

Problem of the Week

Problem D and Solution

Cut Along the Dotted Line

Problem

Four pieces of lumber are placed in parallel positions, as shown above, perpendicular to the line W .

- Piece A is 5 m long and touches W
- Piece B is 3 m long and its left end is 3 m from the line W
- Piece C is 5 m long and its left end is 2 m from the line W
- Piece D is 4 m long and its left end is 1.5 m from the line W

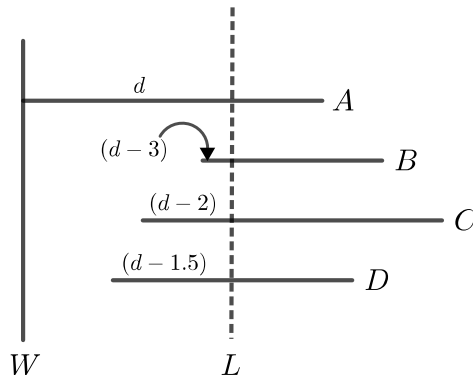
A single cut, parallel to W , is made along the dotted line L . The total length of lumber on each side of L is the same. What is the length, in m, of the part of A to the left of the cut?

Solution

Solution 1

Suppose that the distance from line W to line L is d m. Therefore, the total length of piece A to the left of the cut is d m.

Since piece B is 3 m from line W , then the length of piece B to the left of L is $(d - 3)$ m.



Similarly, the lengths of pieces C and D to the left of line L are $(d - 2)$ m and $(d - 1.5)$ m respectively.

Therefore, the total length of lumber to the left of line L is

$$d + (d - 3) + (d - 2) + (d - 1.5) = 4d - 6.5 \text{ m.}$$

Since the total length of lumber on each side of the cut is equal, then the length on the left side is also $\frac{1}{2}(5 + 3 + 5 + 4) = 8.5$ m.

Therefore, $4d - 6.5 = 8.5$, or $4d = 15$, or $d = 3.75$. Therefore, the length of the part of piece A to the left of L is 3.75 m.





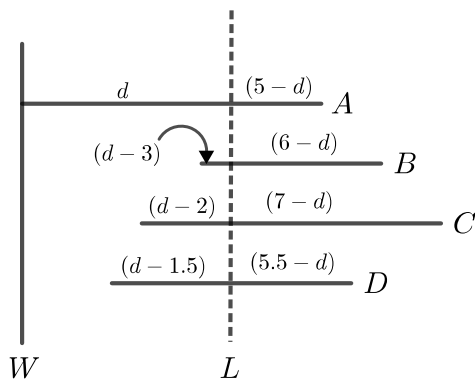
Solution 2

Suppose that the distance from line W to line L is d m. Therefore, the total length of piece A to the left of the cut is d m. Since A is 5 m long, the length of A to the right of the cut is $(5 - d)$ m.

Since piece B is 3 m from line W , then the length of piece B to the left of L is $(d - 3)$ m. Since B is 3 m long, the length of B to the right of the cut is $3 - (d - 3)$, or $(6 - d)$ m.

Since piece C is 2 m from line W , then the length of piece C to the left of L is $(d - 2)$ m. Since C is 5 m long, the length of C to the right of the cut is $5 - (d - 2)$, or $(7 - d)$ m.

Since piece D is 1.5 m from line W , then the length of piece D to the left of L is $(d - 1.5)$ m. Since D is 4 m long, the length of D to the right of the cut is $4 - (d - 1.5)$, or $(5.5 - d)$ m.



Therefore, the total length of lumber to the left of line L is

$$d + (d - 3) + (d - 2) + (d - 1.5) = 4d - 6.5 \text{ m.}$$

The total length of lumber to the right of line L is

$$(5 - d) + (6 - d) + (7 - d) + (5.5 - d) = 23.5 - 4d \text{ m.}$$

Since the total length of lumber on each side of the cut is equal, then

$$4d - 6.5 = 23.5 - 4d$$

$$8d = 30$$

$$d = 3.75$$

Therefore, the length of the part of piece A to the left of L is 3.75 m.

