3}{4x^2} = \dfrac{8x^{\frac{3}{2}}}{4x^2} = \underline{\underline{2x^{-\frac{1}{2}}}}$