# Stat 1040 Recitation packet 4

1. Leonardo da Vinci (1452–1519) theorized that if you put your arms out to the side and measured from the fingertip of one hand to the fingertip of the other, this "wingspan" distance would approximately equal your height. A group of fourth–grade students measured their height and wingspan and found

   average height = 49.5 inches with an SD of 1.8 inches
   average wingspan = 48.9 inches with an SD of 2.1 inches

   The scatter diagram was football-shaped and the correlation coefficient was 0.8.

   (a) If one of these fourth–graders is 52 inches tall and is right on the SD line, what is their wingspan?

   (b) Predict the wingspan of a randomly chosen fourth–grader who is 52 inches tall.

   (c) Find the rms error for your answer in part (b).

   (d) Is it likely that the fourth–grader from part (b) would have a wingspan of 45 inches or more? Explain clearly using your answers to (b) and (c).

2. For a random sample of 20 car models, the average weight (in pounds) was 3236, with an SD of 523. The average gas mileage (in miles per gallon) was 21.4 with an SD of 4.2. The correlation between weight and gas mileage was -0.87. The scatter diagram was football shaped.

   (a) Ignoring weight, and assuming the histogram for gas mileage follows the normal curve, would you be surprised if someone told you that one of these cars got 27 miles per gallon? Explain your reasoning.

   (b) Predict the gas mileage of a car that weighs 3500 pounds.

   (c) Would you be surprised if someone told you that one of these cars weighing 3500 pounds got 27 miles per gallon? Explain your reasoning, using the rms error.

   (d) In one sentence, explain what the correlation coefficient tells you about the relationship between gas mileage and weight of cars like these.

3. In a study on reading and math scores, tests were given to all third graders in Happy county. There were 13 schools in Happy County. The average math score and average reading score was calculated for each of these 13 schools and a scatter diagram was drawn with math score on the vertical axis and reading score on the horizontal axis. The correlation coefficient for these 13 points was .85. A newspaper reporter saw this and concluded "there is a very strong correlation between reading scores and math scores for Happy County third graders". What mistake was the reporter making? Explain briefly.

4. A teacher sees the positive correlation in Question 3 and concludes that "The positive correlation shows that if we focus on teaching verbal skills, math skills will improve also". What does statistics say?

