SURDS – PRACTICE QUESTIONS
NON-CALCULATOR

1.
Simplify:

(a) $4 \times \sqrt{3}$ $= 4\sqrt{3}$

(b) $\sqrt{2} \times 6$ $= 6\sqrt{2}$

(c) $\sqrt{5} \times \sqrt{2}$ $= \sqrt{10}$

(d) $\sqrt{3} \times \sqrt{7}$ $= \sqrt{21}$

(e) $\sqrt{5} \times \sqrt{5}$ $= \sqrt{25} = 5$

(f) $2 \times 4 \times \sqrt{11}$ $= 8\sqrt{11}$

(g) $3 \times \sqrt{2} \times \sqrt{5}$ $= 3\sqrt{10}$

(h) $2 \times 5 \times \sqrt{17}$ $= 10\sqrt{17}$

(i) $4 \times \sqrt{11} \times \sqrt{11}$ $= 4\sqrt{121} = 4 \times 11 = 44$

(j) $2\sqrt{2} \times 8$ $= 16\sqrt{2}$

(k) $\sqrt{10} \times 3\sqrt{3}$ $= 3\sqrt{30}$

(l) $2\sqrt{2} \times \sqrt{13}$ $= 2\sqrt{26}$

(m) $3\sqrt{3} \times 4\sqrt{2}$ $= 12\sqrt{6}$

(n) $2\sqrt{7} \times 4\sqrt{5}$ $= 8\sqrt{35}$

(o) $6\sqrt{19} \times 3\sqrt{2}$ $= 18\sqrt{38}$

(p) $5\sqrt{3} \times 2\sqrt{3}$ $= 10\sqrt{9} = 10 \times 3 = 30$

(q) $10\sqrt{5} \times 3\sqrt{5}$ $= 30\sqrt{25} = 30 \times 5 = 150$

(r) $6\sqrt{2} \times 2\sqrt{11}$ $= 12\sqrt{22}$

(s) $12 \times 10\sqrt{19}$ $= 120\sqrt{19}$

(t) $\sqrt{3} \times 2\sqrt{3} \times \sqrt{13}$ $= 2\sqrt{9} \times \sqrt{13} = 2 \times 3 \times \sqrt{13} = 6\sqrt{13}$

(u) $\sqrt{7} \times \sqrt{7} \times \sqrt{7}$ $= 7\sqrt{7}$

2.
Simplify:

(a) $10\sqrt{2} \div 5$ $= 2\sqrt{2}$

(b) $\sqrt{20} \div \sqrt{2}$ $= \sqrt{10}$

(c) $\sqrt{15} \div \sqrt{3}$ $= \sqrt{5}$

(d) $5\sqrt{21} \div \sqrt{3}$ $= 5\sqrt{7}$

(e) $8\sqrt{24} \div 4\sqrt{8}$ $= 2\sqrt{3}$

(f) $12\sqrt{30} \div 6\sqrt{10}$ $= 2\sqrt{3}$

(g) $21\sqrt{42} \div 3\sqrt{6}$ $= 7\sqrt{7}$

(h) $\sqrt{20} \div \sqrt{5}$ $= \sqrt{4} = 2$

(i) $20\sqrt{18} \div 4\sqrt{2}$ $= 5\sqrt{9} = 5 \times 3 = 15$

(j) $15\sqrt{32} \div 5\sqrt{2}$ $= 3\sqrt{16} = 3 \times 4 = 12$

(k) $\frac{28\sqrt{33}}{7\sqrt{3}}$ $= 4\sqrt{11}$

(l) $\frac{5\sqrt{5}\times\sqrt{10}}{\sqrt{2}}$ $= \frac{5\sqrt{50}}{\sqrt{2}} = 5\sqrt{25} = 5 \times 5 = 25$

