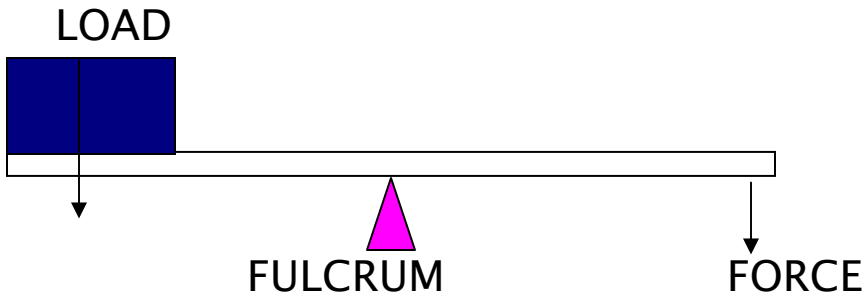
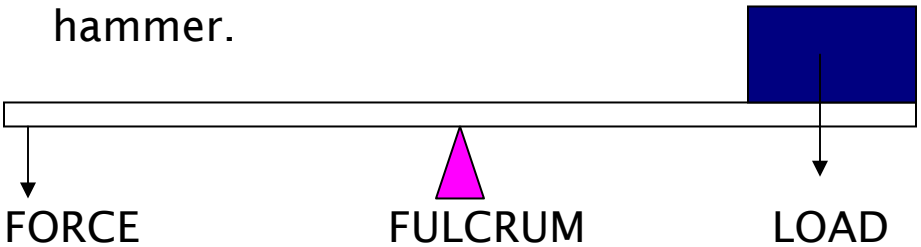
CHAPTER 10: SIMPLE MACHINE (PMR 2008/8a,b,c)

1. Simple machines are devices that make work easier.
2. The diagram below shows a lever. It consists of bar which rests on a point called the fulcrum (F). The point where forces act is called the load (L) and the point where we use our force is called the force (F) or effort (E).



3. There are three classes of levers.
   a. first class lever
   b. second class lever
   c. third class lever
4. First class lever:
   i. The fulcrum is between the force (Effort) and the load.
   ii. The effort and the load act in the same direction, that is downwards on the rod.
   iii. To make work easier, the distance of load should be shorter than the distance of effort. Thus, a heavy load is moved by a small effort.
   iv. Some examples are scissors, pliers, crowbar and hammer.



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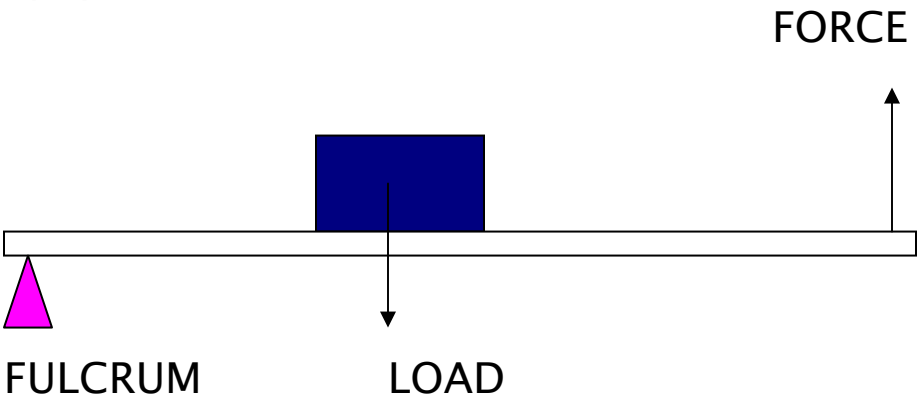
5. Second class lever:

http://www.treca.org/staff/voss/pages/2ndclass.html

i.. The load is between the fulcrum and the force.
ii. The load and effort act in opposite directions.
iii. To make work easier, the distance of effort must be longer than the distance of load. Thus, a heavy load is moved by a small effort.
iv. Some examples are wheelbarrow, nut cracker, bottle opener, opening the hood of a car and paper cutter.



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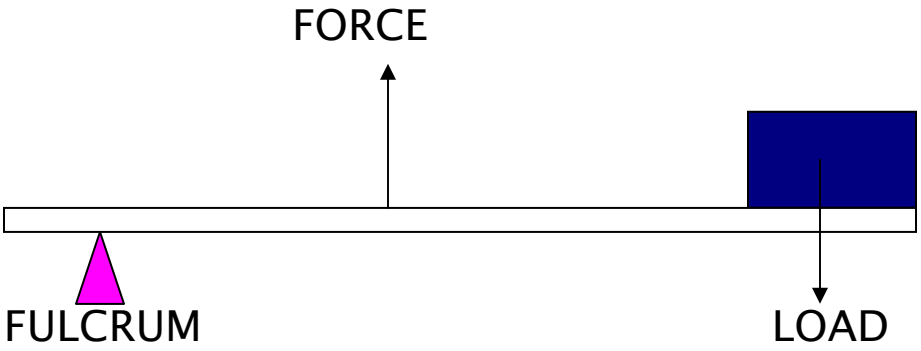
6. Third Class lever:

i.. The force is between the load and the fulcrum.
ii. The load and effort act in opposite directions.
iii. To make work easier, the distance of effort must be shorter than the distance of load. Thus, a small load is moved by a large effort.

iv. Some examples are ice tongs, fishing rod, broom, stapler, knife, golf, forceps, badminton racquet and our forearm.



