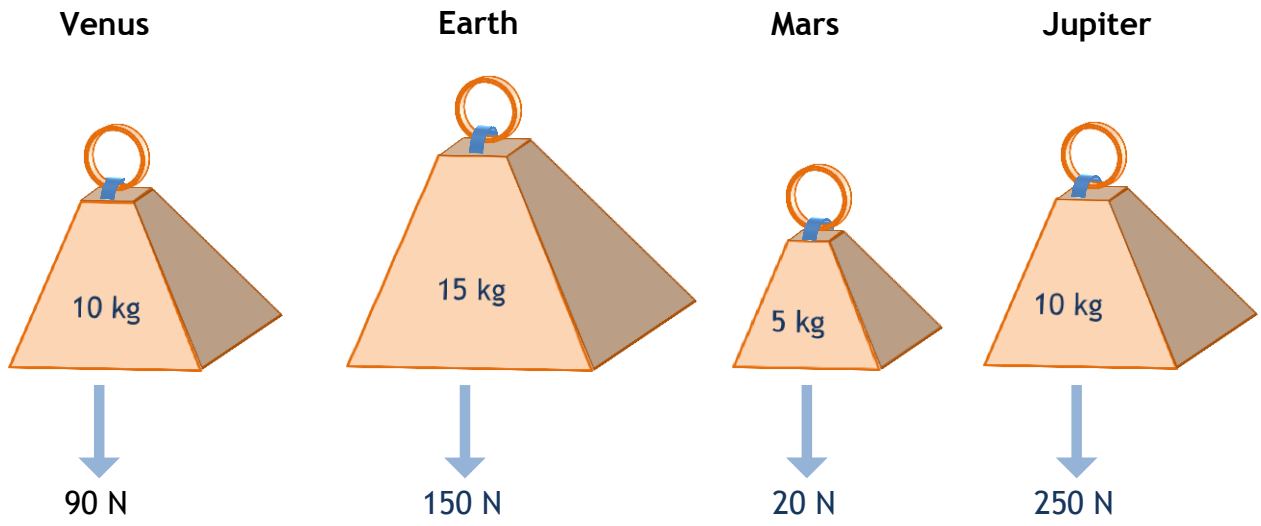
Feeling gravity's pull

Donna and Evie are investigating the difference between mass and weight.

Donna finds a drawing showing the mass and weight of four objects on four different planets.



1. From Donna's drawing, on which of the four planets is the object with the largest mass?

2. How can you tell, from Donna's drawings, that the gravitational strength is greater on Earth than on Mars?

3. Which planet, Venus or Jupiter, has the greater gravitational strength?

4. If the object placed on Mars was 10 kg, what would it weigh?

5. Evie says that the force of gravity is less on the Moon than it is on the Earth.

   Copy and complete Evie's sentences below to compare the weight and mass of an object on the Moon and on the Earth.

   a. The **weight** of an astronaut on the Moon is [more than/ less than/ the same as] their **weight** on the Earth.

   b. The **mass** of an astronaut on the Moon is [more than/ less than/ the same as] their **mass** on the Earth.

Mass and weight

Duncan collects some information about the force of gravity on some other planets.

Planet	Gravitational field strength N / kg	Mass of object kg	Weight of object N
Mercury	4	15	60
Venus	9		90
Earth	10	15	
Mars		10	40
Jupiter	25	10	250
Saturn	11	5	
Uranus		20	180
Neptune	11		110
Pluto	0.7	20	

1. Duncan's information is not complete. Copy and complete the table using the information that it contains.

2. Eddie says "any object can be weightless in space" but Duncan says "planets are not weightless".

   Who is right?

3. Duncan reads that the gravitational force on the surface of the Sun is very big.

   Eddie researches this and finds out that if he stood on the surface of the Sun, then his weight would be 13 500 N.

   Eddie has a mass of 50 kg.

   Use this information to calculate the gravitational strength of the Sun.

Answers

Feeling gravity's pull

1. Earth
2. 5 kg on Earth would have a weight of 50 N whereas on Mars it is 20 N so the gravitational field strength must be greater on Earth
3. Jupiter
4. 40 N
5.
   a. The weight of an astronaut on the Moon is *less than* their weight on the Earth.
   b. The mass of an astronaut on the Moon is *the same as* their mass on the Earth.

Mass and weight

1.

Planet	Gravitational field strength N / kg	Mass of object kg	Weight of object N
Mercury	4	15	60
Venus	9	**10**	90
Earth	10	15	**150**
Mars	**4**	10	40
Jupiter	25	10	250
Saturn	11	5	**55**
Uranus	**9**	20	180
Neptune	11	**10**	110
Pluto	0.7	20	**14**

2.

Duncan is correct. See the following webpages for further explanations.

yalescientific.org/2010/10/mythbusters-does-zero-gravity-exist-in-space/

nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-is-microgravity-58.html

3. 270 N/kg