

## Calculating Mechanical Advantage, Speed Ratio, Work, and Efficiency

*Answer each of the questions below on a separate piece of paper and show all of your work. Remember to label each measurement (N for Newtons, J for Joules, etc.). Round all decimal numbers to the nearest tenth if necessary.*

MA

1. When riding a bicycle the rider puts 580 N of force on the pedals. The gears on the bicycle record a force of 64 N. What is the mechanical advantage of the bicycle?

Formula	Substitute	Answer (with units when appropriate)

MA

2. The input force for a pulley system is 48 N. The output force is 320 N. Calculate the mechanical advantage.

Formula	Substitute	Answer (with units when appropriate)

SR

3. A winch moves an anchor 32 meters when its chain is pulled 128 meters. Calculate the speed ratio.

Formula	Substitute	Answer (with units when appropriate)

MA

4. A pulley system allows a load of 750 N to be lifted by a 50 N input force. What is the mechanical advantage of the pulley system?

Formula	Substitute	Answer (with units when appropriate)

**5. Calculate the mechanical advantage, speed ratio, and efficiency for each set of measurements:**

**5a) Input force = 12.6 N      Output Force = 24N    Input Distance = 3m    Output Distance = 1m**

Mechanical Advantage Formula	Substitute	Answer (with units when appropriate)
Speed Ratio Formula	Substitute	Answer (with units when appropriate)
Efficiency Formula	Substitute	Answer (with units when appropriate)

**5b) Input Force = 40N    Output Force = 14N    Input Distance = 0.8m    Output Distance = 1.6m**

Mechanical Advantage Formula	Substitute	Answer (with units when appropriate)
Speed Ratio Formula	Substitute	Answer (with units when appropriate)
Efficiency Formula	Substitute	Answer (with units when appropriate)

**5c) Input Force = 4.5N    Output Force = 16 N    Input Distance = 15m    Output Distance = 3m**

Mechanical Advantage Formula	Substitute	Answer (with units when appropriate)
Speed Ratio Formula	Substitute	Answer (with units when appropriate)
Efficiency Formula	Substitute	Answer (with units when appropriate)

**5d) Input Force = 30N    Output Force = 6N    Input Distance = 6m    output distance = 2m**

Mechanical Advantage Formula	Substitute	Answer (with units when appropriate)
Speed Ratio Formula	Substitute	Answer (with units when appropriate)
Efficiency Formula	Substitute	Answer (with units when appropriate)

**6. Which machine in question 5 was the most efficient? What does this mean in terms energy input and energy output of the machine?**

7. A mechanical lift moves a wheelchair 6 m. The force exerted by the person and the wheelchair is 320 N. Calculate the work done by the lift.

Formula	Substitute	Answer (with units when appropriate)
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8. A 54 N trunk is lifted 8 m. Calculate the work performed.

Formula	Substitute	Answer (with units when appropriate)
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9. Calculate the work done when a 750 N table is pushed 1.2 m.

Formula	Substitute	Answer (with units when appropriate)
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10. What is the work done by a 6 N skateboard boarding down a ramp of 286 m?

Formula	Substitute	Answer (with units when appropriate)
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11. A student does 440 J of work to move a box 17 m. What force is required to move the box?

Formula	Substitute	Answer (with units when appropriate)
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