$\therefore f_S = F_{g||} = F_g \cdot \sin\theta$ (equation 1) when an object is at rest on a slope without any force being applied.
When an object on a slope is about to start sliding:
$f_{S\,(max)} = F_{g||} = F_g \cdot \sin\theta$ and $f_{S\,(max)} = \mu_S \cdot F_g \cdot \cos\theta$ (equation 2)
Set equation 1 = equation 2.
$\therefore F_g \cdot \sin\theta = \mu \cdot F_g \cdot \cos\theta$

$$\mu_s = \frac{F_g \cdot \sin\theta}{F_g \cdot \cos\theta} = \tan\theta$$

Where θ is the angle of the slope to the horizontal when the object is at the point of starting to slide.

On a slope: $\mu_s = \tan\theta$

1.6.6 Application

In which situations can friction be useful, and in which situations is it a problem?

Advantages	Disadvantages
• Friction between tyres and the surface of the road allows a vehicle to move. • Friction between surfaces allows you to unscrew a lid with your hand. • Friction between the soles of your shoes and the floor enables you to have traction when you walk. • Friction in a gear system causes motion of all parts. • Stepping on the brakes uses friction to slow down a car.	• Walking or running on loose sand or snow is difficult. • Friction due to the rubber of wheels on the road in a cycling race or Grand Prix decreases velocities. • Falling on a rough surface, e.g. tar, takes skin off.

Quick facts

From the earliest times, people used friction to make fire. Some of the San people today still have the skill to make fire that way.

Experiment 1 Date:

Aim: To investigate the relationship between the magnitude of the applied force and the static frictional force of a system.

Investigative question:

_____

_____

Hypothesis:

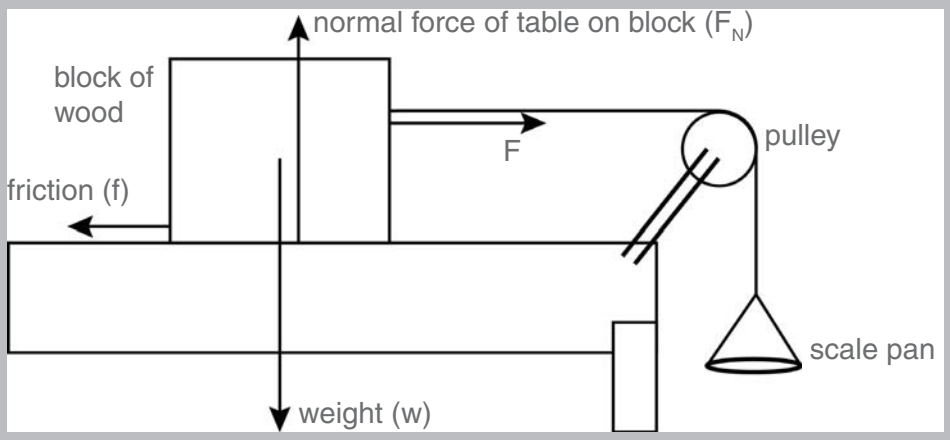
_____

_____

Variables:

Independent variable (Which is changed.)	**Dependent variable** (Which is measured.)	**Controlled variable(s)** (Which remain(s) the same.)

Apparatus:



Method:

1. Measure the masses of the wooden block and the scale pan.
2. Set up the apparatus as shown in the sketch.
3. Place a small mass piece in the scale pan.
4. If the wooden block does not move, add another mass piece to the pan.
5. Carry on adding mass pieces to the pan until the block is at the point of moving.

Results:

Mass of mass piece and scale pan (kg)	**F_T (N) (F_T = mg)**	**Weight of wooden block (w = mg) (N)**	**F_N (N) (F_N = w)**	**f_S (N)**	**Motion (does not move, moves)**

Conclusions: