HW #7

7.2, 7.9, 7.15, 7.25, 7.29

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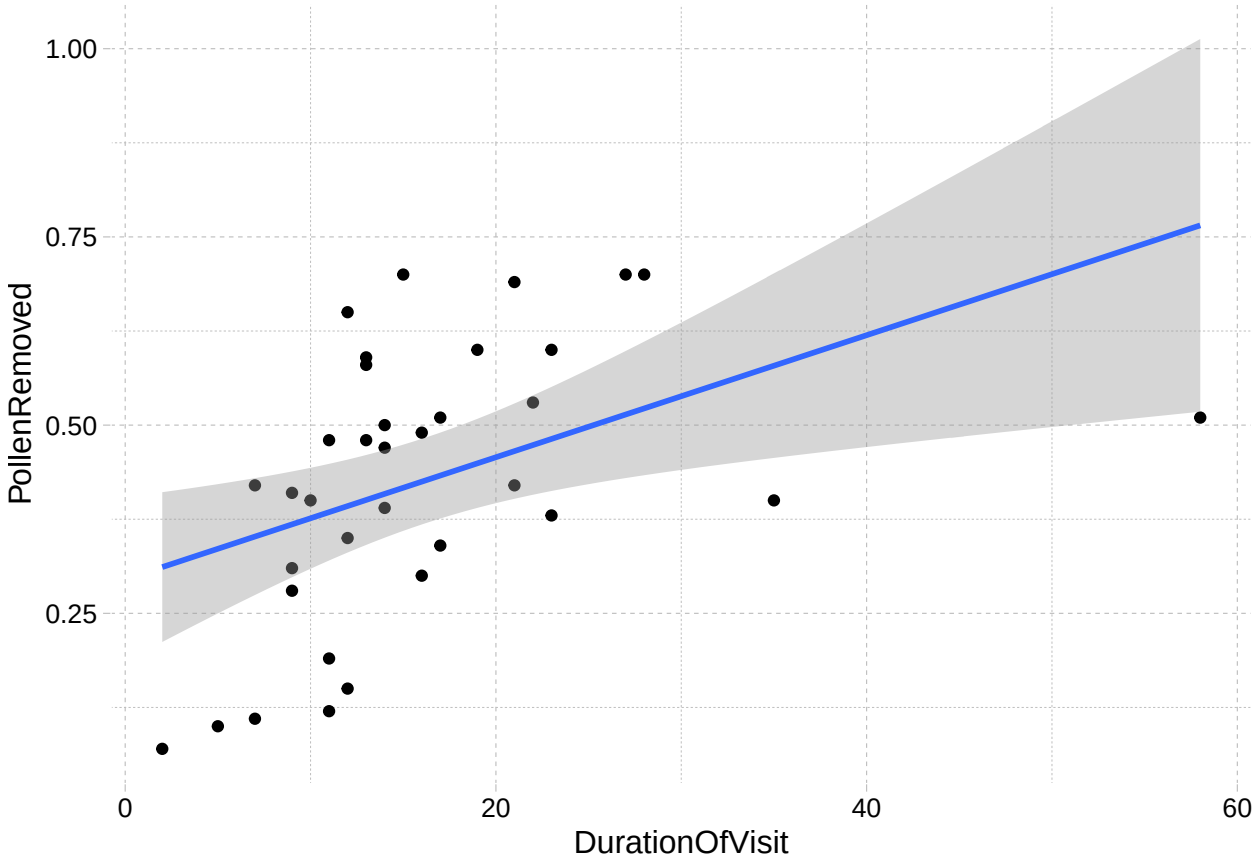
7.2

Improved distance measurements would decrease measurement error, resulting in smaller variation and therefore more precise estimates of the regression coefficients.

7.9

The intercept of 5kg does *not* imply that males of height 0 weigh 5kg on average. This does not render the model meaningless, however, as the model is fitted on a narrow band of height and weight data compared to all theoretical real-number values. A height of 0 is well outside this band, and the model is not designed to predict this value.

