

Name: _____

**FO-2133 Forest Measurement
Exam 3 - 2009**

Your data parameters: (Make sure you are using your set of data parameters!)

Angle Gauge = **BAF 10.0**

Data Set = **N:\fo2213\DataSet1_Exam3_09.xls**

Single Tree Height Function = **$\text{Ln}(\text{Hgt}) = 4.57 - 3.6114*(\text{DBH}^{-1})$**

Single Tree Volume Function = **Bd. Ft Volume = 60 + 0.10(DBH²)**

1. Assuming Points 1 - 5 are all Phase 2 volume points:

A. Single phase estimate of mean volume per acre is: _____ bd. ft/acre. (10)

B. Single phase estimate of mean basal area per acre is: _____ ft²/acre. (20)

C. The final equation for the volume:basal area model $\text{Vol} = b_0 + b_1 (\text{BA}) + \varepsilon$ is:

_____ (25)

D. The stand and stock table for the 5 volume points is: (15)

DBH	Trees/ac	BA/ac	Vol/ac
Totals			

2. Assuming Points 6 - 15 are all Phase 1 basal area points for a double-sample:

A. The overall basal area per acre on **all point** is: _____ ft²/acre. (10)

B. The Linear Regression mean volume estimate is: _____ bd. ft/acre. (20)

Staple your Excel work sheets to the back of this exam.

On my honor, I have neither given nor received assistance on this exam. _____

Point#	DBH	Trees
1	10	2
	12	4
	14	3
2	12	4
	14	3
	10	2
3	14	3
	12	4
	10	6
4	12	4
	14	3
	10	3
5	10	3
	12	2
	14	3
6		8
7		7
8		6
9		7
10		8
11		5
12		8
13		9
14		10
15		6

Equation Formula Sheet

$$s^2 = \frac{\left[\sum_{i=1}^n x_i^2 - \frac{(\sum_{i=1}^n x_i)^2}{n} \right]}{(n-1)} \quad s^2 = \frac{\left[\sum_{i=1}^n x_i^2 - \bar{x} \sum_{i=1}^n x_i \right]}{(n-1)} \quad s = \sqrt{s^2}$$

$$CV\% = \left(\frac{s}{\bar{x}} \right) (100)$$

$$s_{\bar{x}} = \sqrt{\frac{s^2}{n} \left(1 - \frac{n}{N} \right)}$$

$$\bar{x} \pm (t_{\alpha, n-1}) s_{\bar{x}}$$

$$SE\% = \left(\frac{t_{\alpha, n-1} s_{\bar{x}}}{\bar{x}} \right) 100\%$$

$$SS_y: \sum y^2 = \sum Y^2 - \frac{(\sum Y)^2}{n}$$

$$b_1 = \frac{\sum xy}{\sum x^2} = \frac{SP_{xy}}{SS_x}$$

$$SS_x: \sum x^2 = \sum X^2 - \frac{(\sum X)^2}{n}$$

$$b_0 = \bar{Y} - b_1 \bar{X}$$

$$SP_{xy}: \sum xy = \sum XY - \frac{\sum X \sum Y}{n}$$

TSS

$$SS_y = \sum y^2$$

$$ESS = \sum (Y - \hat{Y})^2$$

RSS

$$\frac{(SP_{xy})^2}{SS_x} = \frac{(\sum xy)^2}{\sum x^2} = b_1^2 \sum xy$$

$$I^2 = \left(1 - \frac{\text{Error SS}}{\text{Total SS}} \right)$$

$$S_{y,x} = \sqrt{\frac{\sum (Y - \hat{Y})^2}{n-2}} = \sqrt{\frac{ESS}{n-2}} \quad S_{y,x} = \sqrt{\frac{\sum y_i^2 - b_1 \sum xy}{n-2}} = \sqrt{\frac{ESS}{n-2}}$$

Smalian: $ft^3 = [(B + b)/2] L$

Huber: $ft^3 = [(B_{1/2})] L$

Newton: $ft^3 = [(B + 4 B_{1/2} + b)/6] L$

Doyle Board Feet = $(D - 4)^2 L / 16$

Scribner Board Feet = $(0.79D^2 - 2D - 4)L / 16$

International 1/4 Board Feet 4 ft. log = $0.199D^2 - 0.6420D$

8 ft. log = $0.597D^2 - 1.3290D - 0.7143$

16 ft. log = $0.796D^2 - 1.3740D - 1.2295$

$$PACF = \frac{1}{\text{plot size}}$$

$$\text{plot size} = \frac{ba}{BAF}$$

$$PRF = \frac{8.696}{\sqrt{BAF}}$$

$$\bar{Y}_{lr} = \bar{y}_2 + b_1 [BA_1 - ba_2]$$

BAF =	10											
Point#	DBH	Trees	Hgt	Vol	PACF	Vol/ac	BA	Vol		Y ²	X ²	XY
1	10	2	67.3	70.0	18.34	2,567						
	12	4	71.5	74.4	12.73	3,789						
	14	3	74.6	79.6	9.35	2,234	90	8,590		73,789,612	8100	773107.9
2	12	4	71.5	74.4	12.73	3,789						
	14	3	74.6	79.6	9.35	2,234						
	10	2	67.3	70.0	18.34	2,567	90	8,590		73,789,612	8100	773107.9
3	14	3	74.6	79.6	9.35	2,234						
	12	4	71.5	74.4	12.73	3,789						
	10	6	67.3	70.0	18.34	7,701	130	13,724		188,346,385	16900	1784112
4	12	4	71.5	74.4	12.73	3,789						
	14	3	74.6	79.6	9.35	2,234						
	10	3	67.3	70.0	18.34	3,850	100	9,874		97,486,984	10000	987355
5	10	3	67.3	70.0	18.34	3,850						
	12	2	71.5	74.4	12.73	1,895						
	14	3	74.6	79.6	9.35	2,234	80	7,979		63,663,097	6400	638313.3
6		8										
7		7										
8		6										
9		7										
10		8										
11		5										
12		8										
13		9										
14		10										
15		6										
	Sum	123				Total	490	48,757	Sum	497,075,691	49,500	4,955,996
	BA	82				Mean	98.0	9,751				
									CSS	21,634,944	1480	177851.1
									b₁	120.1697		
									b₀	-2,025.31		

	DBH	Trees	Hgt	Vol	PACF	Volume			DBH	Trees/ac	BA/ac	Vol/ac
	10	2	67.28	70.0	18.34	2,567						
	10	2	67.28	70.0	18.34	2,567						
	10	6	67.28	70.0	18.34	7,701						
	10	3	67.28	70.0	18.34	3,850						
	10	3	67.28	70.0	18.34	3,850		10	58.67	32.0	4107.077	
	12	4	71.454	74.4	12.73	3,789						
	12	4	71.454	74.4	12.73	3,789						
	12	4	71.454	74.4	12.73	3,789						
	12	4	71.454	74.4	12.73	3,789						
	12	2	71.454	74.4	12.73	1,895		12	45.84	36.0	3410.341	
	14	3	74.593	79.6	9.35	2,234						
	14	3	74.593	79.6	9.35	2,234						
	14	3	74.593	79.6	9.35	2,234						
	14	3	74.593	79.6	9.35	2,234						
	14	3	74.593	79.6	9.35	2,234		14	28.06	30.0	2233.897	
	Sum	49				48,757			132.57	98.0	9,751	
	Mean	9.8				9,751						
	Doub	Samp=	9751.3 +		120.17	82.0	98.0	7,828.6				
		Check	-2025.3 +		120.17	82.0		7,828.6				