Worksheet rotation: angular kinematics solutions

**1.** A Scyther flies in a circular path for 2.25 revolutions for no apparent reason.

What is the Scyther's angular displacement in degrees and radians?

$$2.25rev=\left(2.25rev\right)\left(\frac{360^{o}}{1rev}\right)=810^{o}$$

$$2.25rev=\left(2.25rev\right)\left(\frac{2πrad}{1rev}\right)=4.5πrad=14.13rad$$

**2.** If you have a perfectly circular pumpkin pie, and you cut out a piece that is 12.5% of the pie leaving behind the remaining 87.5% of the pie. A gnat now walks across the outer crust of your slice of pie. What is the gnat's angular displacement in radians?

$$12.5\% of 360^{o}=45^{o}$$

$$45^{o}=\left(45^{o}\right)\left(\frac{2πrad}{360^{o}}\right)=\frac{π}{4}rad=0.785rad$$

**3.** Two balls are thrown into the air, a baseball and a tennis ball. The baseball has a constant angular velocity, and rotates through 50 revolutions in half a minute. The tennis ball's angular displacement can be described as the function: $θ=\sin(\left(0.3t^{3}+2t\right))+4t^{2}$

After half a minute has gone by, what ball is rotating faster? How much faster?

$t=0.5min=30s$

 $\frac{θ}{t}=\frac{314.159rad}{30s}$

$$ω\_{baseball}=10.47\frac{rad}{s}$$

$$\frac{dθ}{dt}=\left(0.9t^{2}+2\right)\cos(\left(0.3t^{3}+2t\right))+8t$$

$$ω\_{tennis ball}=10.2\frac{rad}{s}$$

The baseball was rotating 0.27rad/s faster.