

NAME:

SECTION:

Instructor:

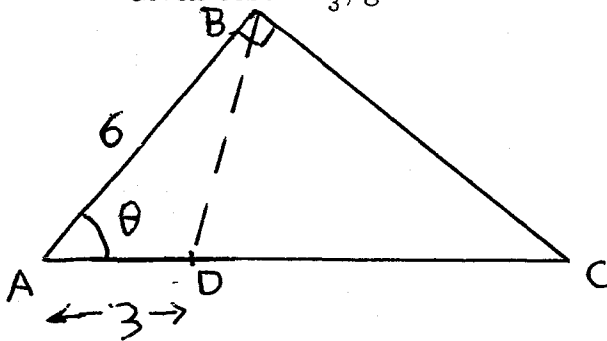
I	30	II	10	III	25	IV	20	V	20	VI	20	VII	15	VIII	20	Total	160

**NO CALCULATOR means: NO CALCULATOR.**

**I. NO CALCULATOR.**

(30 points)

Given  $\cos \theta = \frac{2}{3}$ , give the EXACT values of  $|BD|$  and  $|BC|$ .

**II. With calculator.**

(10 points)

Find angles  $\theta$  and  $\nu$  in degrees so that

$$\sin \theta = \frac{1}{4} \text{ and } 90^\circ \leq \theta \leq 270^\circ$$

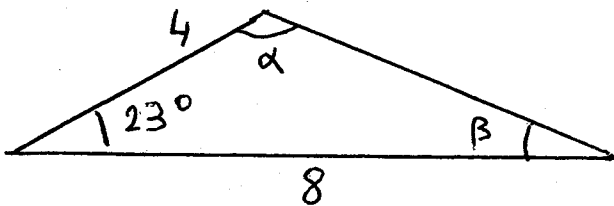
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$$\sin \nu = -\frac{1}{4} \text{ and } 90^\circ \leq \nu \leq 270^\circ.$$

III. An airplane flies at constant elevation in the direction of Dane County airport. From the airplane, the airport is first seen at an angle of depression of  $10^\circ$ . Approaching the airport, 4 miles further, the airport is seen at an angle of depression of  $20^\circ$ . At which elevation (above ground) is the airplane flying? (25 points)

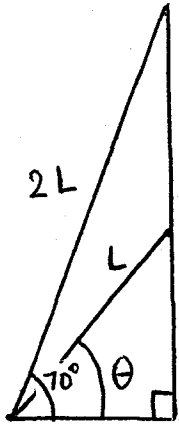
IV. Evaluate the angles  $\alpha$  and  $\beta$ .

(20 points)



V. Evaluate the angle  $\theta$

(20 points)



VI. Check the identity:

(20 points)

$$(1 - \sin 2y)(\sin y + \cos y)^2 = \cos^2(2y)$$

VII. WITHOUT CALCULATOR. Find an angle  $\theta$ , with  $\frac{\pi}{2} \leq \theta \leq \pi$ , and  $\cos 2\theta = \cos \theta$ .  
 (15 points)

VIII. The graph below is the graph of  $\sin(3x + \frac{\pi}{4})$ . (20 points)

1) Give the values of  $a$ ,  $b$  and  $c$ .

2) All the values of  $x_j$  ( $j = 1, 2, 3$  or  $4$ ) satisfy  $\sin(3x_j + \frac{\pi}{4}) = \frac{-1}{3}$ . Give the values of  $x_2, x_3$  and  $x_4$  in terms of  $x_1$ . For which  $j$  is  $3x_j + \frac{\pi}{4} = \sin^{-1}(\frac{-1}{3})$ ?

