Simultaneous Equations - Lesson 4

Simultaneous Equations 4
(in Real-Life)

<u>LI</u>

- Make and solve a pair of simultaneous equations in real-life.

<u>SC</u>

- Elimination.

Mar 18-08:11

<u>Example 1</u>

The sum of two numbers equals 16 and their difference equals 4.

Find the value of each number.

Let the two numbers be x and y.

$$x + y = 16 \qquad ①$$

$$x - y = 4 \qquad ②$$

Signs of y are different, so add :　① + ②

$$2x = 20$$

$$\Rightarrow \qquad x = 10$$

Substitute x = 10 into ② :

$$x - y = 4$$

$$\therefore \qquad 10 - y = 4$$

$$\Rightarrow \qquad -y = -6$$

$$\Rightarrow \qquad y = 6$$

$$\therefore \qquad \boxed{x = 10, \; y = 6}$$

<u>Example 2</u>

A boat travels at 30 knots with a constant wind and travels at 14 knots against this same constant wind.

Find the speed of the boat and the speed of the wind.

Let the boat speed be b and the wind speed be w.

$$b + w = 30 \quad ①$$

$$b - w = 14 \quad ②$$

Signs of w are different, so add : ① + ②

$$2b = 44$$

$$\Rightarrow \quad \underline{b = 22}$$

Substitute b = 22 into ② :

$$b - w = 14$$

$$\therefore \quad 22 - w = 14$$

$$\Rightarrow \quad -w = -8$$

$$\Rightarrow \quad \underline{w = 8}$$

$$\therefore \quad \boxed{b = 22 \text{ knots}, \ w = 8 \text{ knots}}$$

Sep 16-10:24

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<u>Example 3</u>

3 bags of sand and 2 bags of cement weigh 91 kg.

4 bags of sand and 3 bags of cement weigh 124 kg.

Find the weight of one bag of sand and find the weight of one bag of cement.

Let s = weight of 1 sand bag.

Let c = weight of 1 cement bag.

$$3s + 2c = 91 \quad ① \quad \times 3$$

$$4s + 3c = 124 \quad ② \quad \times 2$$

$$9s + 6c = 273 \quad ③$$

$$8s + 6c = 248 \quad ④$$

Signs of c are the same (+), so subtract :   ③ − ④

$$\underline{s = 25}$$

Substitute s = 25 into ① :

$$3s + 2c = 91$$

$$\therefore \quad 3(25) + 2c = 91$$

$$\Rightarrow \quad 75 + 2c = 91$$

$$\Rightarrow \quad 2c = 16$$

$$\Rightarrow \quad \underline{c = 8}$$

$$\therefore \quad \boxed{s = 25 \text{ kg}, c = 8 \text{ kg}}$$

Sep 16-10:24

4

1) The school that Lisa goes to is selling tickets to the annual talent show. On the first day of ticket sales the school sold 4 senior citizen tickets and 5 student tickets for a total of $102. The school took in $126 on the second day by selling 7 senior citizen tickets and 5 student tickets. What is the price each of one senior citizen ticket and one student ticket?

2) Flying with the wind a plane went 183 km/h. Flying into the same wind the plane only went 141 km/h. Find the speed of the plane in still air and the speed of the wind.

3) Castel and Gabriella are selling pies for a school fundraiser. Customers can buy apple pies and lemon meringue pies. Castel sold 6 apple pies and 4 lemon meringue pies for a total of $80. Gabriella sold 6 apple pies and 5 lemon meringue pies for a total of $94. What is the cost each of one apple pie and one lemon meringue pie?

4) The school that Imani goes to is selling tickets to the annual dance competition. On the first day of ticket sales the school sold 3 senior citizen tickets and 3 child tickets for a total of $69. The school took in $91 on the second day by selling 5 senior citizen tickets and 3 child tickets. What is the price each of one senior citizen ticket and one child ticket?

