

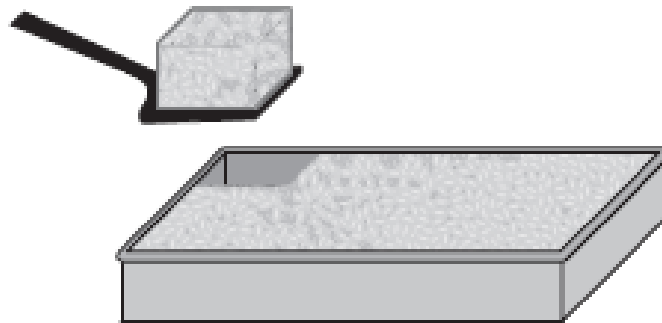


Math  
Released Item 2015

Grade 6  
PBA Item #11  
Estimate Length and Width  
VF888578

# Prompt

15. Megan spent \$9.85 on ingredients and made one pan of cereal bars. The pan has a length of 24 inches and a width of 16 inches.



Megan needs to cut individual cereal bars from the pan. Each cereal bar should be the same size and shape, and should represent a reasonable serving.

Estimate an appropriate length and width for each cereal bar and explain your assumptions.

Based on your estimate, determine the amount each cereal bar will cost Megan to make. Show your work or explain your reasoning.

Task is worth a total of 3 points.

VF888578 Rubric	
Score	Description
3	<p>Student response includes the following 3 elements.</p> <ul style="list-style-type: none"><li>• <b>Modeling component</b> = 2 points<ul style="list-style-type: none"><li>○ The student models a strategy for developing a reasoned estimate for an appropriate length and width of each cereal bar, including explaining assumptions.</li><li>○ The student models a strategy for determining the amount each cereal bar will cost Megan to make.</li></ul></li><li>• <b>Computation component</b> = 1 point<ul style="list-style-type: none"><li>○ The student provides the amount each cereal bar will cost.</li></ul></li></ul> <p>Sample Student Response:</p> <p>I assume that each bar could be 2 inches by 4 inches. This is a reasonable size for a cereal bar and is easy enough to hold and does not appear to be too large a serving size. The cereal bar can also be cut so that all cereal bars are the same size and shape since 24 inches and 16 inches can be evenly divided by 2 inches and 4 inches.</p> <p>For the 1 pan of bars cut so each bar is 2 inches by 4 inches, there would be 6 rows of bars (<math>24 \div 4</math>) and 8 bars in each row (<math>16 \div 2</math>). Altogether, that would make 48 bars for each pan. The amount spent on ingredients is \$9.85, so the amount each cereal bar will cost Megan to make is <math>\\$9.85 \div 48</math>, which is \$0.205... or about \$0.21.</p> <p>Notes:</p> <ul style="list-style-type: none"><li>○ Other reasoned estimates are possible. As long as the modeling steps are valid, credit should be awarded.</li><li>○ The student may receive a combined total of 2 points if the modeling processes are correct but the student makes one or more computational errors resulting in incorrect answers.</li><li>○ The student may receive a total of 1 point if he/she computes the correct answer but shows no work or insufficient work to indicate a correct modeling process.</li></ul>
2	Student response includes 2 of the 3 elements.
1	Student response includes 1 of the 3 elements.
0	Student response is incorrect or irrelevant.

Anchor Set

A1 – A8

A reasonable length and width would be 3 inches by 2 inches. I estimated this because I knew 3 and 2 could both go into 24 and 2 could go into 16.

Each cereal bar will cost me an 15 cents. I figured this out by finding the area of the pan, which was  $384 \text{ in}^2$ , and dividing it by 6 inches<sup>2</sup> the area of the cereal bar. I got 64. Then I divided 9.85 by 64 and got 0.15.

