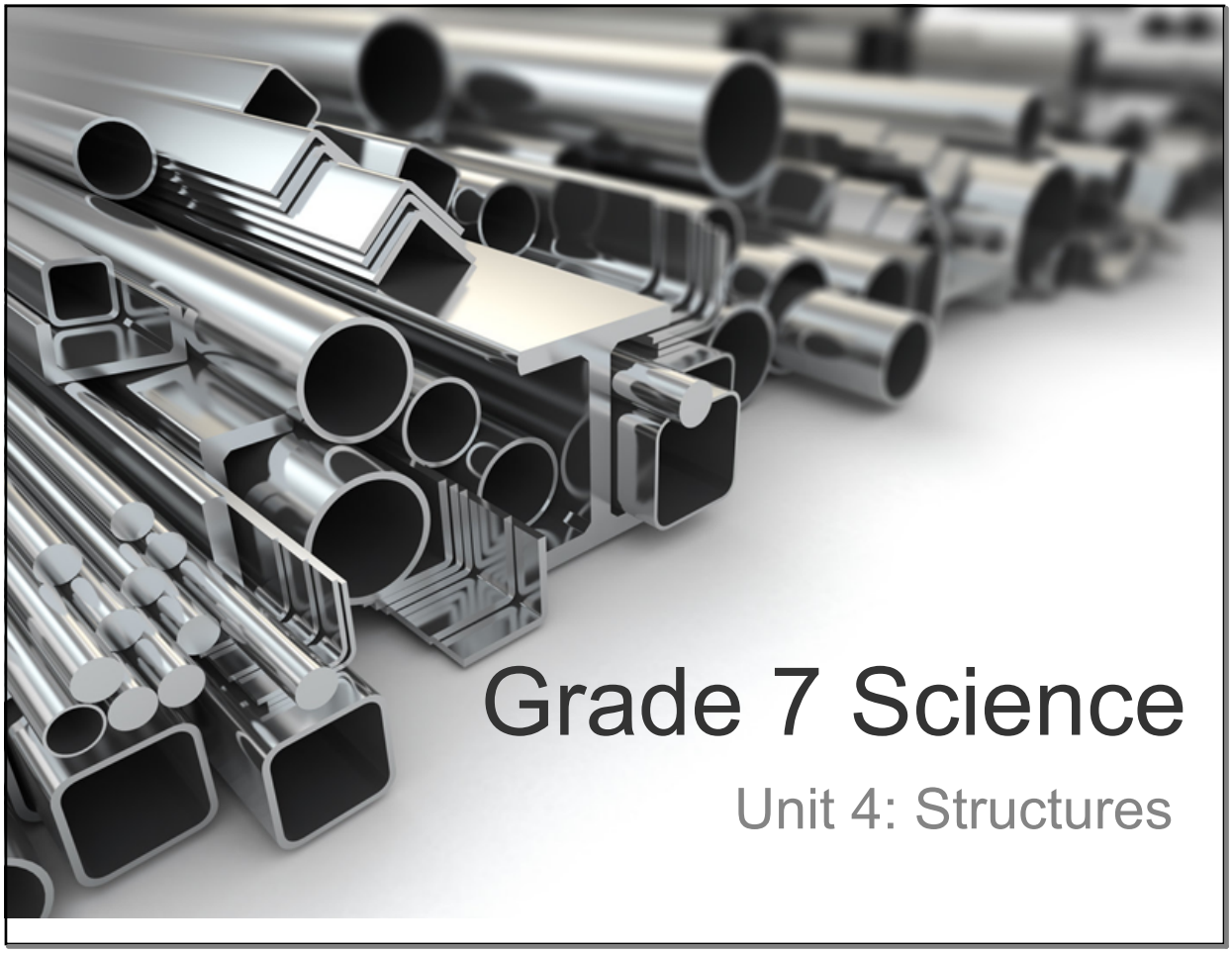


Grade 7 Science

Unit 4: Structures

Review of Definitions

What is mass?	The amount of matter in an object.	kg
What is weight?	The force of gravity exerted on a mass.	N
What is a force?	A push or pull that can cause movement.	N

$W = m \times g$

Where W = Weight (units: Newtons, N), m = Mass (units: kg), and g = gravity (units: *N/kg*)

g = 9.81 *N/kg*

g = 1.6 *N/kg*

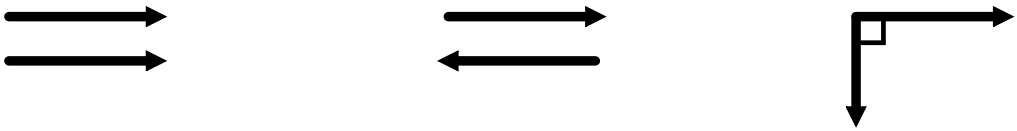
We use 10 N/kg

Forces

Can more than one force act on an object at the same time? Yes

When there is more than one force on an object, there are three scenarios that can happen. The forces can...

"Help" each other. Work against each other. "Ignore" each other.



