

Lifting and Moving Equipment 130

Block and Tackles

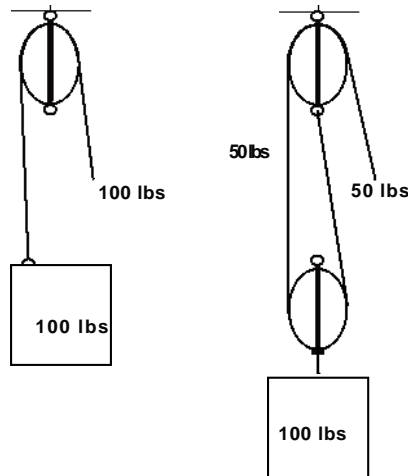


Image illustrated by author

A block and tackle is an arrangement of ropes and pulleys that works by substituting distance for force. The more distance, the less force. In the first drawing, we lift a 100 lb. weight with a single pulley, requiring 100 lbs. of pull on the rope. By doubling the rope length and adding a second pulley, in the second illustration, I have cut in 1/2 the pull needed to lift the weight.

The ceiling supports the upper pulley and 1/2 of the weight. It's a force-distance trade-off. You must pull the rope twice as far!

We can continue to add pulleys and more rope to gain additional lifting advantage. Look up at a crane. How does it lift that much weight? Notice the block and tackle at the end of the crane and then trace back and notice the rigging.

This can be expressed mathematically as $n = F_b / F_a$ where F_a is the haul (pull) and F_b is the load and n is the number of rope sections.

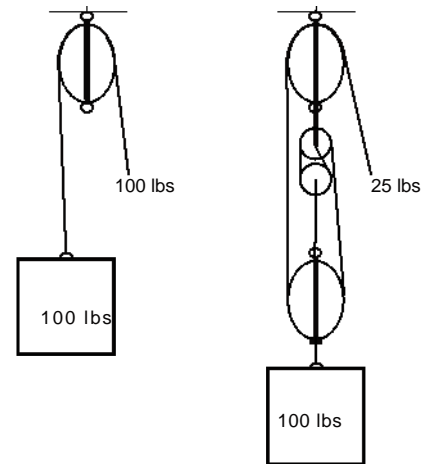


Image illustrated by author

Block and tackle arrangements you will commonly see with their values for n are:

- Gun Tackle: 2
- Luff Tackle: 3
- Double Tackle: 4
- Gyn Tackle: 5
- Threefold purchase: 6

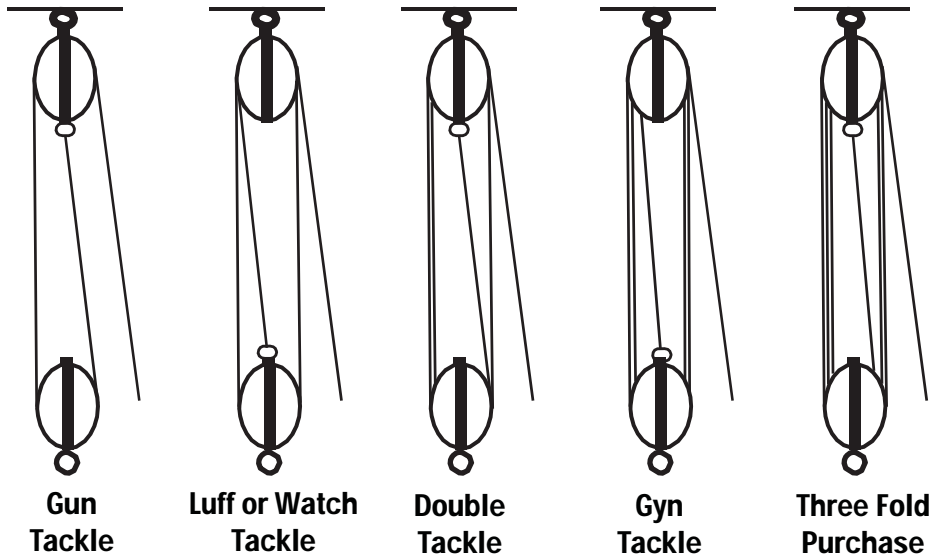


Image illustrated by author

Assume I can comfortably haul (pull) 50 lbs. I have a 250 bale of hay to lift. Which block and tackle is the simplest solution? _____

We need to move a piece of equipment weighing 2500 lbs. I have a double block and tackle and plenty of rope. How many workers need to pull if I want each to exert no more than 50 lbs.?

Suppose I was designing an overhead crane to do various jobs in the facility. What factors would I need to consider in this design?



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