

Name \_\_\_\_\_

SHOW AS MUCH WORK AS POSSIBLE BECAUSE YOU MAY RECEIVE PARTIAL CREDIT FOR THE WORK YOU DO IF YOUR ANSWER IS INCORRECT.

For each of the following, express the scenario as a system of two equations in two variables and as an augmented matrix that corresponds to the system of equations. DO NOT SOLVE THE SCENARIO.

1. A campaign manager has \$36,000 to spend on TV and radio ads. Each TV ad costs \$3000 and is seen by 10,000 voters. Each radio ad costs \$500 and is heard by 2000 voters. The campaign manager wants to reach 130,000 voters with the ads (ignoring repeated exposures).

$$\begin{cases} 3000x + 500y = 36000 \\ 10000x + 2000y = 130000 \end{cases}$$

$$\left( \begin{array}{cc|c} 3000 & 500 & 36000 \\ 10000 & 2000 & 130000 \end{array} \right)$$

2. A stamp and coin dealer spent \$8000 at an auction last weekend. He spent three times as much on coins as on stamps.

$$\begin{cases} x + y = 8000 \\ x - 3y = 0 \end{cases}$$

$$\left( \begin{array}{cc|c} 1 & 1 & 8000 \\ 1 & -3 & 0 \end{array} \right)$$

For each of the following:

- Write the system of equations that corresponds to the augmented matrix.
- Row-reduce the augmented matrix **making sure to clearly show and describe each step**.
- State the solution of the system or identify the system as "inconsistent" or "dependent."

3. a.  $\left( \begin{array}{cc|c} 3 & 1 & 9 \\ 2 & 1 & 4 \end{array} \right)$   $\begin{cases} 3x + y = 9 \\ 2x + y = 4 \end{cases}$

b.  $\left( \begin{array}{cc|c} 3 & -6 & 24 \\ -5 & 10 & 40 \end{array} \right)$   $\begin{cases} 3x - 6y = 24 \\ -5x + 10y = 40 \end{cases}$

$$-R_2 + R_1 \rightarrow \left( \begin{array}{cc|c} 1 & 0 & 5 \\ 2 & 1 & 4 \end{array} \right)$$

$$\begin{aligned} \frac{1}{3}R_1 &\rightarrow \left( \begin{array}{cc|c} 1 & -2 & 8 \\ -5 & 10 & -8 \end{array} \right) \\ -\frac{1}{5}R_2 &\rightarrow \left( \begin{array}{cc|c} 1 & -2 & 8 \\ 1 & -2 & -8 \end{array} \right) \end{aligned}$$

$$-2R_1 + R_2 \rightarrow \left( \begin{array}{cc|c} 1 & 0 & 5 \\ 0 & 1 & -6 \end{array} \right)$$

$$-R_1 + R_2 \rightarrow \left( \begin{array}{cc|c} 1 & -2 & 8 \\ 0 & 0 & -16 \end{array} \right)$$

$$\begin{cases} x = 5 \\ y = -6 \end{cases}$$

$$-\frac{1}{16}R_2 \rightarrow \left( \begin{array}{cc|c} 1 & -2 & 8 \\ 0 & 0 & 1 \end{array} \right)$$

Check:  $3 \cdot 5 + (-6) = 15 - 6 = 9$   
 $2 \cdot 5 + (-6) = 10 - 6 = 4$

**inconsistent**