(A1) a) $\tau = 0$

$(\circlearrowright = \circlearrowleft)$

$\frac{10(g)(3)}{6} = \frac{mg(6)}{6}$

$\boxed{5g = m}$

b) $\tau = 0$

$(\circlearrowright = \circlearrowleft)$

$\frac{10g(3)}{15} = 15g(d)$

$2 = d$

↳ FROM PIVOT ... SO @ $\boxed{\#5 \text{ ON RULER}}$

c) ASSUMING THE CAN'T BE ON SAME NOTCH

$\tau = 0$

$(\circlearrowright = \circlearrowleft)$

$10(g)(3) = 3(g)d_3 + 4(g)d_4$

$30 = 3d_3 + 4d_4$

(2) → @#5 (6) → @#1

d) OPTION ① → HANG THE 10g AT POSITION #7

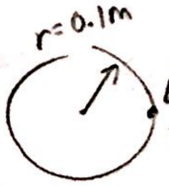
OPTION ② MOVE THE FULCRUM POINT FROM #7 CLOSER TO 10g SO THAT THE MASS OF THE RULER BALANCES THE OTHER SIDE

e) ① τ

2g @ #1 → 12 } 15
3g @ #6 → 3 } 15
5g @ #10 → 15

② 5g @ #11 → 20 } 20=20
3g @ #1 → 18
2g @ #6 → 2

(A2) a)



↙ V HERE IS = TO V of mass

UNITS!!!

$r = 10cm = 0.1m$

$I = 60kg \cdot cm^2 = 0.006 kg \cdot m^2$

$V = \omega r$

$= (2.5 \frac{rad}{s})(0.1m)$

$\boxed{= 0.25 m/s}$

b) $\Sigma \tau = I\alpha$

$(mg)r = I\alpha$

$(0.01)(9.8)(0.1) = (0.006 kg m^2)\alpha$

$\boxed{-1.63 \frac{rad}{s^2} = \alpha}$

c) $\omega_f = \omega_i + \alpha t$

$0 = (2.5) + (-1.63)t$

$\boxed{1.53 sec = t}$

d) $\omega_f = \omega_i + \alpha t$

$\omega_f = (2.5) + (-1.63)2$

$\omega_f = -0.76 rad/s$

$V = \omega r = (-0.76)(0.1)$

$\boxed{= -0.076 m/s}$

e) $a = \alpha r = (-1.63)(0.1)$

$\boxed{= -0.163 m/s^2}$

(A3) $F_g = mg$

$50 = m(9.8)$

$5.1\,kg = m$

$r = 20\,cm = 0.2\,m$

a) $I = mr^2$

$= (5.1)(0.2)^2$

$I = 0.20\,kg\,m^2$

TORQUE FROM PETAL

b) $\tau = F \cdot d$ (CRANK RADIUS)

$= (15\,N)(0.15)$

$= 2.25\,N \cdot m$

FRONT GEAR τ = PEDAL τ

$(T)(.10) = 2.25$

$T = 22.5\,N$

BACK GEAR

$\tau = F \cdot d$

$= (22.5)(0.05)$

$= 1.125\,N \cdot m$

c) $\Sigma\tau = I\alpha$

$1.125 = (.2)\alpha$

$5.625\,\frac{rad}{s^2} = \alpha$

$\tau = F \cdot d = mgd$

(A4) $r_1 = 0.05\,m$

$r_2 = 0.1\,m$

a) $\tau_{cc} = (0.5\,kg)(9.8)(0.05) = 0.245\,N \cdot m$

COUNTER CLOCKWISE

$\tau_{cw} = (0.3\,kg)(9.8)(0.1) = 0.294\,N \cdot m$

b) $\Sigma\tau = I\alpha$

$0.294 - 0.245 = (0.005\,kg\,m^2)\alpha$

$0.049 = (0.005)\alpha$

$9.8\,\frac{rad}{s^2} = \alpha$

c) 300g WILL GO FASTER BECAUSE r IS BIGGER

ω IS SAME BUT V FOR 300g is BIGGER

$\frac{V_{300}}{V_{500}} = \frac{\omega r}{\omega r} = \frac{0.2}{0.1} = 2$

d) $\alpha = 19.6$

$\omega_i = 0$

$\omega_f = ?$

$t = 2\,sec$

$\omega_f = \omega_i^{\,0} + \alpha t$

$\omega_f = (9.8)(2)$

$= 19.6\,\frac{rad}{sec}$

$v = \omega \cdot r$

$= 19.6(0.1)$

$= 1.96\,m/s$

(15)

a) $\Sigma\tau = 0.08 N\cdot m$

α = SLOPE OF GRAPH

$\alpha = \frac{150\pi}{1} = 150\pi \; rad/s^2$

$\Sigma\tau = I\cdot\alpha$

$0.08 = (I)(150\pi)$

$\boxed{0.00017 \; kg\,m^2 = I}$

b) $\Sigma\tau = I\alpha$

$I = 0.00017 \; kg\,m^2$

$\alpha \rightarrow$ SLOPE

$= \frac{-150\pi}{4} = -117.8 \; rad/s^2$

$\Sigma\tau = (0.00017)(-117.8)$

$= -0.02 \; N\cdot m$

c) $\Sigma\tau = 0$

IT STOPS! STAYS AT REST