Simultaneous Equations Problems

Q1.

* The Singh family and the Peterson family go to the cinema.

The Singh family buy 2 adult tickets and 3 child tickets.
They pay £28.20 for the tickets.

The Peterson family buy 3 adult tickets and 5 child tickets.
They pay £44.75 for the tickets.

Find the cost of each adult ticket and each child ticket.

$$2A + 3C = £28.20 \quad ①$$
$$3A + 5C = £44.75 \quad ②$$
$$①×3 \quad 6A + 9C = £84.60 \quad ③$$
$$②×2 \quad 6A + 10C = £89.50 \quad ④$$
$$④-③ \quad C = £4.90$$

Sub for C in ①

$$2A + 3(£4.90) = £28.20$$
$$2A + £14.70 = £28.20$$
$$2A = £28.20 - £14.70$$
$$2A = £13.50$$
$$A = \frac{£13.50}{2} = £6.75$$

Adult £6.75
Child £4.90

(Total for question = 5 marks)

Q2.

3 kg of potatoes and 4 kg of carrots have a total cost of 440p.
4 kg of potatoes and 3 kg of carrots have a total cost of 470p.

Work out the total cost of 1 kg of potatoes and 1 kg of carrots.

$$3P + 4C = 440 \quad ①$$
$$4P + 3C = 470 \quad ②$$
$$①×3 \quad 9P + 12C = 1320 \quad ③$$
$$②×4 \quad 16P + 12C = 1880 \quad ④$$
$$③-④ \quad 7P = 560$$
$$P = \frac{560}{7}$$
$$P = 80$$

Sub for P in ①

$$3(80) + 4C = 440$$
$$240 + 4C = 440$$
$$4C = 440 - 240$$
$$4C = 200$$
$$C = \frac{200}{4}$$
$$C = 50$$

Potatoes 1 kg for 80p
Carrots 1 kg for 50p

.... p

(Total for question = 4 marks)

Q3.

Not a simultaneous linear equations question although at first glance it looks like one.

Susie has to deliver some packages and some parcels.

The total number of packages is 4 times the number of parcels.
The total number of packages and parcels is 40

Each parcel has a weight of 1.5 kg.
The total weight of the packages and parcels is 37.6 kg.

Each of the packages has the same weight.

Work out the weight of each package.

$\frac{1}{5}$ of total are parcels

$40 \div 5 = 8$

So 8 parcels

and 32 packages

Let W be weight of package

$$8 \times 1.5 + 32W = 37.6 \text{ kg}$$
$$12 + 32W = 37.6$$
$$32W = 37.6 - 12$$
$$32W = 25.6$$
$$W = \frac{25.6}{32} = 0.8 \text{ kg}$$

.... 0.8 .... kg

(Total for Question is 4 marks)

Q4.

A cinema sells adult tickets and child tickets.

The total cost of 3 adult tickets and 1 child ticket is £30
The total cost of 1 adult ticket and 3 child tickets is £22

Work out the cost of an adult ticket and the cost of a child ticket.

$$3A + 1C = £30 \quad ①$$
$$1A + 3C = £22 \quad ②$$

①×3 $\quad 9A + 3C = £90 \quad ③$

③−② $\quad 8A = £68$

$$A = £68$$
$$A = \frac{£68}{8}$$
$$\underline{A = £8.50}$$

Sub for A in ①

$$3(£8.50) + C = £30$$
$$£25.50 + C = £30$$
$$C = £30 - £25.50$$
$$\underline{C = £4.50}$$

adult ticket £ .... 8.50 ....

child ticket £ .... 4.50 ....

(Total for question = 4 marks)

Q5.

* Paper clips are sold in small boxes and in large boxes.

There is a total of 1115 paper clips in 4 small boxes and 5 large boxes.

There is a total of 530 paper clips in 3 small boxes and 2 large boxes.

Work out the number of paper clips in each small box and in each large box.

$$4S + 5L = 1115 \quad ①$$
$$3S + 2L = 530 \quad ②$$

$①×2 \quad 8S + 10L = 2230 \quad ③$

$②×5 \quad 15S + 10L = 2650 \quad ④$

$④-③ \quad 7S = 420$

$$S = \frac{420}{7}$$

$$\underline{S = 60}$$

Sub for S in ②

$$3(60) + 2L = 530$$
$$180 + 2L = 530$$
$$2L = 530 - 180$$
$$2L = 350$$
$$L = \frac{350}{2}$$
$$\underline{L = 175}$$

Large Box 175
Small Box 60

(Total for Question is 5 marks)