Algebra Revision

No calculators allowed. If $ax^2 + bx + c = 0$ then $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. (If you haven't learnt this yet, give yourself a clip round the ear please!)

1. Expand and collect like terms in $(x + 3)(2x - 1)(x + 2)$. $\boxed{2x^3 + 9x^2 + 7x - 6}$

2. Factorise fully

   (a) $x^2 + x - 12$. $\boxed{(x + 4)(x - 3)}$

   (b) $6x^2 + x - 2$. $\boxed{(3x + 2)(2x - 1)}$

   (c) $px + py + qx + qy$. $\boxed{(p + q)(x + y)}$

   (d) $4a^5x^2 - 25a^5$. $\boxed{a^5(2x + 5)(2x - 5)}$

   (e) $20ax^3 - 50ax^2 + 30ax$. $\boxed{10ax(2x - 3)(x - 1)}$

   (f) $2(x + 1)^3a^6 + 6(x + 1)^2a^7$. $\boxed{2a^6(x + 1)^2(x + 3a + 1)}$

3. Solve

   (a) $\dfrac{x}{2} + \dfrac{2x - 1}{3} - \dfrac{3 - x}{4} = 2$. $\boxed{x = \frac{37}{17}}$

   (b) $\dfrac{6}{x - 5} + \dfrac{15}{x - 4} = 8$. $\boxed{x = 7 \text{ or } x = 4\frac{5}{8}}$

   (c) $\dfrac{8}{3x - 4} + \dfrac{9}{x + 1} = 7$. $\boxed{x = 0 \text{ or } x = 2}$

   (d) $x^2 < 9$. $\boxed{-3 < x < 3}$

   (e) $x^2 + 12 \geqslant 7x$. $\boxed{x \geqslant 4 \text{ or } x \leqslant 3}$

4. Complete the square

   (a) $y = x^2 + 4x$. $\boxed{(x + 2)^2 - 4}$

   (b) $y = 2x^2 - 8x + 1$. $\boxed{2(x - 2)^2 - 7}$

   (c) $-4x^2 + 16x + 7$. $\boxed{-4(x - 2)^2 + 23}$

5. Solve by the formula $x^2 - 5x + 2 = 0$, simplifying your answer fully in surd form. $\boxed{x = \frac{5 \pm \sqrt{17}}{2}}$

6. For what value(s) of k does $x^2 + kx + 1 = 0$ have one root only? $\boxed{k = 2 \text{ or } k = -2}$

7. Simplify $\dfrac{6(3xy)^3x^3y}{9x^2y(x^2y)^2}$. $\boxed{18y}$

8. Simplify $\dfrac{12x^2 - 14x - 6}{4x^2 - 9}$. [Don't forget the three rules of factorisation!] $\boxed{\frac{2(3x+1)}{2x+3}}$

9. Simplify $\dfrac{(x + 5)^2 - 1}{x^2 + 9x + 20}$. $\boxed{\frac{x+6}{x+5}}$