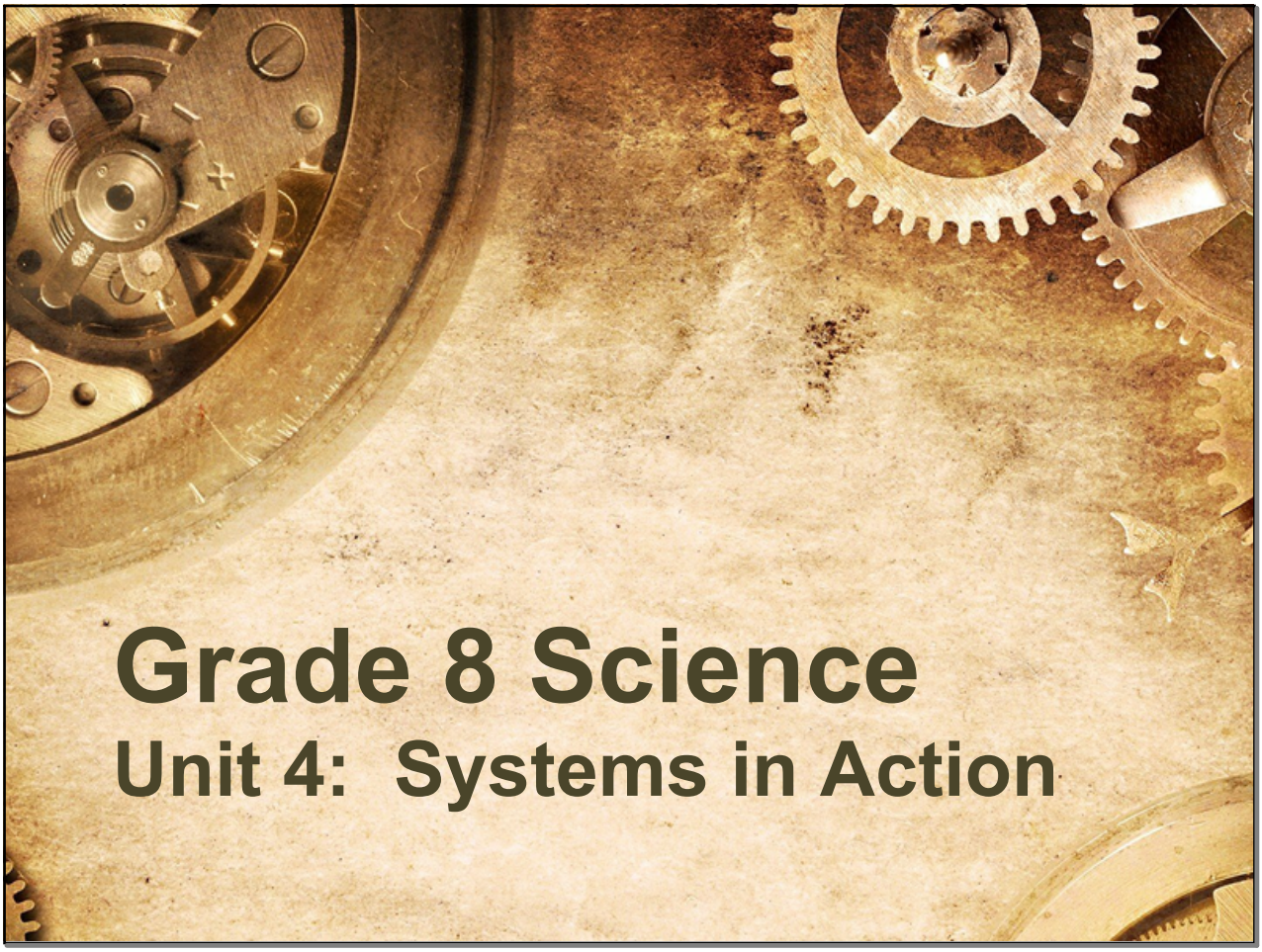


Grade 8 Science

Unit 4: Systems in Action

Equations

Today you will be working on a worksheet that will provide you with practise doing a variety of calculations based on the information we have covered so far in this unit. Before we start, let's review some of the concepts we have covered:

You need to convert mass to weight:

$$Weight = Mass\ x\ 9.8\ {}^{N}/_{kg}$$

We can calculate work:

$$Work = Force\ x\ Distance$$

$$W = Fd$$

Efficiency is how well something works:

$$Efficiency = \frac{Work\ Obtained}{Work\ Put\ In}$$

$$Eff = \frac{W_o}{W_i}$$

Equations

Levers can be sorted into three classes:

Class 1 Lever: The fulcrum is in the middle.

Class 2 Lever: The load is in the middle.

Class 3 Lever: The effort is in the middle.

We were able to relate the dimensions of the lever to the forces involved:

$$\frac{Load\ Arm}{Effort\ Arm} = \frac{Effort\ Force}{Load\ Force}$$

$$\frac{d_l}{d_e} = \frac{F_e}{F_l}$$

Equations

We calculated mechanical advantage:

$$Mechanical\ Advantage = \frac{Output\ Force}{Input\ Force}$$

$$MA = \frac{F_o}{F_i}$$

There were two types of mechanical advantage:

Ideal Mechanical Advantage (IMA)	A calculated value based on measurements of the machine.
Actual Mechanical Advantage (AMA)	A measured value based on input and output of the machine.

We then found another way to calculate efficiency:

$$Efficiency = \frac{Actual\ Mechanical\ Advantage}{Ideal\ Mechanical\ Advantage}$$

$$Eff = \frac{AMA}{IMA}$$

Equations

The ideal mechanical advantage for different machines can be determined in different ways:

Lever: $$IMA = \frac{Length\ of\ Effort\ Arm}{Length\ of\ Load\ Arm} \qquad IMA = \frac{d_e}{d_l}$$

Inclined Plane: $$IMA = \frac{Length\ of\ Ramp}{Height\ of\ Ramp} \qquad IMA = \frac{l}{h}$$

Wheel and Axle: $$IMA = \frac{Diameter\ of\ Wheel}{Diameter\ of\ Axle} \qquad IMA = \frac{D_w}{D_a}$$

Pulleys: $$IMA = \frac{Number\ of\ Support\ Ropes}{Number\ of\ Ropes\ Being\ Pulled}$$

Equations

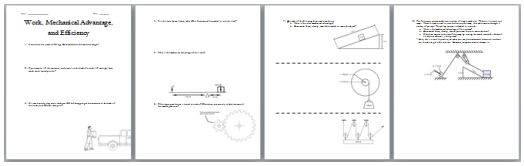
When looking at gears, we discussed that although mechanical advantage can be calculated, we will focus on velocity ratio:

$$Velocity\ Ratio = \frac{Diameter\ of\ Driver}{Diameter\ of\ Follower} \qquad V.R. = \frac{D_d}{D_f}$$

$$Velocity\ Ratio = \frac{Number\ of\ Driver\ Teeth}{Number\ of\ Follower\ Teeth}$$

Calculation Practise

Please take a copy of the worksheet. You will have the remaining time in this period to work on it, as well as, potentially, some time next class.



One week from today you will hand in this worksheet. I will be checking it to see how much of it you have completed. Between now and then, if you have any concerns, please come in to see me at break. Following the due date, I will put the answers online, I will hand back your work, and you may then use the answer key to check it. If, after viewing the answers, you have any questions, I ask that you bring them to my attention.

This unit is very math heavy, so it is important that you can do these questions, as they will appear on the end of unit test.

Attachments

4-6 Systems Calculations.pdf