3.
Simplify:

(a) $\sqrt{2} + \sqrt{2}$ $= 2\sqrt{2}$

(b) $\sqrt{3} + \sqrt{3} + \sqrt{3}$ $= 3\sqrt{3}$

(c) $2\sqrt{5} + 3\sqrt{5}$ $= 5\sqrt{5}$

(d) $8\sqrt{7} - 4\sqrt{7}$ $= 4\sqrt{7}$

(e) $3\sqrt{2} + 2\sqrt{2} + 5\sqrt{2}$ $= 10\sqrt{2}$

(f) $3\sqrt{3} + 2\sqrt{5} + \sqrt{3} + 4\sqrt{5}$ $= 4\sqrt{3} + 6\sqrt{5}$

(g) $2\sqrt{5} - \sqrt{11} + 5\sqrt{5} - 2\sqrt{11}$ $= 7\sqrt{5} - 3\sqrt{11}$

(h) $4\sqrt{7} - 2\sqrt{13} + 3\sqrt{7} + 4\sqrt{13}$ $= 7\sqrt{7} + 2\sqrt{13}$

4.

Expand and simplify:

(a) $3(\sqrt{5}+7)$ $= 3\sqrt{5} + 21$

(b) $\sqrt{2}\,(\sqrt{3}+5)$ $= \sqrt{6} + 5\sqrt{2}$

(c) $\sqrt{5}\,(\sqrt{7}-1)$ $= \sqrt{35} - \sqrt{5}$

(d) $\sqrt{7}(\sqrt{3}+\sqrt{2})$ $= \sqrt{21} + \sqrt{14}$

(e) $2(3\sqrt{5}-9)$ $= 6\sqrt{5} - 18$

(f) $6\sqrt{3}(\sqrt{5}+3)$ $= 6\sqrt{15} + 18\sqrt{3}$

(g) $2\sqrt{7}(3\sqrt{11}+10)$ $= 6\sqrt{77} + 20\sqrt{7}$

(h) $5\sqrt{3}(\sqrt{2}-6\sqrt{3})$ $= 5\sqrt{6} - 30\sqrt{9} = 5\sqrt{6} - 90$

(i) $6\sqrt{2}(3\sqrt{2}+5)$ $= 18\sqrt{4} + 30\sqrt{2} = 36 + 30\sqrt{2}$

(j) $5\sqrt{11}(3\sqrt{3}-\sqrt{11})$ $= 15\sqrt{33} - 5\sqrt{121} = 15\sqrt{33} - 55$

5.

Expand, and give each answer in the form $a\sqrt{b}$ + c:

(a) $\sqrt{2}(\sqrt{2}+3)+2(\sqrt{2}+4)$ $= \sqrt{4} + 3\sqrt{2} + 2\sqrt{2} + 8$

$= 2 + 3\sqrt{2} + 2\sqrt{2} + 8$

$= 10 + 5\sqrt{2}$

(b) $\sqrt{5}(\sqrt{5}-1)+5(2\sqrt{5}+3)$ $= \sqrt{25} - \sqrt{5} + 10\sqrt{5} + 15$

$= 5 - \sqrt{5} + 10\sqrt{5} + 15$

$= 20 + 9\sqrt{5}$

(c) $2\sqrt{3}(3\sqrt{3}-5)+4(\sqrt{3}+3)$ $= 6\sqrt{9} - 10\sqrt{3} + 4\sqrt{3} + 12$

$= 18 - 10\sqrt{3} + 4\sqrt{3} + 12$

$= 30 - 6\sqrt{3}$

(d) $3\sqrt{7}(5+3\sqrt{7})-5(3-\sqrt{7})$ $= 15\sqrt{7}+9\sqrt{49}-15+5\sqrt{7}$
$= 15\sqrt{7}+63-15+5\sqrt{7}$
$= 20\sqrt{7}+48$

(e) $(\sqrt{5}+2)(8-3\sqrt{5})$ $= 8\sqrt{5}+16-6\sqrt{5}-3\sqrt{25}$
$= 8\sqrt{5}+16-6\sqrt{5}-15$
$= 2\sqrt{5}+1$

(f) $(\sqrt{13}-3)(2+3\sqrt{13})$ $= 2\sqrt{13}-6-9\sqrt{13}+3\times 13$
$= 2\sqrt{13}-6-9\sqrt{13}+39$
$= 33-7\sqrt{13}$