## Annotations

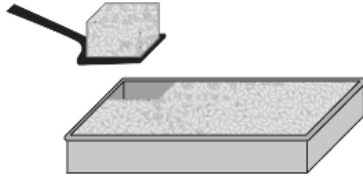
### Anchor Paper 1

#### Score Point 3

This response receives full credit. It includes each of the three required elements:

- The response models a strategy for developing an appropriate length and width for each cereal bar (*A reasonable length and width would be 3 inches by 2 inches. I estimates this because I knew 3 and 2 could both go into 24 and 2 could go into 16*). It is accepted that "go into" represents a statement of the common factors. These numbers could be evenly multiplied with another factor to equal the length and width of the pan.
- The response provides Megan's cost per cereal bar based on the estimated dimensions (*Each cereal bar will cost Megan 15 cents*).
- The response models a strategy for determining Megan's cost per cereal bar (*I figured this out by finding the area of the pan, which was  $384 \text{ in}^2$ , and dividing it by 6 inches<sup>2</sup>, the area of the cereal bar. I got 64. Then I divided 9.85 by 64 and got 0.15*).

Megan spent \$9.85 on ingredients and made one pan of cereal bars. The pan has a length of 24 inches and a width of 16 inches.



Megan needs to cut individual cereal bars from the pan. Each cereal bar should be the same size and shape, and should represent a reasonable serving.

Estimate an appropriate length and width for each cereal bar and explain your assumptions.

Based on your estimate, determine the amount each cereal bar will cost Megan to make. Show your work or explain your reasoning.

**Factors of 16 and 24:**

2 4 8 3 6 1 16 24 12

$6 \times 4 =$  One cereal bar

$16 \times 24 = 384$

$384 \div 24 = 16$  Cereal bars in a pan

$9.85 \div 16 \approx 62$  CENTS a cereal bar

## Annotations

### Anchor Paper 2

#### Score Point 3

This response receives full credit. It includes each of the three required elements:

- The response models a strategy for developing an appropriate length and width for each cereal bar (*Factors of 16 and 24: 2 4 8 3 6 1 16 24 12*), ( $6 \times 4 = \text{One cereal bar}$ ).
- The response models a strategy for determining Megan's cost per cereal bar ( $16 \times 24 = 384$ ,  $384 \div 24 = 16$  *Cereal bars in a pan*,  $9.85 \div 16 \approx 62$  *CENTS a cereal bar*).
- The response provides Megan's cost per cereal bar based on the estimated dimensions (*62 CENTS a cereal bar*).



An appropriate estimation could be the length of 4 and the width of 4 because 4 is a factor of both 24 and 16.

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The amount it will cost for each is .41¢.

$$24 \times 16 = 384 \div 16 = 24$$

$$4 \times 4 = 16$$

$$9.85 \div 24 = .41¢$$

## Annotations

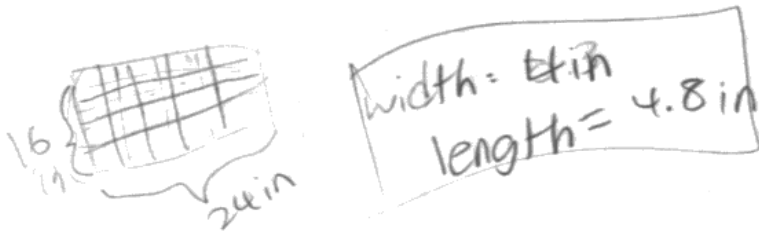
### Anchor Paper 3

#### Score Point 2

This response receives partial credit. It includes two of the three required elements:

- The response models a strategy for developing an appropriate length and width for each cereal bar (*An appropriate estimation could be the length of 4 and the width of 4 because 4 is a factor of both 24 and 16*).
- The response provides Megan's cost per cereal bar based on the estimated dimensions (*The amount it will cost for each is .41¢*).
- The response models a strategy for determining Megan's cost per bar ( $9.85 \div 24 = .41¢$ ).

Note: The work is provided for determining Megan's cost per bar ( $24 \times 16 = 384/16 = 24$ ;  $4 \times 4 = 16$ ;  $9.85/24 = .41c$ ), but work is in the form of a run-on equation; i.e.,  $24 \times 16$  is not equal to  $384/16 = 24$ . A scoring decision exists that if a run-on equation occurs in a given response and the response would have received the top score without the run-on equation, a score point will be deducted.



