

1.5) Surds

Worked example

$$\sqrt{x} \times \sqrt{x}$$

$$\sqrt[3]{y} \times \sqrt[3]{y} \times \sqrt[3]{y}$$

Your turn

$$\sqrt[4]{z} \times \sqrt[4]{z} \times \sqrt[4]{z} \times \sqrt[4]{z}$$

z

Worked example

$$2\sqrt{x} \times 3\sqrt{x}$$

$${}^3\sqrt{y} \times 3{}^3\sqrt{y} \times 4{}^3\sqrt{y}$$

Your turn

$$2{}^4\sqrt{z} \times 3{}^4\sqrt{z} \times 4{}^4\sqrt{z} \times {}^4\sqrt{z}$$

$$24z$$

Worked example

Simplify:

$$\sqrt{72} - \sqrt{18}$$

$$\sqrt{125} - \sqrt{45}$$

Your turn

Simplify:

$$\sqrt{75} - \sqrt{12}$$

$$3\sqrt{3}$$

Worked example

Express in the form $a + b\sqrt{3}$:

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

Your turn

Express in the form $a + b\sqrt{5}$:

$$(2 + 7\sqrt{5})^2$$

$$249 + 28\sqrt{5}$$

Worked example

Express in the form $a + b\sqrt{3}$:

$$(2\sqrt{3} - 5)^2$$

Your turn

Express in the form $a + b\sqrt{5}$:

$$(3\sqrt{5} - 2)^2$$

$$49 - 12\sqrt{5}$$

Worked example

Simplify:

$$(\sqrt{7} + 1)(\sqrt{7} - 1)$$

$$(\sqrt{5} - 2)(\sqrt{5} + 2)$$

Your turn

Simplify:

$$(\sqrt{11} - 3)(\sqrt{11} + 3)$$

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Worked example

Simplify:

$$(7 + 4\sqrt{2})(7 - 4\sqrt{2})$$

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

Your turn

Simplify:

$$(9 - 3\sqrt{5})(9 + 3\sqrt{5})$$

36

Worked example

Simplify:

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

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

Your turn

Simplify:

$$(11\sqrt{5} - 3\sqrt{7})(11\sqrt{5} + 3\sqrt{7})$$

542

Worked example

Express in the form $a + b\sqrt{3}$:

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

Your turn

Express in the form $a + b\sqrt{5}$:

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

$$26 + 11\sqrt{5}$$

Worked example

Given that $a > 0$, show that

$$\sqrt{5a}(\sqrt{20a} + a\sqrt{5a})$$

Is always a multiple of 3

Your turn

Given that $a > 0$, show that

$$\sqrt{3a}(\sqrt{12a} + a\sqrt{3a})$$

is always a multiple of 3

Shown

Worked example

Simplify

$$(3 + \sqrt{2})^2 - (3 - \sqrt{2})^2$$

$$(4 + \sqrt{5})^2 - (4 - \sqrt{5})^2$$

Your turn

Simplify

$$(2 + \sqrt{3})^2 - (2 - \sqrt{3})^2$$

$$8\sqrt{3}$$

Worked example

Find the value of a and b :

$$(a - 3\sqrt{5})^2 = b - 42\sqrt{5}$$

Your turn

Express b and c in terms of a

$$(a - 2\sqrt{3})^2 = b - 20\sqrt{3}$$

$$a = 5, b = 37$$

Worked example

Expand and simplify:

$$(\sqrt{7} - 3)(\sqrt{7} + 2)(\sqrt{7} + 1)$$

Your turn

Expand and simplify:

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

4

Worked example

Expand and simplify:

$$(\sqrt{7} - 3)(\sqrt{7} + 2)(\sqrt{7} + 1)$$

Your turn

Expand and simplify:

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

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