

Quiz 1

This is a two-stage quiz. During the first stage, use your knowledge & calculator to take this quiz. You have 15 min. In the second stage, you are now welcome to use your books, notes, and students in the class to retake the same quiz. You have 15 min. to write one solution (with everyone's name on it!) to be turned in for the group.

Show your work as you would for a colleague. Partial credit requires reasonable support.

1. Ryan is building a toothpick sequence shown to the right.

Source: "ProblemSolv#2, & Win26 Quiz#1"



Figure 1



Figure 2



Figure 3

- (a) [2] Draw the next figure that Ryan would build.

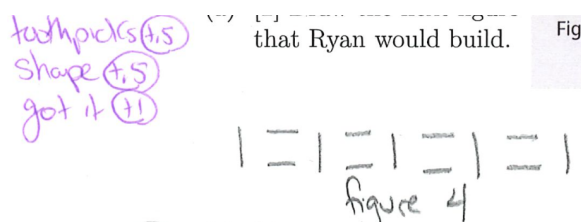


Figure 1: Handwritten solution to part (a).

Figure 4 was drawn as four unit squares joined in a row (continuing the pattern of shared sides).

- toothpicks (+.5)
 - shape (+.5)
 - got it (+1)
- (b) [2] How many toothpicks does Ryan need for the seventh figure?

started (+.5) (b) [2] How many toothpicks does Ryan need for the seventh figure?
 pattern of +3 (+1)
 got it (+.5)

Figure #	1	2	3	4	5	6	7
# of toothpicks	4	7	10	13	16	19	22

Figure 2: Handwritten solution to part (b).

Figure #	1	2	3	4	5	6	7
# of toothpicks	4	7	10	13	16	19	22

Table 1: Toothpick count by figure number.

Ryan needs 22 toothpicks for the seventh figure.

- started (+0.5)
 - pattern of +3 (+1)
 - got it (+0.5)
- (c) [2] How many toothpicks does Ryan need for all seven figures?

Figure 3: Handwritten solution to part (c).

Add up all toothpicks:

$$4 + 7 + 10 + 13 + 16 + 19 + 22 = 91$$

- started (+0.5)
 - looking for sum (+1)
 - got it (+0.5)
2. There are three numbers. The first number is twice the second number. The third is twice the first number. Their sum is 112. What are the numbers?
- (a) [1] What kind of strategy (eg, drawing, tables, clever guessing & checking, models, work backwards, etc) might you try to solve this problem?

Figure 4: Handwritten solution to part (a).

Source: "Suggested #5"

Identify a strategy: let the first number be x , the second number be y , and the third number be z , with $x + y + z = 112$. Since the first number is twice the second, $x = 2y$. Since the third is twice the first, $z = 2x$.

- identify strategy (1)
- (b) [3] Find the numbers. Be sure to use the strategy given in (a).
Using algebra:

$$x + y + z = 112$$

Substituting $x = 2y$ and $z = 2x = 2(2y) = 4y$:

$$2y + y + 4y = 112$$

$$7y = 112$$

start (0.5)
 use strategy (1)
 legal moves (1.5)
 progress (0.5)
 got it (0.5)

$x + y + z = 112$
 maybe also use algebra
 $2y + y + 2x = 112$
 $2y + y + 2(2y) = 112$

so $2y + y + 4y = 112$
 $7y = 112$
 $\Rightarrow y = 112/7 = 16$
 $x = 2 \cdot 16 = 32$ $z = 64$

Figure 5: Handwritten solution to part (b).

$$y = \frac{112}{7} = 16$$

So $x = 2(16) = 32$ and $z = 4(16) = 64$.

The numbers are 32, 16, and 64.

- start (0.5)
- use strategy (1)
- legal moves (0.5)
- progress (0.5)
- got it (0.5)