

Surds

Practice Questions

Simplify the following.

1. $7\sqrt{3} - 4\sqrt{3}$
2. $\sqrt{5} + 4\sqrt{5} + 3\sqrt{5}$
3. $\sqrt{50} - \sqrt{32}$
4. $3\sqrt{54} + 2\sqrt{24}$
5. $-4\sqrt{5} \times 3\sqrt{11}$
6. $3\sqrt{2} \times 5\sqrt{14}$
7. $(2\sqrt{7})^2$
8. $\frac{4\sqrt{12}}{2\sqrt{2}}$
9. $\frac{\sqrt{3}}{3\sqrt{15}}$
10. $\frac{3\sqrt{15}}{6\sqrt{10}}$
11. $\frac{15\sqrt{18}}{10\sqrt{10}}$

Expand and simplify the following.

12. $4\sqrt{3}(\sqrt{3} + 2\sqrt{5})$
13. $-\sqrt{3}(\sqrt{2} - 4\sqrt{6})$
14. $\sqrt{5}(\sqrt{5} - 5\sqrt{3})$
15. $2\sqrt{3}(\sqrt{18} + \sqrt{3})$
16. $-7\sqrt{5}(-3\sqrt{20} + 2\sqrt{3})$
17. $\sqrt{3}(2\sqrt{2} - 5)$
18. $(3\sqrt{10} - 2\sqrt{5}) \times (4\sqrt{2} + 6\sqrt{6})$

19. $(\sqrt{5} + 6\sqrt{2})(3\sqrt{5} - \sqrt{3})$
20. $(\sqrt{2} - \sqrt{3})(\sqrt{2} + \sqrt{3})$
21. $(2\sqrt{11} + 5\sqrt{2}) \times (2\sqrt{11} - 5\sqrt{2})$
22. $(2\sqrt{5} + \sqrt{3})(2\sqrt{5} - \sqrt{3})$
23. $(2\sqrt{3} + 3\sqrt{5})^2$
24. $(3\sqrt{11})^2$
25. $(\sqrt{7} + 2)^2$
26. $(3 + \sqrt{7})(\sqrt{3} - 2)$

Rationalise the denominator of the following.

27. $\frac{1}{\sqrt{7}}$
28. $\frac{2}{5\sqrt{3}}$
29. $\frac{1 + \sqrt{3}}{\sqrt{2}}$
30. $\frac{6\sqrt{7}}{5\sqrt{2}}$
31. $\frac{\sqrt{5} + 2\sqrt{2}}{\sqrt{5}}$
32. $\frac{4\sqrt{3} - 2\sqrt{2}}{7\sqrt{5}}$
33. $\frac{3\sqrt{3}}{2\sqrt{5} + \sqrt{3}}$
34. $\frac{\sqrt{3}}{\sqrt{2} - 7}$
35. $\frac{2\sqrt{3}}{\sqrt{5} + 2\sqrt{6}}$

36. $\frac{\sqrt{3} - 4}{\sqrt{3} + 4}$
37. $\frac{3\sqrt{3} + \sqrt{2}}{2\sqrt{5} + 3\sqrt{2}}$

Evaluate the following, leaving your answers with rational denominators.

38. $\frac{\sqrt{2} + \sqrt{15}}{\sqrt{3} + 4} - 5\sqrt{3}$
39. $\frac{\sqrt{2}}{\sqrt{2} - \sqrt{3}} - \frac{3}{\sqrt{2} + \sqrt{3}}$
40. $\frac{1}{\sqrt{5} + \sqrt{2}} + \frac{3}{3\sqrt{2} - \sqrt{5}}$
41. $\frac{\sqrt{2} - \sqrt{7}}{\sqrt{2} + \sqrt{3}} \times \frac{\sqrt{2}}{2\sqrt{3} + \sqrt{2}}$
42. $\frac{3}{\sqrt{5} + 2} - \frac{\sqrt{2}}{2\sqrt{2} - 1}$
43. $t + \frac{1}{t}$ for $t = \sqrt{3} - 2$
44. $x^2 + \frac{1}{x^2}$ for $x = \frac{1 + 2\sqrt{3}}{1 - 2\sqrt{3}}$
45. $x + y$ where $x = \sqrt{3} + 1$ and $y = \frac{1}{2\sqrt{5} - 3}$
46. $x + \frac{1}{x}$ for $x = \sqrt{3} + 1$
47. $2x^2 - 3x + \frac{1}{x}$ for $x = 2\sqrt{5}$
48. $x^2 + 4x + 4$ for $x = 2 + \sqrt{3}$
49. $2x^2 - 3xy$ where $x = 3 + \sqrt{2}$ and $y = \sqrt{2} - 2$
50. Find integers x and y where $\frac{\sqrt{3}}{2\sqrt{3} + 3} = x + y\sqrt{3}$