

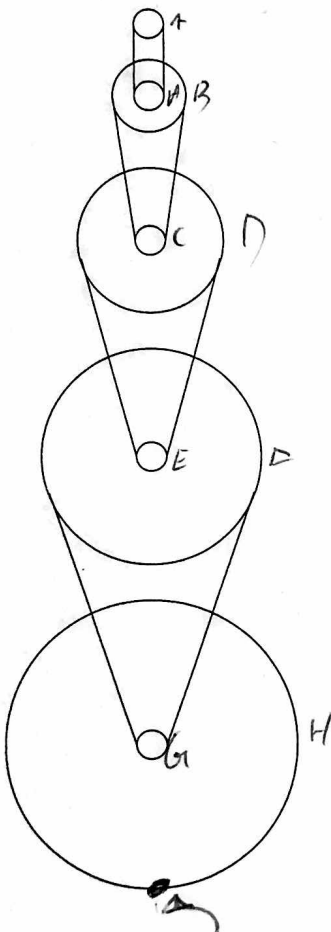
Name:

Key

Answer the questions in the spaces provided. If you run out of room for an answer, continue on the back of the page. Leave your answers in *exact form* or round to 2 decimal places.

1. Pictured below is a new prototype for a compound unicycle, built for speed. The gear attached to the pedals is located at the top, and tire is the large wheel at the very bottom. Each of the central gears has a radius of 2 inches. The larger gears have radii of 4, 6, 8 inches as you go down, and the tire has a radius of 10 inches.

- (a) (10 points) If you pedal at 1 rotation per second, how fast does the unicycle travel? Please put your answer in miles per hour.
- (b) (10 points) A pebble is stuck against the bottom of the tire. Mark on the picture where on the tire the pebble will be after 30 seconds. Explain your reasoning.



	2	4	6	8	10
A	2				
B	4	4			
C	8	8	8		
D	12	12	12	12	
E	16	16	16	16	16
F	20	20	20	20	20
G	24	24	24	24	24
H	28	28	28	28	28

$$480\pi \frac{\text{in}}{\text{sec}} \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) \left(\frac{1 \text{ mile}}{5280 \text{ ft}} \right) \left(\frac{3600 \text{ sec}}{1 \text{ hr}} \right) =$$

(a) 85.68 MPH

(b) $\omega_H = 48\pi \frac{\text{rad}}{\text{sec}} = 24 \frac{\text{rot}}{\text{sec}}$

After 30 seconds, 720 rotations
So @ bottom