(g) $(2\sqrt{11}-5)(2-3\sqrt{11})$ $= 4\sqrt{11}-10+15\sqrt{11}-6\times 11$
$= 4\sqrt{11}-10+15\sqrt{11}-66$
$= 19\sqrt{11}-76$

6.
Rationalise the denominator of each fraction:

(a) $\frac{5}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{5\sqrt{2}}{2}$

(b) $\frac{10}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{10\sqrt{3}}{3}$

(c) $\frac{2}{\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{2\sqrt{7}}{7}$

(d) $\frac{5}{\sqrt{11}} \times \frac{\sqrt{11}}{\sqrt{11}} = \frac{5\sqrt{11}}{11}$

(e) $\frac{3}{\sqrt{13}} \times \frac{\sqrt{13}}{\sqrt{13}} = \frac{3\sqrt{13}}{13}$

(f) $\frac{11}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{11\sqrt{2}}{4}$

(g) $\frac{8}{3\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{8\sqrt{5}}{15}$

(h) $\frac{12}{5\sqrt{7}} \times \frac{\sqrt{7}}{\sqrt{7}} = \frac{12\sqrt{7}}{35}$

(i) $\frac{15}{7\sqrt{11}} \times \frac{\sqrt{11}}{\sqrt{11}} = \frac{15\sqrt{11}}{77}$

7.

Express each surd in the form $a\sqrt{b}$ where a and b are prime numbers:

(a) $\sqrt{20} = \sqrt{4} \times \sqrt{5} = 2\sqrt{5}$

(b) $\sqrt{27} = \sqrt{9} \times \sqrt{3} = 3\sqrt{3}$

(c) $\sqrt{28} = \sqrt{4} \times \sqrt{7} = 2\sqrt{7}$

(d) $\sqrt{44} = \sqrt{4} \times \sqrt{11} = 2\sqrt{11}$

(e) $\sqrt{50} = \sqrt{25} \times \sqrt{2} = 5\sqrt{2}$

(f) $\sqrt{63} = \sqrt{9} \times \sqrt{7} = 3\sqrt{7}$

(g) $\sqrt{99} = \sqrt{9} \times \sqrt{11} = 3\sqrt{11}$

(h) $\sqrt{52} = \sqrt{4} \times \sqrt{13} = 2\sqrt{13}$

(i) $\sqrt{125} = \sqrt{25} \times \sqrt{5} = 5\sqrt{5}$

(j) $\sqrt{68} = \sqrt{4} \times \sqrt{17} = 2\sqrt{17}$

(k) $\sqrt{98} = \sqrt{49} \times \sqrt{2} = 7\sqrt{2}$

(l) $\sqrt{175} = \sqrt{25} \times \sqrt{7} = 5\sqrt{7}$

(m) $\sqrt{242} = \sqrt{121} \times \sqrt{2} = 11\sqrt{2}$

(n) $\sqrt{343} = \sqrt{49} \times \sqrt{7} = 7\sqrt{7}$

(o) $\sqrt{475} = \sqrt{25} \times \sqrt{19} = 5\sqrt{19}$

8.

Rationalise the denominator of each fraction, and simplify your answer fully:

(a) $\frac{\sqrt{3}+2}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}(\sqrt{3}+2)}{2} = \frac{\sqrt{6}+2\sqrt{2}}{2}$

(b) $\frac{2\sqrt{5}+3}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{5}(2\sqrt{5}+3)}{5} = \frac{2\times 5+3\sqrt{5}}{5} = \frac{10+3\sqrt{5}}{5}$

(c) $\frac{\sqrt{7}-\sqrt{3}}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}(\sqrt{7}-\sqrt{3})}{3} = \frac{\sqrt{21}-3}{3}$

(d) $\frac{7-2\sqrt{3}}{3\sqrt{11}} \times \frac{\sqrt{11}}{\sqrt{11}} = \frac{\sqrt{11}(7-2\sqrt{3})}{33} = \frac{7\sqrt{11}-2\sqrt{33}}{33}$

