

## Grade 8 Mathematics Worksheet

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### Problem solving

#### Questions:

1. Jonathan sold  $x$  tickets for the school's valentines ball. His sales came to 24 tickets more than three times the amount that Maria sold.
  - a) Find an expression that relates Maria's sales.
  - b) Based on these figures, what is the minimum amount that each one could have sold?
  - c) Could Jonathan and Maria have sold 125 tickets between the two of them? Explain.
  - d) Based on your calculations in 3(b), give two possible numbers of tickets that could have been sold by Jonathan and Maria together if their sales together is higher than 250 tickets.

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### Solution

1. a) Assume Maria sold  $y$  number of tickets.  
Then Jonathan ( $x$ ) =  $24 + 3 \times$  Maria ( $y$ )  
So:  
 $x = 24 + 3y \rightarrow 3y = x - 24 \rightarrow y = \frac{x - 24}{3}$   
So Maria sold  $\frac{x - 24}{3}$  tickets.
- b) Jonathan could have sold a minimum of 24 tickets, which would mean that Maria sold nothing since  $\frac{24 - 24}{3} = \frac{0}{3} = 0$ .
- c) Jonathan sold  $x$  tickets and Maria sold  $\frac{x - 24}{3}$  tickets. Assume together they sold  $P$  tickets. So:  
 $x + \frac{x - 24}{3} = P$   
 $\therefore 3x + x - 24 = 3P$   
 $\therefore 4x = 3P + 24$   
 $\therefore x = \frac{3}{4}(P + 8) = \frac{3}{4}P + 6$   
To get an answer that is possible, the value of  $P$  must be divisible by 4. For 125, it is clearly not divisible by 4. So between the two of them they could not have sold 125 tickets.

### OR alternatively:

$$x + \frac{x - 24}{3} = 125$$

$$\therefore 3x + x - 24 = 375$$

$$\therefore 4x = 399$$

$$\therefore x = 99\frac{3}{4}$$

This is not possible since  $x$  can only have integral answers

- d) 264 or 284 or ... (as long as the last two digits are divisible by 4)

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Defining the variable properly.

It is important that in this context, the reasonableness of possible answers be investigated.

Here the structure of the algebraic expression is important. What does it say about possible answers?

Educators must always check against algebraic habits of mind. Will this always work for all cases? Are there exclusions due to context? What are my assumptions, and are these valid?