Practice for L3 Equations #1

1. Solve the system of equations

$3x + y + 2z + 2 = 0$ $x + 2y - 3z + 1 = 0$ $2x - 5y + 2z + 12 = 0$

2. Billy watches some games of American football.

In the first his team gets two touchdowns, three penalties and a safety for 25 points.

The next week it gets 3 touchdowns, five penalties and a safety for 38 points.

The week later it gets 3 touchdowns and a penalty for 24 points.

What are the scoring values for a touchdown, penalty and safety?

3. In 2013 the Chiefs hosted the Super15 finals. In the Perry Stand there were three classes of seats: these were Uncovered, Edge, and Central seats.

3 Uncovered and 2 Central seats cost $440

2 Edge and 4 Central seats cost $720

An Uncovered and Edge seat together cost $30 more than a Central seat

Set up and solve a system of equations to find the cost of each type of seats.

4. Three points $(^{-}1, 11)$, (1, 7) and (2, 26) lie on the curve $y = x^3 + bx^2 + cx + d$.

Form a system of equations and solve it to find the equation of the curve.

5. Describe fully the nature of the system of equations below:

$x + 8y + 9z = 28$ $4x + 5y + 3z = 25$ $x = y + 2z - 1$

6. Find k so that that the group of equations below are unsolvable, and describe fully the nature of the lack of solutions:

$5x + 7y + 7z = 5$ $2x + y + 4z = 7$ $x + ky + z = 6$

Answers: Practice for L3 Equations #1

1. $x = -2, y = 2, z = 1$ No alternative

2. $2t + 3p + s = 25$ $3t + 5p + s = 38$ $3t + p = 24$

   Touchdown = 7 points, Penalty = 3 points, Safety = 2 points

   Must answer in context, not just letters with values.

3. $3u + 2c = 440$ $2e + 4c = 720$ $u + e - c = 30$

   Or equivalent rearrangements. Explain the meaning of each variable.

   Uncovered cost $60, Edge cost $100, Central cost $130

   Must answer in context, not just letters with values.

4. $(-1)^3 + (-1)^2 b + (-1) c + d = 11$ $1 b + -1 c + d = 12$

   $(1)^3 + (1)^2 b + (1) c + d = 7$ $1 b + 1 c + d = 6$

   $(2)^3 + (2)^2 b + (2) c + d = 26$ $4 b + 2 c + d = 18$

   Or equivalent rearrangements Giving: $\boldsymbol{y = x^3 + 5x^2 - 3x + 4}$

5. ① $x + 8y + 9z = 28$ ② $4x + 5y + 3z = 25$ ③ $x - y - 2z = -1$

   taking $-1$① $+ 1$② $- 3$③ gives the equation: $0 = 0$ so the system is **dependent**.

   There are an **infinite number of solutions**. All three **planes** mutually **intersect along a common line**.

6. ① $5x + 7y + 7z = 5$ ② $2x + y + 4z = 7$ ③ $x + ky + z = 6$

   taking $1$① $- 1$② $- 3$③ cancels out the x and z components. To do the same for the y component gives that $\boldsymbol{k = 2}$.

   As, using the same ratios, $5 - 7 - 3 \times 6 \neq 0$, the system is **inconsistent**.

   There are **no solutions**. Taking each pair of planes and finding their line of intersection gives a system of **three parallel lines**, so that you can only solve for two at a time.