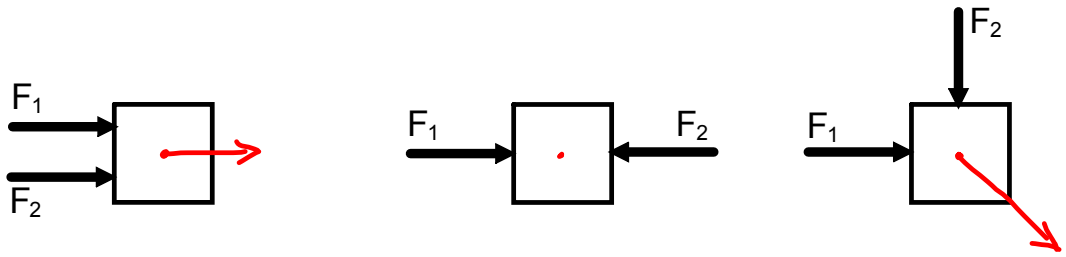
When drawing a force you use an arrow to show the direction. It is also important to label the force. This is done with a capital "F" and a subscripted number.

F_1 →

Force Balance Diagrams

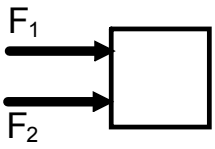
For each of the scenarios below, lets figure out what would happen.

- A box represents the structure - in any situation when we are dealing with forces, this is how we will draw our structure.
- A solid arrow represents a force (blue or black), a force is always labelled with a subscript to differentiate it from other forces.
- A red arrow (or dotted arrow if you do not have red) represents movement, the arrow starts from the middle of the structure and moves in the direction of movement.

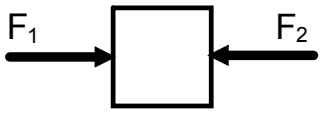


Force Balance Diagrams

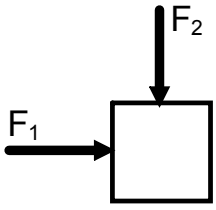
Let's see what happens when we have numerical values for the forces:



$F_1 = 5N$
$F_2 = 5N$

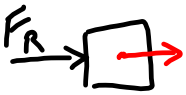


$F_1 = 5N$
$F_2 = 5N$



Ignore each other

$F_1 = 5N$
$F_2 = 5N$



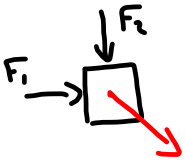
$F_R = F_1 + F_2$
$F_R = 5 + 5$
$F_R = 10N$

F_R = Result Force

$F_R = F_1 + F_2$
$F_R = 5 + (-5)$
$F_R = 0N$

No movement

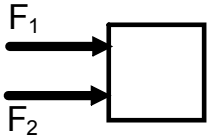
opposite to direction to my guess



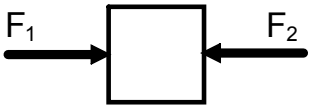
* Not always 45°, see next page.

Force Balance Diagrams

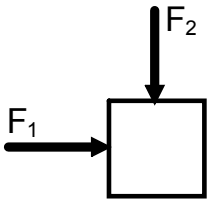
Let's try this again, this time with different numbers.



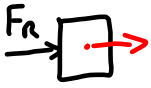
$F_1 = 7N$
$F_2 = 3N$



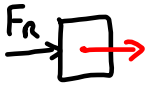
$F_1 = 7N$
$F_2 = 3N$



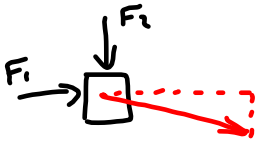
$F_1 = 7N$
$F_2 = 3N$



$F_R = F_1 + F_2$
$F_R = 7 + 3$
$F_R = 10N$



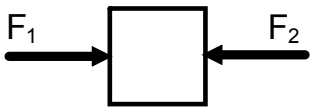
$F_R = F_1 + F_2$
$F_R = 7 + (-3)$
$F_R = 4N$



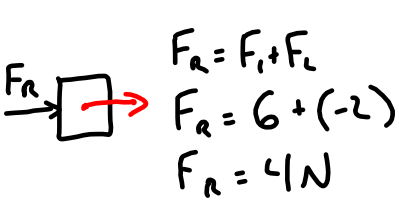
More right than down

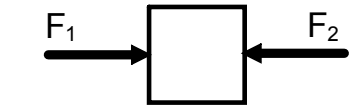
Force Balance Diagrams

If, after determining that value for the resulting force, you have a negative number it means that you have put the force in the wrong direction. Take a look at these two scenarios:

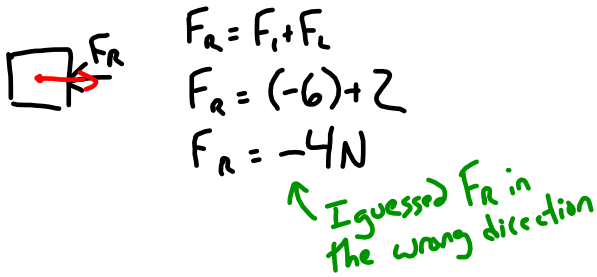


$F_1 = 6N$
$F_2 = 2N$



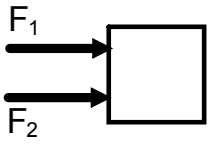


$F_1 = 6N$
$F_2 = 2N$

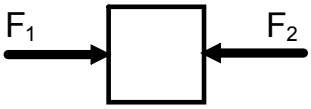


Force Balance Diagrams

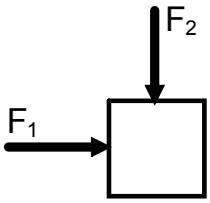
We will repeat this for the remaining time, changing up the numbers each time.



$F_1 =$
$F_2 =$



$F_1 =$
$F_2 =$



$F_1 =$
$F_2 =$

Please bring a calculator next class.