1. Let the sides be of length x and y.

   Area $= 53$ so $x^2 + y^2 = 53$

   Perimeter $= 36$ so

   $4x + 4y = 36$

   $y = 9 - x$

   Sub into area equation

   $x^2 + (9 - x)^2 = 53$

   $2x^2 - 18x + 28 = 0$

   $x = 2, 7 \quad y = 7, 2$

   The squares are of length 2cm and 7cm.

2. For real solutions $\Delta \geq 0$

   $\Delta = b^2 - 4ac$

   $= (a - 2)^2 - 4(4a^2 - a - 1)$

   $= -15a^2 < 0 \quad for\ a \neq 0$

   Hence there are no real solutions for **non-zero values** of a.

3. If roots are b and 2b

Equ is $(x - b)(x - 2b) = 0$

$x^2 - 3bx + 2b^2 = 0$

compare $x^2 - 6kx + (10k + 12) = 0$

$3b = 6k$ so $b = 2k$

$8b^2 = 10k + 12$

So $8k^2 = 10k + 12$

$8k^2 - 10k - 12 = 0$

$4k^2 - 5k - 6 = 0$

$(k - 2)(4k + 3) = 0$

$k = 2$ or -0.75

4.

Roots b and 3b

Equ is $(x - b)(x - 3b) = 0$
$$x^2 - 4bx + 3b^2 = 0$$
compare $\quad x^2 - px \quad + q = 0$

so $p = 4b \quad$ *and* $\quad q = 3b^2$

$b = \dfrac{p}{4} \quad$ *subs* $\quad q = \dfrac{3\,p^2}{16}$

$16q = 3p^2$

5. For one real soln $\Delta = 0$

$$(a + 5)^2 - 4a(3a + 6) = 0$$

$$11a^2 + 14a - 25 = 0$$

$$a = 1, -\frac{25}{11}$$