MASSACHUSETTS MATHEMATICS LEAGUE
CONTEST 5 - FEBRUARY 2017 SOLUTION KEY

Round 4

A) $0.05(50)+0(x)=0.03(50+x)$

$\Leftrightarrow 250=150+3x \Leftrightarrow x=$ **$\frac{100}{3}$**

B) The entire trip was 400 miles.

Rate x Time = Distance $\Rightarrow$ Rate = $\frac{\text{Distance}}{\text{Time}}$

$$\Rightarrow \frac{400}{\frac{200}{48}+\frac{200}{52}}=\frac{2}{\frac{1}{48}+\frac{1}{52}}=\frac{2}{\frac{52+48}{48\cdot 52}}=\frac{2\cdot 48\cdot 52}{100}=0.96(52)=49.92$$

Thus, my average was **0.08** mph less than 50 mph.

C) Points *A* and *B* are travelling on the circumference of concentric circles.

1 revolution for point *A* is 6π inches; for *B*, it is $\frac{5}{8}(6\pi)=\frac{15}{4}\pi$ inches.

At 1024 RPM, in $\frac{1}{10,000}$ of a second, point *B* makes $\frac{1024/60}{10,000}$ of a revolution which is

$\frac{256}{15\cdot 10^4}\cdot\frac{15\pi}{4}=\frac{2^8}{2^4\cdot 5^4}\cdot\frac{\pi}{2^2}=\frac{2^2}{5^4}\pi=$ **$\frac{4\pi}{625}$** $\Rightarrow k=$ **$\frac{4}{625}$** .