



1. Rationalize the denominator in $\frac{5-2\sqrt{3}}{2+3\sqrt{3}}$.
2. Simplify the expression $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ giving your answer in the form $a+b\sqrt{c}$ where a, b and c are integers.
3. Simplify $\frac{\sqrt{96}}{5+\sqrt{24}}$ giving your answer in the form $a+b\sqrt{c}$ where a, b and c are integers.
4. Simplify $\frac{2\sqrt{5}}{\sqrt{3}-\sqrt{5}}$ giving your answer in the form $a+b\sqrt{c}$ where a, b and c are integers.
5. Express $\frac{5}{2\sqrt{2}-5} + \frac{2}{2\sqrt{2}+5}$ in the form $a+b\sqrt{c}$ where a, b and c are rational numbers.
6. Express $\frac{1}{\sqrt{5}} + \frac{5}{2\sqrt{5}-5}$ in the form $a+b\sqrt{c}$ where a, b and c are rational numbers.
7. Find a, b and c if $\frac{\sqrt{28}}{2+\sqrt{7}} - \frac{\sqrt{28}}{\sqrt{7}} = a+b\sqrt{c}$.
8. Evaluate $(3-2\sqrt{3})^2$ hence rationalize the denominator in $\frac{\sqrt{3}}{(3-2\sqrt{3})^2}$.
9. Write $\frac{2\sqrt{3}}{\sqrt{2}+\sqrt{3}}$ in the simplest form leaving your answer in the form $a+b\sqrt{c}$ where a, b and c are integers.
10. Simplify the expression $\frac{\sqrt{48}}{\sqrt{5}+\sqrt{3}}$, leaving your answer in the form $a+b\sqrt{c}$ where a, b and c are integers.
11. Simplify $\frac{4}{5+\sqrt{2}} - \frac{3}{5-\sqrt{2}}$ giving your answer in surd form with a rational denominator.
12. Express $\frac{\sqrt{3}}{1-\cos 30^\circ}$ in surd form and simplify without using a calculator or mathematical tables.
13. Given that $\frac{3}{2-\sqrt{18}} + \frac{5}{2+\sqrt{18}} = a+b\sqrt{c}$, find the value of a, b and c .
14. Given that $\tan 75^\circ = 2+\sqrt{3}$, without using a table or a calculator, determine $5 \tan 15^\circ$ leaving your answer in the form $a+b\sqrt{c}$.
15. Write the expression $\frac{1-\cos 60^\circ}{1+\tan 30^\circ}$ in surd form and rationalize the denominator.
16. Simplify $\sqrt{7} \div (3+\sqrt{7})^2$ giving your answer in surd form with a rational denominator.
17. Simplify $\frac{3}{2\sqrt{2}+3} - \frac{\sqrt{2}}{2\sqrt{2}-3}$ giving your answer in surd form $a+b\sqrt{c}$ where a, b and c are integers.
18. Evaluate $\frac{2}{2\sqrt{2}+3} \div \frac{\sqrt{2}}{2\sqrt{2}-3}$ giving your answer in surd form $a+b\sqrt{c}$ where a, b and c are integers.
19. Simplify without using a calculator or mathematical tables: $\left(\frac{\sin(-330)^\circ + \cos(330)^\circ}{\sin(660)^\circ}\right)^{-1}$
20. Evaluate $8\left(1+\sin\frac{8}{3}\pi^c\right)^3$ without using mathematical tables or a calculator.

Answers

1. $\frac{19\sqrt{3}-28}{23}$

2. $5-2\sqrt{6}$

3. $20\sqrt{6}-48$

4. $-5-\sqrt{15}$

5. $-\frac{15}{17}-\frac{14}{17}\sqrt{2}$

6. $-5-\frac{9}{5}\sqrt{5}$

7. $a=\frac{8}{3}, b=-\frac{4}{3}, c=7$

8. $\frac{7}{3}\sqrt{3}+4$

9. $6-2\sqrt{6}$

10. $-6+2\sqrt{15}$

11. $\frac{5-7\sqrt{2}}{23}$

12. $6+4\sqrt{3}$

13. $a=-1\frac{1}{7}, b=\frac{3}{7}, c=2$

14. $10-5\sqrt{3}$

15. $\frac{3-\sqrt{3}}{4}$

16. $\frac{8\sqrt{7}-21}{2}$

17. $13-3\sqrt{2}$

18. $24-17\sqrt{2}$

19. $\frac{\sqrt{3}-3}{2}$

20. $26+15\sqrt{3}$