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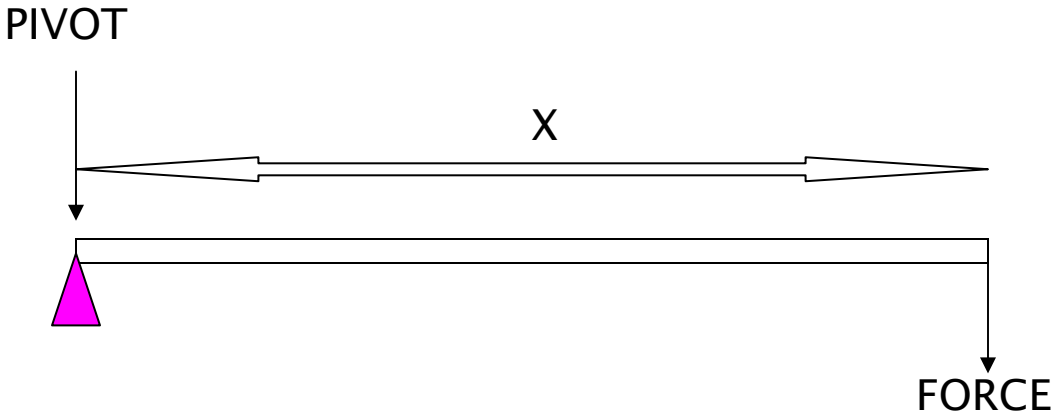
7. Principle of levers

Go to www.pbs.org/wsbh/nova/lostempires/obelisk/ and click on "lever and obelisk" to raise an obelisk using a simple machine. For easy access, go to www.icd.com.my

Load X Distance of the load from fulcrum = Force X Distance of the force from fulcrum.

$$L \times DL = F \times DF$$

8. Moment of force = Force X perpendicular distance from the pivot to force.
9. moment = F X D



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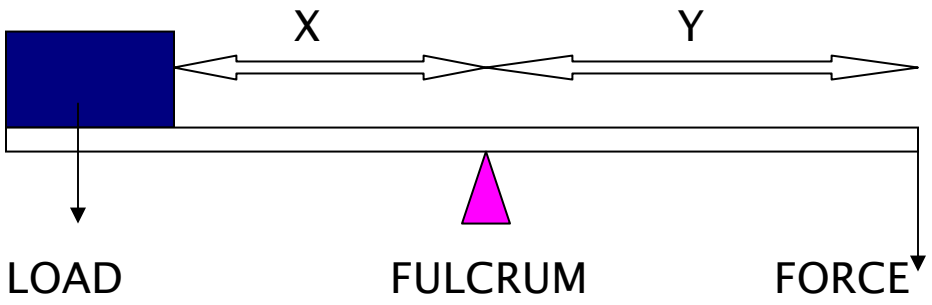
10. Principle of moment:



When lever is in equilibrium,

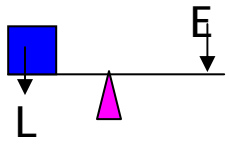
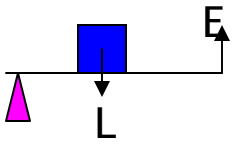
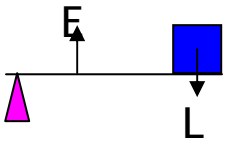
Load X Distance of the load from fulcrum = Force X Distance of the force from fulcrum.

$$L \times DL = F \times DF$$

@

$$L \times DL = E \times DE$$

Comparison between the different classes of lever

model	first class lever	second class lever	third class lever
model			
centre position	Fulcrum	load	effort
direction in which the load (L) and effort (E) act	L and E act in the same direction	L and E act in the opposite directions	L and E act in the opposite directions
Examples	pliers, (PMR 2008) scissors, (PMR 2008) claw hammer, chemical balance, weighing scale, see saw, hoe	bottle opener, (PMR 2008) wheelbarrow, nutcracker, paper cutter,	ice tongs, (PMR 2008) forceps, broom, fishing rod, badminton racquet, golf club,