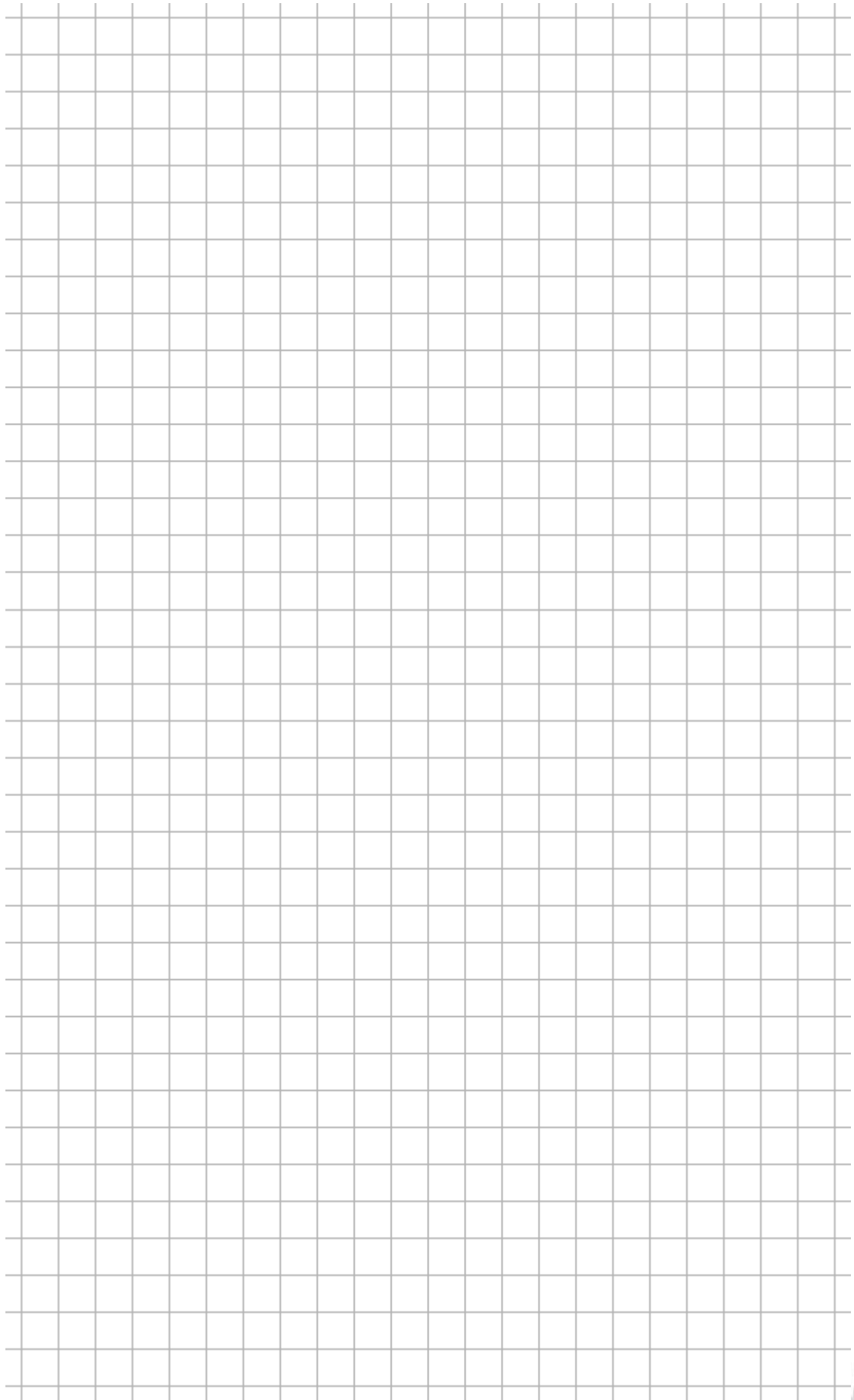# Extension Statistics Practice #3

The married staff at a school are randomly sampled.

They are asked their age when they married, and the age of their husband or wife at that time.

Males age	Females age
20	18
29	27
45	45
35	30
27	24
29	22
34	32
23	22
28	26
31	32
35	29
26	19
28	28
33	31
34	2
29	24
40	28
32	27
20	19
35	36

Analyse the data so that you can:

a) Discuss the age of men and women when they marry.

b) Describe the relationship between the ages of men at marriage and that of women, as shown by the data.

c) Make predictions based on your information, including how accurate those predictions are likely to be.

d) Make any suggestions for improvements for gathering or analysing the data.

# Model Answers: Extension Statistics Practice #3

These answers are more full than would be expected of students.

a) Discuss the age of men and women when they marry.

The typical man married at 30 or 31 (median = 30, mean = 30.65) with most marrying within 5 years of that (**50% in the range from 34 to 28**).

The typical female married at about 27 (mean and median = 27) but **there was more variation than for men** – a greater inter-quartile range (31 to 22).

The distribution of female ages is far less symmetric, with quite a few at either ends of the whiskers (not just a couple of outliers). **The male distribution is much more normally shaped**, centred on 30, although the tail is skewed slightly longer to the right (older).

