Unit(1)
Lesson (1)

Types of levers

The lever: It’s a rigid bar that rotates around a fixed point called fulcrum & is affected by an effort force & a resistance force.

* Fulcrum (O): a fixed point where the bar rotates on

* A resistance force (R): resulted from the weight of the body we want to move

* An effort force (F): exerted by a person to equilibrate the resistance

The importance of levers:

1. Increasing force: crowbar, nutcracker, wheelbarrow, bottle opener
2. Increasing distance: manual broom
3. Increasing speed: hockey bat
4. Moving force from place to another: using manual broom to collect garbage
5. Accuracy in performance: Tweezers
6. Avoid dangers: coal holder, ice holder

* Levers are classified according to the location of effort force, resistance force & fulcrum

1) First class levers:
* Where fulcrum is between effort & resistance
* Ex. crowbar, seesaw, balance, paddle, each of scissors, pliers, pincer & nail clipper

2) Second class levers:
* Where resistance between effort & fulcrum
* Ex. nutcracker, soda water opener, stapler & wheelbarrow

3) Third class levers:
* Where effort is between resistance & fulcrum
* Ex. fishing tool, manual broom, ice or sweet holder, coal holder, hockey bat

Lesson(2)

**Law of levers:**

The effort force \( \times \) its arm = The resistance \( \times \) its arm

- Newton \( \times \) m, cm
- Newton \( \times \) m or cm

* Effort force arm: the distance between the effort force & fulcrum.
* Resistance arm: the distance between the resistance & fulcrum

**Problem:**
The exerted force of the first class lever equal 500 N & the length of its arm is 20 cm & is affected by a resistance with a value of 200 N, find the value of the arm of the resistance.

**Answer:**
The effort force \( \times \) its force = the resistance \( \times \) its arm

\[
500 \times 20 = 200 \times \text{its arm}
\]

the resistance arm = \( \frac{500 \times 20}{200} \)

= 50 Newton

**Types of levers & conserving the effort:**

<table>
<thead>
<tr>
<th>1st.class levers</th>
<th>2nd.class levers</th>
<th>3rd.class levers</th>
</tr>
</thead>
<tbody>
<tr>
<td>* the effort arm may be longer</td>
<td>force arm <strong>always</strong> longer</td>
<td>resistance arm <strong>always</strong> longer</td>
</tr>
<tr>
<td>than, shorter than or equal to</td>
<td>than the resistance arm</td>
<td>longer than the force arm</td>
</tr>
<tr>
<td>to the resistance arm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* it doesn’t conserve effort</td>
<td>conserve (save) effort</td>
<td>don’t conserve effort</td>
</tr>
<tr>
<td>except when force arm is longer than resistance arm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>* some has mechanical benefit</td>
<td>have mechanical benefit</td>
<td>used to increase speed &amp; distance &amp; to avoid dangers</td>
</tr>
<tr>
<td>others used to increase speed</td>
<td>as they save effort</td>
<td></td>
</tr>
<tr>
<td>&amp; distance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Quiz**

**Complete the following statements :**

1 ) The law of levers states that………………………………………………………………………………

2 ) The manual broom is an example of the .................levers

3 ) Levers are classified in to .................types .

**Write the scientific term :**

1 ) A rigid bar that rotates around a fixed point called fulcrum & affected by two forces

( )

2 ) The distance between the effort force & fulcrum

( )

3 ) The measuring unit of resistance force is

( )

**Give reason :**

1 ) The third class levers are very important in our life

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**Give two examples for :**

1 ) The second class levers :..............................................................

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**Problem :**

The affecting force on a second class lever equals 200 N & the length of its arm is 30 cm &

The value of a resistance equals 400 N . Find the length of the resistance arm .

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