2024A5 PULLEY RATIOS

L1:

Part 1 – Yes, there is a mechanical advantage here since both rope sections are load supporting ropes. **The MA is 2, since there are two rope sections applying force on the block**.

Part 2 – We know that since the MA is 2, which means the pulling force applied on the end of the rope will be increased by a factor of 2 when applied to the block. So, we need to find the weight of the block first, and find the equivalent force required to balance it. We can set this up in an equation as follows:

$$w = m*g = (25kg)*(9.81\ m/s^2) = 245.25\ N$$

Then, to find the force T for the tension in the rope, we can say

$$MA * T = 2T = 294.25\ N$$

So,

$$T = 294.3/2 = \mathbf{122.6\ N}$$

L2:

Part 1 – The mechanical advantage of the system is 4, even though there are 5 rope segments, because one of the rope segments is not a load supporting rope.

Part 2 – Since the MA is 4, we know that the balancing force of tension in the rope will be one-fourth of the weight of the box. So, first we need to know what the weight acting downwards on the box is.

$$w = m*g = (70\ kg)*(9.81\ m/s^2) = 686.7\ N$$

Then, to find the force T for the tension in the rope, we can set up the equation as,

$$MA * T = 4T = 686.7\ N$$

Therefore,

$$T = 686.7/4 = \mathbf{171.7\ N}$$