Sample Final Part 3 - Solution

1)

(a) If the payments are numbered and recorded electronically, take an SRS (using a spreadsheet program) of ten of them. If they are kept in a big stack of paper, pick a random integer from 1 to 20. Then pick every 10^{th} payment to check. The SRS is better, but it might be easier to get someone to follow the paper procedure.
(b) Separate the two types of payments and perhaps have different supervisors sample each. If done by the same person, have that person pick five of each (or proportionally if many more of the payments are of one type).

2)

(a) $1.976 \times 8/\sqrt{150} = 1.290718$ (or use 2 standard errors rather than a t-quantile shown here)
(b) They are 95% confident the average waiting time for all callers is within about 1.3 minutes of the average wait of 16 minutes found in this sample.
(c) A narrower interval.
(d) $16 \pm 1.655 \times 8/\sqrt{150} = 14.92$ to 17.08

3)

(a) H_0 $p \leq 0.6$, where p is the proportion of markets selling out in this market. The alternative hypothesis is H_a: $p > 0.6$
(b) A Type I error occurs if we reject H_0 incorrectly, adding an unnecessary delivery. A Type II error occurs if we fail to reject H_0 when it's false, missing an opportunity.
(c) The sample proportion is 35/45 = 7/9. The standard error is $\sqrt{0.6(0.4)/45} \approx 0.07303$. Under H_0: $z = (7/9 - 0.6)/0.07303 \approx 2.434$. Using the rounded z value and the table, the p-value is approximately $P(Z > 2.43) = 0.0075$.

4)

Damage
(a) To have equal numbers with each, randomly order sequences of 225 a's and 225 b's.
(b) $\hat{p}_A = 13/218 \approx 0.0596$. $\hat{p}_B = 33/232 \approx 0.142$. The difference between the rates is less than 0.10; Shipper A does not meet the threshold.
(c) Yes. The 95% confidence interval for $\hat{p}_B - \hat{p}_A$ is [0.0278 to 0.1375] (showing that values less than 0.10 are plausible). The data satisfy the conditions for this method.