2010 Q4

(a) expected number = expected value = mean, and SD of a distribution. Here, we have a sample of 2000 out of 297354 owners. each could be considered a "1 trial"...
- multiple trials of the same thing
- $p = P(\text{bought model E}) = \frac{2323}{297354} \approx .0078$

although this is technically sampling without replacement and probability of next owner buying E given last owner did is $\frac{2322}{297353}$, sampling only 2000 out of 297354 is far less than 10%, pop so we can assume the probability of success is constant.
- finding #Es out of 2000 in the sample = Binomial model w/ $n = 2000$, $p = \frac{2323}{297354} \approx .0078$

expected value of binomial $= \mu = np$
$= 2000\left(\frac{2323}{297354}\right) = \boxed{15.62 \text{ cars}}$

standard deviation of binomial $= \sqrt{np(1-p)}$
$= \sqrt{2000(.0078)(1-.0078)} = \boxed{3.93 \text{ cars}}$

(b) let X be a random variable for # of E models in the sample of 2000.
possible values of X are:

X | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 ---------- 2000

$P(X<12) = \text{binomcdf}(2000, .0078, 11) = \boxed{.1471}$
(n, p, x)

(c) One method to use would be stratified random sampling, taking an SRS from each car model to ensure some from each. we could choose the sample size for each model to be proportional to number of cars sold, like this...

Model	A	B	C	D	E
% of all sold	37.8%	32.3%	28.0%	1.1%	0.78%
this % of $n=2000$	756	646	560	22	16 ← cars sampled with an SRS from each model

↑ even the smallest is above the requirement of at least 12 for each model.