This file contains specific solutions to parts of some questions set in Year 12 tKF sessions, so that you can check that you are on the right track. Some questions, for instance those where the result is given and a proof is required, do not have solutions given here.

These brief solutions are NOT model answers and do not indicate how a full solution should be presented Please don't look at these solutions until you have completed the question or part question. If you are having difficulties, use the hints which are in a separate folder.

1. $\sqrt{24 \times 150} = 2 \times 3 \times 5 = 60$
   $\sqrt{147 \times 48} = 84$
   $\sqrt{abc^2 \times c^4 ab} = abc^3$

2. -

3. [2008 Oxford Admission Test question 1E] (Multiple Choice)
   (d) 504

4. [2004 STEP I question 1]
   (i) $207 + 94\sqrt{5}$.
   (ii) $c = 3$ and $d = 2$.
   (iii) $x = 3 \pm 2\sqrt{2}$.

5. [2008 Oxford Admission Test question 2]

   (a) The smallest positive integers x_1 and y_1, that solve the equation

   $$(x_1)^2 - 2(y_1)^2 = 1$$

   are $x_1 = 3$ and $y_1 = 2$. (There is an infinite number of integral solutions to these equations.)

   (b) $a = 2$, $b = 3$

   (c) A pair of ntegers X, Y which satisfy $X^2 - 2Y^2 = 1$ such that $X > Y > 50$ is $X = 99$, $Y = 70$. (There is an infinite number of larger possibilities.)

   (d) (Using the values of a and b found in part (b)) $\frac{x_n}{y_n} \sim \sqrt{2}$ as n increases.

   (In more formal mathematical terms, $\frac{x_n}{y_n} \to \sqrt{2}$ as $n \to \infty$. This statement can be proved using a branch of mathematics known as analysis.)

6. [2004 STEP I question 3]

   (a)
   $$x^3 - 5x^2 + 2x^2y + xy^2 - 8xy - 3y^2 + 6x + 6y = (x-3)(x+y)(x+y-2)$$

   (b)
   $$6y^3 - y^2 - 21y + 2x^2 + 12x - 4xy + x^2y - 5xy^2 + 10 = (y+2)(2y-x-1)(3y-x-5)$$

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