

Hello!

What are we doing ?

intro

part one

Intro to gear mechanisms. Explain common components/parts to each other.

part two

Group activity - Make a mechanism on paper!

extra time

Intro to mechanical advantage + some examples.

end

Why do we need mechanisms?

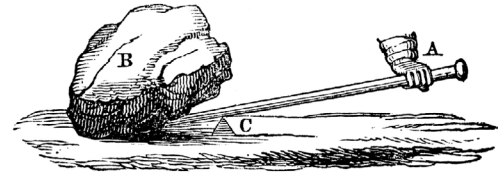
To convert input forces and movement to specific output forces and movements

COMMON USES

convert mechanical energy from engines or motors



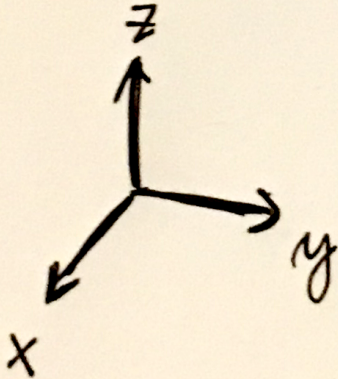
make it easier to do tasks that require a lot of force



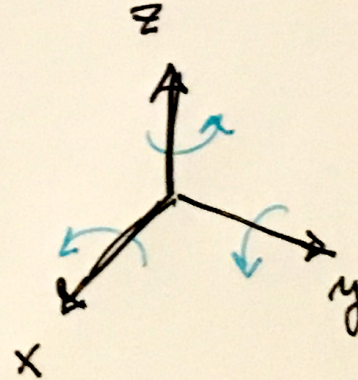
6 Types of Motion

6 types

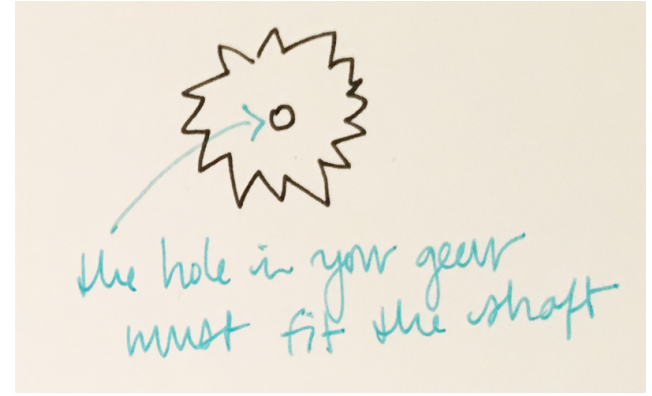
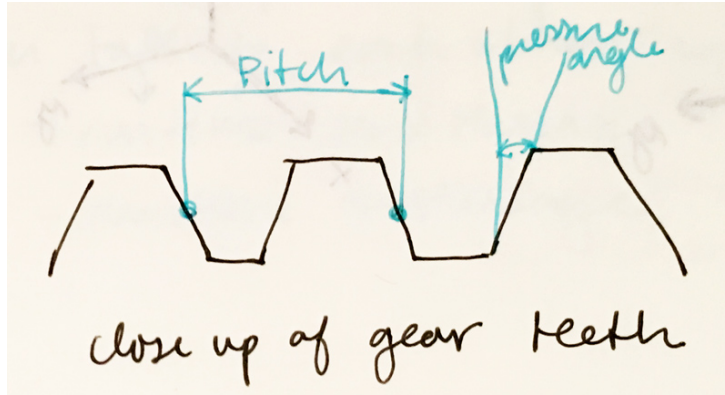
3 axes of translation



3 axes of rotation



Let's talk about gears!



Make sure your gears have the same pitch. Make sure your shafts fit.

OTHERWISE YOUR GEARS WILL NOT MESH, THINGS WILL NOT FIT & YOU WILL BE SAD

Let's talk about gears!

These can vary based on your design

Narrow By

Number of Teeth

11
12
14
15
16
17
18
20

Pressure Angle

14 1/2°
20°

Pitch

6	16	32
8	18	48
10	20	64
12	24	

Pitch Diameter

0.25"
0.292"
0.312"
0.333"
0.375"
0.417"
0.438"
0.5"


For Shaft Diameter

3/32"	13/32"	63/64"
1/8"	7/16"	1"
3/16"	1/2"	1 1/8"
1/4"	5/8"	1 1/4"
5/16"	3/4"	
3/8"	7/8"	

Material


Steel	Iron
Brass	Bronze
Stainless Steel	Nylon

Overall Width



0.25"
0.281"
0.313"
0.315"
0.344"
0.375"
0.406"
0.437"


Hub Width



0.031"	0.438"	0.78"
0.125"	0.44"	0.813"
0.188"	0.5"	0.844"
0.19"	0.56"	0.875"
0.25"	0.62"	0.88"
0.31"	0.625"	0.938"
0.313"	0.688"	1"
0.375"	0.75"	1.25"

This can vary based on your design

Hub Diameter



0.18"
0.188"
0.19"
0.22"
0.25"
0.28"
0.313"
0.328"


