Quest Chapter 04

#	Problem	Hint
1	A ball rolls across the top of a billiard table and slowly comes to a stop. How would Aristotle interpret this observation? How would Galileo interpret it? 1. Galileo would say that the ball comes to rest because the ball seeks its natural state of rest. Aristotle would likely have said it comes to rest because of some forces acting on it; likely friction between the ball and table surface and with the air. 2. All are wrong. 3. Aristotle would say that the ball comes to rest because the ball seeks its natural state of rest. Galileo would likely have said it comes to rest because of some forces acting on it; likely friction between the ball and table surface and with the air. 4. They both would say that it comes to rest because of some forces acting on it; likely friction between the ball and table surface and with the air. 5. They both would say that the ball comes to rest because the ball seeks its natural state of rest.	What was Aristotle's view of motion? How did Galileo disagree with Aristotle? Which answers agrees with Aristotle's view? Eliminate the others. Which of the remaining answers agrees with Galileo?
2	Who first proposed the concept of inertia? 1. Galileo a few years earlier than Newton 2. They came up with the concept of inertia about the same time. 3. Newton a few years earlier than Galileo 4. Galileo after Newton was born 5. Galileo before Newton was even born	Assuming we ignore the Greeks, choose between Galileo and Newton, or both.
3	Your friend says that inertia is a force that keeps things in their places, either at rest or motion. Do you agree? Why or why not? 1. Agree; only forces can keep things in their places. 2. Agree; inertia is not a force that keeps things moving. 3. Disagree; inertia is a force that keeps things moving. 4. Disagree; inertia is a property of matter to behave this way, not some kind of force. 5. All are wrong.	What is inertia? Check the definition and see if your friend phrased the statement correctly or not.

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4	Start a ball rolling down a bowling alley and you'll find it moves slightly slower with time. Does this violate Newton's law of inertia? Defend your answer. 1. No; air resistance and friction act upon the ball. 2. No; the law of inertia can also be applied to moving objects. 3. Yes; no force acts upon it. 4. None of these 5. Yes; the air resistance cancels the friction and the total force on the ball is zero.	State the 1st Law of Motion. What does the "unless" part mean?
5	Before the time of Galileo and Newton, some learned scholars thought that a stone dropped from the top of a tall mast of a moving ship would fall vertically and hit the deck behind the mast by a distance equal to how far the ship had moved forward while the stone was falling. In light of your understanding of Newton's first law, what is true? 1. If the ship speed is fast enough, the stone will drop into the sea. 2. The stone will fall in some trajectory depending on the speed of the ship. 3. Everyone on the ship will see the stone fall vertically if released from rest. 4. The stone will have a horizontal motion; it will hit the deck in front of the mast. 5. All are wrong.	What is your FOR? Within your FOR what will you see when the stone is dropped from the top of the mast?
6	A space probe is carried by a rocket into outer space where it continues to move on its own in a straight line. What keeps the probe moving? 1. None of these 2. Nothing specific; in the absence of forces it would continue moving in a straight line. 3. The gravitation forces from different stars and planets 4. a propeller 5. Nothing; the probe will eventually stop.	Where is the probe? What is there that will change its motion? Review the first law.

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7	Which object has the greatest inertia? 1. a mosquito 2. an ocean liner 3. a VW bug 4. a car	How do we measure inertia? Arrange the answers in ascending order of that measure?
8	One Newton is the force 1. of gravity on a 1 g body. 2. that gives a 1 kg body an acceleration of 9.8 m/s^2. 3. that gives a 1 g body an acceleration of 1 cm/s^2. 4. of gravity on a 1 kg body. 5. that gives a 1 kg body an acceleration of 1 m/s^2.	Check the definition of Newtons in your notes. What numbers make this really easy to understand?
9	What is the net force on a 1-N apple when you hold it at rest above your head and what is the net force on it after you release it? 1. 1 N, 1 N 2. 0 N, 0 N 3. 1 N, 0 N 4. 0 N, 1 N 5. All are wrong.	At first, is there a change in motion? What is the net force? Next, is there a change in motion? What is the net force?
10	Despite a very strong wind, a tennis player manages to hit a tennis ball with her racquet so that the ball passes over the net and lands in her opponent's court. Consider the following forces: 1. A downward force of gravity, 2. A force by the hit, and 3. A force exerted by the air. Which of the above forces is (are) acting on the tennis ball after it has left contact with the racquet and before it touches the ground? 1. 1 only. 2. 1 and 2. 3. 1 and 3. 4. 1, 2, and 3. 5. 2 and 3.	Analyze this. What role does gravity play after the hit? What role does the racquet play after the hit? What role does the wind play after the hit?

