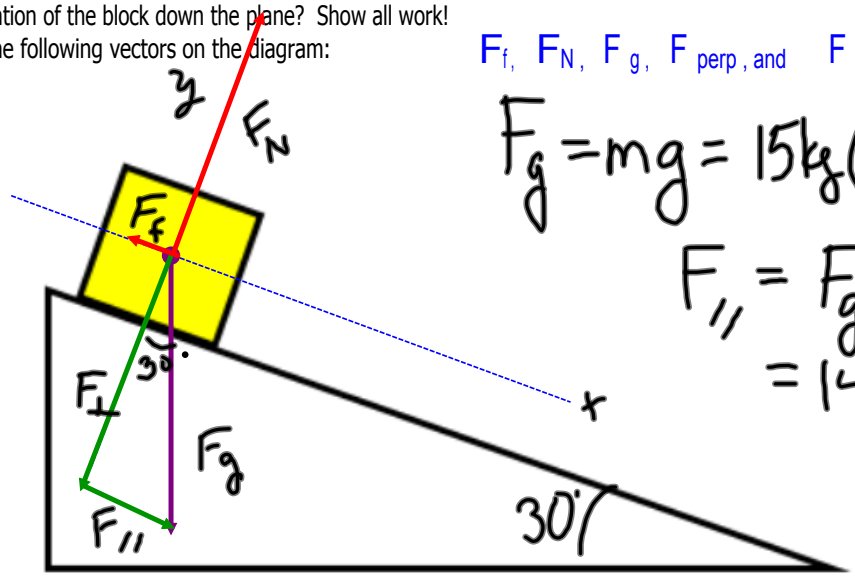
HW due Thurs 10/4 HW review sheet

1. A block is released from rest at the top of an inclined plane that makes a 30 degree angle from the horizontal. The block has a mass of 15kg. If the coefficient of kinetic friction is 0.20, what is the acceleration of the block down the plane? Show all work!

Draw the following vectors on the diagram: F_f, F_N, F_g, F_{perp}, and $F_{parallel}$



$F_g = mg = 15kg\left(9.8\frac{m}{s^2}\right) = 147\,N$

$F_{//} = F_g \sin\theta =$

$= 147N \sin 30° = 73.5N$

$F_\perp = F_g \cos\theta$

$= 147N \cos 30°$

$= 127.3\,N$

$F_\perp = F_N = 127.3N$

$F_f = \mu_k F_N = .20(127.3N)$

$F_f = 25.5N$

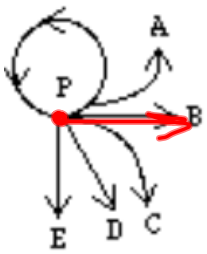
$F_{net} = F_{//} - F_f$

$= 73.5N - 25.5N$

$ma_{net} = 48N$

$a_{net} = \frac{48N}{m} = \frac{48N}{15kg} = 3.2\,m/s^2$

2. A girl attaches a rock to a string, which she then swings counter- clockwise in a horizontal circle. The string breaks at point P on the sketch, which shows a bird's-eye view (i.e., as seen from above). What path will the rock follow?



3. Two bodies of equal mass are separated by a distance R. If you double the distance between them the new gravitational force will be?

$F = \frac{G m_1 m_2}{r^2} = F_{old}$

$F_{new} = \frac{G m_1 m_2}{(2r)^2} = \frac{G m_1 m_2}{4 r^2} = \frac{F_{old}}{4}$

4. Two bodies of equal mass are separated by a distance R. If you double each mass and double the distance between them, the new force will be?

$F = G \frac{2m_1 \, 2m_2}{(2r)^2} = \frac{4 G m_1 m_2}{4 r^2} = \frac{4}{4} \frac{G m_1 m_2}{r^2}$

$= F_{old}$

 # 5 - 8, choose your answers from choices in parentheses below each

5. A Cadillac with mass 3 m$_o$ and a Volkswagen with mass m$_o$ go around the same unbanked circular curve on the freeway. Bumper to bumper they go with the same speed v$_o$. The centripetal acceleration of the VW is a$_o$ and the centripetal force acting on it is F$_o$.
The centripetal acceleration of the Cadillac is ___ a$_o$.
(more than, less than, equal to, or incomparable with)

$a_c = \frac{v^2}{r}$

6. A Cadillac with mass 3 m$_o$ and a Volkswagen with mass m$_o$ go around the same unbanked circular curve on the freeway. Bumper to bumper they go with the same speed v$_o$. The centripetal acceleration of the VW is a$_o$ and the centripetal force acting on it is F$_o$.
The centripetal force acting on the Cadillac is ___ F$_o$.
(more than, less than, equal to, or incomparable with)

3

$F_c = ma_c$

7. A Cadillac with mass 3 m$_o$ and a Volkswagen with mass m$_o$ go around the same unbanked circular curve on the freeway. Bumper to bumper they go with the same speed v$_o$. The centripetal acceleration of the VW is a$_o$ and the centripetal force acting on it is F$_o$.
If its speed was increased to 3 v$_o$, the centripetal acceleration of the VW would be a$_o$ x ___.
(1, 3, 6, 9, 10, or 16)

9

$a_c = \frac{v^2}{r} = \frac{(3v_o)^2}{r}$

8. A Cadillac with mass 3 m$_o$ and a Volkswagen with mass m$_o$ go around the same unbanked circular curve on the freeway. Bumper to bumper they go with the same speed v$_o$. The centripetal acceleration of the VW is a$_o$ and the centripetal force acting on it is F$_o$.
If the speed of the cars was 2 v$_o$, the centripetal force acting on the VW would be F$_o$ x ___.
(1,2, 3, 4, 6, or 8)

4

$F_c = \frac{mv^2}{r} = m\frac{(2v_o)^2}{r}$

$= 4F_o$