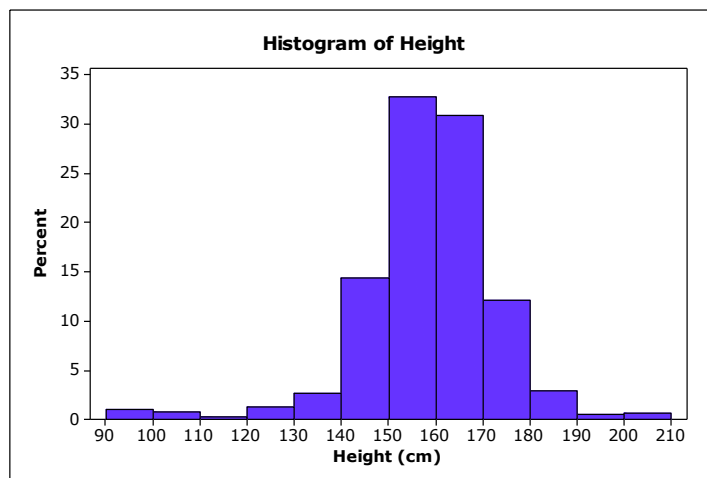




# Are Height and Foot Length Related? Solutions

## TASK A

1.

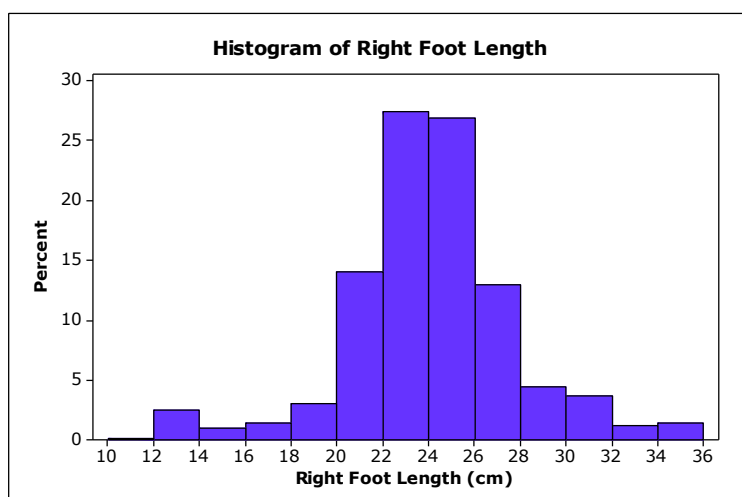


2. Pupils should comment on the distribution of the data. Many values lie at the upper (200–(210)cm) and lower limits (90–(100)cm). The data entry limits for the height variable were 90 to 210cm, so some pupils will have entered these rather than their actual height measurements. We would expect the data to follow a Normal Distribution, however this data is quite skewed, suggesting that fewer younger (therefore shorter) took part in the census. This may look different should we have taken a larger sample. Pupils may suggest cleaning the data to remove the upper and lower values which they believe to be implausible. This would alter the shape of the distribution to become more symmetrical.

Pupils may comment that pupils did not measure their height accurately or that some pupils may have used inches instead of centimetres.

3. The modal group for the height data is 150–(160)cm.

4.



The modal group for foot length is 22–(24)cm.



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5. The modal group for the combined height and foot length data is 150-(160)cm height, 22-(24)cm foot length.

### TASK B

If we were to randomly select a pupil from this sample, the probability that they would have a height from group 90-(100)cm is 1%. This is because there are 10 people in this group out of 1000 (the total of the sample).

1.  $P(\text{Foot Length} = 18 - (20)) = \frac{30}{1000} = \frac{3}{100} = 3\%$

2.  $P(\text{Height} = 150 - (160)) = \frac{327}{1000} = 32.7\%$

3.  $P(\text{Foot Length} = 18 - (20) \text{ and Height} = 150 - (160)) = \frac{5}{1000} = 0.5\%$

4. The foot length a pupil selected at random least likely to have is 10-(12)cm.

5. The combined height and foot length group for a pupil selected at random is most likely to come from 150-(160)cm height, 22-(24)cm foot length (the modal group).

