SURDS

(1) 21. Express $\sqrt{180}$ in the form $a\sqrt{b}$, where a is a whole number and b is a prime number.

$\sqrt{4\times45} = \sqrt{4}\times\sqrt{45} = 2\sqrt{45}$

$2\sqrt{9\times5} = 2\sqrt{9}\times\sqrt{5} = 2\times3\times\sqrt{5} = 6\sqrt{5}$

[2]

(2) (b) Express $\sqrt{192}$ in the form $a\sqrt{b}$, where a is a whole number and b is a prime number.

48
$4\overline{)192}$

$\sqrt{4\times48} = 2\sqrt{48}$

$= 2\sqrt{16\times3}$

$= 2\times4\sqrt{3}$

$= 8\sqrt{3}$

[2]

(3) (c) Simplify $\left(\sqrt{3}+\sqrt{5}\right)^2 - 8$, expressing your answer in surd form.

$(\sqrt{3}+\sqrt{5})(\sqrt{3}+\sqrt{5}) = (\sqrt{3}\times\sqrt{3}) + (\sqrt{5}\times\sqrt{5}) + (\sqrt{5}\times\sqrt{3}) + (\sqrt{5}\times\sqrt{5})$

$= 3 + \sqrt{15} + \sqrt{15} + 5$

$= 8 + 2\sqrt{15}$

So $(\sqrt{3}+\sqrt{5})^2 - 8 = 8 + 2\sqrt{15} - 8 = 2\sqrt{15}$

[2]

Examiner only

(4) 12. (a) Find the value of $(\sqrt{45} - \sqrt{5})^2$.

$\sqrt{45} = \sqrt{9\times5} = \sqrt{9}\times\sqrt{5} = 3\sqrt{5}$

$(\sqrt{45} - \sqrt{5}) = 3\sqrt{5} - \sqrt{5} = 2\sqrt{5}$

$(\sqrt{45} - \sqrt{5})^2 = (2\sqrt{5})^2 = 2^2(\sqrt{5})^2 = 4\times5 = 20$

[2]

(5) (c) Evaluate $\left(\sqrt{72} - \sqrt{2}\right)^2$.

$(\sqrt{36\times2} - \sqrt{2})^2 = (6\sqrt{2} - \sqrt{2})^2 = (5\sqrt{2})^2$

$= 5^2(\sqrt{2})^2 = 25\times2 = 50$

[3]

(6) (c) Simplify $(3-5\sqrt{2})^2$ and state whether your answer is rational or irrational.

$(3-5\sqrt{2})(3-5\sqrt{2}) = 9 - 15\sqrt{2} - 15\sqrt{2} + (25\times 2)$

$= 59 - 30\sqrt{2}$

irrational

[3]

(7) 22. (a) Expand $(5+3\sqrt{2})^2$. Simplify your answer.

$(5+3\sqrt{2})(5+3\sqrt{2}) = 25 + 15\sqrt{2} + 15\sqrt{2} + (9\times 2)$

$= 43 + 30\sqrt{2}$

[2]

(8) (c) Find the value of $(\sqrt{50}-\sqrt{2})^2$.

$(\sqrt{25\times 2}-\sqrt{2})^2 = (5\sqrt{2}-\sqrt{2})^2 = (4\sqrt{2})^2 = 4^2(\sqrt{2})^2 = 16\times 2$

$= 32$

[2]

yn unig

(9) 20. (a) Find the value of $(\sqrt{32}-\sqrt{2})^2$.

$(\sqrt{16\times 2}-\sqrt{2})^2 = (4\sqrt{2}-\sqrt{2})^2 = (3\sqrt{2})^2 = 3^2(\sqrt{2})^2 = 9\times 2$

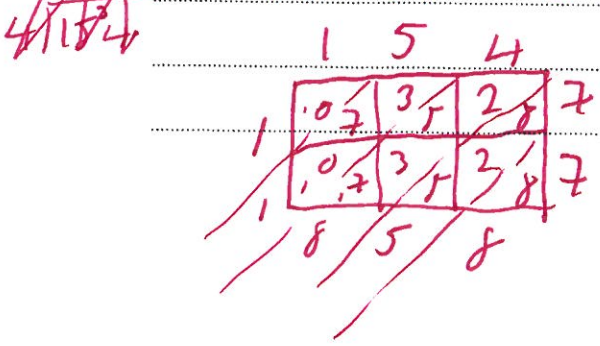
$= 18$

[3]

(10) (b) Given that $p=\sqrt{7}, q=\sqrt{11}$ and $r=\sqrt{154}$, simplify pqr.

$\sqrt{7}\times\sqrt{11}\times\sqrt{154} = \sqrt{7\times 11\times 154} = \sqrt{77\times 154}$

$\sqrt{77}\times\sqrt{77\times 2} = \sqrt{77}\times\sqrt{77}\times\sqrt{2} = 77\sqrt{2}$



$\sqrt{11858} = \sqrt{5929\times 2}$

$= 77\sqrt{2}$

[2]

(b) Given that $p = \sqrt{5}$, $q = \sqrt{13}$ and $r = \sqrt{325}$, simplify pqr.

