

Cutting a Board

Mr. Carpenter cut a board to a length of 10 feet. After checking his measurements he realized that he only needed 75% of the board he had just cut. How many feet should he cut from the board to get the correct length board he needs?

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Suggested Grade Span

Grades 3–5

Grade(s) in Which Task was Piloted

Grade 5

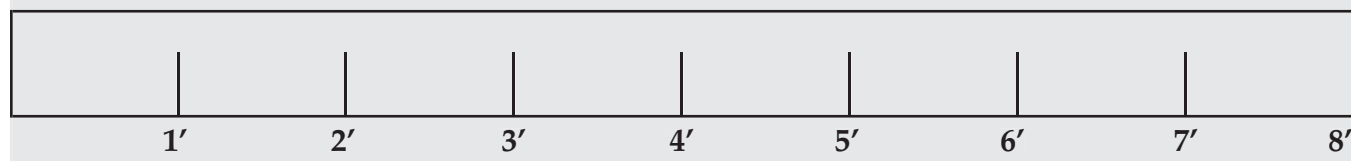
Task

Mr. Carpenter cut a board to a length of 10 feet. After checking his measurements he realized that he only needed 75% of the board he had just cut. How many feet should he cut from the board to get the correct length board he needs?

Alternative Versions of Task

More Accessible Version:

Mr. Carpenter cut a board to a length of 8 feet. After checking his measurements he realized that he only needed 75% of the board he had just cut. How many feet should he cut from the board to get the correct length board he needs?



More Challenging Version:

Mr. Carpenter cut a board to a length of 18 feet. After checking his measurements he realized that he only needed 75% of the board he had just cut. How many feet should he cut from the board to get the correct length board he needs? The original 20 foot long board was worth \$30. How much is the correctly cut length of board worth?

NCTM Content Standards and Evidence

Number and Operations Standard for Grades 3–5

Instructional programs from pre-kindergarten through grade 12 should enable students to —

- Understand numbers, ways of representing numbers, relationships among numbers and number systems
 - *NCTM Evidence:* Recognize and generate equivalent forms of commonly used fractions, decimals and percents
 - *Exemplars Task Specific Evidence:* This task requires students to recognize that 75% of the board length is the same as three fourths of the board.

Time/Context/Qualifiers/Tip(s) From Piloting Teacher

This is a medium length task and takes one class period. Student should have rulers available for their use.

Links

This task can be used in conjunction with any building project such as a class project, set construction for a class play, school renovation, etc.

Common Strategies Used to Solve This Task

Most students started with drawing a board and marking the foot measurements. If their drawing was accurate, they often marked the 50% or half length on the board and then marked half of the remaining length. Some students used both their diagram and arithmetic to complete their solution. If their diagram was not accurate or labeled, they had a harder time finding the correct solution.

Possible Solutions**Original Version:**

25% of 10 feet is 2.5 feet to be cut from the board.

More Accessible Version:

25% of 8 feet is 2 feet to be cut from the board.

More Challenging Version:

25% of 18 feet is 4.5 feet to be cut from the board.

If 20 feet cost \$30, then one foot cost \$1.50. The length of the board that is needed is 13.5 feet. So, $\$1.50 \times 13.5$ feet is \$20.25.

Task Specific Assessment Notes**General Notes**

Be sure numbers are labeled correctly. It should be clear when the student is using percents and when they are using length.

Novice

The Novice will not have a strategy that will lead to a solution. They may not draw a labeled representation and therefore, will have trouble finding the measurement equivalent to 75% of the board. There will be incorrect reasoning or the arguments made will have no mathematical basis.

Apprentice

The Apprentice will have a partially correct strategy. They may be able to draw a fairly accurate representation but will not be able to correctly find the number of feet to cut from the board. They may make an error in their calculations, however, arguments are made with some mathematical basis.

Practitioner

The Practitioner will have a strategy that will result in a correct solution. They will have an accurately labeled representation and their arguments will have adequate mathematical basis. A systematic approach and/or justification of correct reasoning is present.

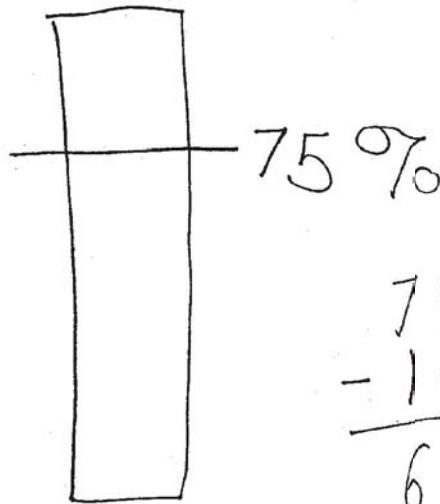
Expert

The Expert will have all that the Practitioner has and more. They may present an efficient strategy or alternative strategies are considered. A sense of audience and purpose is communicated and communication of arguments is supported by mathematical properties used.

