

UNIT 8: SYSTEMS OF EQUATIONS

Exercise 1: Solve these simultaneous equations using the substitution method:

$$\text{a) } \begin{cases} x + 2y = 7 \\ 2x + 5y = 16 \end{cases}$$

$$\text{b) } \begin{cases} 2x + 3y = 14 \\ 3x + y = 7 \end{cases}$$

$$\text{c) } \begin{cases} 2x + y = 8 \\ x - y = 7 \end{cases}$$

$$\text{d) } \begin{cases} 2x + y = 9 \\ 4x - y = 3 \end{cases}$$

$$\text{e) } \begin{cases} 2x + 3y = 4 \\ x + 9y = -13 \end{cases}$$

$$\text{f) } \begin{cases} x + y = 6 \\ 5x - 2y = 37 \end{cases}$$

Exercise 2: Solve these simultaneous equations using the substitution method:

$$\text{a) } \begin{cases} 2x + y = 23 \\ x - 2y = -1 \end{cases}$$

$$\text{b) } \begin{cases} x - 3y = 13 \\ 3x - 2y = 4 \end{cases}$$

$$\text{c) } \begin{cases} x + 5y = 17 \\ 3x - y = -13 \end{cases}$$

$$\text{d) } \begin{cases} 5x - y = -3 \\ 3x - 4y = 22 \end{cases}$$

$$\text{e) } \begin{cases} 5x + y = 7 \\ 10x + 2y = 14 \end{cases}$$

$$\text{f) } \begin{cases} x + 3y = 5 \\ 2x + 6y = 7 \end{cases}$$

Exercise 3: Solve these simultaneous equations using the elimination method:

$$\text{a) } \begin{cases} 3x - y = 1 \\ 2x + 5y = 29 \end{cases}$$

$$\text{b) } \begin{cases} 3x - 4y = -1 \\ x + 5y = 6 \end{cases}$$

$$\text{c) } \begin{cases} 5x + 3y = 1 \\ x - 4y = 14 \end{cases}$$

$$\text{d) } \begin{cases} 2x + y = 1 \\ 7x + 2y = -7 \end{cases}$$

$$\text{e) } \begin{cases} 4x - 2y = 7 \\ 2x + 3y = 5 \end{cases}$$

$$\text{f) } \begin{cases} 3x - 5y = 5 \\ 2x + 7y = 24 \end{cases}$$

$$\text{g) } \begin{cases} 4x + y = 7 \\ 12x + 3y = 21 \end{cases}$$

$$\text{h) } \begin{cases} 6x + 2y = 4 \\ 9x + 3y = 5 \end{cases}$$

$$\text{i) } \begin{cases} 5x + 3y = 7 \\ 2x + 4y = 5 \end{cases}$$

Exercise 4: Solve these simultaneous equations using the graphical method and check the solution using Geogebra:

$$\text{a) } \begin{cases} x + 4y = 4 \\ x + y = -2 \end{cases}$$

$$\text{b) } \begin{cases} 2x + y = 1 \\ 3x + y = 3 \end{cases}$$

$$\text{c) } \begin{cases} -5x + y = 1 \\ 2x - y = 2 \end{cases}$$

$$\text{d) } \begin{cases} x + 4y = 3 \\ 2x + 8y = 14 \end{cases}$$

$$\text{e) } \begin{cases} 3x + y = -2 \\ x - 2y = 4 \end{cases}$$

$$\text{f) } \begin{cases} x + y = 2 \\ x + 3y = 0 \end{cases}$$

Exercise 5: Solve the following simultaneous equations using the indicated method:

$$\text{a) } \begin{cases} x - 2y = 5 \\ 3x - 5y = 11 \end{cases} \quad \text{Substitution}$$

$$\text{b) } \begin{cases} 2x - y = 16 \\ 3x + 5y = 11 \end{cases} \quad \text{Elimination}$$

$$\text{c) } \begin{cases} x + y = 1 \\ 3x + y = 9 \end{cases} \quad \text{Graphically}$$

$$\text{d) } \begin{cases} \frac{x}{8} + \frac{3y}{4} = 17 \\ \frac{5x}{4} - \frac{7y}{5} = -8 \end{cases}$$