7.15

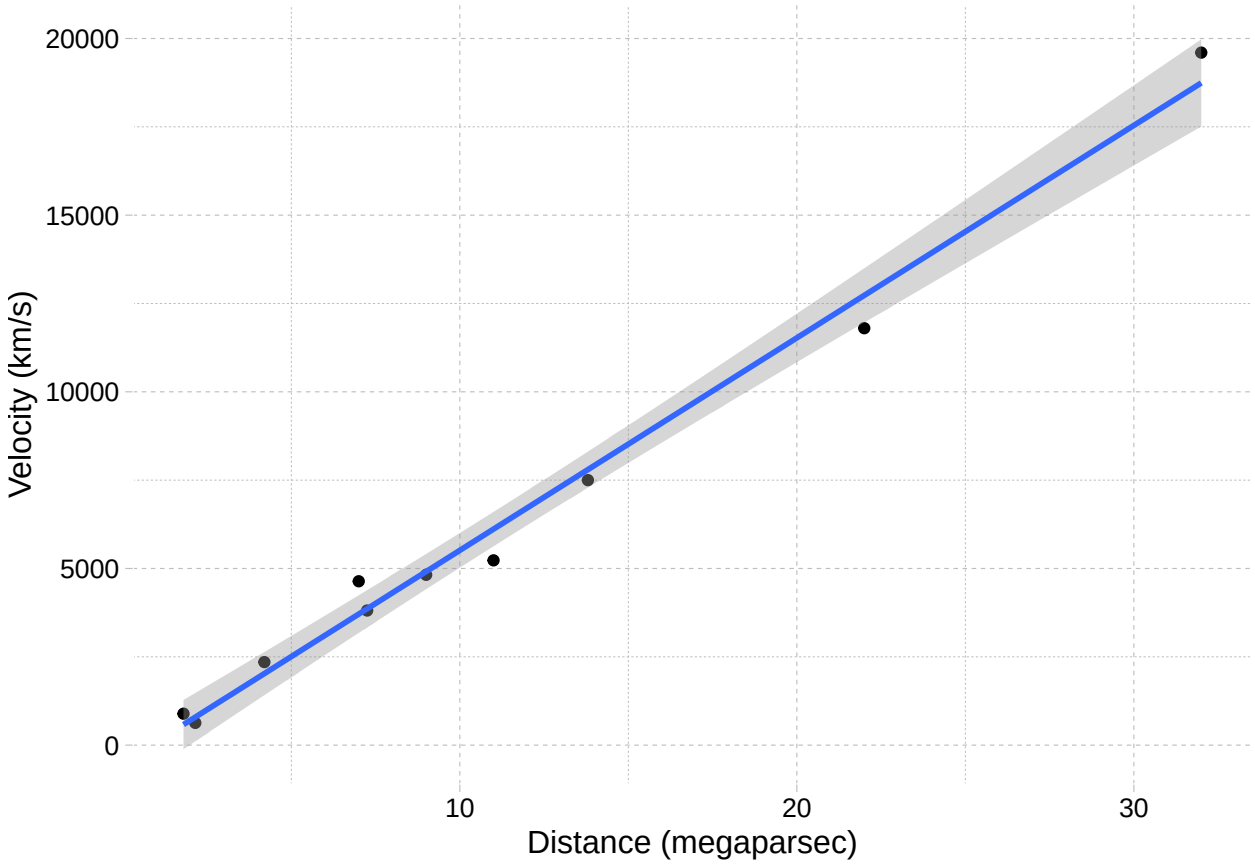


And a table of the model fit:

term	estimate	std.error	statistic	p.value
(Intercept)	0.3179	0.0386	8.24	0
DurationOfVisit	0.0080	0.0014	5.57	0

7.25

A plot of the data:



Fitting the data to a linear model with an intercept term gives:

term	estimate	std.error	statistic	p.value
(Intercept)	-500	333.6	-1.50	0.172
Distance	601	23.4	25.67	0.000

