

Name: _____



INTELLIGENT INTELLIGENCE: SATELLITE IMAGERY

RESOLUTION FACTORS
Aperture/lens diameter = D
Wavelength = λ
Distance from object = h

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}

1. You receive word that the enemy country of ABCDE has developed a new warplane that is 21 meters long. This new plane looks almost exactly like a type of passenger plane that is 18 meters long. If you wanted to look at images of airfields and pick out which planes are the warplanes and which are the passenger planes, what is the maximum resolution you could use to differentiate between the two?
2. You have multiple satellites you could use to take pictures of ABCDE's airfields, each with different lens sizes and distances from the earth. They all sense visible light with a wavelength of 532 nanometers. Which of these satellites could get you the resolution you need?

Satellite 1	Satellite 2	Satellite 3	Satellite 4
Distance: 750 kilometers	Distance: 200 kilometers	Distance: 500 kilometers	Distance: 600 kilometers
Diameter: 26 centimeters	Diameter: 2 centimeters	Diameter: 15.5 centimeters	Diameter: 26 centimeters



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3. Uh-oh! ABCDE has their own reconnaissance satellites, and you would like to know just what they are capable of seeing. You know that these satellites are at a distance of 700 kilometers from earth. Using additional intelligence, you can estimate their lens diameter to be half a meter. Assuming the ABCDE satellite is sensing visible light with a wavelength of 532 nanometers, what is its resolution?

4. What would be the same satellite's resolution if it was sensing short-wave infrared, with a wavelength of 1 micrometer (also called a micron)?

5. A new reconnaissance satellite is being developed that has a resolution of 2 millimeters. You are going to be able to count the number of ants on an anthill! The satellite will sense a wavelength of 5 microns, and be at a distance of 330 kilometers. What will the aperture diameter be?