Tecno 3r ESO - Fitxa de Forces (in English)

1. Choose if the following statements are true or false:

a) If the forces acting on an object are unbalanced, the object will accelerate or decelerate. T F
b) Objects always stop if you wait enough, even if there aren't any forces acting on them. T F
c) If we throw something in space, it'll keep going in the same direction forever unless a force stops it. T F
d) Without an atmosphere, everything falls down at the same speed. T F
e) Something with a bigger mass will accelerate faster. T F
f) If an object is stationary, it means that no forces are applied to it. T F
g) Your weight is the same in the earth and the moon. T F
h) Your mass is the same everywhere. T F
i) If the forces acting on an object are balanced, then the net force is 0. T F
j) If two forces have the same direction, they also have the same sense. T F
k) If two forces have the same sense, they also have the same direction. T F
l) Every time we push something, that thing pushes us back with the same force, in the same direction, but in opposite sense. T F
m) The moon also has gravity, but here on Earth we don't notice it. T F
n) If I'm in space and throw a pencil at my astronaut friend, I'll accelerate towards my friend. T F
o) If an elephant pushes a chicken, the chicken is applying an equal but opposite force on the elephant. T F

2. Which of this best explains why rockets can go up?

a) The rocket makes a lot of heat. The heat makes the air under the rocket less dense and so it raises up (like a hot air balloon).
b) The rocket pushes a lot of gas down, and so the gas provides an equal but opposite force pushing the rocket up.
c) The rocket burns a lot of fuel, and the heat created makes the rocket go up.

3. If Newton's Third Law is true, does it mean that the gravity also pulls the earth towards me? If I fall to the ground, will the earth go up towards me? Why don't we see it?

4. Explain why you can jump a lot higher in the moon.

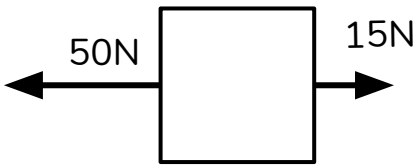
5. If I throw a ball towards the wall, what causes it to bounce back?

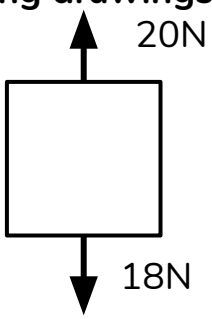
6. Explain two ways in which the third law of motion takes place when a tennis player hits the ball.

7. When something falls from really high, there's a point in which it stops accelerating (and just falls at the same speed all the tim). Can you explain why can it stay at the same speed?

8. I try to move a really big rock on my town by applying a 200N force on it. If my mass is 50kg and the rock's mass is 2800kg, which force does the rock apply against me?

9. Calculate the resultant force from the following drawings





10. Calculate the following weights and masses:

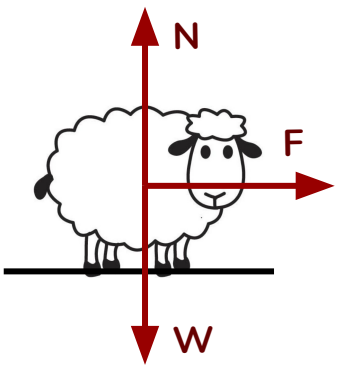
a)	15 kg =	N	d)	300 N =	kg
b)	28 kg =	N	e)	24 kg =	N
c)	125 N =	kg	f)	5 N =	kg

11. The mass of a cow is 1400 kg. Calculate its weight on the Earth and on the moon (in the moon, the gravitational field is 1.622 m/s^2).

12. If I push a box of 20 kg with a force of 400N, how much will it accelerate? Draw the free-body diagram of the box.

13. An astronaut with a mass of 60 kg is experiencing a force of 3600 N in the moment of launching. Determine the acceleration of the rocket in this moment.

14. Jacob has put his sheep on top of his skate, and is pulling it with a string. This gives the sheep an acceleration of 5 m/s^2.
The following drawing is a free-body diagram of the sheep's situation.



F = 200 N
W = N = 100 N

Calculate the mass of the sheep.

Why doesn't it also accelerate up or down?

Could we just draw a box instead of the sheep?

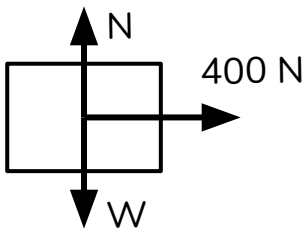
15. A car is accelerating at 2 m/s^2. If its mass is 980 kg, what force is the motor applying to push it forward?

16. Héctor doesn't want to go to the exam, so his sister drags him through the floor. The sister pulls with a force of 230 N, and the friction between Héctor and the school's floor is of 40 N. Knowing that Héctor's mass is 42 kg, draw Héctor's free-body diagram and calculate the acceleration that her sister is applying on him.

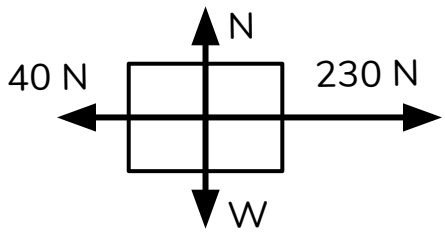
1. a) T b) F c) T d) T e) F f) F g) F h) T i) T j) F
k) T l) T m) F n) F o) T
2. b
3. Yes. Yes. Because the Earth's mass is so big that it almost doesn't accelerate.
4. Because my legs can apply the same force there, but the gravity pulls me back a lot less than on Earth.
5. When the ball pushes the wall, the wall pushes back the ball with an equal but opposite force.
6. When the racket hits the ball, the ball applies an equal but opposite force on the racket. The tennis player also pushes against the floor and the floor pushes back.
7. The air is pushing the ball up with the same force than gravity pulls it down.
8. 200N (the weight doesn't matter)
9. 35N to the left. 2N up.
10. a) 147.15 N b) 274.68 N c) 12.74 kg d) 30.58 kg e) 235 N f) 0.51 kg
11. Earth: 13734 N, Moon: 2270.8 N
12. 20m/s^2
13. 60m/s^2
14. 40 kg. Because the forces that go up and down are balanced. Yes, the shape of the sheep on the drawing doesn't matter (we just want to see the forces).
15. 1960 N
16. 4.52m/s^2

Free-body diagrams

12.



16.



Formulas:
$F = m \cdot a$ $m = F / a$ $a = F / m$ $P = m \cdot g$
$g = 9.81$ m/s^2

Vocabulary:
Balanced (equilibrat): the net force (the sum of all forces) is 0.
Unbalanced (desequilibrat): the net force (the sum of all forces) is not 0.
Towards (cap a): going in the direction that makes you closer.
.**Bounce (rebotar):** change direction after hitting something.

Mass (massa, kg) - Weight (pes, N)
Normal force (força normal): force that the ground applies on the object.
free-body diagram (diagrama de cos lliure): drawing with all the forces applied on an object.