(e) $\frac{11+4\sqrt{2}}{2\sqrt{19}} \times \frac{\sqrt{19}}{\sqrt{19}} = \frac{\sqrt{19}(11+4\sqrt{2})}{38} = \frac{11\sqrt{19}+4\sqrt{38}}{38}$

(f) $\frac{2\sqrt{5}-1}{4\sqrt{13}} \times \frac{\sqrt{13}}{\sqrt{13}} = \frac{\sqrt{13}(2\sqrt{5}-1)}{52} = \frac{2\sqrt{65}-\sqrt{13}}{52}$

9.

Express $\sqrt{75} + 2\sqrt{12} + 4\sqrt{3}$ in the form $a\sqrt{3}$ where a is an integer.

$\sqrt{75} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$

$2\sqrt{12} = 2 \times \sqrt{4} \times \sqrt{3} = 4\sqrt{3}$

$5\sqrt{3} + 4\sqrt{3} + 4\sqrt{3} = 13\sqrt{3}$

10.

Express $\sqrt{45} - 4\sqrt{5} + \sqrt{80}$ in the form $a\sqrt{5}$ where a is an integer.

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

$\sqrt{80} = \sqrt{16} \times \sqrt{5} = 4\sqrt{5}$

$3\sqrt{5} - 4\sqrt{5} + 4\sqrt{5} = 3\sqrt{5}$

11.

Express $\sqrt{99} - 2\sqrt{11} + 4\sqrt{44}$ in the form $a\sqrt{11}$ where a is an integer.

$\sqrt{99} = \sqrt{9} \times \sqrt{11} = 3\sqrt{11}$

$4\sqrt{44} = 4 \times \sqrt{4} \times \sqrt{11} = 8\sqrt{11}$

$3\sqrt{11} - 2\sqrt{11} + 8\sqrt{11} = 9\sqrt{11}$

12.

Express $\sqrt{128} - 3\sqrt{18} + 3\sqrt{72}$ in the form $a\sqrt{2}$ where a is an integer.

$\sqrt{128} = \sqrt{64} \times \sqrt{2} = 8\sqrt{2}$

$3\sqrt{18} = 3 \times \sqrt{9} \times \sqrt{2} = 9\sqrt{2}$

$3\sqrt{72} = 3 \times \sqrt{36} \times \sqrt{2} = 18\sqrt{2}$

$8\sqrt{2} - 9\sqrt{2} + 18\sqrt{2} = 17\sqrt{2}$

13.

Express $2\sqrt{90} - 3\sqrt{40} + \sqrt{160}$ in the form $a\sqrt{b}$ where a and b are integers.

$2\sqrt{90} = 2 \times \sqrt{9} \times \sqrt{10} = 6\sqrt{10}$

$3\sqrt{40} = 3 \times \sqrt{4} \times \sqrt{10} = 6\sqrt{10}$

$\sqrt{160} = \sqrt{16} \times \sqrt{10} = 4\sqrt{10}$

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

14.

Express $\sqrt{300} - 2\sqrt{48} + 3\sqrt{108}$ in the form $a\sqrt{b}$ where a and b are integers.

$\sqrt{300} = \sqrt{100} \times \sqrt{3} = 10\sqrt{3}$

$2\sqrt{48} = 2 \times \sqrt{16} \times \sqrt{3} = 8\sqrt{3}$

$3\sqrt{108} = 3 \times \sqrt{36} \times \sqrt{3} = 18\sqrt{3}$

$10\sqrt{3} - 8\sqrt{3} + 18\sqrt{3} = 20\sqrt{3}$

15.

Express $\sqrt{112} + 5\sqrt{28} - 2\sqrt{63}$ in the form $a\sqrt{b}$ where a and b are integers.

$\sqrt{112} = \sqrt{16} \times \sqrt{7} = 4\sqrt{7}$

$5\sqrt{28} = 5 \times \sqrt{4} \times \sqrt{7} = 10\sqrt{7}$

$2\sqrt{63} = 2 \times \sqrt{9} \times \sqrt{7} = 6\sqrt{7}$

$4\sqrt{7} + 10\sqrt{7} - 6\sqrt{7} = 8\sqrt{7}$

16.

