Name: _____

INTELLIGENT INTELLIGENCE: RADIO COMMUNICATIONS

tera	giga	mega	kilo	hecto	deka		deci	centi	milli	micro	nano	pico
T	G	M	K	h	da		d	c	m	μ	n	p
10^{12}	10^{9}	10^{6}	10^{3}	10^{2}	10^{1}	10^{0}	10^{-1}	10^{-2}	10^{-3}	10^{-6}	10^{-9}	10^{-12}

FORMULA ELEMENTS	UNIT OF MEASURE
Wavelength = λ	Meters (m)
Distance = d	Meters (m)
Frequency = f	Hertz (hz)
Gain = G	
Power = P	Watts (w)
Area = A	Square meters (m^2)
Radius = r	Meters (m)

FORMULAS
$\text{Path loss} = \left(\frac{\lambda}{4\pi d}\right)^2$
$f\lambda = 300 \times 10^6 m/s$
$P_R = \frac{P_T G_T G_R \lambda^2}{(4\pi d)^2}$
$G = \frac{4\pi A}{\lambda^2}$
$\text{Area of a circle} = \pi r^2$

1. Calculate the path loss given a wavelength of 2 meters and distance of 70 kilometers.

2. What are the units of path loss?

3. What is the frequency of a signal with a wavelength of 20 centimeters?

4. What is the path loss of a signal at 100 megahertz over 1 kilometer?

5. You are in the field transmitting with a power of 10 watts, gain of 10, and wavelength of 3 meters. The receiver is 6 kilometers away and has a gain of 45. What is the power received?

6. What if you used the same transmitter and receiver, but transmitted at a frequency of 2.4 megahertz? What would be the power received?

7. You want to intercept the communications of terrorists using handheld radios at a frequency of 200 megahertz, with a transmit power of 10 watts and gain of 1.5. You are 50 kilometers away, and your receiver requires 10 microwatts of power. In order to receive the terrorists' signals, what gain would your antenna need to have?

8. Using the gain of the receiver in Question 7, what would be the area of your dish?

9. Assuming the dish is a circle, what would be the radius of the dish?