11

$\sqrt{325} = \sqrt{25 \times 13} = 5\sqrt{13}$

$pqr = \sqrt{5} \times \sqrt{13} \times 5 \times \sqrt{13}$

$= 65\sqrt{5}$

[2]

25. Given that $f = \sqrt{2}, g = \sqrt{3}$ and $h = \sqrt{6}$, find in the simplest form,

12

(a) $\frac{fh}{g}$,

$\frac{\sqrt{2}\sqrt{6}}{\sqrt{3}} = \sqrt{\frac{12}{3}} = \sqrt{4} = 2$

[1]

13

(b) $fg + 2h$.

$\sqrt{2} \times \sqrt{3} + 2\sqrt{6} = \sqrt{2 \times 3} + 2\sqrt{6}$

$= \sqrt{6} + 2\sqrt{6}$

$= 3\sqrt{6}$

[1]

14

(c) Given that $f = \sqrt{2}$, $g = \sqrt{5}$ and $h = \sqrt{10}$, find, in its simplest form,

(i) $\frac{fg}{h}$,

$\frac{\sqrt{2} \times \sqrt{5}}{\sqrt{10}} = \sqrt{\frac{10}{10}} = 1$

[1]

15

(ii) $fg + h$,

$\sqrt{2} \times \sqrt{5} + \sqrt{10} = \sqrt{10} + \sqrt{10} = 2\sqrt{10}$

[1]

16

(iii) fh.

$\sqrt{2} \times \sqrt{10} = \sqrt{20} = \sqrt{4 \times 5} = \sqrt{4} \times \sqrt{5} = 2\sqrt{5}$

[1]

21. Given that $a = \sqrt{5}$, $b = \sqrt{7}$ and $c = \sqrt{35}$, simplify abc and state whether your answer is rational or irrational.

$\sqrt{5} \times \sqrt{7} \times \sqrt{35}$

$= \sqrt{35} \times \sqrt{35}$

$= 35$

[2]

(c) Given that $a = \sqrt{5}$, $b = \sqrt{7}$ and $c = \sqrt{70}$, find the value of abc.

Write your answer in the form $n\sqrt{2}$ where n is a whole number. [2]

$\sqrt{5} \times \sqrt{7} \times \sqrt{70}$

$\sqrt{35} \times \sqrt{2 \times 35}$

$\sqrt{35} \times \sqrt{2} \times \sqrt{35}$

$35\sqrt{2}$

SURDS

(1) **21.** Express $\sqrt{180}$ in the form $a\sqrt{b}$, where a is a whole number and b is a prime number.

[2]

(2) *(b)* Express $\sqrt{192}$ in the form $a\sqrt{b}$, where a is a whole number and b is a prime number.

[2]

(3) *(c)* Simplify $\left(\sqrt{3}+\sqrt{5}\right)^2 - 8$, expressing your answer in surd form.

[2]

(4) **12.** *(a)* Find the value of $(\sqrt{45} - \sqrt{5})^2$.

[2]

(5) *(c)* Evaluate $\left(\sqrt{72} - \sqrt{2}\right)^2$.

[3]

6

(c) Simplify $\left(3-5\sqrt{2}\right)^2$ and state whether your answer is rational or irrational.

[3]

7

22. (a) Expand $(5+3\sqrt{2})^2$. Simplify your answer.

[2]

8

(c) Find the value of $\left(\sqrt{50}-\sqrt{2}\right)^2$.

[2]

yn unig

9

20. (a) Find the value of $\left(\sqrt{32}-\sqrt{2}\right)^2$.

[3]

10

(b) Given that $p=\sqrt{7}, q=\sqrt{11}$ and $r=\sqrt{154}$, simplify pqr.

[2]

(b) Given that $p = \sqrt{5}$, $q = \sqrt{13}$ and $r = \sqrt{325}$, simplify pqr.

11

.....

.....

.....

.....

.....

.....

[2]

25. Given that $f = \sqrt{2}, g = \sqrt{3}$ and $h = \sqrt{6}$, find in the simplest form,

12

(a) $\frac{fh}{g}$,

.....

.....

[1]

13

(b) $fg + 2h$.

.....

.....

.....

[1]

14

(c) Given that $f = \sqrt{2}$, $g = \sqrt{5}$ and $h = \sqrt{10}$, find, in its simplest form,

(i) $\frac{fg}{h}$,

.....

.....

.....

[1]

15

(ii) $fg + h$,

.....

.....

[1]

16

(iii) fh.

.....

.....

[1]

21. Given that $a = \sqrt{5}$, $b = \sqrt{7}$ and $c = \sqrt{35}$, simplify abc and state whether your answer is rational or irrational.

.....

.....

.....

.....

.....

[2]

(c) Given that $a = \sqrt{5}$, $b = \sqrt{7}$ and $c = \sqrt{70}$, find the value of abc.

Write your answer in the form $n\sqrt{2}$ where n is a whole number. [2]

.....

.....

.....

.....

.....

.....