(a) Rationalise the denominator: $\frac{9}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{9\sqrt{5}}{5}$

(b) Expand and simplify $2\sqrt{3}(\sqrt{3} - 2)$

$2 \times 3 - 4\sqrt{3} = 6 - 4\sqrt{3}$

(c) Express $\sqrt{76}$ in the form $a\sqrt{b}$ where a and b are prime numbers.

$\sqrt{76} = \sqrt{4} \times \sqrt{19} = 2\sqrt{19}$

17.

(a) Expand and simplify $(\sqrt{7} - 2)(5 - \sqrt{7})$

$5\sqrt{7} - 10 - 7 + 2\sqrt{7} = 7\sqrt{7} - 17$

(b) Rationalise the denominator: $\frac{3}{2\sqrt{11}} \times \frac{\sqrt{11}}{\sqrt{11}} = \frac{3\sqrt{11}}{22}$

(c) Express $5\sqrt{8} + \sqrt{32} - \sqrt{50}$ in the form $a\sqrt{2}$ where a is an integer.

$5\sqrt{8} = 5 \times \sqrt{4} \times \sqrt{2} = 10\sqrt{2}$

$\sqrt{32} = \sqrt{16} \times \sqrt{2} = 4\sqrt{2}$

$\sqrt{50} = \sqrt{25} \times \sqrt{2} = 5\sqrt{2}$

$10\sqrt{2} + 4\sqrt{2} - 5\sqrt{2} = 9\sqrt{2}$

18.

(a) Rationalise the denominator: $\frac{9+\sqrt{7}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}(9+\sqrt{7})}{2} = \frac{9\sqrt{2}+\sqrt{14}}{2}$

(b) Fully simplify: $3\sqrt{2}(\sqrt{18} - \sqrt{2})$ $= 3\sqrt{36} - 3 \times 2$

$= 18 - 6$

$= 12$

(c) Express $3\sqrt{2}(\sqrt{24} + 5\sqrt{2})$ in the form $a\sqrt{3} + b$ where a and b are integers.

$3\sqrt{48} + 15 \times 2 = 3\sqrt{48} + 30$

$3\sqrt{48} = 3 \times \sqrt{16} \times \sqrt{3} = 12\sqrt{3}$

$12\sqrt{3} + 30$

19.

Rationalise the denominator of each fraction, and simplify your answer fully:

(a) $\frac{2\sqrt{5}}{3+\sqrt{5}} \times \frac{3-\sqrt{5}}{3-\sqrt{5}} = \frac{2\sqrt{5}(3-\sqrt{5})}{(3+\sqrt{5})(3-\sqrt{5})} = \frac{6\sqrt{5}-2\times5}{9+3\sqrt{5}-3\sqrt{5}-5} = \frac{6\sqrt{5}-10}{4}$

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

(b) $\frac{\sqrt{3}+7}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{(\sqrt{3}+7)(\sqrt{3}+1)}{(\sqrt{3}-1)(\sqrt{3}+1)} = \frac{3+7\sqrt{3}+\sqrt{3}+7}{3-\sqrt{3}+\sqrt{3}-1} = \frac{8\sqrt{3}+10}{2}$

$= 4\sqrt{3}+5$

(c) $\frac{\sqrt{2}+4}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = \frac{(\sqrt{2}+4)(3+\sqrt{2})}{(3-\sqrt{2})(3+\sqrt{2})} = \frac{3\sqrt{2}+12+2+4\sqrt{2}}{9-3\sqrt{2}+3\sqrt{2}-2} = \frac{7\sqrt{2}+14}{7}$

$= \sqrt{2}+2$

(d) $\frac{2\sqrt{7}-3}{\sqrt{7}+1} \times \frac{\sqrt{7}-1}{\sqrt{7}-1} = \frac{(2\sqrt{7}-3)(\sqrt{7}-1)}{(\sqrt{7}+1)(\sqrt{7}-1)} = \frac{2\times7-3\sqrt{7}-2\sqrt{7}+3}{7+\sqrt{7}-\sqrt{7}-1} = \frac{17-5\sqrt{7}}{6}$

20.

