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ЗАОЧНАЯ ФИЗМАТШКОЛА

ИЗБРАННЫЕ ЗАДАНИЯ РОССИЙСКИХ И ЗАРУБЕЖНЫХ ЭКЗАМЕНОВ И ОЛИМПИАД

Законы Ньютона

1. $\exists$ИСО
2. $\sum \overline{F} = m\overline{a}$
3. $\overline{F}_{1,2} = -\overline{F}_{2,1}$

1.

Question 1.
A girl throws a teddy bear straight up. Consider the motion of the bear only after it has left the girl's hand but before it touches the ground, and assume that forces exerted by the air are negligible. For these conditions, the force(s) acting on the bear is (are):

(A) a downward force of gravity along with a steadily decreasing upward force.
(B) a steadily decreasing upward force from the moment it leaves the girl's hand until it reaches its highest point; on the way down there is a steadily increasing downward force of gravity as the bear gets closer to the earth.
(C) an almost constant downward force of gravity along with an upward force that steadily decreases until the bear reaches its highest point; on the way down there is only a constant downward force of gravity.
(D) an almost constant downward force of gravity only.
(E) none of the above. The bear falls back to the ground because of its natural tendency to rest on the surface of the earth.

This question is looking for the common misconception that there is always a force in the direction of motion, and many students did give answers indicating that they held this misconception. 33% of students answered this question correctly. The most common answer given was c.

2.

A school bus breaks down and receives a push back to the garage from a small compact car as shown in the diagram.

While the car, still pushing the bus, is speeding up to get up to cruising speed:

(A) the amount of force with which the car pushes against the bus is equal to that with which the bus pushes back against the car.

(B) the amount of force with which the car pushes against the bus is smaller than that with which the bus pushes back against the car.

(C) the amount of force with which the car pushes against the bus is greater than that with which the bus pushes back against the car.

(D) the car's engine is running so the car pushes against the bus, but the bus's engine is not running so the bus can't push back against the car. The bus is pushed forward simply because it is in the way of the car.

(E) neither the car nor the bus exert any force on the other. The bus is pushed forward simply because it is in the way of the car.

3. Сережа участвует в беге через препятствия. Чему равен его вес когда он перепрыгивает через препятствие?
4. Витя подбрасывает баскетбольный мяч вверх. Опишите силы, действующие на мяч на протяжении всех траектории.

Домашнее задание

1. На столе лежит телефон. **Нарисуйте** силы, действующие на него.
2. Почему когда автобус тормозит, пассажиры падают вперед?
3. Витя подбросил мяч в воздух. Мяч пробыл в полете 2 секунды. С какой скоростью Витя подбросил мяч? Какая была скорость мяча, когда Витя его поймал?

4. В программе desmos.com постройте траекторию полета пули выпущенной под углом к горизонту и линию, на которой находятся все верхние точки полета для различных начальных углов. При каком угле достигается максимальная высота полета? А дальность?