1. $\Delta\theta = 24 \text{ rotations}\left(\frac{2\pi \text{ rad}}{1 \text{ rot}}\right) = \boxed{151 \text{ rad}}$

2. $\boxed{s = \theta r}$

or

$\boxed{\Delta x = \Delta\theta r}$

$0.8\text{m} = 151\text{rad}\,(r)$

$\boxed{r = 0.0053\text{m}}$

↑ Distance traveled by a point on the edge of the axle during descent

3. $\boxed{\Delta\theta = \omega_0 t + \frac{1}{2}\alpha t^2}$

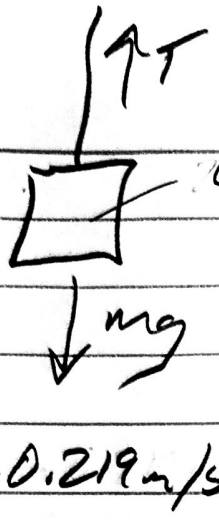
$151\text{rad} = 0(2.7\text{s}) + \frac{1}{2}\alpha(2.7\text{s})^2$

$\boxed{\alpha = 41.4\text{rad/s}^2}$

4. $\boxed{a = \alpha r}$ $= 41.4\text{rad/s}^2\,(0.0053\text{m})$

$\boxed{a = 0.219\text{m/s}^2}$

5.



$\Sigma F = ma$

$\Sigma F = T - mg$

$ma = T - mg$

$ma + mg = T$

$T = m(a+g)$ Downward

$T = 0.2kg(-0.219 m/s^2 + 9.8 m/s^2)$

$\boxed{T = 1.92N}$

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6. $\omega = \omega_0 + \alpha t = 0 + 41.4 rad/s^2 (2.7s)$

$\boxed{\omega = 112 rad/s}$

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7. $v = \omega r = 112 rad/s (0.08m)$ ← Wheel radius

$\boxed{v_{edge\ of\ wheel} = 8.96 m/s}$

8. $\boxed{s = \Delta\theta r}$ (arc length)

or

$\boxed{\Delta x = \Delta\theta r}$ (Δx: linear displacement)

$\Delta\theta$: radians of rotation; r: wheel radius

$d = 264\ \text{rad}\,(0.08\text{m}) = 21.1\text{m}$

d: distance traveled by a point on the wheel edge

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9. $\boxed{PE_0 + KE_0 + W_{NC} = PE + KE}$

$mgh_0 + 0 + W_{NC} = mgh + 0$

$0.2\text{kg}(9.8\text{m/s}^2)(0.8\text{m}) + W_{NC} = 0.2\text{kg}(9.8\text{m/s}^2)(0.6\text{m})$

$\boxed{W_{NC} = -0.392\text{J}}$

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10. $\boxed{s = \theta r}$ $\quad (0.8\text{m} + 0.6\text{m}) = \theta\,(0.0053\text{m})$

$(0.8\text{m} + 0.6\text{m})$: distance traveled by edge of axle; 0.0053m: axle radius

$\boxed{\theta = 264\ \text{rad}}$

It's like $W_{ork} = Fd$

11. $\boxed{W = \tau \Delta \theta}$ $\quad -0.392\,J = \tau_{Friction}\,(264\,rad)$

$$\boxed{\tau_{Fr} = -0.00148\ Nm}$$

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12. $\boxed{\tau = rF}$

$$\tau_{String} = (\text{axle radius})(\text{String tension})$$

$$\tau_{String} = (0.0053m)(1.92N) = \boxed{0.0102\ Nm}$$

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13. $\boxed{\tau_{net} = \tau_{String} + \tau_{Friction}}$

$$\tau_{net} = 0.0102\ Nm - 0.00148\ Nm$$

$$\boxed{\tau_{net} = 0.00872\ Nm}$$

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14. $\boxed{\tau_{Net} = I\alpha}$ $\quad 0.00872\ Nm = I\,(41.4\ rad/s^2)$

$$\boxed{I = 0.000211\ kg\,m^2}$$

$I = 0.000211\ kgm^2$