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11	A female gymnast weighs 400 N. If she is hanging stationary from a high bar, how many forces are acting on her? 1. five 2. two 3. one 4. three 5. four	Draw a diagram of the problem. Label the forces. Count.
12	Can an object be in mechanical equilibrium when only a single force acts on it? Explain. 1. Yes; the object will act back with an equal and opposite force. 2. Yes; a single force is necessary to keep the object in mechanical equilibrium. 3. None of these 4. No; even one force is too much. There should be no forces acting on an object. 5. No; at least one other force is needed to cancel the action of the first force.	What is the definition of equilibrium? How would a single force affect that condition?
13	A hockey puck slides across the ice at a constant speed. Which of the following is true? 1. The puck is at rest. 2. None of these 3. The puck is moving and thus not in equilibrium. 4. The puck can be considered neither at rest nor in equilibrium. 5. It is in equilibrium.	What is the definition of “rest”? What is the definition of “equilibrium?
14	Is it correct to say that no force acts on a body at rest? 1. No net force acts on a body at rest; no force acts on the body at all. 2. No force acts on a body at rest; if at least one force acted on it the body would move. 3. No net force acts on a body at rest; when the net force is zero, the body is in static equilibrium. 4. All are wrong. 5. No force acts on a body at rest; all forces cancel each other.	Draw a diagram of a body at rest – say a ball on a table. Label the forces acting on it. Now, evaluate the question and the answers.

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15	What is the net force on a Mercedes convertible traveling along a straight road at a steady speed of 100 km/h? 1. 10 N 2. All are wrong. 3. 100 N 4. 200 N 5. 0 N	What is happening in the problem? Straight road and steady speed…What does this describe? What state is this?
16	If an object is not accelerating, how many forces act on it? 1. 3 2. 2 3. 1 4. Unable to determine 5. 0	If an object is not accelerating, in what state is it? How many forces could be drawn that act on the object?
17	(part 1 of 4) You have two forces, 90 N and 58.6 N. What is their resultant if the first acts upward and the second acts downward?	Draw the vectors. Add them.
18	(part 2 of 4) What is the direction of the resultant? 1. downward 2. upward	Same diagram. Different question.
19	(part 3 of 4) What is their resultant if they both act downward?	Redraw the problem.
20	(part 4 of 4) What is the direction of this resultant? 1. downward 2. upward	Same diagram. Different question.
21	(part 1 of 3) A 34.5 N object is in free fall. What is the magnitude of the net force which acts on the object? Answer in units of N	Draw a diagram. Make sure you label the forces. What does “net” force mean?
22	(part 2 of 3) What is the magnitude of the net force when the object encounters 15.5 N of air resistance? Answer in units of N	Update the diagram. Make sure you label the forces. What does “net” force mean?

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23	(part 3 of 3) What is the magnitude of the net force when it falls fast enough to encounter an air resistance of 34.5 N? Answer in units of N	Update the diagram. Make sure you label the forces. What does “net” force mean?
24	Beth, a construction worker, attempts to pull a stake out of the ground by pulling on a rope that is attached to the stake. The rope makes an angle of 52.2^0 with the horizontal. If Beth exerts a force of 122.1 N on the rope, what is the magnitude of the upward component of the force acting on the stake? Answer in units of N	Draw the diagram. Label the forces both known and unknown. Complete the triangles. Do the trig to find the components. Solve for the unknown force.
25	Two men decide to use their cars to pull a truck stuck in mud. They attach ropes and one pulls with a force of 938 N at an angle of 25^0 with respect to the direction in which the truck is headed, while the other car pulls with a force of 1389 N at an angle of 20^0 with respect to the same direction.	Draw the diagram. (Sound familiar?) Label the forces both known and unknown. Complete the triangles. Do the trig to find the components. Solve for the unknown force.
26	Your car is stuck in a mud hole. You are alone, but you have a long, strong rope. Having studied physics, you tie the rope tautly to a telephone pole and pull on it sideways at the midpoint, as shown. Find the force exerted by the rope on the car when the angle is 5.7^0 and you are pulling with a force of 256 N but the car does not move. Answer in units of kN.	Draw the diagram. (Yes, again.) Each side of the rope acts like a separate force and each share the load. This is like the lantern problem! (But upside down.) NOTE the UNITS! You will calc in N but they want kN.
27	How strong must the rope be if it takes a force of 512 N to move the car when Θ is 4.8^0? Answer in units of kN.	Draw the diagram. OK. You get it…