AQA Level 2 Further mathematics Number & algebra

Section 1: Basic number and algebra

Exercise

1. Work out:
   (i) $3\frac{3}{4} - 2\frac{2}{3}$ (ii) $1\frac{2}{5} \times 2\frac{1}{3}$ (iii) $3\frac{3}{5} \div 2\frac{2}{3}$

2. Three quantities x, y and z are such that $x : y = 2 : 5$ and $y : z = 3 : 4$.
   Express the following ratios in their simplest form.
   (i) $x : z$ (ii) $2y : 5z$ (iii) $x + 2y : y$

3. $x : y = y : 4$
   Find a possible pair of positive whole number values of x and y for each of the following possibilities.
   (a) $x = y$ (b) $x > y$ (c) $y > x$.

4. (i) A laptop is priced at £230 plus VAT at 20%. What is the full price of the laptop including VAT?
   (ii) A sofa is reduced from £800 to £680. By what percentage has the price of the sofa been reduced?

5. Simplify the following expressions:
   (i) $2x + 3y - x + 5y + 4x$
   (ii) $5a - 2b + 3c - 2a + 5b$
   (iii) $4p + q - 6p - 5q + 5p + 4q$

6. Multiply out the brackets and simplify where possible:
   (i) $3(2x + 3y)$
   (ii) $4(3a - 2b) - 3(a + 2b)$
   (iii) $p(2p - q) + 2q(p - 3q)$

7. Multiply out these expressions.
   (i) $(x + 1)(x - 3)$ (ii) $(x + 2)(2x + 1)$
   (iii) $(x - 3)(x - 4)$ (iv) $(3x + 2)(x - 2)$
   (v) $(2x + 1)(4x - 1)$ (vi) $(1 - 2x)(1 + x)$
   (vii) $(3 + 2x)(x - 1)$ (viii) $(5x - 3)(2x + 5)$
   (ix) $(x + 3)^2$

8. Expand the brackets and simplify the following as far as possible:
   (i) $(x-2)(2x^2-3x+1)$
   (ii) $(3x-2)(x^3-2x+4)$
   (iii) $(2x+1)(x^3+2x^2-3x-5)$
   (iv) $(x+3)(2x-1)(x-4)$
   (v) $(2x-1)^3$

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9. Write these in terms of the simplest possible surd.

(i) $\sqrt{8}$ (ii) $\sqrt{50}$ (iii) $\sqrt{48}$

(iv) $\sqrt{216}$ (v) $\sqrt{63}$ (vi) $\sqrt{300}$

(vii) $\sqrt{6}\times\sqrt{27}$ (viii) $\sqrt{12}\times\sqrt{15}$ (ix) $\sqrt{10}\times\sqrt{24}\times\sqrt{15}$

10. Simplify the following

(i) $\left(1+\sqrt{2}\right)+\left(3-2\sqrt{2}\right)$ (ii) $\left(5\sqrt{2}-2\sqrt{3}\right)-\left(\sqrt{2}+3\sqrt{3}\right)$

(iii) $2\left(\sqrt{5}-3\sqrt{3}\right)+3\left(2\sqrt{5}+\sqrt{3}\right)$ (iv) $\sqrt{18}+\sqrt{72}-\sqrt{98}$

11. Multiply out the brackets and simplify as far as possible.

(i) $\left(1+\sqrt{2}\right)\left(3-\sqrt{2}\right)$ (ii) $\left(2-\sqrt{3}\right)\left(3+2\sqrt{3}\right)$

(iii) $\left(3-2\sqrt{5}\right)\left(1-3\sqrt{5}\right)$ (iv) $\left(\sqrt{2}+2\sqrt{3}\right)\left(5\sqrt{2}-\sqrt{3}\right)$

(v) $\left(\sqrt{7}+\sqrt{2}\right)\left(\sqrt{7}-\sqrt{2}\right)$ (vi) $\left(3-\sqrt{2}\right)^2$

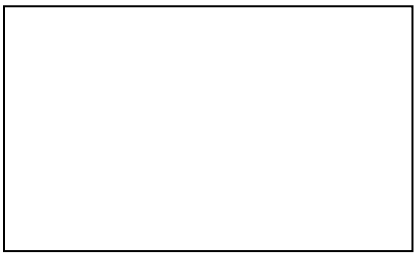
12. Rationalise the denominators of the following.

(i) $\frac{3}{\sqrt{3}}$ (ii) $\frac{1}{\sqrt{5}}$ (iii) $\frac{1+\sqrt{2}}{\sqrt{2}}$

(iv) $\frac{1}{\sqrt{3}+1}$ (v) $\frac{\sqrt{2}}{2-\sqrt{2}}$ (vi) $\frac{1-\sqrt{3}}{2-\sqrt{3}}$

(vii) $\frac{1+2\sqrt{5}}{3-\sqrt{5}}$ (viii) $\frac{1+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ (ix) $\frac{\sqrt{6}+\sqrt{3}}{\sqrt{6}-\sqrt{3}}$

13. The rectangle below has length $\left(\sqrt{7}+1\right)$ cm. The area of the rectangle is a whole number of cm^2.



$\left(\sqrt{7}+1\right)$

Find a possible width for the rectangle and state its area.