9 Yards

Novice

How much wood do you cut off?
I will make the board.



$$\begin{array}{r} 75\% \\ - 10 \\ \hline 65 \end{array}$$

answer - 65

The student has a beginning understanding for 75% of the board although not accurate.

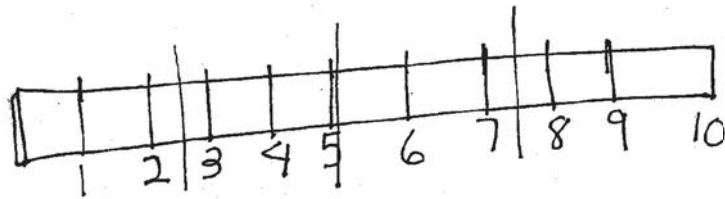
Subtracting 10 feet from 75% is not a strategy that will solve the problem.

9 Yrdlg

Apprentice

No measurements are labeled.

You have to see how much wood to cut off his board. Make the board



The student does show an understanding of the problem through their diagram.

$$\begin{array}{r} 100 \\ - 25 \\ \hline 75 \end{array}$$

only use 75% of the board.

$$4 \overline{) 10} \begin{array}{r} 2 \\ \underline{8} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

answer
 $7\frac{1}{2}$

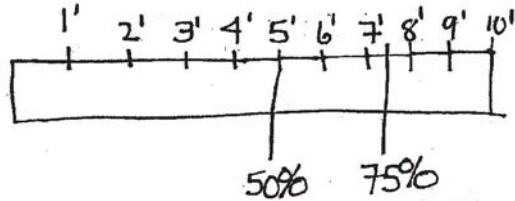
The student did not solve for the number of feet to be cut from the board.

Practitioner

All measurements are labeled.

correct length board he needs:

I need to find how much to cut off the board.
I plan to first make a diagram of the board.



The student makes connections between decimals and fractions.

5' is 50% of the board. $7\frac{1}{2}'$ is 75% of the board. You just count how much is after $7\frac{1}{2}'$. My answer is $2\frac{1}{2}'$ because $7\frac{1}{2}'$ to 8' is $\frac{1}{2}'$. 8' to 9' is 1' and 9' to 10' is 1' $\frac{1}{2}' + 1' + 1' = 2\frac{1}{2}'$. Until I made the diagram I didn't know the answer to the problem. I noticed that if you take off $2\frac{1}{2}'$ then 50% of the board will be $3\frac{3}{4}'$. I got that by 2 divided into 7.50 is 3.75 and .75 is the same as $\frac{3}{4}$.

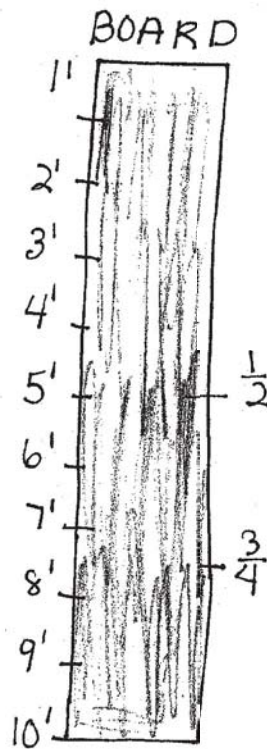
A correct solution is achieved.

An observation is made that $3\frac{3}{4}$ will be the middle of the new board.

9 Yrd Ufg

Expert

This problem wants me to find how much feet should Mr. Carpenter cut off his board. My plan is to use percents and a diagram and fractions.



$$\frac{1}{2} \text{ of } 10 \text{ feet} = 5' = 50\%$$

$$\frac{3}{4} \text{ of } 10 \text{ feet} = 7.5' = 75\%$$

because $\frac{1}{4}$ of 10 = 2.5

$$\begin{array}{r} 2.5 \\ 4 \overline{)10.0} \\ \underline{8} \\ 20 \end{array}$$

So take off $\frac{1}{4}$ or 2.5' so
the board is 7.5' long

I can prove I am
rite by doing a new way

The student connects
percents and fractions.

Using a proportion extends the
student's prior knowledge.

9 Yrd Ufg

Expert cont.

The student solved the problem two ways.

way 2

100% of board - 75% he wants =
25%

$$\frac{25}{100} = \frac{?}{10}$$

$$10 \overline{) 25}$$

$$\begin{array}{r} 100 \\ - 75 \\ \hline 25 \end{array}$$

$$n = 2.5$$

Using a proportion is a sophisticated strategy for this age student.

Take off 2.5'. I did the problem 2 ways and 2.5' cut off is the rite answer

A correct solution is achieved.