

# Gravity, Gears, and Review

## Gravity

Gravity is a force that pulls any two masses towards each other. Nothing can stop gravity.

Gravity increases with mass.

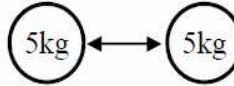
*Less mass: less gravity*



*Heavier things have more gravitational force (weight) because they have more mass.*

Gravity decreases with distance.

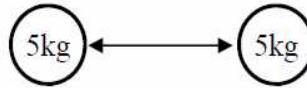
*Less distance: more gravity*



*More mass: more gravity*



*More distance: less gravity*

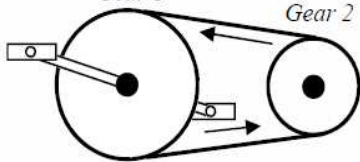


*As a spaceship gets closer to a planet, the gravity between the planet and the ship gets stronger.*

## Gears

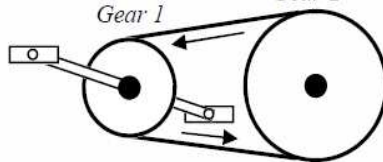
Gears increase or decrease force or speed thru a difference of gear size. Remembering your experience with bicycles will help you understand how gears work.

Driving gear  
Gear 1



*Gear 2 turns faster, but more force is needed to turn gear 1. Bicycle gears work like this on flat roads, when speed is needed, not force.*

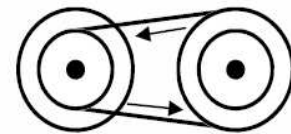
Driving gear  
Gear 1



*Gear 2 turns slower, but less force is needed to turn gear 1. Bicycle gears work like this on hills when a mechanical advantage is needed.*



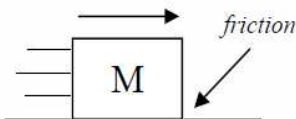
Front      Rear



*Multi-speed bikes have multiple gears, so you can choose the right combination for the right conditions.*

## Friction

Friction is a force that opposes moving objects and occurs any time objects touch. Friction causes heat and takes energy away from moving objects and machines.



*The object and the table heat up as the two object rub against each other.*

Rough surfaces have more friction than smooth surface.

**An object must be touching something to have friction.**




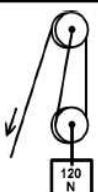


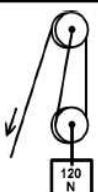


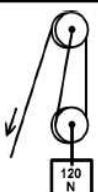




Air friction (air resistance) occurs when objects move thru air. Air friction increases with speed.



*Friction can be helpful. A car use the friction of its tires to turn corners.*

<p>What is gravity?</p> <p>Does gravity increase or decrease?</p> <p>___ If you increase the mass of one of the objects?</p> <p>___ If you decrease the distance between the two objects?</p> <p>___ If you decrease one of the masses?</p> <p>___ If the objects are farther apart?</p>	<p>Give an example of good friction.</p> <p>Give an example of bad friction.</p>
<p>If an object is not touching a table is there friction between them?</p> <p>What is another name for air friction?</p> <p>Friction always causes what?</p>	<p>Connect the bike gears to make the rear gears move fastest.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Front</p> </div> <div style="text-align: center;"> <p>Rear</p> </div> </div> <p>Connect the bike gears to make it easy to go up a hill.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Front</p> </div> <div style="text-align: center;"> <p>Rear</p> </div> </div>