This does not give evidence that the intercept is different from 0, so we fit without an intercept term as well:

term	estimate	std.error	statistic	p.value
Distance	574	15.83	36.27	0

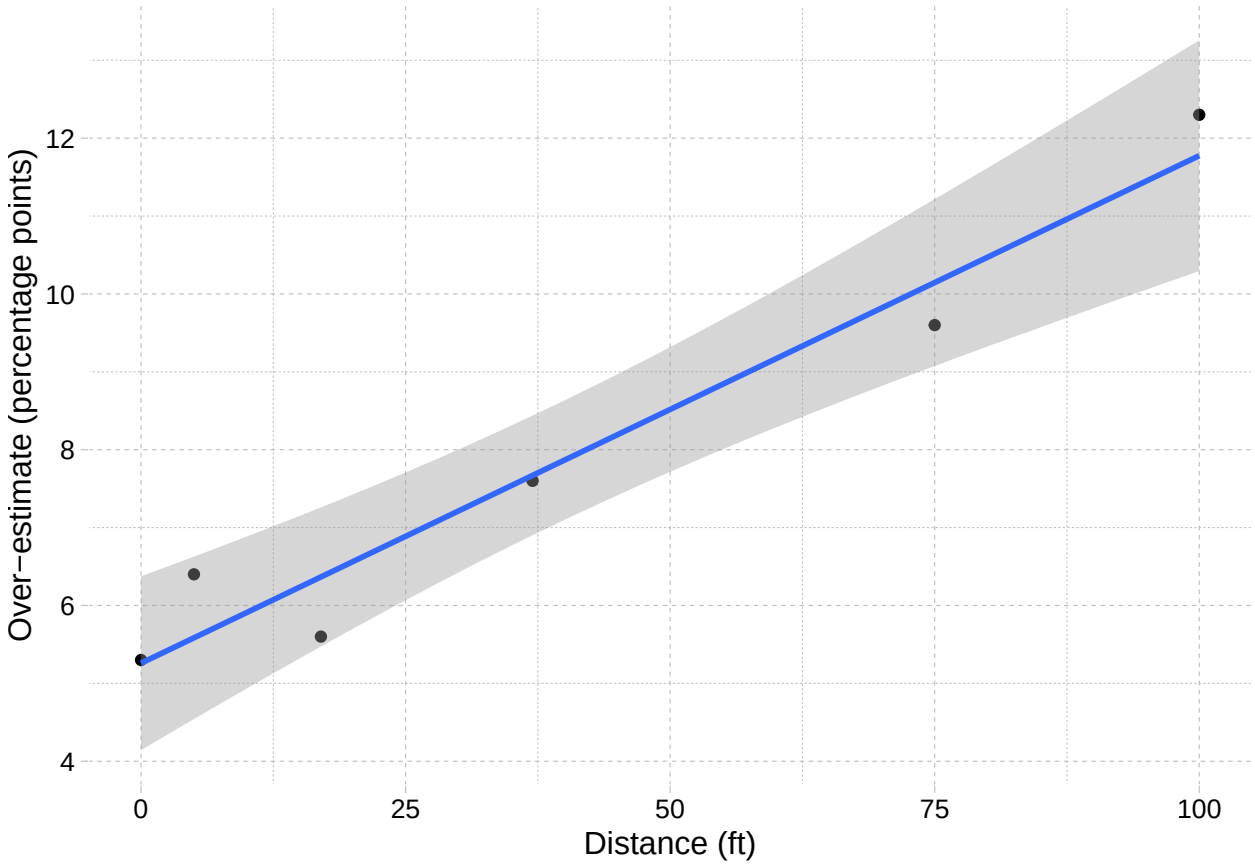
Because there is no evidence from these data that the intercept is not equal to zero, and because Hubble's theory predicts that the intercept *should* be zero, we will use the second model to calculate the age of the universe. This gives us:

$$
\begin{aligned}
Age &= 574.17 \frac{\text{megaparsec}}{\text{km/sec}} \times \frac{3.086 \times 10^{19} \text{km}}{\text{megaparsec}} \times \frac{\text{billion years}}{3.156 \times 10^{16} \text{sec}} \\
&= 5.61415 \times 10^5 \text{ billion years}
\end{aligned}
$$

This is many orders of magnitude greater than the current scientific estimate of around 14 billion years for the age of the universe

7.29

A plot of the data:



And a summary of the model:

term	estimate	std.error	statistic	p.value
(Intercept)	5.258	0.4019	13.08	0.00020
Distance	0.065	0.0075	8.71	0.00096

This gives overwhelming evidence that there is a correlation between over-estimation of Kerry votes and distance of the pollsters from the door, lending credence to the theory that Bush voters were more likely to avoid exit polls.