



## Random sampling

Selecting packages at random either by:

- **Number**; from stock, or
- **Time**; direct from the production line





# Random sampling

## Determining sample size ( $n$ )

- First, we need to know the **inspection lot size**
- Consult R87 Table 2 to determine **sample size**
- This allows us to prepare an appropriate random sampling plan

## Random sampling

Choosing a random sample not collected from the production line:

- Pallets and pallets of product





# Random sampling

## ‘Mechanical’ method

- Start by allocating a reference number to each prepackage in the inspection lot



# Random sampling

## 1. 'Drawing cards from a hat'

- Record the numbers allocated to the individual prepackages in some physical way i.e. on cards, slips of paper etc
- After thoroughly mixing, choose as many cards etc. as there are prepackages needed for the sample
- The corresponding prepackages of the inspection lot will then make up the sample



# Random sampling

## 2. Random number tables

- Any position in the table has a probability of 0.1 of being occupied by any particular digit
- Select a starting point by using a random procedure
  - For example, use Table 1 on a Monday, Table 2 on a Tuesday etc
  - Then stab the page with a pin to begin
- Start taking random digits top to bottom & left to right or vice versa



# Random sampling

## 2. Random number tables

- For a lot containing up to 999 pre-packages use 001, 002, ....999
- Ignore any triplet outside the sample size range
- Similarly for lot sizes between 1000 and 9999 use four digit numbers



## Random sampling

### 3. Random number generation using excel

An excel spreadsheet can generate random numbers by using function “**=RANDBETWEEN(low,high)**”

- **low** being 0, and
- **high** being the number of prepackages in the inspection lot



## Random sampling

### 4. Random number generation using a calculator

Many calculators can generate random numbers between 0.000 and 0.999 inclusive



# Random sampling

## Worked example:

- To choose a random sample of 49 prepackages from a lot size of 100 (**R 87 Table 2**)
- **Allocate** each of the 100 packages in the lot their own reference number i.e. 1, 2....100
- Generate a random sequence of numbers (as per previous slides)



# Random sampling

## Worked example:

49 randomly generated numbers from 1 to 100

5	6	99	1	68	91	84	89	61	79
86	69	26	49	11	22	72	50	80	97
92	77	10	24	8	95	32	25	29	18
67	55	4	19	9	37	2	41	33	52
45	38	30	47	13	7	14	21	43	



# Random sampling

## Worked example:

1	7	13	22	30	41	50	68	80	92
2	8	14	24	32	43	52	69	84	95
4	9	18	25	33	45	55	72	86	97
5	10	19	26	37	47	61	77	89	99
6	11	21	29	38	49	67	79	91	



# Random sampling

## Worked example:

- Select your samples starting from 1, 2, 4, 5, 6...
- Now you can conduct your reference test to determine the individual error on each prepackage





# Random sampling

## Choosing a random sample from the production line:

- Reference test completed using samples taken from 1 hour of production
- Lot size will equal the total hourly output of the production line
- Each sample to be taken is given a random time
- Take the samples after the point of final checks by the packer from the production line
- Remember to stop the clock when production stops

# Random sampling





# Random sampling

## Choosing a random sample from the production line procedure:

- Divide the hour into 3600 seconds
- Choose the random times in the range from 0001 to 3600 for the required sample size
- Use one of the 4 methods explained previously:
  - Drawing cards from a hat
  - Random number tables
  - Generate from excel
  - Generate from a calculator



## Random sampling

- The following sequence of numbers would produce the corresponding times throughout the hour:
  - 1287 = 21 min 27 sec
  - 1936 = 32 min 16 sec
  - 1677 = 27 min 57 sec

List your times into chronological order and begin taking the required samples



# Random sampling

- Fortunately the excel R 87 template has an inbuilt random number and time generator

**Quantity of product in prepackages - OIML R87:2004**  
Reference Test Spread Sheet V 01.5.2016  
Licensed to Ministry of Business, Innovation & Employment

Fill in the green and blue panels only. Press Tab after each data entry.

**Numbers and characters can be used in the green sections**  
**Use numbers only in blue (or if required white) sections**  
**Instructions and error messages are in red** (Note: when correct entry made instruction deletes)

It is important to complete all sections on each page.  
Cells with a red triangle in the top right contain tips. Rest the mouse pointer over these cells to read.

To **print** ensure the page you want to print is displayed  
Select File, Print, All, Active Sheet(s), OK.  
**Note: Do NOT select workbook.** Contact: [srinivas.bobbala@mbie.govt.nz](mailto:srinivas.bobbala@mbie.govt.nz)

**START TEST**

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Random Time      Random Number Tables