

**SURDS – PRACTICE QUESTIONS
NON-CALCULATOR**



1.
Simplify:

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

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

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

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

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

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

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

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

(i) $4 \times \sqrt{11} \times \sqrt{11}$

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

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

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

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

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

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

(p) $5\sqrt{3} \times 2\sqrt{3}$

(q) $10\sqrt{5} \times 3\sqrt{5}$

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

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

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

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

2.

Simplify:

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

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

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

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

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

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

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

(h) $\sqrt{20} \div \sqrt{5}$

(i) $20\sqrt{18} \div 4\sqrt{2}$

(j) $15\sqrt{32} \div 5\sqrt{2}$

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

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

3.

Simplify:

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

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

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

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

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

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

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

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

4.

Expand and simplify:

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

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

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

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

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

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

(g) $2\sqrt{7}(3\sqrt{11} + 10)$

(h) $5\sqrt{3}(\sqrt{2} - 6\sqrt{3})$

(i) $6\sqrt{2}(3\sqrt{2} + 5)$

(j) $5\sqrt{11}(3\sqrt{3} - \sqrt{11})$

5.

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

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

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

(c) $2\sqrt{3}(3\sqrt{3} - 5) + 4(\sqrt{3} + 3)$

(d) $3\sqrt{7}(5 + 3\sqrt{7}) - 5(3 - \sqrt{7})$

(e) $(\sqrt{5} + 2)(8 - 3\sqrt{5})$

(f) $(\sqrt{13} - 3)(2 + 3\sqrt{13})$

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

6.

Rationalise the denominator of each fraction:

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

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

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

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

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

(f) $\frac{11}{2\sqrt{2}}$

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

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

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

7.

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

(a) $\sqrt{20}$

(b) $\sqrt{27}$

(c) $\sqrt{28}$

(d) $\sqrt{44}$

(e) $\sqrt{50}$

(f) $\sqrt{63}$

(g) $\sqrt{99}$

(h) $\sqrt{52}$

(i) $\sqrt{125}$

(j) $\sqrt{68}$

(k) $\sqrt{98}$

(l) $\sqrt{175}$

(m) $\sqrt{242}$

(n) $\sqrt{343}$

(o) $\sqrt{475}$

8.
Rationalise the denominator of each fraction, and simplify your answer fully:

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

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

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

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

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

(f) $\frac{2\sqrt{5}-1}{4\sqrt{13}}$

9.
Express $\sqrt{75} + 2\sqrt{12} + 4\sqrt{3}$ in the form $a\sqrt{3}$ where a is an integer.

10.
Express $\sqrt{45} - 4\sqrt{5} + \sqrt{80}$ in the form $a\sqrt{5}$ where a is an integer.

11.

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

12.

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

13.

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

14.

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

15.

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

16.

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

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

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

17.

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

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

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

18.

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

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

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

19.

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

(a) $\frac{2\sqrt{5}}{3+\sqrt{5}}$

(b) $\frac{\sqrt{3}+7}{\sqrt{3}-1}$

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

(d) $\frac{2\sqrt{7}-3}{\sqrt{7}+1}$

20.

Put the following numbers into order, smallest to largest:

$\sqrt{23}$

$2\sqrt{5}$

$\sqrt{17}$

$3\sqrt{2}$

21.

Put the following numbers into order, smallest to largest:

$3\sqrt{8}$

$\sqrt{79}$

$2\sqrt{19}$

$5\sqrt{3}$

22.

Put the following numbers into order, smallest to largest:

$5\sqrt{5}$

$8\sqrt{2}$

$3\sqrt{14}$

$2\sqrt{31}$

23.

Put the following numbers into order, smallest to largest:

$5\sqrt{11}$

$12\sqrt{2}$

$10\sqrt{3}$

$3\sqrt{29}$

24.

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

25.

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

26.

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