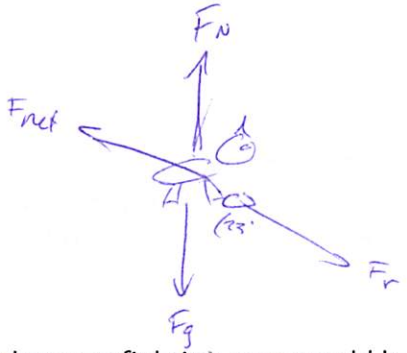
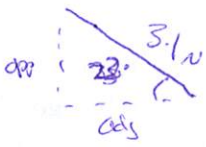
NAME: Key DATE: Today Period:

CBA II Review

1. Draw a free body diagram of Hershel, the nub-tailed squirrel pulling a pecan out of the ground. The angle in which he is pulling is 23° and with a force of 3.1N.



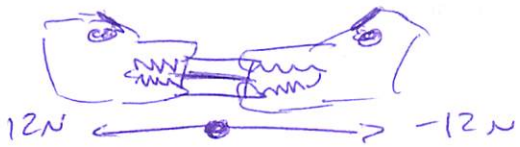


$3.1 \sin 23 = opp$

$3.1 \cos 23 = adj$

$opp = 1.21_N$ $adj = 2.85_N$

2. Two rabid dogs are fighting over an old ham sandwich. They are both pulling on the sandwich with a force of 12N. Draw this FBD.



3. Currently the fastest car in the world, the Porsche 918 Spyder can accelerate to 60mph (26.82m/s) in 2.2 seconds. The mass of the car is 1640kg. What is the maximum force exerted by the car?

$F = M \cdot a$ $F = 1640 \cdot 12.2\ m/s^2$

$V = at$

$26.82 = a \cdot 2.2$

$12.2\ m/s^2 = a$

$F = 20{,}000N$ ← that's a lot

4. The 918 can also brake well, too. It can slow from 26.82m/s to 0m/s in 28.6m. What is the deceleration?

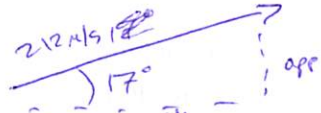
$d = \frac{1}{2}(V_i + V_2)t$ $28.6_m = \frac{1}{2}(26.82 + 0)t$

$2.1_s = t$

$d = \frac{1}{2}at^2$

$28.6m = \frac{1}{2}a(2.1)^2$ $a = (-)12.9\ m/s^2$

5. An airbus A-380 takes off from John Wayne International Airport at 212m/s. The liftoff angle is 17°. What are the horizontal and vertical components of this vector?



$212 \cos 17 = adj$ $adj = 202.7\ m/s$

$212 \sin 17 = opp$ $opp = 62\ m/s$

6. Describe all three of Newton's laws of motion. What do they mean in real life?

1 - Motion stays in motion. Rest, stay at rest

2 - Force and mass are proportionate

3 - Forces come in pairs.

7. What is a frictional coefficient?

a fraction of the force required to overcome normal force

8. What is the μ_s of a skidding car with a mass of 1350kg and a lateral acceleration of 2.7m/s²?

$\mu_s = \frac{F_s}{F_N}$

↳ $\times 9.8 = 13{,}230N = F_N$

↳ $1350 \cdot 2.7 = 3645_N = F_s$

$\mu_s = \frac{3645}{13{,}230} = 0.275$

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9. Which law of motion postulates the formula F=ma?

#2

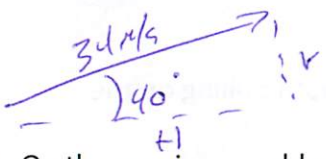
10. Why is Mass different from Weight?

Weight is a Force, Mass does not change w/ different gravities.

11. If Jailene rolls down a tall hill (30m) in 15s, how fast was she rolling?

$d = vt \quad 30 = v \cdot 15 \quad v = 2\ m/s$

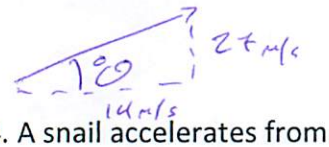
12. Isaac wins the lottery and decides to go all Dukes of Hazard with his brand new Dodge Charger hellcat over the Taylor train bridge. If his upward velocity is 34m/s at an angle of 40°, what are the horizontal and vertical components of his jump? Draw this.



$34 \cos 40 = H \quad H = 26\ m/s$

$34 \sin 40 = V \quad V = 21.86\ m/s$

13. On the previous problem, calculate the angle at which Isaac takes the next jump if his horizontal velocity is 14m/s and his vertical velocity is 27m/s.



$\tan^{-1} \frac{27}{14} = \theta^\circ \quad \theta^\circ = 62.6^\circ$

14. A snail accelerates from 2cm/min to 4cm/min over 4 min. What is the acceleration?

$\frac{\Delta v}{\Delta t} = a \quad \frac{4-2}{4} = 0.5\ cm/min^2$

15. Ray is on an airliner headed toward New Orleans at a blistering 217m/s. If he walks toward the back of the plane at 4m/s, what is his velocity relative to the ground?

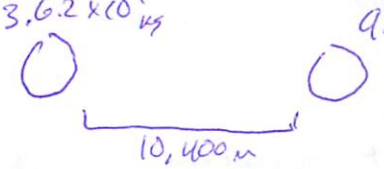
$217\ m/s - 4\ m/s = (213\ m/s)$

16. What is a resultant? When would you use one?

The result of adding 2 or more vectors together.
You do this when you need to add vectors together

17. Two small planetismals are floating in deep space. Plantismal A is 3.62×10^9kg and Plantismal B is 9.34×10^5kg. They are separated by 10.4km. What is the gravitational force between them?

$G = 6.67 \times 10^{-11}$



$F = G \frac{3.62 \times 10^9 \cdot 9.34 \times 10^5}{10,400^2_m}$

$F = 0.0021\ N$

18. On a gravitation question like the previous, what would happen to the force if we reduced the distance by half? Show me this mathematically.

the Force would increase 4x

$F = \frac{6.67 \times 10^{-11} \cdot 3.62 \times 10^9 \cdot 9.34 \times 10^5}{5,200^2_m}$

$F = 0.0083\ N$