Expectations: i. solve systems of equations using substitution and elimination.

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5. Jason and Greg go to a café with their friends. If they order two small hot chocolates and two cookies, their bill totals $4.40. If they order three small hot chocolates and four cookies, their bill totals $7.50. How much does a small hot chocolate cost? How much does a cookie cost?

6. Three lines $y - 2x - 1 = 0$, $3y + 7x + 10 = 0$, and $2y - 17x + 50 = 0$ intersect to form a triangle. Find the coordinates of the vertices of the triangle.

7. Solve the following system of equations. Geometrically, what does the result mean?

\begin{align*}
3x - y + 13 &= 0 \\
4x + 2y &= 4 \\
5x - 3y + 27 &= 0
\end{align*}

8. A Slice of History

Gauss developed a method of elimination that used matrices to solve least squares problems relating to space and astronomy. He later used it while making measurements of the earth and its surface.

9. The solution to each linear system is $(-1, 2)$. Determine the values of $m$ and $n$.

\begin{align*}
a. \quad 3x + my &= 7 \\
3nx + 4y &= 5 \\
b. \quad mx + ny &= 9 \\
7x + 2ny &= -3 \\
c. \quad 6ny + 3mx &= 0 \\
2ny + 5mx &= 8
\end{align*}

**CHALLENGE YOURSELF!**

10. Solve this system of equations for $x$ and $y$ by letting $a = \frac{1}{x}$ and $b = \frac{1}{y}$, $x \neq 0$, $y \neq 0$.

\begin{align*}
\frac{3}{x} + \frac{2}{y} &= 2 \\
\frac{8}{x} - \frac{4}{y} &= 2 \\
\frac{2}{x} - \frac{2}{y} &= 3
\end{align*}
11. Chuck ran 8 km on the treadmill at the gym. He ran at an average speed of 9 km/h and walked at an average speed of 5 km/h for the rest. He spent 30 minutes more time running than walking. How long did it take him to finish his workout?

12. Solve each system of equations of three or four variables.
   
   a. \[ y + z = 0 \]
   \[ 2x - y + z = 6 \]
   \[ x + y = 3 \]
   
   b. \[ y + z = 2 \]
   \[ 2y - z = 1 \]
   \[ x + y + z = 3 \]
   
   c. \[ x - y = 1 \]
   \[ y - z = 2 \]
   \[ z + x = 3 \]
   
   d. \[ y + z = 7 \]
   \[ 2y - z = 2 \]
   \[ w + x - y - z = -4 \]
   \[ 2w - x + y + 4z = 19 \]
   
   e. \[ x_1 + x_2 = 2 \]
   \[ x_1 - x_2 = -4 \]
   \[ x_3 + x_4 = 2 \]
   \[ x_3 - x_4 = -4 \]
   
   f. \[ x - 3y - 2z = -9 \]
   \[ 2x - 5y + z = 3 \]
   \[ 3x - 6y - 2z = -8 \]

EXTENSIONS

13. Nancy is travelling with her family to Florida for vacation. To fly, there are weight restrictions on her baggage. If she brings two identical carry-on bags and one checked baggage, the total weight is 69.5 lbs. If she brings one carry-on and two identical checked baggage, the total weight is 100 lbs. Nancy’s bags are full. The airline has a maximum weight of 50 lb for checked bags and 22 lb for carry-on baggage.
   
   a. Determine the weights of Nancy’s carry-on bag and checked baggage.
   
   b. Does Nancy’s carry-on and checked baggage meet the guidelines?

14. If the system of equations \[ ax + by + cz = 6 \]
   \[ bx + cy + az = -1 \]
   \[ cx + ay + bz = -1 \]
   
   has the solution \((2, -1, 1)\), find the values of \(a\), \(b\), and \(c\).

15. Solve the system of equations to find \(x\), \(y\), and \(z\).
   
   \[ x^2 + y^2 + z^2 = 9 \]
   \[ 3x^2 - y^2 - z^2 = 7 \]
   \[ y^2 + 2z^2 = 6 \]
   
   (Hint: Let \(d = x^2\), \(e = y^2\), and \(f = z^2\). Find \(d\), \(e\), and \(f\) first.)

16. Solve for \(x\) and \(y\).
   
   a. \[ ax + by = c \]
   \[ ax - by = d \]
   
   b. \[ gx + hy = 1 \]
   \[ hx + gy = 1 \]
   
   c. \[ (p - q)x + (p + q)y = 2(p^2 - q^2) \]
   \[ x + y = 2p \]

Expectations: i. solve systems of equations using substitution and elimination.
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