If the width of each cereal bar is 4 in, and the length is 4.8 in, the cereal bars are a reasonable serving and 20 cereal bars can be made from each pan.

$$\begin{array}{r} 0.8 \\ 20 \overline{) 16.85} \\ \underline{160} \phantom{0} \\ 85 \\ \underline{80} \\ 5 \end{array}$$

$$16.85 \div 20 = 0.8425$$

$$\approx \$0.03$$

## Annotations

### Anchor Paper 4

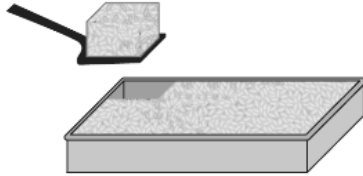
#### Score Point 2

This response receives partial credit. It includes two of the three required elements:

- The response models a strategy for developing an appropriate length and width for each cereal bar (*If the width of each cereal bar is 4 in, and the length is 4.8 in, the cereal bars are a reasonable serving and 20 cereal bars can be made from each pan*). Note: In this case, the number of cereal bars (20) is clearly used to support the cereal bar size as shown by the line drawn after the statement.
- The response models Megan's cost per cereal bar ( $9.85 \div 20$ ).

The response provides an incorrect amount for what each cereal bar will cost Megan to make ( $\$0.03$ ). The correct cost per bar of 4 by 4.8 dimensions is  $\$0.49$ .

Megan spent \$9.85 on ingredients and made one pan of cereal bars. The pan has a length of 24 inches and a width of 16 inches.



Megan needs to cut individual cereal bars from the pan. Each cereal bar should be the same size and shape, and should represent a reasonable serving.

Estimate an appropriate length and width for each cereal bar and explain your assumptions.

Based on your estimate, determine the amount each cereal bar will cost Megan to make. Show your work or explain your reasoning.

I think that each bar should be 6 inches by 2 inches.



Each bar should cost about *forty – one* cents. I divided \$9.85 by the 24 total bars in the pan. I rounded the answer to *forty – one* cents.

## Annotations

### Anchor Paper 5

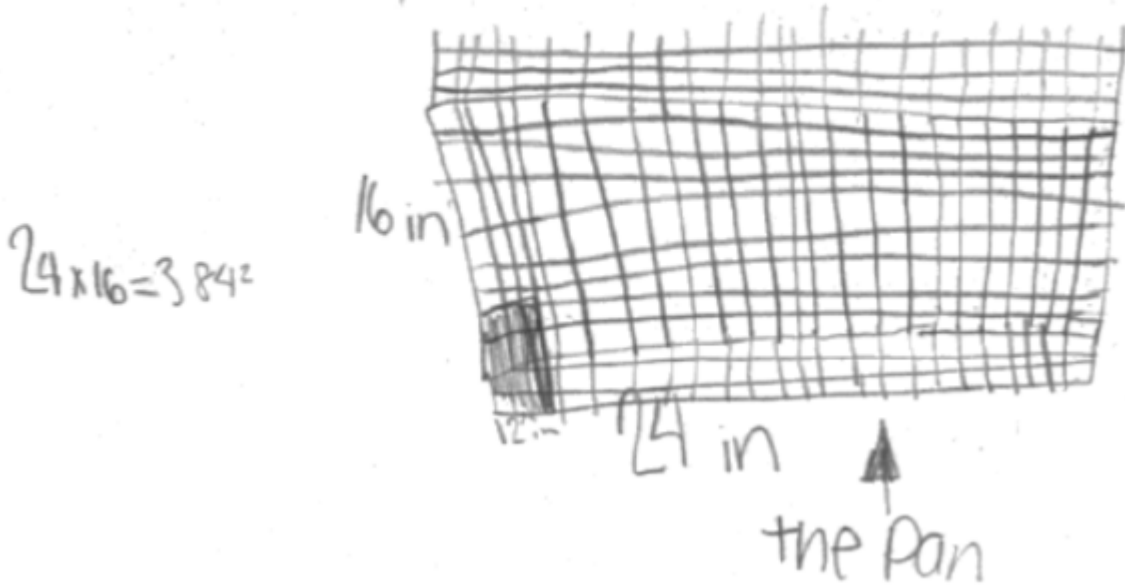
#### Score Point 1

This response receives partial credit. It includes one of the three required elements:

- The response models Megan's cost per cereal bar based on the estimated dimensions (*1 divided \$9.85 by the 24 total bars in the pan*).

