Manipulating Surds

Simplify

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

(c) $2\sqrt{3} - 4\sqrt{3}$ (d) $2\sqrt{3} - 4\sqrt{5}$

(e) $-4\sqrt{2} + 2\sqrt{2}$ (f) $\sqrt{2} - 2\sqrt{2}$

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

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

(a) $6\sqrt{3}$ (b) $2\sqrt{3}$
(c) $-2\sqrt{3}$ (d) Not possible
(e) $-2\sqrt{2}$ (f) $-\sqrt{2}$
(g) $5\sqrt{5}$
(h) $6\sqrt{3}$

Expand and simplify where possible

(a) $5(2 + \sqrt{3})$ (b) $\sqrt{5}(2 + \sqrt{3})$

(c) $\sqrt{5}(\sqrt{2} - \sqrt{3})$ (d) $5(\sqrt{2} - \sqrt{3})$

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

(g) $5\sqrt{2}(2 + \sqrt{3})$ (h) $\sqrt{5}(2\sqrt{3} + \sqrt{5})$

(i) $\sqrt{5}(\sqrt{2} + 2\sqrt{3})$ (j) $3\sqrt{5}(2\sqrt{2} + 3\sqrt{3})$

(a) $10 + 5\sqrt{3}$ (b) $2\sqrt{5} + \sqrt{15}$
(c) $\sqrt{10} - \sqrt{15}$ (d) $5\sqrt{2} - 5\sqrt{3}$
(e) $3 - 7\sqrt{3}$ (f) $2\sqrt{3} + 3$
(g) $10\sqrt{2} + 5\sqrt{6}$ (h) $2\sqrt{15} + 5$
(i) $\sqrt{10} + 2\sqrt{15}$ (j) $6\sqrt{10} + 9\sqrt{15}$

Expand and simplify where possible

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

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

(c) $(5 - \sqrt{5})(4 + \sqrt{5})$

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

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

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

(a) $5 + 3\sqrt{3}$
(b) $11 + 6\sqrt{3}$
(c) $15 + \sqrt{5}$
(d) $3 + 2\sqrt{5}$
(e) $-2 + 7\sqrt{3}$
(f) $-22 + 8\sqrt{5}$

Calculate the areas of these shapes, giving answers in their simplest form

(a) A square with side length $2 + \sqrt{5}$ cm

(b) A rectangle width length $\sqrt{7}$ cm and width $1 + \sqrt{3}$ cm

(c) A triangle with base $\sqrt{8}$ cm and height $2\sqrt{8}$ cm

(a) $(9 + 4\sqrt{5})$ cm²
(b) $(\sqrt{7} + \sqrt{21})$ cm²
(c) 8 cm²