5. In one study students took a math test and a verbal test. The following summary statistics are calculated:

Average math score 70,   SD = 10
Average verbal score 60,   SD = 15   r = 0.6.
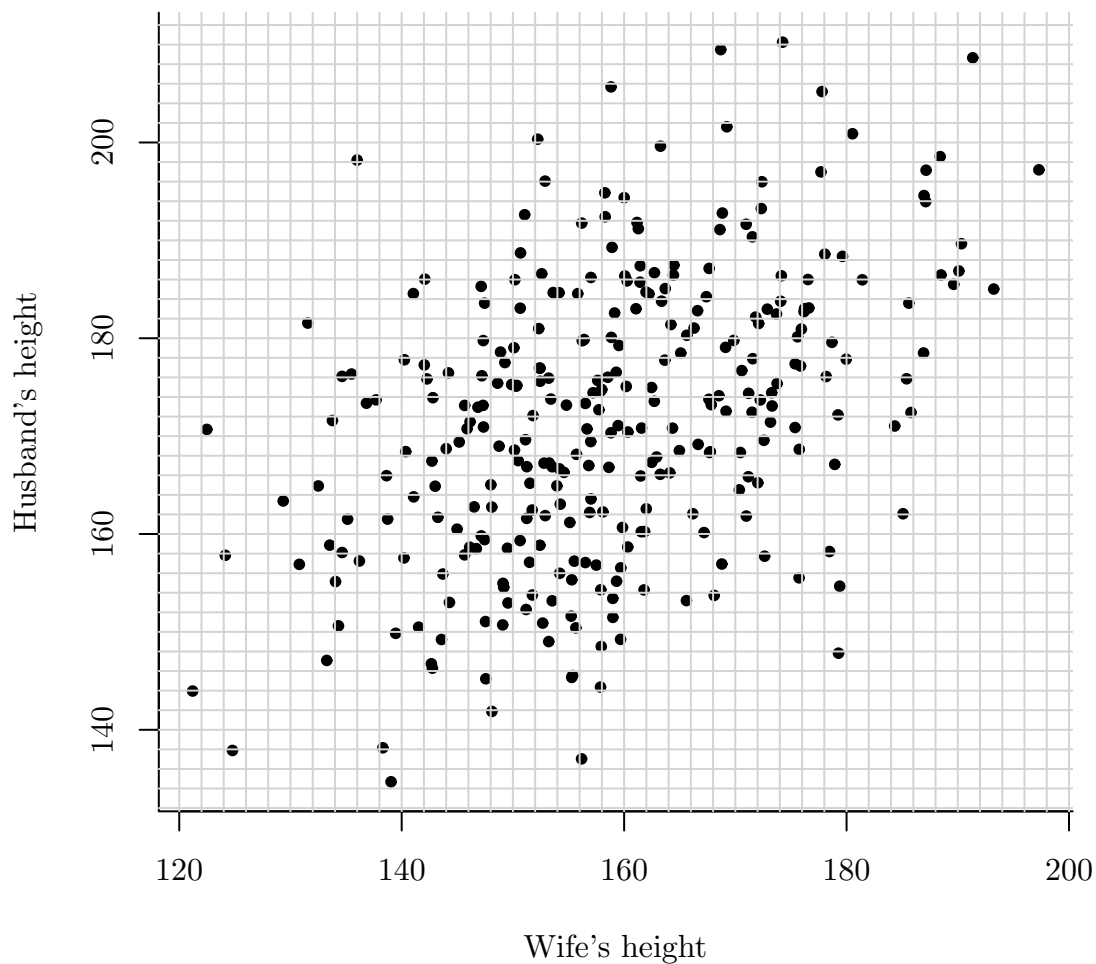
The scatter-diagram is football-shaped. Sketch the football.
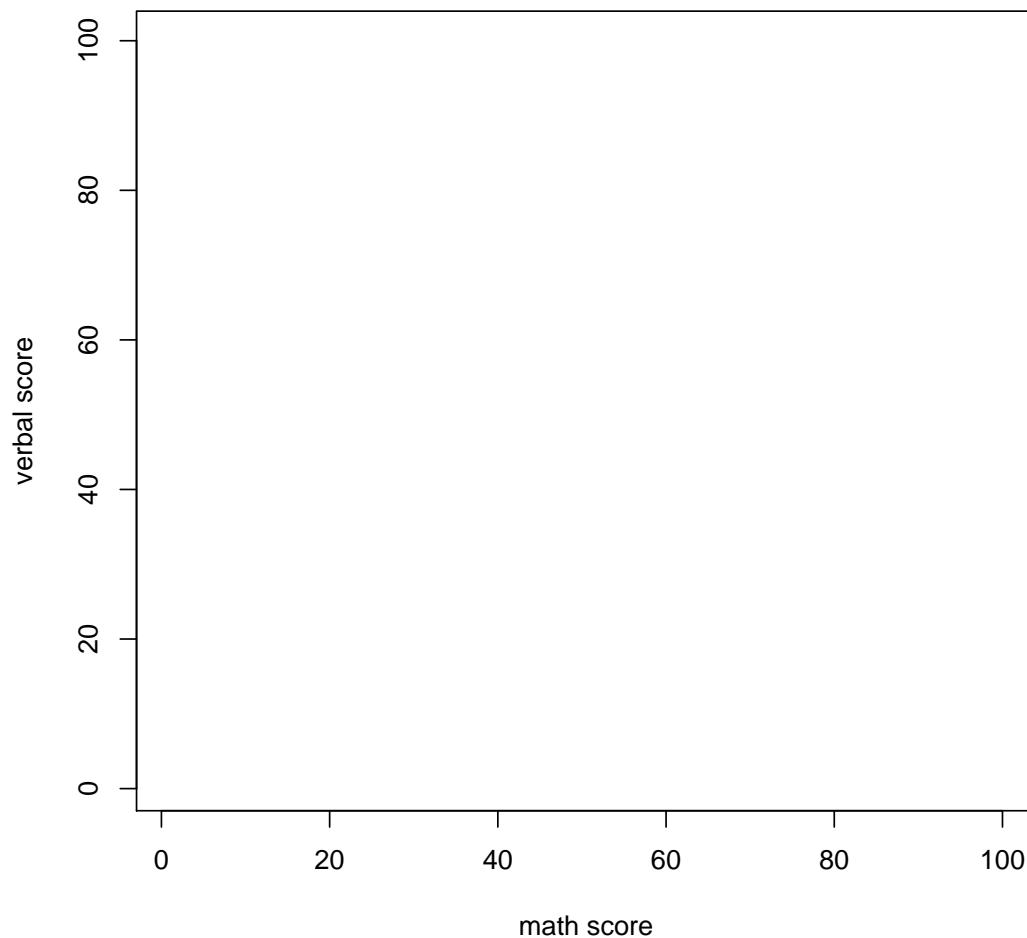
6. For a random sample of married couples in Britain,

Height of wife: average = 160 cm,   SD = 14 cm
Height of husband: average = 173 cm,   SD = 15 cm, $r = 0.4$.

The scatter diagram is shown below:

Wife's height

(a) Draw, as accurately as possible, the regression line and the SD line on the plot.

(b) Estimate the height of a husband if you know that his wife is 158 cm tall.

(c) If all the heights were changed to inches (with no rounding) find the average and the SD for the wives' heights. (2.54 cm = 1 inch).

(d) If all the heights were changed to inches (with no rounding) would the correlation coefficient increase, decrease, or stay the same?