While the response includes dimensions (*each bar should be 6 inches by 2 inches*), the explanation for choosing those dimensions is not included to support the decision for this model.

The response provides an incorrect amount for Megan's cost per bar (*Each bar should cost about forty - one cents*). Based on the dimensions given (*each bar should be 6 inches by 2 inches*), there would be 32 bars, not 24, and  $9.85/32$  is approximately \$0.31 per bar, not \$0.41 per bar.



Each serving should be  $3 \times 4$  because then she can make 32 bars.

$3 \times 4$  is a good size for one serving so you don't get a bar that is too big or small. Each bar should be \$1.00 because then Megan earns more than she spent.

## Annotations

### Anchor Paper 6

#### Score Point 1

This response receives partial credit. It includes one of the three required elements:

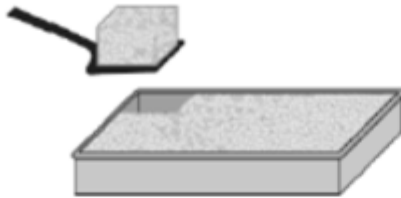
- The response models a strategy for developing an appropriate length and width for each cereal bar (*Each serving should be  $3 \times 4$  because then she can make 32 bars.  $3 \times 4$  is a good size for one serving so you don't get a bar that is too big or small*). The student provides an acceptable non-arithmetical reason for their estimation.

The response suggests a retail price instead of providing Megan's cost per bar based on the number of bars that can be made using the length and width developed above (*Each bar should be \$1.00 because then Megan earns more than she spent*).

The response does not model a strategy for determining Megan's cost per cereal bar.



Megan spent \$9.85 on ingredients and made one pan of cereal bars. The pan has a length of 24 inches and a width of 16 inches.



Megan needs to cut individual cereal bars from the pan. Each cereal bar should be the same size and shape, and should represent a reasonable serving.

Estimate an appropriate length and width for each cereal bar and explain your assumptions.

Based on your estimate, determine the amount each cereal bar will cost Megan to make. Show your work or explain your reasoning.



≈

$24 \times 16 = 384$  in  
 $384 \div 24 = 16$  in = *the* width  
of cereal bars  
and 16 in is the length of cereal  
bars because it shaped like a  
square and a square has all equal  
sides

► Numbers

► Arithmetic and Units

► Exponents and Roots

► Relations

► Geometry

► Groups

## Annotations

### Anchor Paper 7

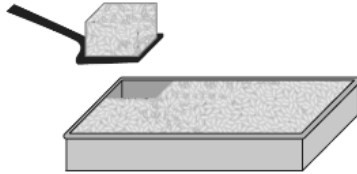
#### Score Point 0

This response does not receive credit. It does not include any of the three required elements:

The response does not model a strategy for developing an appropriate length and width for each cereal bar, here giving an inappropriate length and width (*16in = the width of cereal bars and 16 is the length of cereal bars because it shaped like a square and a square has all equal sides*). These dimensions create one cereal bar with some left over.

The response does not provide an amount each cereal bar would cost to make or model a strategy for determining the amount each cereal bar will cost to make.

Megan spent \$9.85 on ingredients and made one pan of cereal bars. The pan has a length of 24 inches and a width of 16 inches.



Megan needs to cut individual cereal bars from the pan. Each cereal bar should be the same size and shape, and should represent a reasonable serving.

Estimate an appropriate length and width for each cereal bar and explain your assumptions.

Based on your estimate, determine the amount each cereal bar will cost Megan to make. Show your work or explain your reasoning.

