Practical 7

Using Excel 2010 to select a simple random sample (without replacement)

Simple random sampling approach:
1. First assign a random number to each of the elements in the population.
2. Select the ***n*** elements with the smallest random numbers assigned to them.
3. Using this approach will for the most part eliminate the chance of selecting the same element twice from the population.

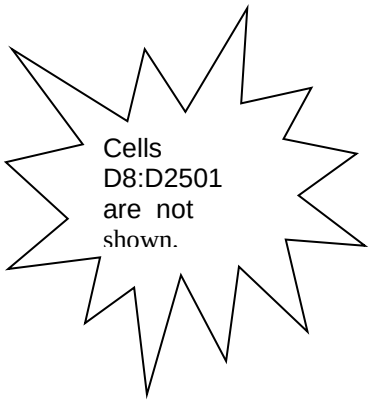
Steps:
1. Open textbook on page 319.
   Exercise: Select a simple random sample of 30 managers from 2500 managers.
2. **Enter data:** On the computer, open the **EAI** file on ClickUP in the ***Data files for Practicals*** folder.
3. Type the following formula into cell D2: =rand(). This function will generate a random number between 0 and 1, WHICH WILL NOT BE THE SAME AS THE NUMBER GENERATED IN THE TEXTBOOK, BECAUSE THIS IS A RANDOM NUMBER.

D2 | = | =RAND()

	A	B	C	D
1	Manager	Annual Salary	Training Program	Random numbers
2	1	55769.50	No	0.41884
3	2	50823.00	Yes	
4	3	48408.20	No	
5	4	49787.50	No	
6	5	52801.60	Yes	

4. Copy the formula in D2 to the rest of the elements in the population in cell D3: D2501, by dragging the formula down the column.

	A	B	C	D
1	Manager	Annual Salary	Training Program	Random numbers
2	1	55769.50	No	0.39757
3	2	50823.00	Yes	0.67243
4	3	48408.20	No	0.17564
5	4	49787.50	No	0.15561
6	5	52801.60	Yes	0.50606
7	6	51767.70	No	0.19933



Turn off the automatic recalculation option for the worksheet. Select **Formulas** on the **Ribbon,** select the **Calculation options** tab, and in the calculation section select **Manual.** If we had not turned off automatic recalculation, the random numbers in column D would not have appeared in ascending order. In other words, if the automatic recalculation option is not turned off when the sort operation takes place Excel will do a recalculation and a new set of random numbers will be generated.

6. To find the managers with the 30 smallest random numbers, sort the data in column A to D in ascending order by the random numbers in column D

   i) Select any cell in the range D2: D2501
   ii) Click the **Home** tab on the **Ribbon**
   iii) In the **Editing** group, click **Sort and Filter**
   iv) Choose **Sort Smallest to Largest**

NOTE: The simple random sample of 30 managers which you will select will **NOT** be the same as the simple random sample of managers selected in the textbook, since different random numbers are generated each time this procedure is used.

Exercise P1 - Point estimation

1. Open your textbook on p.325 at exercise 9. Enter the 5 months of sales data on a new spread sheet. Calculate exercise 9a and b by using Excel 2010 as shown in the spread sheets below.

Formula sheet

	A	B	C	D
1	1	94	Point estimate of population mean:	=AVERAGE(B1:B5)
2	2	100	Point estimate of population std deviation:	=STDEV.S(B1:B5)
3	3	85		
4	4	94		
5	5	92		

Value sheet

	A	B	C	D
1	1	94	Point estimate of population mean:	93
2	2	100	Point estimate of population std deviation:	5.3852
3	3	85		
4	4	94		
5	5	92		

2. Do Exercise 10 on p.325 by making use of Excel 2010. Open the **Morningstar data** file on ClickUP in the ***Data files for Practicals*** folder. *Compare your answers with the textbook answers on p.974*

Exercise P2 - Sampling distribution for $\bar{x}$

CUMULATIVE PROBABILITY FORMULA IN GENERAL: =NORM.DIST($\bar{x}$, μ, $\frac{\sigma}{\sqrt{n}}$, TRUE)

SAMPLE AVERAGE FORMULA IN GENERAL: =NORM.INV(area to the left, μ, $\frac{\sigma}{\sqrt{n}}$)

1. Open your textbook on p.337 at exercise 20. Calculate exercise 20 by using Excel 2010 as shown in the spread sheets below.

   20a. $\bar{x}$ is normally distributed with $E(\bar{x}) = 17.5$ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{4}{\sqrt{50}} = 0.57$

Formula sheet

	A	B	C
1	b.	P(16.5 < xbar < 18.5)	=NORM.DIST(18.5,17.5,0.57,TRUE)-NORM.DIST(16.5,17.5,0.57,TRUE)
2	c.	P(17 < xbar <18)	=NORM.DIST(18,17.5,0.57,TRUE)-NORM.DIST(17,17.5,0.57,TRUE)

Value sheet

	A	B	C
1	b.	P(16.5 < xbar < 18.5)	0.9206
2	c.	P(17 < xbar <18)	0.6196

Exercise P3 - Sampling distribution for $\bar{p}$

CUMULATIVE PROBABILITY FORMULA IN GENERAL: = NORM.DIST($\bar{p}$, p, $\sigma_{\bar{p}}$, TRUE)

SAMPLE PROPORTION FORMULA IN GENERAL: =NORM.INV(area to the left, p, $\sigma_{\bar{p}}$)

where $\sigma_{\bar{p}} = \sqrt{\frac{p(1-p)}{n}}$

1. Open your textbook on p.344 at exercise 34. Calculate exercise 34 by using Excel 2010 as shown in the spread sheets below.

   34a. $\bar{p}$ is normally distributed because $np = 126\ and\ n(1-p) = 274$ – both greater than 5. $E(\bar{p}) = 0.42$ and $\sigma_{\bar{p}} = \sqrt{\frac{(0.42)(0.58)}{300}} = 0.0285$

Formula sheet

	A	B	C
1	b.	P(0.37 < pbar < 0.47)	=NORM.DIST(0.47,0.42,0.0285,TRUE)-NORM.DIST(0.37,0.42,0.0285,TRUE)

Value sheet

	A	B	C
1	b.	P(0.37 < pbar < 0.47)	0.9206

c. Larger samples will increase the probabilities.