Key

Exam 3 Test Prep

1. What are the 3 methods of solving a system of linear equations?

Substitution, elimination, graphing

2. Solve the system using substitution.

$3x + y = 14$

$2x - y = 1$

$x = 3 \quad y = 5$

$(3, 5)$

3. Solve using elimination.

$4x + 5y = 11$

$2x + 3y = 7$

$x = -1 \quad y = 3$

$(-1, 3)$

4. Solve using either method.

$-2x + 4y = 6$

$x - 2y = 5$

parallel, no solution

5. Solve using either method

$x + 3y = 5$

$3x + 9y = 15$

same line, infinite solutions

6. How do we find the dimensions of a matrix?

rows x columns

7. A coffee roaster is creating a specialty blend by mixing two types of beans: a Light Roast and a Dark Roast.

- The Light Roast costs $14 per pound. x
- The Dark Roast costs $11 per pound. y
- The roaster wants to create a total of 75 pounds of the new blend.
- The total cost of the beans for the blend must be $990.

What is the system of linear equations and the augmented matrix that represents this problem?

$x + y = 75$

$14x + 11y = 990$

55 pounds light roast (x)
20 pounds dark roast (y)

$$\begin{bmatrix} 1 & 1 & 75 \\ 14 & 11 & 990 \end{bmatrix} \rightarrow \text{rref} \rightarrow \begin{bmatrix} 1 & 0 & 55 \\ 0 & 1 & 20 \end{bmatrix}$$

8. A small restaurant offers three main items: a Soup, a Salad, and a Sandwich.

- A Soup costs $4. x
- A Salad costs $6. y
- A Sandwich costs $8. z

On a busy Friday night, the restaurant sold a total of 120 items (Soup, Salad, and Sandwich combined). The number of Salads sold was twice the number of Soups sold. The total revenue from all sales was $760.

How many Soups, Salads, and Sandwiches were sold?

25 Soups (x)
50 salads (y)
45 sandwich (z)

9. Solve $5 - 2(y - 4) = (y/3) + 1$

$y = \frac{36}{7}$

10. Solve $2 - 3(y + 1) \leq (y/2) - 5$

$y \geq \frac{8}{7}$

11. The formula for converting temperature from Celsius to Fahrenheit is $F = (9/5)C + 32$.

What temperature range in Celsius corresponds to the range from 59F to 104F?

15°C to 40°C

12. A local bakery makes and sells specialty cakes. The fixed cost for rent and utilities is $1,500 per month. The variable cost for ingredients and labor for each cake is $25. The bakery sells each specialty cake for $65. Let x be the number of cakes sold.

Find the values of x for which the bakery will break even or make a profit in a month.

$X \geq 38$ → 38 cakes

13. A small-scale auto detailing service is starting up. The owner charges $150 for a full detailing job. The fixed cost for monthly rent and insurance is $900. The variable cost (soap, wax, and labor) for each detailing job is $45. Let x be the number of detailing jobs completed.

How many detailing jobs need to be completed each month to break even or make a profit?

$X \geq 9$ → 9 or more jobs.

14. Where can you find all of the possible solutions when graphing a linear inequality?

above/below the line, shaded area

15. When you have a system of 2 inequalities, what is the area where the solutions are found called?

feasible region

16. Given the following system of inequalities, answer the questions below.

$$x + 2y \leq 10$$

$$3x + y > 6$$

$$x \geq 0$$

$$y \geq 0$$

a. Is the point (1, 4) in the solution region?

yes

b. Is the point (5, 0) in the solution region?

yes

c. Is the point (3, 2) in the solution region?

yes

d. Is the point (0, 7) in the solution region?

no

17. Find the maximum and minimum values of the objective function $z = 3x + 5y$, subject to the following constraints:

$$x + y \leq 5$$

$$x + 3y \geq 6$$

$$x \geq 0$$

$$y \geq 0$$

max. at (0,5)

min. at (0,2)

Corner Points	Objective Function $3x+5y$
(0,5)	$3(0)+5(5) = 25$
(0,2)	$3(0)+5(2) = 10$
(4.5, 0.5)	$3(4.5)+5(.5) = 16$

19. A small nutritional supplement company produces two different protein powder mixes: Sport Blend (S) and Keto Blend (K). Each batch of Sport Blend (S) requires 5 hours on the mixing machine and 2 hours of packaging time. Each batch of Keto Blend (K) requires 3 hours on the mixing machine and 4 hours of packaging time. The company has at most 150 total hours of mixing time available per week and at most 120 total hours of packaging time available per week. The cost to produce one batch of Sport Blend is $400, and the cost to produce one batch of Keto Blend is $600. Due to high demand, the company must produce at least 15 batches of Sport Blend per week. and at least 5 keto blend

The company wants to determine how many batches of each powder to produce to minimize the total production cost.

	Number of Units	Mixing Machine	Packaging Machine	Cost
Sport	x	5	2	400
Keto	y	3	4	600
max. time		≤ 150	≤ 120	

Mixing $5x+3y \leq 150$

Packaging $2x+4y \leq 120$

Production constraint $x \geq 15, y \geq 05$

Objective $400x + 600y$

produce 15 sport blend
+
5 keto blend