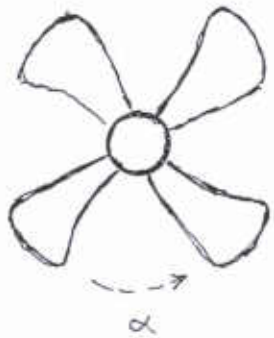
Name_____

**Phys 121**
**Quiz #4**




**1.** A fan is initially stationary; it is turned on and after 3.20 s is turning at a rate of 15.0 revolutions per second. (We'll assume that the angular acceleration was constant for this period.)

**a)** Express the final angular velocity of the fan in units of $\frac{\text{radians}}{s}$

$15.0\ \frac{rev}{s}$

$= (15.0\ \frac{rev}{s})\left(\frac{2\pi\ \text{radians}}{1\ rev}\right) = \boxed{94.2\ \frac{rad}{s}}$

**b)** What is the fan's angular acceleration?

$\alpha = \frac{\omega - \omega_0}{t} = \frac{94.2\ \frac{rad}{s} - 0}{3.20\ s} = \boxed{29.4\ \frac{rad}{s^2}}$

**c)** Through what *angle* did the fan turn during this period?

$\theta = \omega_0 t + \frac{1}{2}\alpha t^2 = 0 + \frac{1}{2}(29.4\ \frac{rad}{s^2})(3.2s)^2 = \boxed{151\ rad}$

**d)** Through how many *revolutions* did the fan turn?

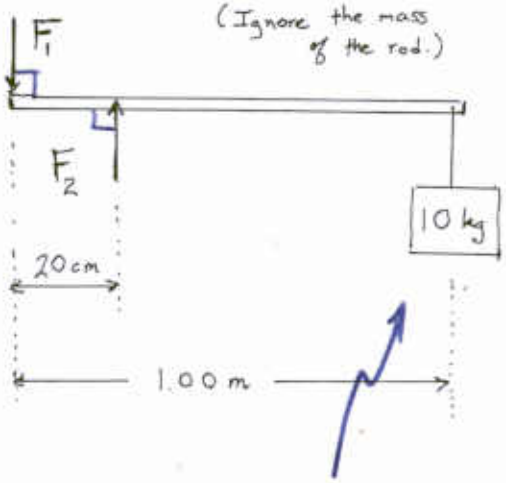
$(151\ rad)\left(\frac{1\ rev}{2\pi\ rad}\right) = \boxed{24.0\ \text{revolutions}}$

**e)** When the fan was rotating at 15 rev/sec, what was the centripetal acceleration of a point 22.0 cm from the axis?

$a_c = \frac{v_T^2}{r} = \omega^2 r = (94.2\ \text{rad/s})^2 (0.220\ \text{m}) = \boxed{1.95 \times 10^3\ \text{m/s}^2}$

**2.** A $10.0-$ kg mass is hung from the far end of a $1.00-$ m rod. The rod is supported by a downward force $F_1$ at the near end and an upward force $F_2$ applied 20.0 cm from the near end.

Find the forces $F_1$ and $F_2$.




Weight = $mg = 98.0$ N = Force on rod at far end

Setting pivot point at left end, $\Sigma \tau = 0$ gives

$+F_2(0.20\ \text{m}) - (98.0\ \text{N})(1.00\ \text{m}) = 0$

Solve for $F_2$:

$F_2 = \frac{(98.0\ \text{N})(1.00\ \text{m})}{(0.20\ \text{m})} = \boxed{490\ \text{N}}$

$\Sigma F_y = 0$ gives (we now know $F_2$)

$-F_1 + 490\ \text{N} - 98.0\ \text{N}) = 0$

$\rightarrow \quad F_1 = \boxed{392\ \text{N}}$

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**You must show all your work!**

$180^\circ = \pi$ radians  1 revolution $= 360^\circ$  $g = 9.80\ \frac{\text{m}}{\text{s}^2}$

$\omega = \omega_0 + \alpha t \qquad \theta = \omega_0 t + \frac{1}{2}\alpha t^2 \qquad \omega^2 = \omega_0^2 + 2\alpha\theta \qquad \theta = \frac{1}{2}(\omega_0 + \omega)t$

$s = \theta r \qquad v_T = \omega r \qquad a_c = \frac{v_T^2}{r} \qquad a_T = \alpha r$

$\tau = Fr\sin\phi = (Force) \cdot (Lever\ arm)$  (Watch signs!)