

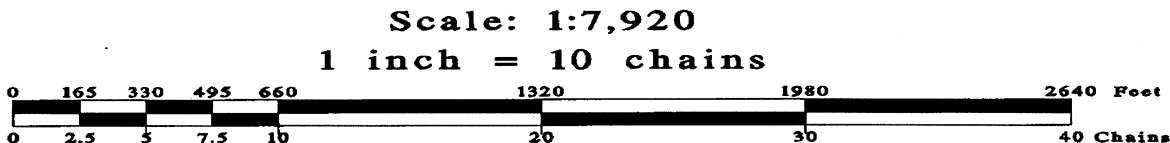
Name: Key

FO-4313/6313
Third Hour Exam, 2006
"Scale, Scale, Scale & More Scale"

$$RF = \frac{1}{S} = \frac{d}{D} = \frac{f}{(H-h)}$$

Show calculations or no partial credit!

1. The graphic scale bar below appeared on a copy of a map that you acquired from your hunting companion; however you suspect he has changed the scale during copying. If the distance between 0 and 660 ft or 0-10 chains is now $83/60$ inches instead of $60/60$ inches,



$$\frac{1}{S} = \frac{83/60 \text{ in}}{60 \text{ in}}$$

A. The actual/true RF scale is: 1:5725.3 (5)

B. Equivalent scale is: 1 inch = 477.11 feet $5725.3/12 = 477.11$ (5)

2. If the RF of the quad sheet you are using is 1:100,000:

A. 1 inch = 8,333.33 feet $100,000/12 =$ (5)

B. 1 square inch = 645.16 hectares $(1 \text{ in})^2 = \frac{(2540 \text{ m})^2}{10,000}$ (5)

3. The true geographic point location system for a point on the earth's sphere on a 7.5' Quad is: Latitude and Longitudes (5)

4. At a desired scale of 1:12,000, the smallest object that can be detected on aerial imagery (assuming the human eye can see 0.005 inches with slight magnification) is:

5.0 ft $\frac{1}{12,000} = \frac{0.005 \text{ in}}{X}$ (10)

5. If the average terrain elevation is 500 ft and you desire a scale of 1:12,000 to be at average elevation, the aircraft altitude for a camera with a 50mm lens should be:

2,468.50 ft $\frac{1}{12,000} = \frac{50 \text{ mm} / 25.4 \text{ in}}{h - 500}$ (10)

$h = 1968.5 + 500$

6. If we assume the scale on the 7.5' Quad (1:24,000) is constant and represents true ground distance, then:

$$1:24,000 \Rightarrow 1'' = 200 \text{ ft}$$

A. The straight-line ground distance between Points A and B that are 28.5/60 inches apart on the quad sheet is: 950 ft $\frac{28.5}{60} \times 2000 =$ (5)

B. If the image distance between Points A and B on an aerial image of the same area is 68.4/60 inches, the RF of the aerial image is: 1:10,000 (5)

$$\frac{1}{5} = \frac{68.4/60}{950}$$

C. The equivalent scale of the aerial image is: 1 square inch = 15.97 acres (5)

$$(1'')^2 = (20,000/12)^2 / 43,560$$

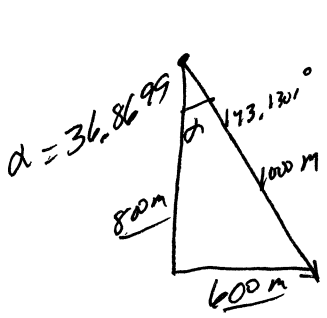
7. Given that the coordinates of Point A are
 UTM = 319,095 m E, 3,677,295 m N, Zone 16N
 Lat/Long = 32° 20.0' N 88° 45.0' W

on a 7.5' quad sheet (1:24,000) that has a lat/long X scale of 382/60 inches per 2.5 minutes and a Y scale of 458/60 per 2.5 minutes.

If the true grid azimuth and range from Point A to Point B is 143.1301° and 1000 meters,

A. The UTM coordinate of Point B are $\begin{matrix} 319,095 \\ + \\ 600 \\ \hline 319,695 \end{matrix}$ m E, $\begin{matrix} 3,677,295 \\ - \\ 800 \\ \hline 3,676,495 \end{matrix}$ m N (20)

B. The Latitude-Longitude of Point B is $\begin{matrix} 32^\circ 20' N \\ - \\ 0.43 \\ \hline 32^\circ 19.57' N \end{matrix}$ $\begin{matrix} 88^\circ 45' W \\ - \\ 0.39 \\ \hline 88^\circ 44.61' W \end{matrix}$ (20)



Latitude = Y coordinate
 $\frac{458}{60} \times 609.6 \text{ m} = 4653.28 \text{ m per } 2.5' \text{ down}$
 $\Delta Y = \left(\frac{800}{4653.2}\right)(2.50) = 0.43 \text{ minutes}$
 Longitude = X coordinate
 $\left(\frac{382}{60}\right)(609.6) = 3882.116 \text{ m per } 2.5' \text{ down}$
 $\Delta X = \left(\frac{600}{3882.116}\right)(2.5) = 0.39 \text{ minutes}$

Bonus: All or None 10 points

If LandsAT imagery has a 60m pixel resolution (on the ground) and the desired scale of a printed image of a 10 inch by 10 inch format size is 1:48,000,

A. the total number of pixels on the printed image would be: $20375 \times 20375 = 41209$ pixels (20)

B. the ground area covered by the printed image would be: $14,872 \text{ } \approx 14,864 \text{ ha}$

$\frac{1}{48000} = \frac{d}{60}$ $d = 0.00125 \text{ m} = 0.125 \text{ cm} = 0.0492''$
 $10'' / 0.0492 = 203.25 \text{ pixels} \times 60 \text{ m} = 12,195.62 \text{ m} / 10,000$
 $1'' = 1219.2 \text{ m}$
 $10'' = 12,190.2 \text{ m}$
 $10 \times 10 = 14,864 \text{ ha}$