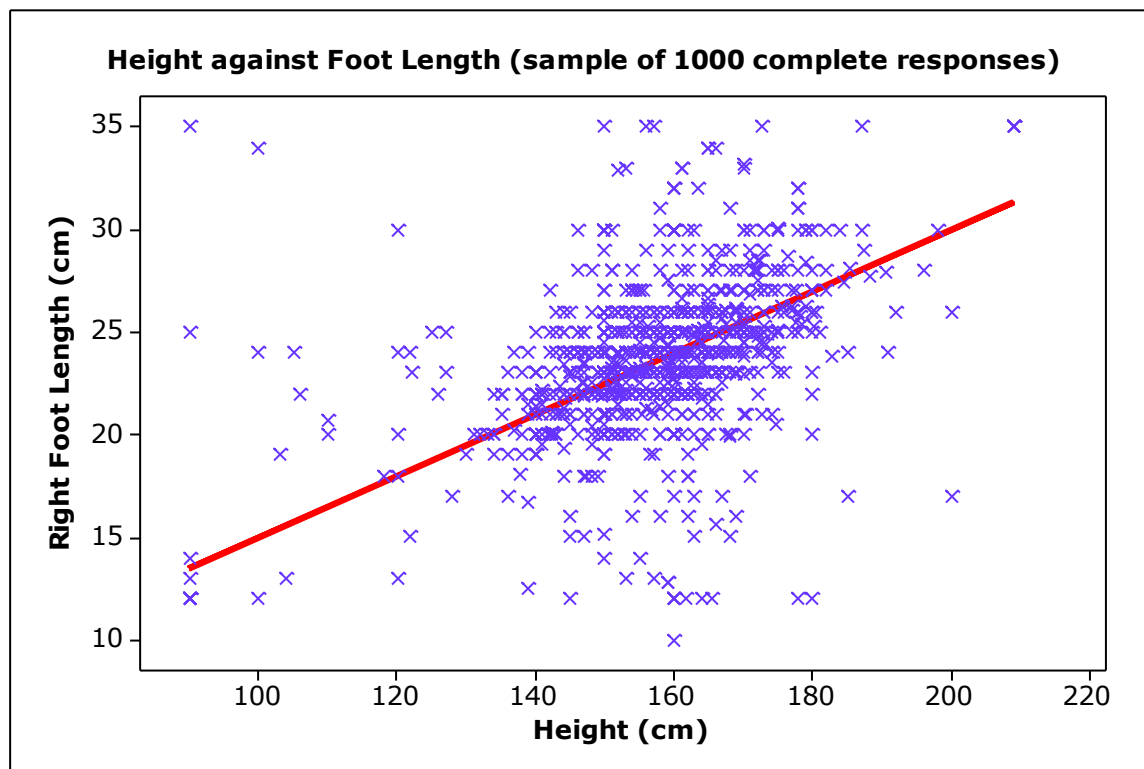
$$P(\text{Foot Length} = 22 - (24) \text{ and Height} = 150 - (160)) = \frac{123}{1000} = 12.3\%$$



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## TASK C

The graph below shows the data in a scatterplot to show the correlation between height and foot length.



Graph 1 – A scatterplot of height against foot length from a sample of 1000 completed responses from *CensusAtSchool* 2012/13.

1. The scatterplot shows very strong positive correlation between height and foot length, suggesting that foot length and height are related.
2. As height increases, foot length increases.
3. Pupils may consider that their outliers may have been incorrectly input, or incorrectly measured.
4. This is a small sample of data, so it would be better to use the whole dataset. Looking at the smaller values for height and foot length, it suggests that fewer younger people have answered the questionnaire. This may mean that there are not enough responses to accurately predict for these age groups. The data collected from *CensusAtSchool* is from schools that have chosen to take part and therefore may not be representative of all 10 to 18 year old pupils in the country.
5. It would not be appropriate to make predictions on the whole UK population as no data has been collected on under 10s and over 18 year olds.