Put the following numbers into order, smallest to largest:

$\sqrt{23}$ $\quad$ $2\sqrt{5}$ $\quad$ $\sqrt{17}$ $\quad$ $3\sqrt{2}$

$\sqrt{4}\times\sqrt{5}=\sqrt{20}$ $\quad$ $\sqrt{9}\times\sqrt{2}=\sqrt{18}$

$\sqrt{17}, 3\sqrt{2}, 2\sqrt{5}, \sqrt{23}$

21.

Put the following numbers into order, smallest to largest:

$3\sqrt{8}$ $\quad$ $\sqrt{79}$ $\quad$ $2\sqrt{19}$ $\quad$ $5\sqrt{3}$

$\sqrt{9}\times\sqrt{8}=\sqrt{72}$ $\quad$ $\sqrt{4}\times\sqrt{19}=\sqrt{76}$ $\quad$ $\sqrt{25}\times\sqrt{3}=\sqrt{75}$

$3\sqrt{8}, 5\sqrt{3}, 2\sqrt{19}, \sqrt{79}$

22.
Put the following numbers into order, smallest to largest:

$5\sqrt{5}$ $\quad 8\sqrt{2}$ $\quad 3\sqrt{14}$ $\quad 2\sqrt{31}$

$\sqrt{25} \times \sqrt{5} = \sqrt{125}$ $\quad \sqrt{64} \times \sqrt{2} = \sqrt{128}$ $\quad \sqrt{9} \times \sqrt{14} = \sqrt{126}$ $\quad \sqrt{4} \times \sqrt{31} = \sqrt{124}$

$2\sqrt{31}, 5\sqrt{5}, 3\sqrt{14}, 8\sqrt{2}$

23.
Put the following numbers into order, smallest to largest:

$5\sqrt{11}$ $\quad 12\sqrt{2}$ $\quad 10\sqrt{3}$ $\quad 3\sqrt{29}$

$\sqrt{25} \times \sqrt{11} = \sqrt{275}$ $\quad \sqrt{144} \times \sqrt{2} = \sqrt{288}$ $\quad \sqrt{100} \times \sqrt{3} = \sqrt{300}$ $\quad \sqrt{9} \times \sqrt{29} = \sqrt{261}$

$3\sqrt{29}, 5\sqrt{11}, 12\sqrt{2}, 10\sqrt{3}$

24.
Show that $\sqrt{8} + \sqrt{50}$ can be written in the form $\sqrt{a}$ where a is an integer.

$\sqrt{8} = \sqrt{4} \times \sqrt{2} = 2\sqrt{2}$

$\sqrt{50} = \sqrt{25} \times \sqrt{2} = 5\sqrt{2}$

$2\sqrt{2} + 5\sqrt{2} = 7\sqrt{2} = \sqrt{49} \times \sqrt{2} = \sqrt{98}$

25.
Show that $\sqrt{75} + \sqrt{27}$ can be written in the form $\sqrt{a}$ where a is an integer.

$\sqrt{75} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$

$\sqrt{27} = \sqrt{9} \times \sqrt{3} = 3\sqrt{3}$

$5\sqrt{3} + 3\sqrt{3} = 8\sqrt{3} = \sqrt{64} \times \sqrt{3}$
$= \sqrt{192}$

26.
Show that $2\sqrt{325} - 3\sqrt{52}$ can be written in the form $\sqrt{a}$ where a is an integer.

$2\sqrt{325} = 2 \times \sqrt{13} \times \sqrt{25} = 10\sqrt{13}$

$3\sqrt{52} = 3 \times \sqrt{4} \times \sqrt{13} = 6\sqrt{13}$

$10\sqrt{13} - 6\sqrt{13} = 4\sqrt{13} = \sqrt{16} \times \sqrt{13}$
$= \sqrt{208}$