Mixed Review: Work, Power, Mechanical Advantage
and Efficiency

Solve the following problems and show all of your work!!

1. A book weighing 1.5N is lifted 3.4m. How much work was done?

\[ W = F \times d \]
\[ W = 1.5N \times 3.4m \]
\[ = 5.1J \]

2. It took 55J to push a chair 6m across the floor. With what force was the chair pushed?

\[ F = \frac{W}{d} = \frac{55J}{6m} = 9.17N \]

3. A force of 125N was necessary to lift a rock. A total of 155J of work was done. How far was the rock lifted?

\[ d = \frac{W}{F} = \frac{155J}{125N} = 1.24m \]

4. A young man exerted a force of 9450N on a stalled car but was unable to move it. How much work was done?

\[ W = F \times d \]
\[ = 9450N \times 0m = 0J \]

5. A 500N passenger is inside a 24,500N elevator that rises 30.0m in 1.0min. How much power is needed?

\[ P = \frac{F \times d}{t} = \frac{2500N \times 30m}{60s} = 12500W \]
6. What is the MA of a lever that requires 75 N of force to lift a 980 N sack of peanuts?

\[ \text{MA} = \frac{F_r}{F_e} = \frac{980 \text{ N}}{75 \text{ N}} = 13.06 \]

7. If a pulley system (block and tackle) has a mechanical advantage of 20, how much force is needed to pull up a 1050 N bail of hay?

\[ F_e = \frac{F_r}{\text{MA}} = \frac{1050 \text{ N}}{20} = 52.5 \text{ N} \]

8. Mr. DeRafelo used a screwdriver with an MA of 4 to open a can of paint. The force holding on the lid was 90 N. How hard did he push?

\[ F_e = \frac{F_r}{\text{MA}} = \frac{90 \text{ N}}{4} = 22.5 \text{ N} \]

9. A worker pushed a 2500N crate of bananas up an 8 m long ramp onto the bed of a truck 1.5 m high. He used 1000N of force to move the crate. What was the efficiency of the ramp?

\[ \text{Eff} = \frac{W_{out}}{W_{in}} \times 100\% \]

\[ = \frac{F_r \times D_r \times 100\%}{F_e \times D_e} \]

\[ = \frac{2500 \text{ N} \times 1.5 \text{ m}}{1000 \text{ N} \times 8 \text{ m}} = 47 \times 100\% = 47\% \]