



# The Math Forum@Drexel

## *MathMentor: An Online Career and Math-Mentoring Program for High-Potential, Low-Income Students*

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## **MathMentor Goals:**

Engage high-ability, low-income high-school age students in challenging mathematics and enable the students to explore career options that involve mathematics.



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## The MathMentor in Numbers:

<b>2 years</b>	Duration of the program
<b>5</b>	Number of participating school in the Philadelphia area.
<b>290</b>	Number of enrolled students
<b>16</b>	Number of participating teachers.
<b>87</b>	Number of recruited mentors.
<b>20</b>	Number of participating mentors.



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## **The MathMentors' Approach to Mentoring:**

Value student mathematical thinking.

Examine student work.

Support multiple approaches to solving the problem.

Focus is on the process not the answer.

Help students improve their skills in problem solving and communication.



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## The MathMentor's Approach to Mentoring:

I Notice/I Wonder  Revision



Melissa

## Boxing Up Harry's Broom



Harry needs to put his 4' long broom in a box. The first box he found was only 36 inches long, but he was able to fit his broom flat on the bottom of it.

## Boxing Up Harry's Broom



Harry needs to put his 4' long broom in a box. The first box he found was only 36 inches long, but he was able to fit his broom flat on the bottom of it. What's the smallest the width of the box could be?

**Extra:** Harry found another box that was 2' long by 3' wide, and while his broom didn't fit on the bottom, it did fit in the box. What's the shortest the height of the box could be?



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## **Resources made available to support the MathMentors:**

Problem Packet: (expected solution –teaching suggestions- student work )

Communication Activity Series: Student activities for applying various problem solving activities in the classroom with examples of student thinking (was not available to the MathMentors).

## First Submission

### Answer:

5 inches wide

### Explanation:

I really did not get this problem I took a educated guess on what the answer might be.

## Revised Submission

### Answer:

2.645 inches wide

### Explanation:

First, what i did was i draw a box with the length of 36 inches. Then I draw a diagonal line that represent the broom. Then i Knew that the broom was 4 feet , but I then convert the 4 feet into inches which gave me 48 inches. I got that answer by multiplying 4 by 12 because in a foot their are 12 inches. Then after that I knew the hypotenuse was 48 inches and I knew the length which is 36 inches. Then I use Pythagorean a Theorem. Then I solve it then square root my answer which was 1008 and had 31.745 inches then i converted it back to feet wich was 2.645 feet.

## Mentor's Reply:

Hello Jefferson,

It's good that you took a guess!!! Many people would just leave it blank and not send in their answer. Trying your hardest is definitely worth a lot!

Let's see if we can get you on the right track.

Why don't you try putting some items in a shoebox. See what's the longest item you can get in the box and how it has to fit in there. I bet you'll see some shapes that look familiar and that could start you on your way to success.

Sincerely,  
J. Gibney

## First Submission

### Answer:

10.39 inches

### Explanation:

$$A^2 + B^2 = C^2$$

$$36^2 + B^2 = 48^2$$

$$1296 + B^2 = 2104$$

$$\begin{array}{r} -1296 \\ -1296 \end{array} \quad \begin{array}{r} -2104 \\ -2104 \end{array}$$

$$\sqrt{B^2} = \sqrt{108}$$

$$B = 10.39 \text{ inches}$$

## Mentor's Reply

S.,

Nice job on this problem! The way you set up the Pythagorean Theorem equation, substituted in the known values, and showed all steps leading to your solution makes your work very easy to follow.

I especially like the way you indicated the square root with the  $\sqrt{\quad}$  and the  $\sqrt{\quad}$  symbols. I wouldn't have thought of that! I noticed that on the step where you subtracted from both sides of the equation, you subtracted 1296 from the left side and 2104 from the right side. Do you think you can do that and keep both sides equal? How can you fix that to keep both sides of your equation equal?

Also, can you explain why you decided to use the Pythagorean Theorem?

I look forward to hearing back from you.

Best Regards,  
Elaine

## Revised Submission

### Answer:

About 31.75 in.

### EXTRA

H = 1.73 ft

### Explanation:

$$\begin{aligned}A^2 + B^2 &= C^2 \\36^2 + B^2 &= 48^2 \\1296 + B^2 &= 2304 \\-1296 &\quad -1296\end{aligned}$$

$$\frac{\quad}{B^2} = \frac{\quad}{1008}$$

B = 31.75 inches

### EXTRA

l = 2   w = 3   H = ?

$$A^2 + B^2 = C^2$$

$$2^2 + 3^2 = C^2$$

$$4 + 9 = C^2$$

$$13 = C^2$$

$$\frac{\quad}{13} = \frac{\quad}{C^2}$$

$$3.61 = C$$

We just found the hypotenuse of the Base, which is also the base of a vertical plane stretching diagonally across the box. The broom would be 2 dimensionally on this plane.

$$A^2 + B^2 = C^2$$

$$3.61^2 + B^2 = 4^2$$

$$13 = B^2 = 16$$

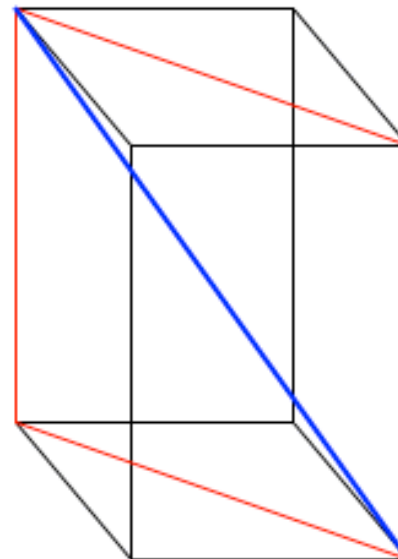
$$-13 \quad -13$$

$$B^2 = 3$$

$$\frac{\quad}{B^2} = \frac{\quad}{3}$$

$$B = 1.73$$

$$H = 1.73 \text{ feet}$$



## First Submission

### Answer:

The smallest the width of the box could be is 12".