- 1.) I think that the cereal bars should have 4 length and 3 width.
- 2.) I think that because you can divide 16 by 3 and you can divide 24 by 4.
- 3.) It will cost her 3.25.

## Annotations

### Anchor Paper 8

#### Score Point 0

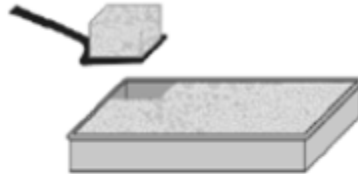
This response does not receive credit. It does not include any of the three required elements:

The response includes a possible set of dimensions (*4 length and 3 width*) but the modeling strategy described does not support the given dimensions (*you can divide 16 by 3 and you can divide 24 by 4*).

The response does not provide the correct cost per cereal bar (*It will cost her 3.25*) or model a strategy for determining Megan's cost per cereal bar.

Practice Set  
P101 - P105

Megan spent \$9.85 on ingredients and made one pan of cereal bars. The pan has a length of 24 inches and a width of 16 inches.



Megan needs to cut individual cereal bars from the pan. Each cereal bar should be the same size and shape, and should represent a reasonable serving.

Estimate an appropriate length and width for each cereal bar and explain your assumptions.

Based on your estimate, determine the amount each cereal bar will cost Megan to make. Show your work or explain your reasoning.



≈

I think each cereal bar should be 4 inches by 4 inches. 4 divides evenly into 24 and 16 so in is a good size. Also, 2 inches by 2 inches would be too small.



- ▶ Numbers
- ▶ Arithmetic and Units
- ▶ Exponents and Roots
- ▶ Relations
- ▶ Geometry
- ▶ Groups

$$24 \div 4 = 6 \text{ length}$$

$$16 \div 4 = 4$$



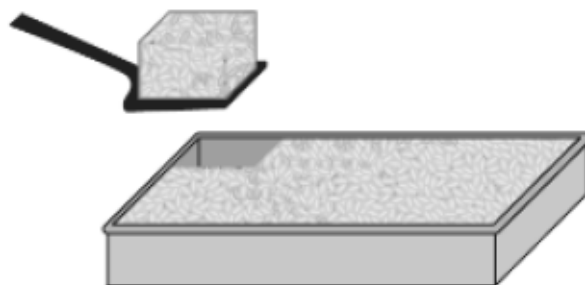
I think a cereal bar should have a width of 4 inches and length of 4 inches. I estimated by using finding the greatest common factor and dividing the pan by that. The ~~less~~ common factor I chose was 4. I think each cereal bar would cost about \$0.41

$$9.88 \div 24 = 0.41$$

I estimated the cereal bar to be two inches in length and two inches in width.



Megan spent \$9.85 on ingredients and made one pan of cereal bars. The pan has a length of 24 inches and a width of 16 inches.



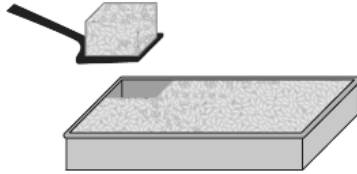
Megan needs to cut individual cereal bars from the pan. Each cereal bar should be the same size and shape, and should represent a reasonable serving.

Estimate an appropriate length and width for each cereal bar and explain your assumptions.

Based on your estimate, determine the amount each cereal bar will cost Megan to make. Show your work or explain your reasoning.

**12 BY 16. \$4.92 DOLLARS BECAUSE  
 $9.85 \div 2 = \$4.925$  DOLLARS.**

Megan spent \$9.85 on ingredients and made one pan of cereal bars. The pan has a length of 24 inches and a width of 16 inches.



Megan needs to cut individual cereal bars from the pan. Each cereal bar should be the same size and shape, and should represent a reasonable serving.

Estimate an appropriate length and width for each cereal bar and explain your assumptions.

Based on your estimate, determine the amount each cereal bar will cost Megan to make. Show your work or explain your reasoning.

$$24 \div 4 = 6$$

$$16 \div 4 = 4$$

each bar is 6 inches by 4 inches

## Practice Set

Paper	Score
P101	1
P102	3
P103	0
P104	2
P105	1