Age at Marriage
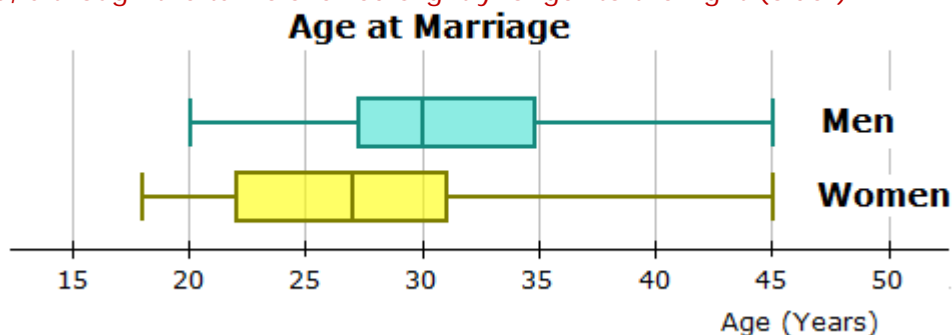
Statistics calculated

Males	Mean = 30.65	Median = 30	Range = 45 – 20	IQR = 34.5 – 27.5
Females	Mean = 27.03	Median = 27	Range = 45 – 18	IQR = 31 – 22

Note: **the Female age of "2" had to be left out of the analysis**, since it is an obvious mistake. Therefore the female statistics are out of 19, while the men are out of 20.

b) Describe the relationship between the ages of men at marriage and that of women, as shown by the data.

I subtracted the female age at marriage from the male age and analysed the result. If the female was older, the result was left as negative. I ignored the result for the woman aged "2".

The result was that the men were typically one or two years older than their wives (mean = 1.16, median = 2). **Half of men were between 1 and 5 years older** (from IQR).

The differences were not symmetrical, being skewed towards older men: no women was more than a year older than her husband, but one man was 12 years older than his wife.

However, the difference in medians may be merely random effects from sample variation, as the median for the men lies just within the IQR for the women. The women's median is outside the men's IQR so we are at the border of saying the difference is statistically significant.

c) Make predictions based on your information, including how accurate those predictions are likely to be.

Predicting marriage age cannot be done with much certainty: it seems men will mostly marry between 25 and 35, but women are likely to marry younger.

Predictions about the difference in age are better – men will typically be less than five years older than their wives – but we cannot say this confidently with such a small sample size.

d) Make any suggestions for improvements for gathering or analysing the data.

The data is likely to not be representative of all New Zealanders, as school staff are not very representative. A properly random selection of all NZers would be better.

It is not clear how second marriages have been counted. They should be separated out.

Data collected by relying on memory is often not accurate. Using records is better.

Perhaps the age at marriage (or the difference in age) has changed over time. An analysis based on the age at first marriage grouping by current age might show a change over time.

Model Answers: Version 2.

These answers are not better or worse than Version 1. In general the box-and-whisker analysis is better for numbers and the scatter plot better for seeing the <u>relationship</u> between the ages.

Ages at Marriage
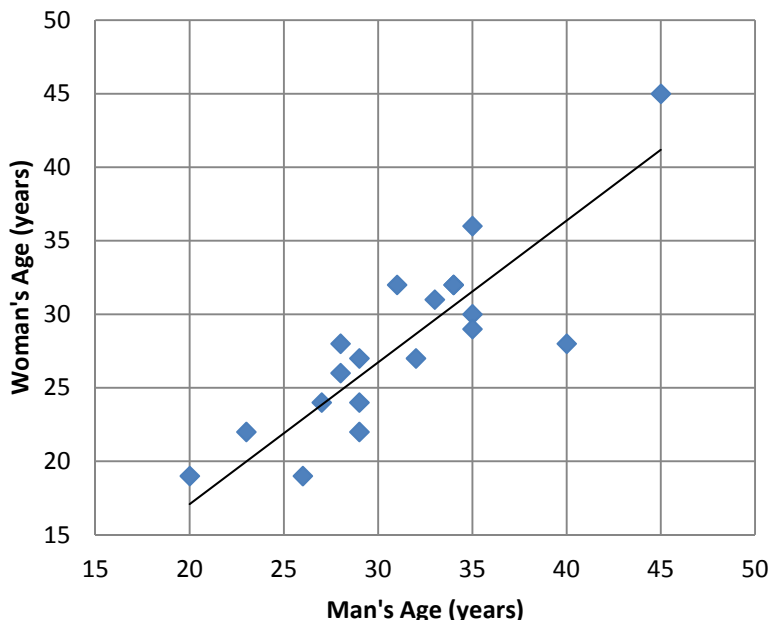
a) Discuss the age of men and women when they marry.

The scatter graph shows most men marry between 27 and 35.

The typical female married between 24 and 32.

There is some clustering around 28 for men and 25 for women and another for 34 for men and 30 for women. That is probably just random effects.

There is only one value well outside the others (M = 40, F = 28). This appears to likely be real and has been left in, as it does not distort the pattern too much.

b) Describe the relationship between the ages of men at marriage and that of women, as shown by the data.

The scatter plot shows **a moderately strong positive correlation** between the ages of the men and the women at marriage.

The line of best fit starts at about man = 20/woman = 17 and runs to man = 45/woman = 41. **That suggests that men are generally about 3 years older than their wives.**

The scatter is fairly even along the length of the line of best fit, which indicates that there is no greater variation in age difference if people marry late. (Otherwise we would see a "cone" effect, as the variation grew larger as age increased.)

c) Make predictions based on your information, including how accurate those predictions is likely to be.

Making predictions on marriage age is unreliable with so much variation: it seems men will mostly marry between 27 and 35, but women are likely to marry much younger.

Predictions about the difference in age are much better, as the correlation is reasonably strong to the line of best fit. Mostly men are about three years older than their wives.

d) Make any suggestions for improvements for gathering or analysing the data.

Improvements as for Version 1 of the Model Answers.