Calculus Surds Practice #2

Simplify fully:

1. $\sqrt{15} \times 2\sqrt{12}$

2. $3\sqrt{8} + 4\sqrt{98}$

3. $\frac{\sqrt{72}}{\sqrt{8}}$

4. $\frac{\sqrt{20}}{\sqrt{75}}$

5. $\frac{\sqrt{18x^4}}{\sqrt{50x^5}}$

Expand and simplify fully:

6. $\sqrt{32}(2 + 3\sqrt{8})$

7. $(1 - \sqrt{2})(2 + \sqrt{8})$

8. $(\sqrt{5} + \sqrt{3})(\sqrt{5} + \sqrt{12})$

9. $(x + \sqrt{28})(x - \sqrt{7})$

10. $(x - \sqrt{2})(x - \sqrt{8})$

Rationalise the denominator, then simplify fully:

11. $\frac{3\sqrt{10}}{\sqrt{5}}$

12. $\frac{1}{3 + \sqrt{5}}$

13. $\frac{\sqrt{2}}{8 - \sqrt{2}}$

14. $\frac{2}{\sqrt{5} - \sqrt{3}}$

15. $\frac{7 + \sqrt{3}}{5 - \sqrt{12}}$

Prove that:

16. $\frac{x + \sqrt{x}}{1 + \sqrt{x}} = \sqrt{x}$

Answers: Calculus Surds Practice #2

Simplify fully:

1. $\sqrt{15} \times 2\sqrt{12} \quad = 2\sqrt{180} \quad = 2\sqrt{4}\sqrt{9}\sqrt{5} \quad = 12\sqrt{5}$

2. $3\sqrt{8} + 4\sqrt{98} \quad = 3\sqrt{4}\sqrt{2} + 4\sqrt{49}\sqrt{2} \quad = 6\sqrt{2} + 28\sqrt{2} \quad = 34\sqrt{2}$

3. $\dfrac{\sqrt{72}}{\sqrt{8}} \quad = \dfrac{\sqrt{36}\sqrt{2}}{\sqrt{4}\sqrt{2}} \quad = \dfrac{6\sqrt{2}}{2\sqrt{2}} \quad = 3$

4. $\dfrac{\sqrt{20}}{\sqrt{75}} \quad = \dfrac{\sqrt{4}\sqrt{5}}{\sqrt{15}\sqrt{5}} \quad = \dfrac{2\sqrt{5}}{\sqrt{15}\sqrt{5}} \quad = \dfrac{2}{\sqrt{15}}$

5. $\dfrac{\sqrt{18x^4}}{\sqrt{50x^5}} \quad = \dfrac{\sqrt{9}\sqrt{2}\sqrt{x^4}}{\sqrt{25}\sqrt{2}\sqrt{x^4}\sqrt{x}} \quad = \dfrac{\sqrt{9}}{\sqrt{25}\sqrt{x}} \quad = \dfrac{3}{5\sqrt{x}}$

Expand and simplify fully:

6. $\sqrt{32}(2 + 3\sqrt{8}) \quad = 2\sqrt{32} + 3\sqrt{256} \quad = 8\sqrt{2} + 48$

7. $(1 - \sqrt{2})(2 + \sqrt{8}) \quad = 2 + \sqrt{8} - 2\sqrt{2} - \sqrt{16} \quad = {}^{-}2$

8. $(\sqrt{5} + \sqrt{3})(\sqrt{5} + \sqrt{12}) \quad = 5 + 2\sqrt{15} + \sqrt{15} + 6 \quad = 11 + 3\sqrt{15}$

9. $(x + \sqrt{28})(x - \sqrt{7}) \quad = x^2 - \sqrt{7}\,x + 2\sqrt{7}\,x - \sqrt{196} \quad = x^2 + \sqrt{7}\,x - 14$

10. $(x - \sqrt{2})(x - \sqrt{8}) \quad = x^2 - \sqrt{2}\,x - 2\sqrt{2}\,x + \sqrt{16} \quad = x^2 - 3\sqrt{2}\,x + 4$

Rationalise the denominator, then simplify fully:

11. $\dfrac{3\sqrt{10}}{\sqrt{5}} \quad = \dfrac{3\sqrt{10}\sqrt{5}}{\sqrt{5}\sqrt{5}} \quad = \dfrac{3\sqrt{2}\sqrt{25}}{5} \quad = 3\sqrt{2}$

12. $\dfrac{1}{3 + \sqrt{5}} \quad = \dfrac{3 - \sqrt{5}}{(3 + \sqrt{5})(3 - \sqrt{5})} \quad = \dfrac{3 - \sqrt{5}}{9 - 3\sqrt{5} + 3\sqrt{5} - 5} \quad = \dfrac{3 - \sqrt{5}}{4}$

13. $\dfrac{\sqrt{2}}{8 - \sqrt{2}} \quad = \dfrac{\sqrt{2}\,(8 + \sqrt{2})}{(8 - \sqrt{2})(8 + \sqrt{2})} \quad = \dfrac{8\sqrt{2} + 2}{64 - 2} \quad = \dfrac{2 + 8\sqrt{2}}{62}$

14. $\dfrac{2}{\sqrt{5} - \sqrt{3}} \quad = \dfrac{2\,(\sqrt{5} + \sqrt{3})}{(\sqrt{5} - \sqrt{3})(\sqrt{5} + \sqrt{3})} \quad = \dfrac{2\,(\sqrt{5} + \sqrt{3})}{5 - 3} \quad = \sqrt{5} + \sqrt{3}$

15. $\dfrac{7 + \sqrt{3}}{5 - \sqrt{12}} \quad = \dfrac{(7 + \sqrt{3})(5 + \sqrt{12})}{(5 - \sqrt{12})(5 + \sqrt{12})} \quad = \dfrac{35 + 7\sqrt{12} + 5\sqrt{3} + \sqrt{36}}{25 - 12} \quad = \dfrac{41 + 19\sqrt{3}}{13}$

Proof:

16. $\dfrac{x + \sqrt{x}}{1 + \sqrt{x}} \quad = \dfrac{(x + \sqrt{x})(1 - \sqrt{x})}{(1 + \sqrt{x})(1 - \sqrt{x})} \quad = \dfrac{x - x\sqrt{x} + \sqrt{x} - x}{1 - x}$

$= \dfrac{\sqrt{x} - x\sqrt{x}}{1 - x} \quad = \dfrac{\sqrt{x}(1 - x)}{1 - x} \quad = \sqrt{x}$