Show all work for full credit. Keep 3 decimal places in calculations and answers. Frame your answers

Problem 1 (35 minutes, 35 points)

The following data are obtained for about 1000 men:

average height: 69 inches, SD: 2.5 inches
average forearm length: 18 inches, SD: 1 inch,   r: 0.8   (assume football sho

A. Of the men who were 6 feet tall, about what percentage had forearms shorter than 18 inches?

B. Of men who had 19 inches forarms, about what percentage had height taller than 69.5 inches?

C. A man's height is the 96th percentile of height distribution. Predict the percentile rank of his forearm.

$2 = \frac{x - \bar{x}}{SD}$

a) 6ft. = 72 in. $\frac{72-69}{2.5}$ = 1.2 SD away   new SD = $\sqrt{1-.8^2} \cdot 1$ =

SD for forearm = 1.2 · .8

= .96 ≈ .95 SD

.96 · 1 + 18 in = 18.96 in (new mean)

$\frac{18-18.96}{.6}$ = -1.6   x-1.60 for SD

answer ← 50 - $\frac{89.04}{2}$ = 5.480% have forearms shorter than 18 in at 6ft tall

b) $\frac{19-18}{1}$ = 1 SD away

new mean = .8 · 1 · 2.5 + 69 = 71 in.

new SD = $\sqrt{1-.8^2} \cdot 2.5$ = 1.5 in

SD = $\frac{69.5-71}{1.5}$ = -1

50 - $\frac{68.27}{2}$ = 15.865   100 - 15.865 = 84.135 % are taller than 69.5 with forearms of 19 in.

c) (100 - 96) · 2 = 8   100 - 8 = 92 ≈ 1.75 SD away

new SD for x is 1.75 · .8 = 1.4 SD

50 + $\frac{83.85}{2}$ = 91.925 percentile

$$r = \frac{12.3 - 1 \cdot 8}{1 \cdot 5} = .86667$$

$$r = \frac{Cov(x,y)}{SD_x \cdot SD_y}$$

$$\frac{\sum xy}{6} = \frac{74}{6} = 12.\overline{3}$$

Problem 2 *(15 minutes, 15 points)*

A. What is the correlation coefficient for the data below (show all work)

x	y	xy	$\bar{x}$	$\bar{y}$
0	1	0	1	8
0	3	0		
1	7	7		
1	9	9		
1	13	13		
3	15	45		

$\frac{0 \cdot 2 + 1, 3 + 3}{6}$

$\frac{1 + 3 + 7 + 9 + 13 + 15}{6}$

$$SD_x = \sqrt{\frac{(0-1)^2 + (0-1)^2 + 0 + (3-1)^2}{6}}$$

$$= 1$$

$$SD_y = \sqrt{\frac{(8-1)^2 + (3-8)^2 + (7-8)^2 + (9-8)^2 (13-8)^2 + (15-8)^2}{6}}$$

$$= 5$$

B. If possible fill in the two blanks so that the correlation for the data below equals the correlation in part A. If this is not possible, explain why.

x	y
-0	-3
-0	-7
-2	-15
-2	-19
-2	-27
-6	-31

(assume -0 is 0)

$$r = \frac{Cov(x,y)}{SD_x \cdot SD_y}$$

it is a transformation of $x \cdot (-2) - 1$

the values are $([0,-7], [-2,-19]$

$$\bar{x} = \frac{0 + 0 - 2 - 2 - 2 - 6}{6} = -2$$

$$\bar{y} = \frac{-3 - 7 - 15 - 19 - 27 - 31}{6} = -17$$

$$SD_x = \sqrt{\frac{2^2 + 2^2 + 0^2 + 0^2 + 0^2 + 4^2}{6}} = 2$$

$$SD_y = \sqrt{\frac{14^2 + 10^2 + 2^2 + 2^2 + 10^2 + 14^2}{6}} = 10$$

$$\sum xy = 0 + 0 + 30 + 38 + 54 + 186 = 308$$

$$\frac{\sum xy}{6} = 51.\overline{3}$$

$$r = \frac{51.\overline{3} - -2 \cdot -17}{2 \cdot 10} = .86$$

same correlation