Bore Type

Plain
Finished

Mount Type

Press Fit
Keyway

OD



0.28"
0.29"
0.33"
0.35"
0.37"
0.4"
0.41"
0.42"

Face Width

0.08"
0.11"
1/8"
0.13"
3/16"
0.19"
1/5"
7/32"

[link to animations](#)

bevel gear

worm gear

lead screw
(not a gear, but
useful & easy)

***Tell us
about your
component (:***

helical gear

spur gear

rack and
pinion

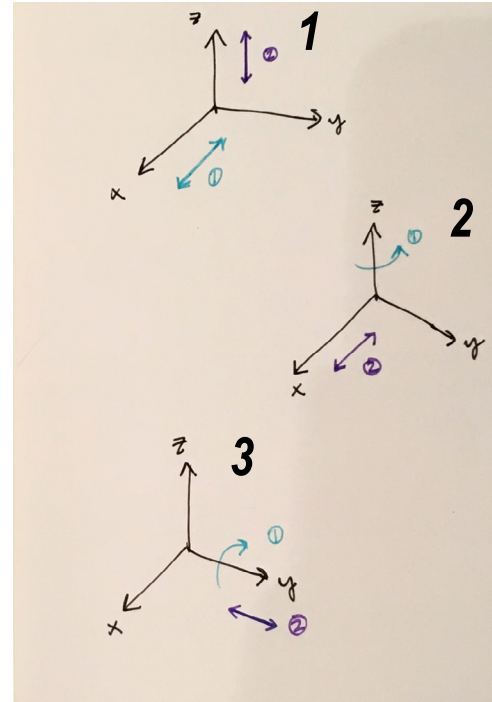
cam and follower
(not a gear, but
super cool)

Make a mechanism!

GROUP 1:
convert x translation to z translation

GROUP 2:
convert z rotation to x translation

GROUP 3:
convert y rotation to y translation



Questions?

THANK YOU!!!

***Share your feedback
on this workshop:***

<https://bit.ly/2K5IIUX>

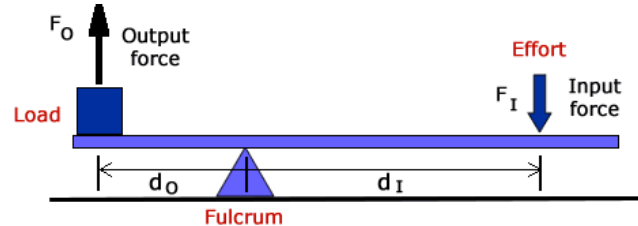
Mechanical Advantage

**How do we make it easier to
do tasks that require a lot of
force??**

Instead of inputting a large force at
one point,

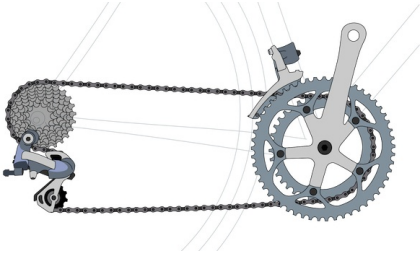
you input a smaller amount of force
over a distance.

In both scenarios, you are still have
the same total input power and
acheive the same task.



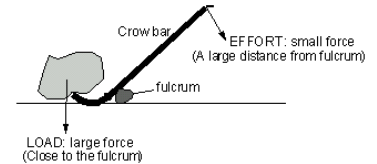
$$\text{MA} = (\text{force output}) / (\text{force input})$$

Examples!



**Shifting the gears on your bike
when you go uphill**

crowbars



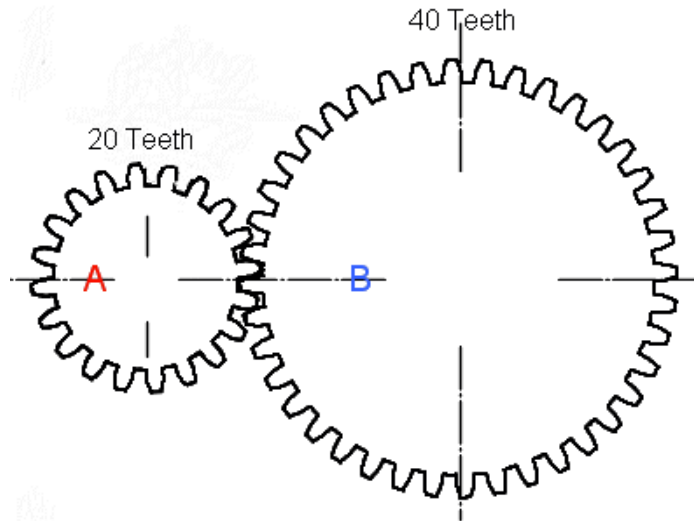
things with levers

**pushing a door close to the hinge
vs pushing it at the handle**



Equations !!!

This example has two spur gears with the same pitch.



Mech. Advantage

=

$$\frac{(\text{\# of teeth on output gear})}{(\text{\# of teeth on input gear})}$$

=

$$\frac{(\text{diameter of output gear})}{(\text{diameter of input gear})}$$