

## Practice for L3 Equations #1

1. Solve the system of equations

$$3x + y + 2z + 2 = 0$$

$$x + 2y + 1 = 3z$$

$$2x + 2z + 12 = 5y$$

2. Billy watches some games of American football.

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

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

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

What are the scoring values for a touchdown, field goal 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. Describe fully the nature of the system of equations below:

$$x + 8y + 9z = 28$$

$$4x + 5y + 3z = 25$$

$$x = y + 2z - 1$$

5. Bill goes through company expenses and finds that his workers, who were meant to buy their clothing from the same store at about the same time have billed him: \$109 for a shirt, a pair of trousers, and a pair of socks; \$146 for two shirts, a pair of trousers and two pairs of socks, and \$40 for a shirt and a pair of socks. Should he be suspicious?

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

**Touchdown = 7 points, Field goal = 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.

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

taking  $-1① + 1② - 3③$  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**. Solutions include approximately  $(0, 6.714, -2.847)$  and  $(2.222, 3.2222, 0)$ .

5. ①  $x + y + z = 109$  ②  $2x + y + 2z = 146$  ③  $x + z = 40$

taking  $1① - 1③$  gives the  $y = 69$  we put that into the equations and we get

④  $x + z = 40$  and ⑤  $2x + 2z = 77$  and then taking  $⑤ - 2④$  gives  $0 = -3$

So **Bill should be suspicious**. If the clothes all were bought from the same store at the same time then he would get a dependent result, not an inconsistent one, since there would be at least one correct solution (although, being dependent, we wouldn't know which one).

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

taking  $1① - 1② - 3③$  cancels out the  $x$  and  $z$  components. To do the same for the  $y$  component gives that  $k = 2$ .

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.