### Explanation:

$$a(a) + b(b) = c(c)$$

$$36(36) + b(b) = 48(48)$$

$$36 + b = 48$$

$$-36 = -36$$

$$b = 12$$

## Mentor's Reply

Hello B.,

Thank you for submitting a solution to the 'Boxing Up Harry's Broom' problem.

I can see that you applied the Pythagorean Theorem which is the right step toward solving this problem. However, this was only my guess because you didn't explain where does the equation "a(a) + b(b) = c(c)" come from. Also, what do variables a, b, c, represent?

You write: "36(36) + b(b) = 48(48)" How did you then get from this equation to "36 + b = 48"

I look forward to seeing your revised solution.

James

## Revised submission

### Answer:

The smallest the width of the box could be is 32".

### Explanation:

$$a^2 + b^2 = c^2$$

$$36^2 + b^2 = 48^2$$

$$-36^2 \quad -36^2$$

$$b^2 = 48^2 - 36^2$$

$$b^2 = 48(48) - 36(36)$$

$$b^2 = 2304 - 1296$$

$$b^2 = 1008$$

$$b^2 = 32$$

10:54 AM: Student: Mort, What do you do?

10:54 AM: Mort Mackof: I am a new technology evangelist/ entrepreneur

10:55 AM: Mort Mackof: I have a degree in Electrical Engineering and graduate work in Comp Sci from RPI

10:56 AM: Student: I want to be an entrepreneur.

10:56 AM: Mort Mackof: I pioneered minicomputers to replace mainframes, MRI technology at its birth, and online trading systems over the web.

10:59 AM: Student: i want to take business.

10:59 AM: Student: Do you have any suggestions, Mort?

...

11:02 AM: Student: How do suggest that we go about starting something we like while in highschool?

11:02 AM: Mort Mackof: and if you could, say what you would like your work accomplishments to be rather than a major

11:04 AM: Student: To start a busniess of my own.

11:04 AM: Mort Mackof: what would the purpose of the business be?

11:05 AM: Student: I'm not sure yet. I want to be entrepreneur but I want to do so much. I am in the middle of my invention now.

11:06 AM: Mort Mackof: that's very exciting to hear

11:06 AM: Mort Mackof: Do you have enough knowledge and skill to finish the invention?

11:07 AM: Student: No

11:07 AM: Student: Is it possible you can help me?

11:07 AM: Mort Mackof: yes, I can help you help yourself

11:07 AM: Student: You can email me at ....How can you help?

11:09 AM: Mort Mackof: we'd need to talk about what kind of invention you are working on, unless you already know what additional education you need.

11:10 AM: Student: I am working on a new technology piece for classrooms of the 21st century so that it will help student learn better.

11:11 AM: Student: Like our school has laptops for every student so we can learn better.

11:15 AM: Mort Mackof: are you building something hard or soft or both?

11:16 AM: Student: Its hard.

11:19 AM: Student: I'm doing a rough prototype this summer.

11:20 AM: Mort Mackof: hardware, software or both?

11:20 AM: Student: both

11:21 AM: Mort Mackof: who pays for the materials?

11:22 AM: Student: I do.

11:24 AM: Mort Mackof: You've already chosen a rewarding career

11:25 AM: Mort Mackof: are there any obstacles to completion of your prototype?

11:25 AM: Student: yes... i am a little confused with programming because I want to make new application but I dont know how

11:26 AM: Mort Mackof: do you know any languages?

11:26 AM: Mort Mackof: programming that is. 11:27 AM: Student: I know little html

11:28 AM: Mort Mackof: Will html be enough?

11:28 AM: Student: No

11:29 AM: Mort Mackof: Well if you know the functions you need to perform then you should be able to pick a programming language.

11:30 AM: Student: oh okay.

11:30 AM: Mort Mackof: have you written out a complete design?

11:33 AM: Student: yes just not the software.

11:33 AM: Mort Mackof: do they offer programming at your school in summer or 9th grade?

11:34 AM: Student: No

11:35 AM: Mort Mackof: do you learn on your own?

11:35 AM: Student: what do you mean learn on my own?

11:36 AM: Mort Mackof: If I asked you to read some course material and do some exercises in learning Java, can you learn that way, on your own, or are you better with an instructor?

11:37 AM: Student: depends...I am about 50/50....I can learn it but I want an instructor to further explain.

11:40 AM: Mort Mackof: do you have access to a computer and the internet outside of school?

11:40 AM: Student: yes

11:41 AM: Mort Mackof: I suggest that you start your programming learning. And I recommend java very strongly.

11:41 AM: Mort Mackof: what operating system do you have?

11:41 AM: Student: mac and pc

11:42 AM: Mort Mackof: go to [www.sun.com](http://www.sun.com) and find java and the java trails

11:43 AM: Student: okay kool

11:43 AM: Mort Mackof: everything you need is free