

Brackets with surds

Multiply and simplify,

$$1) (3\sqrt{2} + 2\sqrt{3})(4\sqrt{6} + 2\sqrt{3})$$

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

$$3) (3\sqrt{6} + 4\sqrt{3})(3\sqrt{7} + 4\sqrt{6})$$

$$4) (5\sqrt{7} + 3)(3\sqrt{6} + 3)$$

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

$$6) (3 + 5\sqrt{3})(4\sqrt{3} + 4)$$

$$7) (2\sqrt{3} + 2\sqrt{2})(5\sqrt{6} + 5\sqrt{6})$$

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

$$9) (4\sqrt{2} + 3\sqrt{6})(2\sqrt{6} + 3\sqrt{2})$$

$$10) (5\sqrt{6} + 2\sqrt{2})(3\sqrt{3} + 5\sqrt{3})$$

$$11) (2 + 3\sqrt{2})(2\sqrt{5} + 5)$$

$$12) (4\sqrt{6} + 3\sqrt{2})(3\sqrt{5} + 3\sqrt{7})$$

$$13) (3\sqrt{6} + 2)(5\sqrt{7} + 5)$$

$$14) (4\sqrt{3} + 3\sqrt{2})(5\sqrt{7} + 2\sqrt{2})$$

$$15) (4\sqrt{3} + 3)(4 + 4\sqrt{6})$$

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- 1)
$$\begin{aligned}(3\sqrt{2} + 2\sqrt{3})(4\sqrt{6} + 2\sqrt{3}) &= 8\sqrt{18} + 12\sqrt{12} + 4\sqrt{9} + 6\sqrt{6} \\&= 24\sqrt{2} + 24\sqrt{3} + 12 + 6\sqrt{6}\end{aligned}$$
- 2)
$$\begin{aligned}(4 + 3\sqrt{5})(3\sqrt{3} + 2) &= 8 + 6\sqrt{5} + 12\sqrt{3} + 9\sqrt{15} \\&= 8 + 6\sqrt{5} + 12\sqrt{3} + 9\sqrt{15}\end{aligned}$$
- 3)
$$\begin{aligned}(3\sqrt{6} + 4\sqrt{3})(3\sqrt{7} + 4\sqrt{6}) &= 16\sqrt{18} + 12\sqrt{36} + 12\sqrt{21} + 9\sqrt{42} \\&= 48\sqrt{2} + 72 + 12\sqrt{21} + 9\sqrt{42}\end{aligned}$$
- 4)
$$\begin{aligned}(5\sqrt{7} + 3)(3\sqrt{6} + 3) &= 9 + 15\sqrt{7} + 9\sqrt{6} + 15\sqrt{42} \\&= 9 + 15\sqrt{7} + 9\sqrt{6} + 15\sqrt{42}\end{aligned}$$
- 5)
$$\begin{aligned}(3\sqrt{5} + 5\sqrt{2})(2\sqrt{2} + 2\sqrt{6}) &= 6\sqrt{10} + 10\sqrt{4} + 6\sqrt{30} + 10\sqrt{12} \\&= 6\sqrt{10} + 20 + 6\sqrt{30} + 20\sqrt{3}\end{aligned}$$
- 6)
$$\begin{aligned}(3 + 5\sqrt{3})(4\sqrt{3} + 4) &= 12 + 20\sqrt{3} + 12\sqrt{3} + 20\sqrt{9} \\&= 72 + 32\sqrt{3}\end{aligned}$$
- 7)
$$\begin{aligned}(2\sqrt{3} + 2\sqrt{2})(5\sqrt{6} + 5\sqrt{6}) &= 10\sqrt{18} + 10\sqrt{12} + 10\sqrt{18} + 10\sqrt{12} \\&= 60\sqrt{2} + 40\sqrt{3}\end{aligned}$$
- 8)
$$\begin{aligned}(3\sqrt{5} + 5)(5 + 3\sqrt{3}) &= 25 + 15\sqrt{5} + 15\sqrt{3} + 9\sqrt{15} \\&= 25 + 15\sqrt{5} + 15\sqrt{3} + 9\sqrt{15}\end{aligned}$$
- 9)
$$\begin{aligned}(4\sqrt{2} + 3\sqrt{6})(2\sqrt{6} + 3\sqrt{2}) &= 9\sqrt{12} + 12\sqrt{4} + 6\sqrt{36} + 8\sqrt{12} \\&= 34\sqrt{3} + 60\end{aligned}$$
- 10)
$$\begin{aligned}(5\sqrt{6} + 2\sqrt{2})(3\sqrt{3} + 5\sqrt{3}) &= 25\sqrt{18} + 10\sqrt{6} + 15\sqrt{18} + 6\sqrt{6} \\&= 120\sqrt{2} + 16\sqrt{6}\end{aligned}$$
- 11)
$$\begin{aligned}(2 + 3\sqrt{2})(2\sqrt{5} + 5) &= 10 + 15\sqrt{2} + 4\sqrt{5} + 6\sqrt{10} \\&= 10 + 15\sqrt{2} + 4\sqrt{5} + 6\sqrt{10}\end{aligned}$$
- 12)
$$\begin{aligned}(4\sqrt{6} + 3\sqrt{2})(3\sqrt{5} + 3\sqrt{7}) &= 9\sqrt{14} + 12\sqrt{42} + 9\sqrt{10} + 12\sqrt{30} \\&= 9\sqrt{14} + 12\sqrt{42} + 9\sqrt{10} + 12\sqrt{30}\end{aligned}$$
- 13)
$$\begin{aligned}(3\sqrt{6} + 2)(5\sqrt{7} + 5) &= 10 + 15\sqrt{6} + 10\sqrt{7} + 15\sqrt{42} \\&= 10 + 15\sqrt{6} + 10\sqrt{7} + 15\sqrt{42}\end{aligned}$$
- 14)
$$\begin{aligned}(4\sqrt{3} + 3\sqrt{2})(5\sqrt{7} + 2\sqrt{2}) &= 6\sqrt{4} + 8\sqrt{6} + 15\sqrt{14} + 20\sqrt{21} \\&= 12 + 8\sqrt{6} + 15\sqrt{14} + 20\sqrt{21}\end{aligned}$$
- 15)
$$\begin{aligned}(4\sqrt{3} + 3)(4 + 4\sqrt{6}) &= 12 + 16\sqrt{3} + 12\sqrt{6} + 16\sqrt{18} \\&= 12 + 16\sqrt{3} + 12\sqrt{6} + 48\sqrt{2}\end{aligned}$$