

$\text{inv}(A)$. Consequently, the solution vector \mathbf{x} is calculated by the *Maple* command

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with(linalg): x := multiply(inverse(A), b);
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or the *Mathematica* command

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x = Inverse[A].b
```

or the *MATLAB* command

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x = inv(A)*b
```

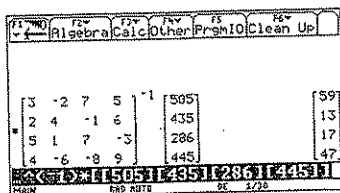


FIGURE 3.5.2. TI-92 solution of a linear system $A\mathbf{x} = \mathbf{b}$.

Figure 3.5.2 illustrates a similar calculator solution of the linear system

$$3x_1 - 2x_2 + 7x_3 + 5x_4 = 505$$

$$2x_1 + 4x_2 - x_3 + 6x_4 = 435$$

$$5x_1 + x_2 + 7x_3 - 3x_4 = 286$$

$$4x_1 - 6x_2 - 8x_3 + 9x_4 = 445$$

for the solution $x_1 = 59$, $x_2 = 13$, $x_3 = 17$, $x_4 = 47$.

Use an available calculator or computer system to solve the linear systems in Problems 1–6 of the 3.3 Application. The applied problems below are elementary in character—resembling the “word problems” of high school algebra—but might illustrate the practical advantages of automated solutions.

1. You are walking down the street minding your own business when you spot a small but heavy leather bag lying on the sidewalk. It turns out to contain U.S. Mint American Eagle gold coins of the following types:

- One-half ounce gold coins that sell for \$285 each,
- One-quarter ounce gold coins that sell for \$150 each, and
- One-tenth ounce gold coins that sell for \$70 each.

A bank receipt found in the bag certifies that it contains 258 such coins with a total weight of 67 ounces and a total value of exactly \$40,145. How many coins of each type are there?

4. Now you really strike it rich! You find a bag containing one-ounce U.S. American Eagle gold coins valued at \$550 each, together with half-ounce and quarter-ounce coins valued as in the preceding problem. If this bag contains a total of 365 coins with a total weight of exactly 11 pounds and a total value of \$100,130, how many gold coins of each type are there?

5. A commercial customer orders 81 gallons of paint that contains equal amounts of red paint, green paint, and blue paint—and, hence, could be prepared by mixing 27 gallons of each. However, the store wishes to prepare this order by mixing three types of paint that are already available in large quantity:

- a *reddish* paint that is a mixture of 50% red, 25% green, and 25% blue paint;
- a *greenish* paint that is 12.5% red, 75% green, and 12.5% blue paint; and
- a *bluish* paint that is 20% red, 20% green, and 60% blue paint.

How many gallons of each are needed to prepare the customer’s order?

4. Now the paint store receives a really big order—for 244 gallons of paint that is $1/2$ red paint, $1/4$ green paint, and $1/4$ blue paint. The store has three already-mixed

types of paint available in large quantity—the greenish paint and the bluish paint of the preceding problem, plus a reddish paint that is $\frac{2}{3}$ red paint, $\frac{1}{6}$ green paint, and $\frac{1}{6}$ blue paint. How many gallons of each must be mixed in order to fill this order?

5. A tour busload of 45 people attended two Florida theme parks on successive days. On Day 1 the entrance fee was \$15 per adult, \$8 per child, \$12 per senior citizen and the total charge was \$558. On Day 2 the entrance fee was \$20 per adult, \$17 per child, \$17 per senior citizen and the total charge was \$771. How many adults, children, and senior citizens were on this tour bus?
6. For some crazy reason, the lunches bought at the first theme park were totaled separately for the adults, children, and seniors. The adults ordered 34 hot dogs, 15 French fries, and 24 soft drinks for a total bill of \$70.85. The children ordered 20 hot dogs, 14 French fries, and 15 soft drinks for a total bill of \$46.65. The senior citizens ordered 11 hot dogs, 10 French fries, and 12 soft drinks for a total bill of \$30.05. What were the prices of a hot dog, an order of French fries, and a soft drink?
7. A fast-food restaurant sells four types of sandwiches—hamburgers, cheeseburgers, roast beef, and chicken—and has four cash registers. At the end of each day each cash register tallies the number of each type of sandwich sold, and the total sandwich receipts for the day. The four cash register operators work at different speeds, and one day's totals were as follows:

	Hamburgers	Cheeseburgers	Roast Beef	Chicken	Receipt
Register 1	37	44	17	23	\$232.99
Register 2	28	35	13	17	\$178.97
Register 3	32	39	19	21	\$215.99
Register 4	47	51	25	29	\$294.38

What was the price of each of the four types of sandwiches?

8. The fast-food restaurant of the preceding problem adds a ham sandwich to its menu and, because of increased business, it also adds a fifth cash register and reduces prices. After this expansion, one day's totals were as follows:

	Hamburgers	Cheeseburgers	Roast Beef	Chicken	Ham	Receipt
Register 1	41	49	22	26	19	\$292.79
Register 2	34	39	18	20	16	\$236.73
Register 3	36	43	23	24	18	\$270.70
Register 4	49	52	26	31	24	\$340.19
Register 5	52	55	24	28	25	\$341.64

What were the new prices of the five types of sandwiches?