

Practice for L3 Equations #3

1. Solve the system of equations

$$5e + g = 2f + 9$$

$$2e + 2g + 3f + 5 = 0$$

$$2e + 4f = 3 + g$$

2. A squash club has three kinds of membership: super, adult and child.

In January they sell five super, ten adult and one child for \$2930. In February they sell one super, three adult and one child for \$810. In March they sell four super, five adult and four child for \$2120. These can be represented by the following equations:

In April they sell two super, five adult and six child memberships. How much do they raise?

3. A builder buys 100 pavers, 400 bricks and 50 tiles for \$1,340.

Another buys 120 pavers, 2,000 bricks and 400 tiles for \$4,160.

A brick costs 70 cents more than a tile.

Set up and solve a system of equations to find the cost of pavers, bricks and tiles.

4. Peter sells candy floss at the market in three sizes – Standard, Large and Family.

Standard bags sell for \$2.25 each. Large bags sell for twice that. Family bags sell for \$1.50 more than Large Bags.

On his first day, Peter sold 196 bags in total. He sold three times as many Standard bags as he did Large and Family bags together. His takings for the day were \$581.25.

Set up and solve a system of equations to find the numbers of each size that was sold.

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

$$2a + 3b + 4c = 31$$

$$a + 5b + c = 35$$

$$a - 9b + 5c = 4$$

6. Consider the following system of equations:

$$3x + 2y + 2z = 15$$

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

$$kx = y + z$$

Find k so that the system is inconsistent and explain with a full geometrical description.

Answers: Practice for L3 Equations #3

1. $5e - 2f + g =$ $2e + 2g + 3f = -5$ $2e + 4f - g = 3$

Solution: $e = 2, f = -1, g = -3$

2. $5x + 10y + z = 2930$ $x + 3y + z = 810$ $4x + 5y + 4z = 2120$

Solving gives: $x = 250, y = 160, z = 80$ $2 \times 250 + 5 \times 180 + 6 \times 80 = \mathbf{\$1,880}$

3. $100p + 400b + 50t = 1340$ $100p + 400b + 50t = 1340$
 $120p + 2000b + 400t = 4160$ $120p + 2000b + 400t = 4160$
 $b = t + 0.7$ $0p + 1b - 1t = 0.7$

Solving gives $p = 7, b = 1.5, t = 0.8$.

Must answer in context: **pavers cost \$7, bricks cost \$1.50 and tiles cost 70 cents.**

4. $x + y + z = 196$ $x + y + z = 196$
 $x = 3(y + z)$ $x - 3y - 3z = 0$
 $2.25x + 4.5y + 6z = 581.25$ $2.25x + 4.5y + 6z = 581.25$

$x = 132, y = 44, z = 22$. In context **147 Standard bags, 29 Large bags, 20 Family bags**

5. ① $2a + 3b + 4c = 10$ ② $a + 5b + c = 5$ ③ $a - 9b + 5c = 4$

taking $2① - 3② - 1③$ gives the equation: $0 = 1$ so 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.

6. ① $3x + 2y + 2z = 15$ ② $x + 2y - z = 12$ ③ $kx - 1y - 1z = 0$

The ratio of y and z components of ① $-2 \times$ that of 3③. So also for k , giving $k = -1.5$

With this value of k the first equation and last equation become parallel, so they never meet. (The equation of ② is irrelevant once you have parallel planes.)