

QUANTITATIVE METHODS

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Assignment 12

SOLUTIONS

This assignment is due **Wednesday March 16**. A copy of your Excel work must be send by e-mail.

Questions 1 and 2 are to be done by hand, while question 3 is to be done with Excel.

Question 1 (10 points)

Here is the probability distribution for the number of teachers absent on a given day at SLC.

x	$p(x)$	$xp(x)$	$x^2p(x)$
0	0.41	0.00	0.00
1	0.37	0.37	0.37
2	0.16	0.32	0.64
3	0.05	0.15	0.45
4	0.01	0.04	0.16
		0.88	1.62

- a) Find the probability that at least 2 teachers are absent.

$$P(x \geq 2) = P(2) + P(3) + P(4) = 0.16 + 0.05 + 0.01 = 0.22$$

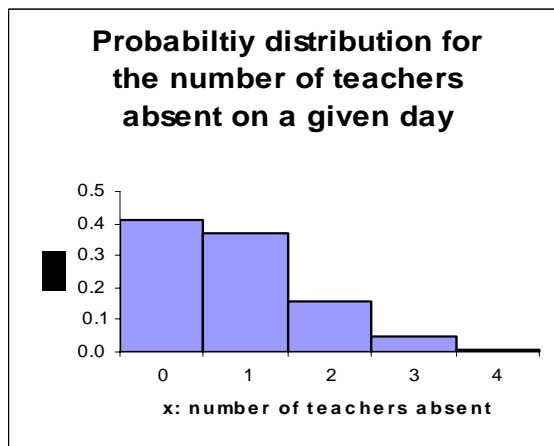
- b) How many teachers are expected to be absent?

$$\mu = \sum xp(x) = 0.88 \text{ teachers}$$

- c) Find the standard deviation of this probability distribution.

$$\sigma = \sqrt{\sum x^2 p(x) - \mu^2} = \sqrt{1.62 - 0.88^2} = 0.92 \text{ teachers}$$

- d) Draw a histogram for this probability distribution.



Question 2 (5 points)

Consider the following distribution, where x represents the amount of money (in \$) that you could win with a Quebec 49 lotto ticket and $p(x)$ the probability of the event.

Ticket	x	$p(x)$	$xp(x)$
6/6	1 000 000	0.000000072	0.0720
5/6+	50 000	0.000000429	0.0215
5/6	500	0.000018450	0.0092
4/6	50	0.000968620	0.0484
3/6	5	0.017650404	0.0883
No win	0	0.981362455	0.0000
			0.2394

- a) How much money can you expect to win with a ticket? (Find the mean.)

$$\mu = \sum xp(x) = 0.2394 \quad \text{Thus, you are expected to win 24 cents.}$$

- b) A Quebec 49 lotto ticket costs \$0.50. What percentage of this is given as prize money and what percentage is kept by Lotto Quebec?

$$\text{Prize Money: } \frac{0.2396}{0.5} = 0.4792 \approx 48\%$$

$$\text{Money kept by lotto Quebec: } \frac{1 - 0.2396}{0.5} = 0.5218 \approx 52\%$$

This question is to be done using Excel

Question 3 (10 points)

Here is the probability distribution for the number of magazine subscriptions sold per evening by a door-to-door salesman.

x	0	1	2	3	4	5	6	7
$p(x)$	0.08	0.21	0.26	0.21	0.13	0.07	0.03	0.01

- Find the probability that the salesman will sell more than 4 magazine subscriptions this evening.
- Find the probability that the salesman will sell at least one magazine subscription this evening.
- Compute μ , the expected number of magazine subscriptions sold by the salesman during an evening
- Compute σ , the standard deviation of the number of magazine subscriptions sold by the salesman during an evening.
- Sketch a graph of the probability distribution.

Probability Distribution				
x	$P(x)$	$xP(x)$	$x^2P(x)$	
0	0.08	0.00	0.00	
1	0.21	0.21	0.21	
2	0.26	0.52	1.04	
3	0.21	0.63	1.89	
4	0.13	0.52	2.08	
5	0.07	0.35	1.75	
6	0.03	0.18	1.08	
7	0.01	0.07	0.49	
	1.0000	2.48	8.54	
a) $P(x > 4) = 0.11$				
b) $P(x \geq 1) = 0.92$				
c) $\mu = 2.48$ magazine subscriptions				
d) $\sigma = 1.55$ magazine subscriptions				