Accel. PreCalc. Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Systems and Inverses Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Examples & Practice**

Example 1: For the AHS talent show, tickets purchased at the door cost $10, and tickets purchased at lunch cost $5. 435 tickets were purchased, and $2,770 was raised.

**a.** Write a system of equations *(no matrices)* that would help you determine how many of each type of ticket was sold.

**b.** Convert your system from part **a** into a matrix equation.

**c.** Use an inverse matrix and a graphing calculator to solve the equation.

Example 2:A box of 6 glazed and 6 jam‑filled donuts costs $3. A box of 8 chocolate and 4 blueberry donuts costs $3. A box of three of each type costs $3. A box of 10 jam‑filled, 1 chocolate, and 1 blueberry costs $3.50.

**a.** Write a system of equations *(no matrices)* that would help you determine the price of each donut.

**b.** Convert your system from part **a** into a matrix equation.

**c.** Use an inverse matrix and a graphing calculator to solve the equation.

Example 3: You have 16 coins—a combination of pennies, nickels, and dimes worth $0.86. You have an equal number of pennies and dimes.

**a.** Write a system of equations *(no matrices)* that would help you determine how many pennies, nickels, and dimes you have.

**b.** Convert your system from part **a** into a matrix equation.

**c.** Use an inverse matrix and a graphing calculator to solve the equation.

**Homework**

**1.** At a carnival, different rides take different types of tokens. For $20, you could get any of the following packages:

|  |  |  |  |
| --- | --- | --- | --- |
|    | 14 gold, 20 silver, 24 bronze; | 20 gold, 15 silver, 19 bronze; | 30 gold, 5 silver, 13 bronze |

**a.** Write a system of equations *(no matrices)* that would help you determine the value of each type of token.

**b.** Convert your system from part **a** into a matrix equation.

**c.** Use an inverse matrix and a graphing calculator to solve the equation.

Gold tokens cost \_\_\_\_ each; silver, \_\_\_\_ each; bronze, \_\_\_\_ each.

**2.** In the election of 1912, Woodrow Wilson, Teddy Roosevelt, and William Howard Taft were the only candidates to receive electoral votes—a total of 531. Wilson received the most electoral votes: he got 347 more than Roosevelt, who received 11 times as many votes as Taft.

**a.** Write a system of equations *(no matrices)* that would help you determine how many electoral votes each candidate received.

**b.** Convert your system from part **a** into a matrix equation.

**c.** Use an inverse matrix and a graphing calculator to solve the equation.

\_\_\_\_ votes were cast for Wilson, \_\_\_\_ for Roosevelt, and \_\_\_\_ for Taft.

**3.** In a full day of sales, Regal Cinemas sold 2068 tickets and made $19,104. Tickets can be bought in three ways: a matinee ticket for $8.50, a student ticket (all day) for $8.00, or a regular ticket for $10.50. Based on past data, you believe that the number of regular‑price tickets is probably 40% more than the number of matinee tickets.

**a.** Write a system of equations *(no matrices)* that would help you determine how many of each type of ticket were sold.

**b.** Convert your system from part **a** into a matrix equation.

**c.** Use an inverse matrix and a graphing calculator to solve the equation.

Regal Cinemas sold \_\_\_\_ matinee tickets, \_\_\_\_ student tickets, and \_\_\_\_ regular tickets.

**4.** In a room, there are some four‑legged tables, some ears of corn, some people, and some dogs. (That must have been a weird party.) Altogether there are 508 legs, 198 ears, 180 eyes, and 150 items (tables + corn + people + dogs).

**a.** Write a system of equations *(no matrices)* that would help you determine how many of each item (tables, corn, people, dogs) there are.

**b.** Convert your system from part **a** into a matrix equation.

**c.** Use an inverse matrix and a graphing calculator to solve the equation.