THE DISTRIBUTIVE LAW

Expand and simplify the expressions in this exercise.

1 $\sqrt{5}(\sqrt{2}+\sqrt{3})$ 2 $\sqrt{5}(\sqrt{5}+\sqrt{2})$ 3 $\sqrt{2}(\sqrt{2}+\sqrt{8})$

4 $\sqrt{3}(\sqrt{2}-\sqrt{6})$ 5 $\sqrt{6}(\sqrt{3}-2)$ 6 $7(2\sqrt{5}-1)$

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

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

③ $\sqrt{2}(\sqrt{2}+\sqrt{8}) = 2+\sqrt{16} = 2+4 = 6$

④ $\sqrt{3}(\sqrt{2}-\sqrt{6}) = \sqrt{6}-\sqrt{18} = \sqrt{6}-3\sqrt{2} = \sqrt{3}\sqrt{2}-3\sqrt{2} = \sqrt{2}(\sqrt{3}-3)$

⑤ $\sqrt{6}(\sqrt{3}-2) = \sqrt{18}-2\sqrt{6} = \sqrt{3^2\times 2}-2\sqrt{6} = 3\sqrt{2}-2\sqrt{2}\sqrt{3} = \sqrt{2}(3-2\sqrt{3})$

⑥ $7(2\sqrt{5}-1) = 14\sqrt{5}-7$

8 $3\sqrt{2}(2\sqrt{6}-\sqrt{5})$ 9 $\sqrt{a}(\sqrt{a}+\sqrt{b})$ 10 $\sqrt{x}(\sqrt{x}-\sqrt{y})$

⑧ $3\sqrt{2}(2\sqrt{6}-\sqrt{5}) = 12\sqrt{3}-3\sqrt{10}$

⑨ $\sqrt{a}(\sqrt{a}+\sqrt{b}) = a+\sqrt{ab}$

⑩ $\sqrt{x}(\sqrt{x}-\sqrt{y}) = x-\sqrt{xy}$

14 $(\sqrt{5}+2)(2\sqrt{5}+3)$ 15 $(2\sqrt{3}-5)(2\sqrt{3}+3)$ 16 $(\sqrt{3}-\sqrt{2}(2\sqrt{3}-\sqrt{2}))$

⑭ $(\sqrt{5}+2)(2\sqrt{5}+3) = 10+3\sqrt{5}+4\sqrt{5}+6 = 16+7\sqrt{5}$

⑮ $(2\sqrt{3}-5)(2\sqrt{3}+3) = 12+6\sqrt{3}-10\sqrt{3}-15 = -3-4\sqrt{3}$

⑯ $[\sqrt{3}-\sqrt{2}(2\sqrt{3}-\sqrt{2})] = \sqrt{3}-2\sqrt{6}+2 = 2+\sqrt{3}(1-2\sqrt{2})$

20 $(\sqrt{5}-\sqrt{2})^2$ 21 $(2\sqrt{6}+\sqrt{3})^2$ 22 $(2\sqrt{2}-1)(2\sqrt{2}+1)$

⑳ $(\sqrt{5}-\sqrt{2})^2 = 5-2\sqrt{10}+2 = 7-2\sqrt{10}$

㉑ $(2\sqrt{6}+\sqrt{3})^2 = 24+4\sqrt{18}+3 = 27+4\sqrt{3^2\times 2} = 27+12\sqrt{2}$

㉒ $(2\sqrt{2}-1)(2\sqrt{2}+1) = (2\sqrt{2})^2-1^2 = 8-1 = 7$

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23 $(2\sqrt{6}-\sqrt{3})(2\sqrt{6}+\sqrt{3})$ **24** $(\sqrt{11}-\sqrt{7})(\sqrt{11}+\sqrt{7})$ **25** $(\sqrt{7}-2)(\sqrt{7}+2)$

(23) $(2\sqrt{6}-\sqrt{3})(2\sqrt{6}+\sqrt{3}) = (2\sqrt{6})^2-(\sqrt{3})^2 = 24-3 = 21$

(24) $(\sqrt{11}-\sqrt{7})(\sqrt{11}+\sqrt{7}) = (\sqrt{11})^2-(\sqrt{7})^2 = 11-7 = 4$

(25) $(\sqrt{7}-2)(\sqrt{7}+2) = (\sqrt{7})^2-(2)^2 = 7-4 = 3$

30 $(\sqrt{11}-\sqrt{10})(\sqrt{11}+\sqrt{10})$ **31** $(\sqrt{6}-\sqrt{5})(\sqrt{6}+\sqrt{5})$ **32** $(2\sqrt{2}+\sqrt{3})^2$

(30) $(\sqrt{11}-\sqrt{10})(\sqrt{11}+\sqrt{10}) = (\sqrt{11})^2-(\sqrt{10})^2 = 11-10 = 1$

(31) $(\sqrt{6}-\sqrt{5})(\sqrt{6}+\sqrt{5}) = (\sqrt{6})^2-(\sqrt{5})^2 = 6-5 = 1$

(32) $(2\sqrt{2}+\sqrt{3})^2 = (2\sqrt{2})^2+2(2\sqrt{2})(\sqrt{3})+(\sqrt{3})^2$

$= 4\times 2 + 4\sqrt{6} + 3 = 11 + 4\sqrt{6}$

36 Expand and simplify $(4\sqrt{3}+1)(2\sqrt{3}-3)$. Some steps in this simplification are given below. Indicate whether each statement is a correct or incorrect step.

(a) $72-12\sqrt{3}+2\sqrt{3}-3$ **(b)** $24-12\sqrt{3}+2\sqrt{3}-3$ **(c)** $21-10\sqrt{3}$ **(d)** $27-10\sqrt{3}$

$(4\sqrt{3}+1)(2\sqrt{3}-3) = 24-12\sqrt{3}+2\sqrt{3}-3$

$= 21-10\sqrt{3}$

37 $(5\sqrt{2}-4)(5\sqrt{2}+4)$ **38** $(2\sqrt{7}+3\sqrt{6})^2$ **39** $(2\sqrt{15}+\sqrt{5})(\sqrt{15}-3\sqrt{5})$

(37) $(5\sqrt{2}-4)(5\sqrt{2}+4) = (5\sqrt{2})^2-4^2 = 50-16 = 34$

(38) $(2\sqrt{7}+3\sqrt{6})^2 = (2\sqrt{7})^2+2\times(2\sqrt{7})\times 3\sqrt{6}+(3\sqrt{6})^2$

$= 28 + 12\sqrt{42} + 54 = 82+12\sqrt{42}$

(39) $(2\sqrt{15}+\sqrt{5})(\sqrt{15}-3\sqrt{5}) = 30-30\sqrt{3}+5\sqrt{3}-15$

$= 15-25\sqrt{3}$