

Practice for L3 Equations #5

1. Solve the system of equations

$$x + y + z = 3$$

$$x - y = 7$$

$$2(x + 5z) = 49 - 3y$$

2. Two adults, two pensioners and two children cost \$94 dollars.

One adult and two children cost \$44.

Two adults, one pensioner and one child cost \$67.

Set up a system of equations, and calculate the cost of each fare.

3. A farmer sells a rooster, five hens and twelve chicks for \$73.

He sells a rooster, eight hens and eight chicks for \$80.

A rooster is twelve times the cost of a chick.

How much is a rooster?

4. Sally picks chooses a three-digit number. The digits add up to 16.

If she reverses the order of the digits and subtracts that from her first number, she gets 396.

The middle digit is equal to the sum of the other two digits.

What is her three digit number?

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

$$2x + y + 4z = 27$$

$$x + 2y + z = 16$$

$$5x + 7y + 7z = 75$$

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 #5

1. $x + y + z = 3$ $1x - 1y + 0z = 7$ $2x + 3y + 10z = 49$

Solution: $x = 2, y = -5, z = 6$

2. $2a + 2p + 2c = 94$ $a + 2c = 44$ $2a + p + c = 67$

Adults cost \$20, Pensioners cost \$15 and Children cost \$12.

3. $r + 5h + 12c = 73$ $r + 5h + 12c = 73$
 $r + 8h + 8c = 80$ $r + 8h + 8c = 80$
 $r = 12c$ $r - 12c = 0$

Solving gives $r = 24, h = 5, c = 2$. Must answer in context: **A rooster costs \$24.**

4. The number is $xyz.$ = $100x + 10y + z$. Reversing digits gives $zyx.$ = $100z + 10y + x$
 $x + y + z = 16$ $x + y + z = 16$
 $100x + 10y + z - (100z + 10y + x) = 396$ $99x - 99z = 396$
 $x + z = y$ $x - y + z = 0$

Solving gives $x = 6, y = 8$ and $z = 2$. So **the number was 682**

5. ① $2x + y + 4z = 27$ ② $x + 2y + z = 16$ ③ $5x + 7y + 7z = 75$

taking $1① + 3② - 1③$ 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 $3x + 2y + 2z = 15$ 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.)