Physics 11 Unit 2 Forces - Review Sheet

Name: _____

Main topics
In chapter three we looked at forces including friction, gravity, normal forces, and the forces in stretched materials (Hooke's Law)

1. When does Hooke's Law not apply to materials that are being stretched?

just before they break or permenty deform.

2. You stretch an elastic 4 cm using a 5 N force.

a) How much force will you need to stretch it 8 cm?

10 N $F \propto \Delta L$, if you double ΔL, you double F

b) Find k.

$$K = \frac{F}{\Delta L} = \frac{5}{4} = 1.25 \text{ N/cm}$$

c) How much force will you need to stretch it 10.1 cm?

$$F = K\Delta L = (1.25)(10.1) = 12.6 \text{ N}$$

3. What are the units for the units the coefficient of friction? no units

4. What are the metric units for mass? Kg

5. What are the metric units for force? N

6. What it the approximate mass of a liter of milk? 1 Kg

7. What is your approximate mass? 50-80 Kg

8. If you go to the moon what changes, your mass, your weight or both?

Only your weight. F_g.

9. Give a brief definition of mass and weight.

mass: amount of matter

weight: F_g on object.

10. Calculate the weight of a 2 kg brick on Earth.

$$F_g = mg = (2)(9.8) = 19.6\ N$$

11. What is the symbol for gravitational field strength? g

12. What are the units for gravitational field strength? N/kg

13. Find the normal force on the block in the following cases.

a) A 20 N block sitting on a desk.

$$F_{up} = F_{down}$$
$$F_\perp = F_g = 20N$$

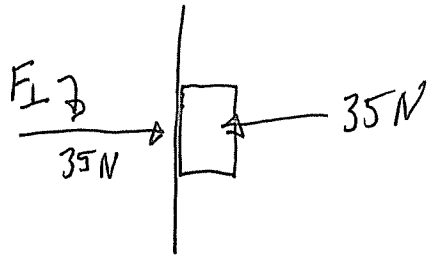
b) A 15 N block sitting on a desk with a rope pulling up on the block with 5 N

$$F_{up} = F_{down}$$
$$F_\perp + 5 = 15 \qquad F_\perp = 10\ N$$

c) A 22 N block sitting on a desk with Bob pushing down on the block with a 3 N force.

$$F_{up} = F_{down}$$
$$F_\perp = F_g + 3 = 22 + 3 = 25N$$

d) A 30 N block being held against a vertical wall, Bob is pushing the block against the wall with a 35 N force.



Newtons 3rd Law.

14. The formula for the force of friction is $F_f = \mu F_n$. When can we use $F_f = \mu F_g$ instead?

when $F_\perp = F_g$

15. The coefficient of friction between the pavement and a set of car tires is 0.6 . If the car has a mass of 1800 kg, what is the maximum friction force the tires can produce?

$F_f = \mu F_g = (.6)(800)(9.8) = 10{,}584\,N$

16. A 4 kg block is sitting on a flat table. The block is being pulled to the right with a 22 N force 40 degrees above the horizontal. The coefficient of friction is 0.3
Find the force of friction. Does the block move?

① $F_g = mg = 39.2\,N$

② $F_y = 22 \sin 40 = 14.141\,N$

$F_x = 16.853\,N$

③ $F_\perp = 39.2 - 14.141 = 25.059\,N$

④ $F_f = \mu F_\perp = 7.52\,N.$

$F_x > F_{f_{MAX}}$

so it moves.

17. What did we notice when we dropped a big rock and a small rock off of the gym roof? Who got famous for this?

both dropped @ same rate.

Galileo!

~~40,000 km~~ 400,000 km!

18. You are orbiting the Earth in a space ship at a distance of $4 * 10^8$ m (from the center of the Earth). If your mass is 55 kg, what is the force of gravity on you at this location?

$$F_g = \frac{GmM}{R^2} = \frac{(6.67\times10^{-11})(55)(5.98\times10^{24})}{(4\times10^8)^2}$$

$= 0.137\ N$ * This is part the moon, way! out there

19. Find the force of gravity on a 589 kg rock that is 110 km above the surface of the Earth.

$$F_g = \frac{GmM}{R^2}$$

$$F_g = \frac{(6.67\times10^{-11})(589)(5.98\times10^{24})}{(6.49\times10^6)^2}$$

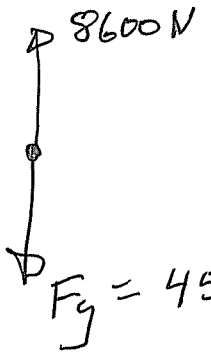
$R = R_E + 110\,000\ m$

$= 6.38\times10^6 + 110{,}000$

$= 6.49\times10^6$

$F_g = 5578\ N$.

