Math 10 Spring 2010 Quiz 6

Name: KEY May 21, 2010

(7) (1) A gardening shop advertises that 20% of their mixed-color tulip bulbs give yellow tulips. The bulbs arrive at the shop pre-mixed in a large bin. A customer who placed a large order for 100 tulips found that 26 of them were yellow. Is this evidence that the advertised percentage is inaccurate? A portion of the normal curve table of areas and χ^2 curve table of areas are reproduced below.

Box model
$2\times[1], 8\times[0]$
↑ yellow ↑ not yellow

(ori prob dist

color	prob
yellow	20%
other	80%

)

Box $\begin{cases} \text{mean} = 0.2 \\ SD = \sqrt{\frac{1}{5}\cdot\frac{4}{5}} = \frac{2}{5} \end{cases}$

Sample of 100 $\begin{cases} EV = 20 \\ SE = 10\cdot\frac{2}{5} = 4 \end{cases}$

$$z = \frac{26-20}{4} = 1.5$$

$$p = \frac{100-86.64}{2} = 6.68\%$$

$p > 5\%$, so accept 26 as consistent with 20%

Abridged table of areas from $-z$ to z under the standard normal curve

z	area	z	area	z	area
0.50	38.29	1.00	68.27	1.65	90.11
0.70	51.61	1.30	80.64	2.00	95.45
0.85	60.47	1.50	86.64	2.35	98.12

Abridged table of areas to the right of χ^2 for certain degrees of freedom

d.f.	99%	95%	5%	1%
2	0.02	0.1	5.99	9.21
3	0.12	0.35	7.82	11.34
4	0.3	0.71	9.49	13.28

(9) (2) The same gardening shop sells packets of morning glory seeds that are in a mixture of colors. The packet says the flowers of the plants grown from these seeds should be 15% dark purple, 30% light purple, 20% pink, and 35% white. A customer's packet of 50 seeds turns out 5 dark purple-flowered plants, 18 light purple, 11 pink, and 16 white. Does it seem that something might have been going wrong with the machinery that mixes the seeds? Refer to the previous page for the normal curve and χ^2 curve tables.

	observed	expected
DP	5	7.5
LP	18	15
Pi	11	10
Wh	16	17.5
	50	50

$$\chi^2 = \frac{(5-7.5)^2}{7.5} + \frac{(18-15)^2}{15} + \frac{(11-10)^2}{10} + \frac{(16-17.5)^2}{17.5}$$

$$= 1.66$$

degrees of freedom = $4 - 1 = 3$

$\chi^2 = 1.66$ gives P somewhere between 5% and 95%

so this is within expected range for the number of each color.