Practical 5

Exercise P1
1. Open your textbook on p.237 Table 5.5 and Table 5.6 at the **DiCarlo Motors** example.

2. Enter the data in Table 5.5 into a new Excel spread sheet in columns A and B.

   $x =$ the number of automobiles sold during a day at *DiCarlo Motors*

   By making use of the explanation on p.238 in the textbook, calculate the expected value, variance and standard deviation for x. Compare your answers with Figure 5.2 on p.238 in the textbook.

Exercise P2
The probability distribution for the number of television sets per household in New Orleans is shown. Answer the following questions by making use of Excel 2010.

a. Compute the expected value, variance and standard deviation of the number of television sets per household by making use of Excel 2010.

Figure 7.1: Formula Worksheet

	A	B	C
1	x	f(x)	Sq Dev from mean
2	0	0.01	=(A2-B9)^2
3	1	0.23	=(A3-B9)^2
4	2	0.41	=(A4-B9)^2
5	3	0.20	=(A5-B9)^2
6	4	0.10	=(A6-B9)^2
7	5	0.05	=(A7-B9)^2
8			
9	Mean:	=SUMPRODUCT(A2:A7,B2:B7)	
10			
11	Variance:	=SUMPRODUCT(C2:C7,B2:B7)	
12			
13	Std. Deviation:	=SQRT(B11)	

Figure 7.2: Value Worksheet

	A	B	C
1	x	f(x)	Sq Dev from mean
2	0	0.01	5.29
3	1	0.23	1.69
4	2	0.41	0.09
5	3	0.20	0.49
6	4	0.10	2.89
7	5	0.05	7.29
8			
9	Mean:	2.3	
10			
11	Variance:	1.23	
12			
13	Std. Deviation:	1.10905	

b. Answer the following questions with Excel 2010.

(i) The probability that a household has at most 2 TV's *i.e.* $P(x \leq 2)$
(ii) The prob. that a household has more than 2 TV's *i.e.* $P(x > 2)$
(iii) The prob. that a household has less than 4 TV's *i.e.* $P(x < 4)$
(iv) The prob. that a household has at least 1 TV *i.e.* $P(x \geq 1)$
(v) The prob. that a household has between 1 and 5 TV's *i.e.* $P(1 < x < 5)$

Figure 7.3 Formula and Value Worksheet

	A	B	C
1	x	f(x)	
2	0	0.01	
3	1	0.23	
4	2	0.41	
5	3	0.20	
6	4	0.10	
7	5	0.05	
8			
9	Answers of P2 (b):		
10			
11	i	=SUM(B2:B4)	
12	ii	=SUM(B5:B7)	
13	iii	=SUM(B2:B5)	
14	iv	=SUM(B3:B7)	
15	v	=SUM(B4:B6)	

	A	B
1	x	f(x)
2	0	0.01
3	1	0.23
4	2	0.41
5	3	0.20
6	4	0.10
7	5	0.05
8		
9	Answers of P2 (b):	
10		
11	i	0.65
12	ii	0.35
13	iii	0.85
14	iv	0.99
15	v	0.71

Using Excel to compute Binomial probabilities:
- To calculate the probability distribution $f(x)$ of x use the formula
  =BINOM.DIST($x, n, p, FALSE$).

- To calculate the cumulative probability distribution of x use the formula
  =BINOM.DIST($x, n, p, TRUE$).

Exercise P3

1. Open your textbook on p.258 Fig 5.6 (Martin Clothing $n = 3$) and on p.259 Fig 5.7 (Martin Clothing $n = 10$).

2. Re-do the case where $n = 10$ customers (Re-do fig 5.7). Let $x =$ the number of customers making a purchase. The probability of a customer making a purchase is $p = 0.3$.

   Calculate the probability distribution and the cumulative probability distribution of x. Use the BINOM.DIST function as explained on p. 258. Compare your results with that of Figure 5.7 on p.259.

Exercise P4
Use Excel to answer the following Binomial problem (Exercise 41 on p.262 of textbook):

A university found that 20% of its students withdraw without completing the introductory statistics course. Assume that 20 students registered for the course.
   a) Compute the probability that two or fewer will withdraw.
   b) Compute the probability that exactly four will withdraw.
   c) Compute the probability that more than three will withdraw.
   d) Compute the expected number and variance of withdrawals.

Formula sheet:

	A	B	C	D
1			Number of trials(n)	20
2			Probability of withdrawal	0.2
3				
4		x	f(x)	Cum prob
5		0	=BINOM.DIST(B5,D1,D2,FALSE)	=BINOM.DIST(B5,D1,D2,TRUE)
6		1	=BINOM.DIST(B6,D1,D2,FALSE)	=BINOM.DIST(B6,D1,D2,TRUE)
7		2	=BINOM.DIST(B7,D1,D2,FALSE)	=BINOM.DIST(B7,D1,D2,TRUE)
8		3	=BINOM.DIST(B8,D1,D2,FALSE)	=BINOM.DIST(B8,D1,D2,TRUE)
9		4	=BINOM.DIST(B9,D1,D2,FALSE)	=BINOM.DIST(B9,D1,D2,TRUE)
10				
11			Expected value	=D1*D2
12			Variance	=D1*D2*(1-D2)

Value sheet:

	A	B	C	D
1			Number of trials(n)	20
2			Probability of withdrawal	0.2
3				
4		x	f(x)	Cum prob
5		0	0.0115	0.0115
6		1	0.0576	0.0692
7		2	0.1369	0.2061
8		3	0.2054	0.4114
9		4	0.2182	0.6296
10				
11			Expected value	4
12			Variance	3.2

Answers:

   a) $P(x \leq 2) = 0.2061$
   b) $f(4) = 0.2182$
   c) $P(x > 3) = 1 - P(x \leq 3) = 1 - 0.4114 = 0.5886$
   d) $E(x) = 4$ and $Var(x) = 3.2$

Exercise P5
Use Excel to solve the Binomial problem in the textbook: **Exercise 42 on p.263**.
(Similar to Exercise P4) *Compare your answers to the textbook answers on p.970-971.*