5) Ming and Carlos are selling cookie dough for a school fundraiser. Customers can buy packages of chocolate chip cookie dough and packages of gingerbread cookie dough. Ming sold 8 packages of chocolate chip cookie dough and 12 packages of gingerbread cookie dough for a total of $364. Carlos sold 1 package of chocolate chip cookie dough and 4 packages of gingerbread cookie dough for a total of $93. Find the cost each of one package of chocolate chip cookie dough and one package of gingerbread cookie dough.

6) Kayla's school is selling tickets to the annual dance competition. On the first day of ticket sales the school sold 3 senior citizen tickets and 5 child tickets for a total of $70. The school took in $216 on the second day by selling 12 senior citizen tickets and 12 child tickets. Find the price of a senior citizen ticket and the price of a child ticket.

7) A plane traveled 580 miles to Ankara and back. The trip there was with the wind. It took 5 hours. The trip back was into the wind. The trip back took 10 hours. Find the speed of the plane in still air and the speed of the wind.

8) Amanda and Ndiba are selling flower bulbs for a school fundraiser. Customers can buy packages of tulip bulbs and bags of daffodil bulbs. Amanda sold 6 packages of tulip bulbs and 12 bags of daffodil bulbs for a total of $198. Ndiba sold 7 packages of tulip bulbs and 6 bags of daffodil bulbs for a total of $127. Find the cost each of one package of tulips bulbs and one bag of daffodil bulbs.

9) The local amusement park is a popular field trip destination. This year the senior class at High School A and the senior class at High School B both planned trips there. The senior class at High School A rented and filled 16 vans and 8 buses with 752 students. High School B rented and filled 5 vans and 5 buses with 380 students. Each van and each bus carried the same number of students. How many students can a van carry? How many students can a bus carry?

10) The senior classes at High School A and High School B planned separate trips to New York City. The senior class at High School A rented and filled 16 vans and 5 buses with 417 students. High School B rented and filled 10 vans and 8 buses with 480 students. Every van had the same number of students in it as did the buses. How many students can a van carry? How many students can a bus carry?

11) The senior classes at High School A and High School B planned separate trips to the water park. The senior class at High School A rented and filled 14 vans and 16 buses with 1086 students. High School B rented and filled 10 vans and 13 buses with 870 students. Every van had the same number of students in it as did the buses. Find the number of students in each van and in each bus.

12) Yellowstone National Park is a popular field trip destination. This year the senior class at High School A and the senior class at High School B both planned trips there. The senior class at High School A rented and filled 7 vans and 10 buses with 332 students. High School B rented and filled 4 vans and 15 buses with 459 students. Each van and each bus carried the same number of students. Find the number of students in each van and in each bus.

Nov 27-12:55

1. Reg paid 17 pence for four sweets and a lolly.

    Jen paid 13 pence for three sweets and a lolly.

    What is the cost of each sweet and each lolly ?

    Copy and complete :–

    > **Let cost of one sweet = x p**
    >
    > **and cost of one lolly = y p**
    >
    > Reg : $4x + y = 17$ 1
    > Jen : $3x + y = 13$ 2
    >
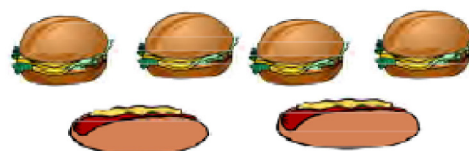   > $-1 \times 2 \Rightarrow$ $-3x - y = -...$ 3
    >
    > $1 + 3 \Rightarrow$ $x = ...$
    >
    > Substitute $x = ...$ in equation 1
    >
    > $4 \times ... + y = 17$
    >
    > $\Rightarrow$ $y = ...$
    >
    > **One sweet costs .... p. One lolly costs ...p.**

2. Sally bought 4 hamburgers and 2 hotdogs at a cost of £14.

    Fred paid £20 for 7 hamburgers and 2 hotdogs.