<p>Balanced or unbalanced forces?</p> <p>___ 10 N left and 5 N right?      ___ If <math>a = 0</math>?</p> <p>___ An object accelerating?      ___ If <math>\Delta v = 0</math>?</p> <p>___ An object at constant speed?      ___ When an object turns a corner?</p> <p>___ An object at rest?</p>	<p>Which has more inertia:</p> <p>A 50 kg object or a 10 kg object?</p> <p>A 30 kg object on the earth or in space?</p> <p>A 20 kg object going 50 m/s, or a 30 kg object at rest.</p>			
<p>Balanced or unbalanced forces?</p> <p>Calculate the net force and acceleration of the object.</p> <div style="text-align: center;">  </div>	<p>What is the difference between mass and weight?</p> <p>Which changes in space?</p> <p>Mass or Weight: ___ 20 N; ___ 30 kg?</p>			
<p>Which falls faster: heavy or light objects?</p> <p>Why?</p>	<p>A 4 kg object accelerates <math>12 \text{ m/s}^2</math> to the left, find the force on it.</p> <p>A 30 N net force pulls to the right on a 5 kg object. Find its acceleration.</p>			
<p>Will it accelerate faster or slower?</p> <p>___ If you increase an object's mass.</p> <p>___ If you increase the force on the object.</p>	<p>Calculate the weight of a 12 kg object.</p>			
<p>How do simple machines multiply force?</p>	<table border="1"> <tr> <td data-bbox="776 884 959 1215"> <ol style="list-style-type: none"> <li>1. Experimental variables</li> <li>2. Control Setup</li> <li>3. Control variable</li> <li>4. Procedures</li> <li>5. One</li> </ol> </td> <td data-bbox="959 884 1421 1215"> <ol style="list-style-type: none"> <li>A. Variables that don't change in an experiment.</li> <li>B. A list of how you perform an experiment.</li> <li>C. An experimental setup without the variable you are studying.</li> <li>D. How many variables you change in a good experiment.</li> <li>E. The variable that you change in an experiment.</li> </ol> </td> </tr> </table>	<ol style="list-style-type: none"> <li>1. Experimental variables</li> <li>2. Control Setup</li> <li>3. Control variable</li> <li>4. Procedures</li> <li>5. One</li> </ol>	<ol style="list-style-type: none"> <li>A. Variables that don't change in an experiment.</li> <li>B. A list of how you perform an experiment.</li> <li>C. An experimental setup without the variable you are studying.</li> <li>D. How many variables you change in a good experiment.</li> <li>E. The variable that you change in an experiment.</li> </ol>	
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<p>Using a simple machine do you use more or less energy (and why)?</p>	<p>Why is a control setup so important?</p>			
<p style="text-align: center;"><u>Input Force</u> (<math>F_{in}</math>) or <u>Output Force</u> (<math>F_{out}</math>)?</p>	<p>Label <math>F_{in}</math>, <math>F_{out}</math>, <math>D_E</math>, and <math>D_R</math>. What do we call the circle?</p>			
<p>___ How far you push from the fulcrum.</p> <p>___ How heavy the object is.</p> <p>___ How hard the pulley pulls on the object.</p> <p>___ How much force you push up a ramp.</p>	<p>Calculate <math>F_{out}</math>?</p> <p>Which is bigger <math>F_{in}</math> or <math>F_{out}</math>?</p> <p>To make it easier, which side should be longer, left or right?</p> <div style="text-align: right;">  </div>			
<p style="text-align: center;"><u>Distance of Effort</u> (<math>D_E</math>) or <u>Distance of Resistance</u> (<math>D_R</math>)?</p>	<p>Label <math>F_{in}</math>, <math>F_{out}</math>, <math>D_E</math>, and <math>D_R</math>.</p> <p>Calculate is <math>F_{out}</math>?</p> <p>Which is bigger <math>F_{in}</math> or <math>F_{out}</math>?</p> <p>To make <math>F_{in}</math> easier what would you do?</p> <div style="text-align: right;">  </div>			
<p>___ How far you apply your force from the fulcrum.</p> <p>___ How high you lift the object.</p> <p>___ How far the pulley lifts the object.</p> <p>___ How far the object is from the fulcrum.</p>	<table border="0"> <tr> <td data-bbox="131 1451 349 1640"> <p>A. </p> </td> <td data-bbox="349 1451 560 1640"> <p>B. </p> </td> <td data-bbox="560 1451 776 1640"> <p>C. </p> </td> </tr> </table> <p>Label <math>F_{in}</math> and <math>F_{out}</math> on diagram B.</p> <p>Label <math>D_E</math> and <math>D_R</math> on diagram C.</p> <p>Which has three support ropes?</p> <p>Which has the greatest output force?</p> <p>Which needs the smallest input force?</p> <p>Which has the greatest MA?</p> <p>Find <math>F_{in}</math> for each.</p>	<p>A. </p>	<p>B. </p>	<p>C. </p>
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