NAME: KEY DATE: Today Period: All

Force AND Kinematics problems exam review

Define:

Newton's 1st law – objects stay in motion or at rest unless acted upon

Newton's 2nd law – force is ~~ourselx~~ proportional to mass

Newton's 3rd Law – forces come in pairs. they push on eachother.

Friction – resistive force caused by contact w/ another surface.

Force – product of mass and acceleration "push or pull"

Free Body Diagram – a graphic representing the vectors of force.

Draw and solve each problem.

1. A Vincent Black Shadow motorcycle has a curb weight of 2500N. What is its mass?

$F_N = m \cdot g$ $2500N / 9.8 = 255kg$

2. That same motorcycle has a normal force of 2500N.

3. If Hunter S. Thompson (78kg) was riding that motorcycle and accelerating at 3.0m/s^2, what is the total net force?

$255kg + 78kg = 333kg$

$F = m \cdot a$ $333kg \cdot 3m/s^2 = 999N$

4. If the motorcycle has a kinetic frictional coefficient of 0.095, what is the kinetic force (F_k)?

$\mu_k = \frac{F_k}{F_N}$ $0.095 = \frac{F_k}{2500_N}$ $F_k = 237.5_N$

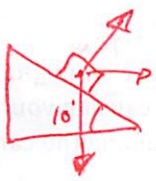
5. "Enrique the wonder goat" is on an ice rink with almost no friction. He has a mass of 40kg and it takes 10N to get him to move on the ice. What is his static frictional coefficient μ_s?

$\mu_s = \frac{F_s}{F_N}$ $\mu_s = \frac{10_N}{(40)(9.8)}$ $\mu_s = 0.0255$

$F_N = 40_{kg} \cdot 9.8 m/s^2$

$F_N = 392$

6. If "Enrique the wonder goat" were on an incline of 10°, would he slide?



~~cos~~ $\sin 10° = \frac{F_s}{392}$

$F_s = 68$

yes

7. The wind has a force of 501N on news anchor Anderson Cooper in a severe storm. He has a mass of 80kg. What would the static frictional coefficient have to be for him to not slide away, out of the camera's view?

501 N → 80kg ↓

$F_N = 784$

$\mu_s = \frac{501N}{784N}$ $\mu_s = 0.64$

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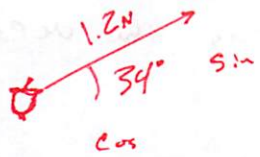
8. Students in physics class notice that gravity has changed and hypothesize that this is due to the earths core cooling. The students test this new gravity be dropping tennis balls and timing their decent. If a tennis ball dropped from 2m takes 0.578s, what is the new acceleration due to gravity? $d = \frac{1}{2}at^2$ $2 = \frac{1}{2}a(0.578)^2$ $2 = .17a$ $a = 12\ m/s^2$

9. A Squirrel pulls at an acorn stuck in the ground with a force of 1.2N with an angle of 34° from the horizontal. Find the X and Y components.



$\sin 34 = \frac{opp}{1.2}$ $opp = 0.67N = Y$

$\cos 34 = \frac{adj}{1.2}$ $adj = 1N = X$

10. What has to act on an object to change that objects motion?

Force

11. Name 3 scalar quantities and 3 vector quantities

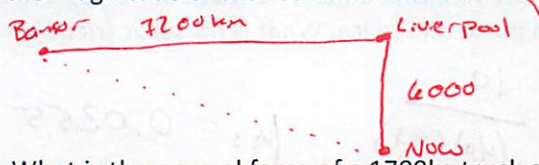
S: Time, Volume, Mass, distance, Speed

V: Force, displacement, Velocity, acceleration

12. What makes a vector quantity different from a scalar quantity? (you only need one word to answer this)

direction

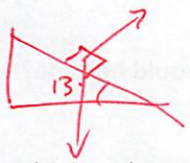
13. The Queen Elizabeth II is sailing from Liverpool, England to Bangor, Maine. The trip is 7200km directly east. After 6000km, the first mate realizes they are traveling directly south and must correct their path. How far away from Bangor are they now? What is the magnitude of the resultant course?



→ 9372km

→ 9372km

14. What is the normal force of a 1700kg truck on a 13 incline?



$F_{Fg} = M \cdot g$ $F_{Fg} = 1700\ kg \cdot 9.8\ m/s^2$ $F_N = 16,660N$

$16,660 \cos 13° = F_N$

$16233 = F_N$

15. You are driving along Main Street when all of a sudden the stoplight turns red (skipping yellow, why did that happen?). You slam on your brakes causing your Pumpkin Spice Latte to fly forward, splattering all over the dashboard ruining the car's resale value. Why did this happen?

the latte had inertia. it was moving along w/ the car. When the car suddenly stopped, the latte continued forward, as you did not because you were wearing a seatbelt.