16 total

Name:________________________ Section: (day/time) ________________________

AMS5 - Quiz 3
Thursday 18th February, 2016

$\boxed{1}$ $\boxed{0}$

$\boxed{8}$ 1. A coin is tossed 100 times. True or false, and explain

(a) The expected value for the number of heads is 50.

1 + 1 True : EV = # draws x mean of box

$= 100 \times \frac{1+0}{2} = 50$.

(b) The expected value for the number of heads is 50, give or take 5 or so.

1 + 1 False : there is no variability in the expected value.

(c) The number of heads will be 50.

1 + 1 False (most likely) - there is chance variability in the # of heads in 100 tosses

(d) The number of heads will be around 50, give or take 5 or so.

1 + 1

$SE = \sqrt{\#\text{ draws}} \times SD_{box}$

$= \sqrt{100} \times (1-0)\sqrt{\frac{1}{2} \times \frac{1}{2}}$

$= 10 \times \frac{1}{2}$

$= 5$

True : # heads will be Expected Value ± SE

50 ± 5

4

2. A box contains ten tickets, four marked with a positive number, and six with a negative number. All the numbers are between -10 and 10. One thousand draws will be made at random with replacement from the box. You are asked to estimate the chance that the sum will be positive.

(a) Can you do it on the basis of the information already given? Explain briefly.

No, we need some information about the distribution of the numbers.

1 + 1

eg could have $4 \times \boxed{10} + 6 \cdot \boxed{-1}$ or $4 \times \boxed{1}$ and $6 \times \boxed{-10}$ very different chances

(b) Can you do it if you are also told the average and SD of the numbers in the box, but are not told the numbers themselves? Explain briefly.

1 + 2

Yes - use the normal approximation ~~base~~

find expected value (= average of box, given).

SE_{sum} (= $\sqrt{\#\text{draws}} \times SD_{box}$, also given)

find area under normal curve to rt of zero converted to standard units

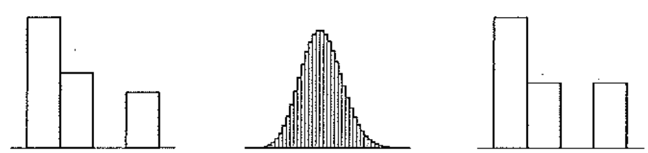
4

3. Twenty draws are made at random with replacement from the box

$\boxed{1}\ \boxed{1}\ \boxed{2}\ \boxed{4}$

One of the graphs below is the probabilty histogram for the average of the draws. Another is the histogram for the numbers drawn. And the third is the histogram for the contents of the box. Which is which? Explain.

$\frac{1}{2} + \frac{1}{2}$



numbers drawn — average — contents of box

(i) (ii) (iii)

no variability around $\frac{1}{2}, \frac{1}{4}, 0, \frac{1}{4}$

1 + 1 + 1

shows sampling variability around the predicted values from the probability of each outcome.

average of draws follows normal curve