

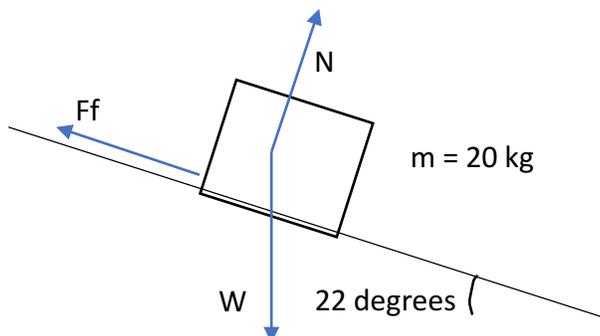
# Physics 111 Session 6

## Gravitational Force

- 1) Planet Earth is  $1.496 \times 10^8$  km from the Sun. The Sun has mass  $1.989 \times 10^{30}$  kg, and Earth has mass  $5.972 \times 10^{24}$  kg. Find the gravitational force between the Sun and Earth.
- 2) The ISS is 409 km from the Earth's surface, and the Earth's radius is 6371 km, and has mass  $5.972 \times 10^{24}$  kg. Find the gravitational force between Earth and the ISS.
- 3) Two bodies orbit around each other at a radius  $R$ . they have masses  $m_1$  and  $m_2$ . What happens when we:
  - a) Double the radius
  - b) Halve the radius
  - c) Double the mass of one of the bodies
  - d) Halve the mass of one of the bodies

## Frictional Force

- 4) A box with mass 5 kg is resting on a perfectly level surface, and the coefficient of static friction between the box and the surface is 0.63. What is the force that somebody should push the box to get it to move?
- 5) You have to drag a log that weighs 50 kg off the road, so you pull on it at an angle of 27 degrees from the ground. If the coefficient of kinetic friction between the log and the road is .48, how hard are you pulling?
- 6) A box is sitting on a plane inclined at 22 degrees and is staying put due to its frictional force. Find the coefficient of static friction between the box and the incline.



**Normal Force:**

- 7) A man has a mass of 100kg. he is standing on a scale, and is partially held up by a rope and harness. Find the reading on the scale for:
- a) The rope holding none of his weight
  - b) The rope holding half of his weight
  - c) The rope holding all of his weight
- 8) The same man as question 7 is now on a scale in an elevator. Find the reading on the scale if:
- a) The elevator is **stopped**
  - b) The elevator is going up at a **constant speed** of 3 ft/s
  - c) The elevator is **accelerating downward** at  $2 \text{ ft/s}^2$
  - d) The elevator is **accelerating upwards** at  $4 \text{ ft/s}^2$
  - e) The elevator's cable breaks and is in **freefall**
- 9) A box is sitting on the same inclined plane as in problem 6. This box has mass 15 kg. Find its normal and frictional forces.