



Problem of the Week

Problem A and Solution

Sporting Sleuth

Problem

- A) A physical education teacher weighed some of the equipment in the gym. She recorded the following measurements:

$$\begin{array}{rcccl} \text{baseball} & + & \text{soccer ball} & = & 530 \text{ grams} \\ \text{baseball} & + & \text{baseball} & = & 280 \text{ grams} \\ \text{soccer ball} & + & \text{basketball} & = & 890 \text{ grams} \end{array}$$

Determine the mass of each type of ball: baseball soccer ball basketball



- B) A gym bag contains three baseballs, a soccer ball and two basketballs. What is the approximate total mass of the gym equipment?

Solution

- A) From the second equation we know that two baseballs weigh 280 grams. So each baseball is $280 \div 2 = 140$ grams. We can use that information and the first equation to determine that a soccer ball weighs 140 grams less than 530 grams. So a soccer ball weighs $530 - 140 = 390$ grams. Looking at the last equation, now we know that a basketball weighs 390 grams less than 890 grams. So a basketball weighs $890 - 390 = 500$ grams.
- B) Using the results from the first part, we can calculate that three baseballs will weigh $3 \times 140 = 420$ grams. We can also calculate the mass of two basketballs as $2 \times 500 = 1000$ grams. So the total mass of the gym equipment would be $420 + 1000 + 390 = 1810$ grams.





Teacher's Notes

The images of baseballs, soccer balls and basketballs are acting like variables in mathematical equations. We could rewrite the statements algebraically with more traditional symbols for variables such as x , y , and z .

Let x be the weight of a baseball.

Let y be the the weight of a soccer ball.

Let z be the weight of a basketball.

Therefore:

$$x + y = 530 \quad (1)$$

$$2x = 280 \quad (2)$$

$$y + z = 890 \quad (3)$$

Now, if we wanted, we can use standard mathematical methods to solve the equations and find the mass of each piece of sports equipment.

From equation (2), we can divide by 2 on both sides, giving us the following:

$$x = 140 \quad (4)$$

Knowing the value of x , we can use *substitution* to solve the other two equations:

Substituting $x = 140$ into equation (1) we get:

$$(140) + y = 530 \quad (5)$$

$$140 - 140 + y = 530 - 140 \quad (6)$$

$$y = 390 \quad (7)$$

Substituting $y = 390$ into equation (3) we get:

$$(390) + z = 890 \quad (8)$$

$$390 - 390 + z = 890 - 390 \quad (9)$$

$$z = 500 \quad (10)$$

Using images or symbols in equations is an example of *abstraction*. The idea of abstraction is to take a real life situation and create a mathematical model. Once the model has been created, then it is possible to use known mathematical techniques to solve the problem. When solving the problem, the actual symbols used to represent the real life situation do not affect the outcome.

