

## Suggested Answers for WarmUps for Lesson 19

**For the following FIVE questions, write down the name of the random variable and complete information about its distribution. DO NOT TRY TO SOLVE THE PROBLEM. JUST WRITE DOWN THE VARIABLE AND ITS DISTRIBUTION.**

1.	"Men seem more reluctant to flee the family nest, with 34% aged between 25 and 29 living with their parents, compared to 15% of women in the same age group." Suppose 45 randomly selected males aged between 25 and 29 were studied. What is the probability that no less than 20 or no more than 15 of them live with their parents?
Answer	Binomial, where X is the number out of 45 who report still living with their parents. n=45, pi = 0.34.
2.	Family also plays a big role when times are tight as well, the survey suggests, with 63% males in the 25 to 29 year age group saying they would ask relatives or friends if they were in financial trouble. If the survey interviewed 640 males in the same age group, what is the margin of error of a 98% confidence interval for the proportion of males who would rely on someone for help or advice in financial trouble?
Answer	$0.63 \cdot 640 = 403.2$ $0.37 \cdot 640 = 236.8$ $p \sim N(0.63, \sqrt{\frac{0.63 \cdot (1 - 0.63)}{640}} = 0.019085)$
3.	According to research carried out by the Institute for Sodor Railroad Development, freight trains on Sodor Island carry 120 cargo cars. In actual fact, the number of cargo cars carried by a train is a normally distributed random variable with a mean of 110 and a standard deviation of 40. If 64 trains are selected randomly, what is the probability that their mean number of cargo cars will be at most 112?
Answer	$\bar{X} \sim N(110, \frac{40}{\sqrt{64}} = 5)$
4.	According to research carried out by the Institute for Sodor Railroad Development, freight trains on Sodor Island carry 120 cargo cars. In actual fact, the number of cargo cars carried by a train is a normally distributed random variable with a mean of 110 and a standard deviation of 40. Which will be greater, the probability that the mean number of cargo cars will be at most 115 for samples of n=100 or the probability that the mean number of cargo cars will be at most 120 for samples of n=25? (Hint: There are TWO distributions to describe here.)
Answer	$\bar{X}_{115} \sim N(110, \frac{40}{\sqrt{100}} = 4)$ $\bar{X}_{120} \sim N(110, \frac{40}{\sqrt{25}} = 8)$
5.	A recent study of British workers revealed that 1 in 5 workers reports being bullied on the job some time in the last two years. If the study interviewed 400 workers, what is the margin of error of a 98% confidence interval for the proportion of

	workers who report being bullied on the job some time in the last two years?
Answer	$\frac{1}{5} * 400 = 80$ $\frac{4}{5} * 400 = 320$ Thus $p \sim N(0.20, \sqrt{\frac{0.2 * (1 - 0.2)}{400}} = 0.02)$
<b>Answer the actual question for the last two questions.</b>	
6.	Suppose that a 95% confidence interval was calculated for the proportion of drivers who report failing to wear their seat belt more than one time per week, and the interval was [0.17, 0.23]. Interpret this confidence interval.
Answer	There is 95% confidence that the population proportion of drivers who report failing to wear their seat belt more than one time per week is between 17 and 23 %.
7.	Suppose that a 95% confidence interval was calculated for the proportion of drivers who report failing to wear their seat belt more than one time per week, and the interval was [0.17, 0.23]. What sample size was used to estimate this parameter? Explain your work.
Answer	<p>The width of the confidence interval is 0.06 (0.23-0.17), thus the margin of error is 0.06/2 or 0.03. The sample proportion, p, the point estimate, is the midpoint of the interval and is 0.20 (0.17+0.23)/2. A 95% confidence interval has an alpha equal to 1-0.95 = 0.05, thus <math>\frac{\alpha}{2} = \frac{0.05}{2} = 0.025</math>. The corresponding Z-score is found by using =ABS(NORMSINV(0.025))=1.959964 or 1.96. Plug values into the formula for n for a sample proportion:</p> $n = \left( \frac{Z_{\frac{\alpha}{2}}}{e} \right)^2 * (p * (1 - p)) = \left( \frac{1.96}{0.03} \right)^2 * 0.2 * 0.8 = 4268.444 * 0.16 = 682.951 \approx 683$