Exercise 6: Solve and classify the following systems of equations, using the method you prefer:

$$\begin{array}{lll} \text{a) } \left. \begin{array}{l} 5x - y = 3 \\ 10x - 2y = 7 \end{array} \right\} & \text{b) } \left. \begin{array}{l} 2x + 5y = 5 \\ 5x + 7y = -4 \end{array} \right\} & \text{c) } \left. \begin{array}{l} 5x - 10y = 15 \\ 3x - 6y = 9 \end{array} \right\} \end{array}$$

Exercise 7: Solve and classify the following simultaneous equations using the indicated method:

$$\begin{array}{ll} \text{a) } \left. \begin{array}{l} x - 3y = 13 \\ 2x + 5y = 4 \end{array} \right\} & \text{Substitution} \\ \text{b) } \left. \begin{array}{l} 3x + 5y = 17 \\ 2x - y = -6 \end{array} \right\} & \text{Elimination} \\ \text{c) } \left. \begin{array}{l} x + y = 2 \\ 2x - y = 7 \end{array} \right\} & \text{Graphically} \\ \text{d) } \left. \begin{array}{l} 6x + 3y = 5 \\ 4x + 2y = 7 \end{array} \right\} & \text{Whatever} \end{array}$$

Exercise 8: Solve and classify the following simultaneous equations using the indicated method:

$$\begin{array}{ll} \text{a) } \left. \begin{array}{l} 3x + 4y = 9 \\ 5x - 3y = 44 \end{array} \right\} & \text{Elimination} \\ \text{b) } \left. \begin{array}{l} x + y = 4 \\ x + 2y = 1 \end{array} \right\} & \text{Graphically} \\ \text{c) } \left. \begin{array}{l} 3x + y = 4 \\ 9x + 3y = 12 \end{array} \right\} & \text{Substitution} \end{array}$$

Exercise 9: The sum of two numbers is 14 and their difference is 2. Find the numbers.

Exercise 10: As you already know, I am gonna quit teaching and start a farm to breed animals. No dragons, because when they grow they eat the other animals and it's a ruin. I've found out that I have enough money to feed a total of 51 animals, and I want twice as many sheep as ponies. How many animals of each type can I have on my farm?

Exercise 11: A farmer has cows and chickens. He counts 50 legs and 18 heads. How many animals of each type does he have?

Exercise 12: In a hotel we can find single and double rooms. We have a total of 37 rooms and 62 beds. How many rooms of each type are there?

Exercise 13: In a warehouse I have 431 stools. Some of them have three legs and the others have four. I have counted a total of 1554 legs. How many stools of each type are there?

Exercise 14: An amusement park sells 1000 tickets for a certain day. Adult tickets cost €8.50, children's cost €4.50, and they collected a total of €7300. How many tickets of each kind were sold?

Exercise 15: In a rectangle, the length of the altitude is three units less than the length of the base and the perimeter is 94 cm. Find its dimensions.

Exercise 16: Two kilos of tomatoes and three kilos of apples cost thirteen euro, while one kilo of tomatoes and two kilos of apples cost eight euro. What's the price of a kilo of each product?

Exercise 17: We are visiting the Patios in Córdoba on May. Legend says that every patio in the Santa Marina route has 300 red pots, while every patio in the San Basilio route has 400 blue pots. Last Saturday it wasn't raining and I visited them both. 16 patios and 5700 colored pots. How many patios are there in each one of the routes?

Exercise 18: As everybody knows, the fairies of Emerald City have only four wings, while the fairies of Turquoise City have six wings. One hundred fairies reunited this year at the Spring Fairy Convention, that took place in the Enchanted Valley. If I counted four hundred and ninety wings, how many fairies of each city attended the meeting?

Exercise 19: In my class we are building a plastic dinosaur collection. The red ones have five spikes and the blue ones have seven. So far we have 107 dinosaurs and we have counted a total of 619 spikes. How many dinosaurs of each type do we have?

Exercise 20: I have to get some food for my birthday party. Cured ham sandwiches are one euro more expensive than Spanish omelet ones, and I have thought of buying one hundred and seventy five omelet sandwiches and one hundred and fifty ham sandwiches. A total of eight hundred euro, they say. I'm in ruins. But, what's the price of each sandwich?

Exercise 21: Last night I had a nightmare. An alien invasion in my own bedroom! I could only see legs and heads everywhere. I counted 107 heads. And 293 legs. It was crazy. Then they took me to the airship and while I was lying on a stretcher I realized that there were two types of aliens: some of them had two heads and three legs, while the others only had one head, but four legs. How many aliens of each type did I dream of?