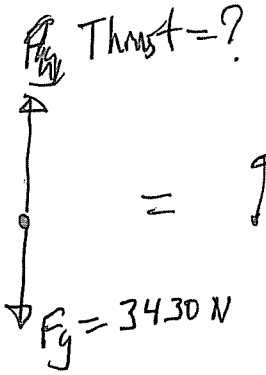
20. A 468 kg rocket has a thrust of 8600 N straight up. What is the acceleration of the rocket?



$F_{NET} = 8600 - 4586 = 4013.6\ N$ up.

$a = \frac{F_{NET}}{m} = 8.58\ m/s^2$

21. A 350 kg rocket is accelerating at 4.5 m/s^2 straight up. What thrust is required?



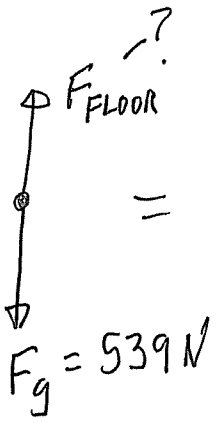
$= \uparrow F_{NET} = ma = (350)(4.5) = 1575N$

$F_{NET} = Th - F_g$

$1575 = Th - 3430$

Thrust = 5005 N

22. A 55 kg boy is accelerating down in an elevator at 2.4 m/s^2 . What is the force on the boy from the floor of the elevator?



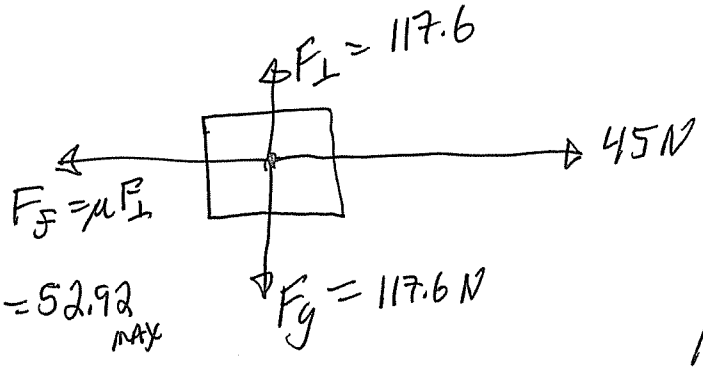
$= \downarrow F_{NET} = ma = (2.4)(55) = 132\ N$

$F_{NET} = F_g - F_{FLOOR}$

$132 = 539 - F_{FLOOR}$

$F_{FLOOR} = 539 - 132 = 407\ N$

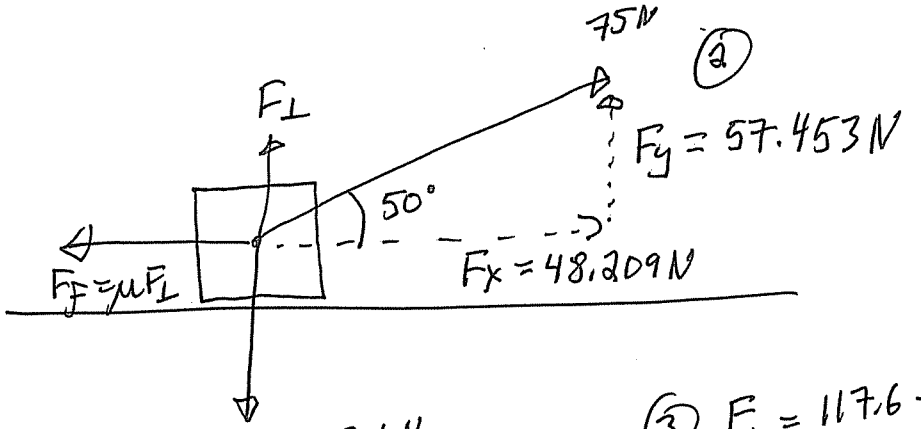
23. Find the acceleration of a 12 kg block that is being pulled sideways with a 45 N force if the coefficient is 0.45



as $F_{F_{MAX}} > F_{applied}$

block does not move.

24. Find the acceleration of a 12 kg block if the coefficient of friction is 0.35 and the block is a 75 N force 50 degrees above the horizon.



② $F_y = 57.453\,N$

① $F_g = 117.6\,N$

③ $F_\perp = 117.6 - 57.453 = 60.147\,N$

④ $F_F = \mu F_\perp = (.35)(60.147)$

$= 21.05$ MAX

⑤ $F_{NET} = F_x - F_F$

$= 48.209 - 21.05 =$

$= 27.159$

$= 27.2\,N$

⑥ $a = \frac{F_N}{m} = 2.26\,m/s^2$.