    (a) Set up two equations to represent this information.

    (b) Find the cost of one hamburger.

    (c) Find the cost of one hotdog.

    (d) How much would Bill have to pay for three hamburgers and two hotdogs ?

3. Cheri pays £11 for 2 grow-bags and one plant.
   Ali pays £15 for 3 grow-bags and one plant.
   Find the cost of each grow-bag and each plant.

5. Sara purchased three identical blouses and four skirts costing £60.
   May paid £33 for three blouses and one skirt.
   Find the cost of each blouse.

6. Mike and Fran went to the local pet shop.
   Mike bought three mice and a lizard for £16.
   Fran paid £27 for two mice and three lizards.
   Find the cost of each mouse and each lizard.

8. Three steak meals and two fish dishes cost £43.
   Five steak meals and five fish dishes cost £85.

   (a) How much would it cost for a steak meal ?
   (b) If I bought two fish dishes and a steak meal, how much change would I receive from £30 ?

10. Miss Spencer bought 3 packs of white paper and 2 packs of coloured paper and found she had 1200 sheets of paper.
    Mr Lott had 2300 sheets from 4 packs of white and 5 coloured packs.
    How many sheets were in each pack ?

11. A group of teachers and pupils went on a school trip.
    The teachers hired three tandems (2-seater bikes) and four bicycles which cost £27.
    If they had hired four tandems and two bicycles it would have cost them £26.
    How much would the hire charge have been for five tandems ?

4. Shez buys 2 coffees and 2 donuts for £3.

   Jeri pays £4 for 3 coffees and 2 donuts.

   Baz bought one coffee **and** one donut.
   How much did Baz have to pay ?

7. The weight of six DVD players and two Blu-Ray players is 22 kg.
   Four DVD's and a Blu-Ray player weighs 14 kg.
   Find the weight of a Blu-Ray player.

9. Mr Forbes paid £60 for five adults and four children's puppet show tickets.
   Mrs Rae paid £21 for two adults and one child.

   (a) Write down two equations to represent this information.
   (b) Find the cost of :-
       (i) an adult ticket   (ii) a child's ticket.
   (c) Mr Allison bought four adult and five children's tickets.
       How much did he pay for the tickets ?

12. The *PHOTO-Shop* produce high quality photographic posters.
    Alex paid £255 for four A3 sized posters and three A2 sized posters, Sean paid £240 for five A3 posters and two A2 posters and Tariq bought two A3 and one A2 poster.
    How much did Tariq have to pay ?

13. Tara spent £13·54 on 11 litres of petrol and 3 litres of oil for her car.
    It cost Jake £15·39 for 15 litres of petrol and 2 litres of oil.
    Find the cost of a litre of oil.

Answers

1) senior citizen ticket: $8, student ticket: $14
2) Plane: 162 km/h, Wind: 21 km/h
3) apple pie: $4, lemon meringue pie: $14
4) senior citizen ticket: $11, child ticket: $12
5) chocolate chip cookie dough: $17,
   gingerbread cookie dough: $19
6) senior citizen ticket: $10, child ticket: $8
7) plane: 87 mph, wind: 29 mph
8) package of tulips bulbs: $7,
   bag of daffodil bulbs: $13
9) Van: 18, Bus: 58
10) Van: 12, Bus: 45
11) Van: 9, Bus: 60
12) Van: 6, Bus: 29

1. Sweet 4p. Lolly 1p
2. a $4x + 2y = 14$, $7x + 2y = 20$
   b £2   c £3   d £12
3. Grow-bag £4. Plant £3
4. £1·50
5. £8
6. Mouse £3. Lizard £7
7. 2 kg
8. a £9   b £5
9. a $5a + 4c = 60$, $2a + c = 21$
   b (i) £8   (ii) £5   c £57
10. White 200 sheets. Coloured 300 sheets.
11. £25
12. £105
13. £1·47