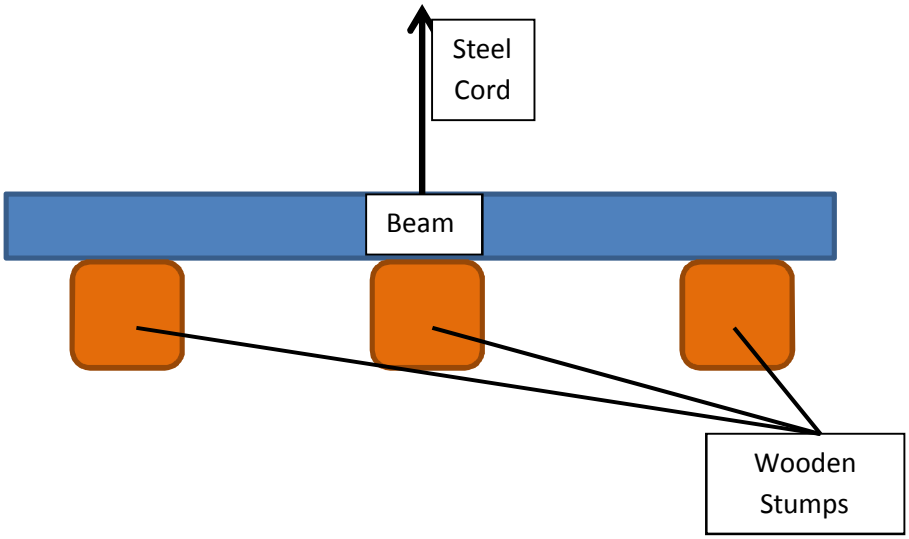
Name: _____ Date: _____ Class: _____

Beam Example

A steel beam that is part of a monument needs to be held up from the ground. It is a large, heavy beam that weighs about 1300 kg (2866.0 lbs). Three wooden stumps are to be placed underneath the beam to hold it up, as well as a steel cord that can hold up 300 kg (661.4 lbs) for additional stability. However, the amount of weight that each stump can hold is a concern. If each stump can hold the same amount of weight and the cord is pulling up 300 kg of the beam's weight, how much weight should each stump be able to carry for the beam monument? Assume that any weight is being pushed or pulled vertically (up or down).



ANSWER:

Generally, when talking about the beam, the weight of the beam is the only weight that is trying to move down onto the ground because of gravity. Therefore, everything else is pushing up. In equation form, all of the weight that is being pushed or pulled up is a positive number or term, and whatever is pushing or pulling down is considered a negative number or term. For a structure standing still, there should be no extra weight or force pulling or pushing it from any other direction. Otherwise, the structure may move, so that is why any weight balance equation is set equal to 0. In general, ***every weight needs to be balanced*** so that the monument can be held up in place. Therefore, your equation should look like this:

$$-1300\ kg + 300\ kg + 3s = 0$$

where *s* is the weight that should be held by each stump. The sum of all weights should equal 0, since they should cancel out each other for a structure to stand still. We are trying to solve for *s*. Rearranging the constant terms on one side, we get:

$$3s = 1000\ kg$$

We divide by 3 on both sides, and our answer is ***333.3 kg***. So, each stump should be able to hold up 333.3 kg for the monument to be held in place.