

Random sampling

Selecting packages at random either by:

- **Number**; not from the production line, or
- **Time**; from the production line

First determine the **inspection lot size** and the **sample size**

Random sampling

Determine the **inspection lot size** (N)

- From production line at the packer; use **max hourly output** figure
- Not from production line at the packer; use **max hourly output** figure or **100,000** (whichever is lesser)

Random sampling

Determine the **inspection lot size** (N)

- Not from the packer, unknown max hourly output and unknown lot size; **LMO discretion**, but no more than 100,000
- Generally the legal metrology official should take the number of prepackages **available** as the inspection lot size

Random sampling

Determine the **sample size** (n)

Inspection lot size N	Sample size n
20 or less	Total inspection
40	32
60	35
80	47
100	49

Inspection lot size N	Sample size n
200	64
300	67
400	81
500	81
600 to 100 000	98

Remember detailed sampling plans in Annex I

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:

In numerical order for convenience

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

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

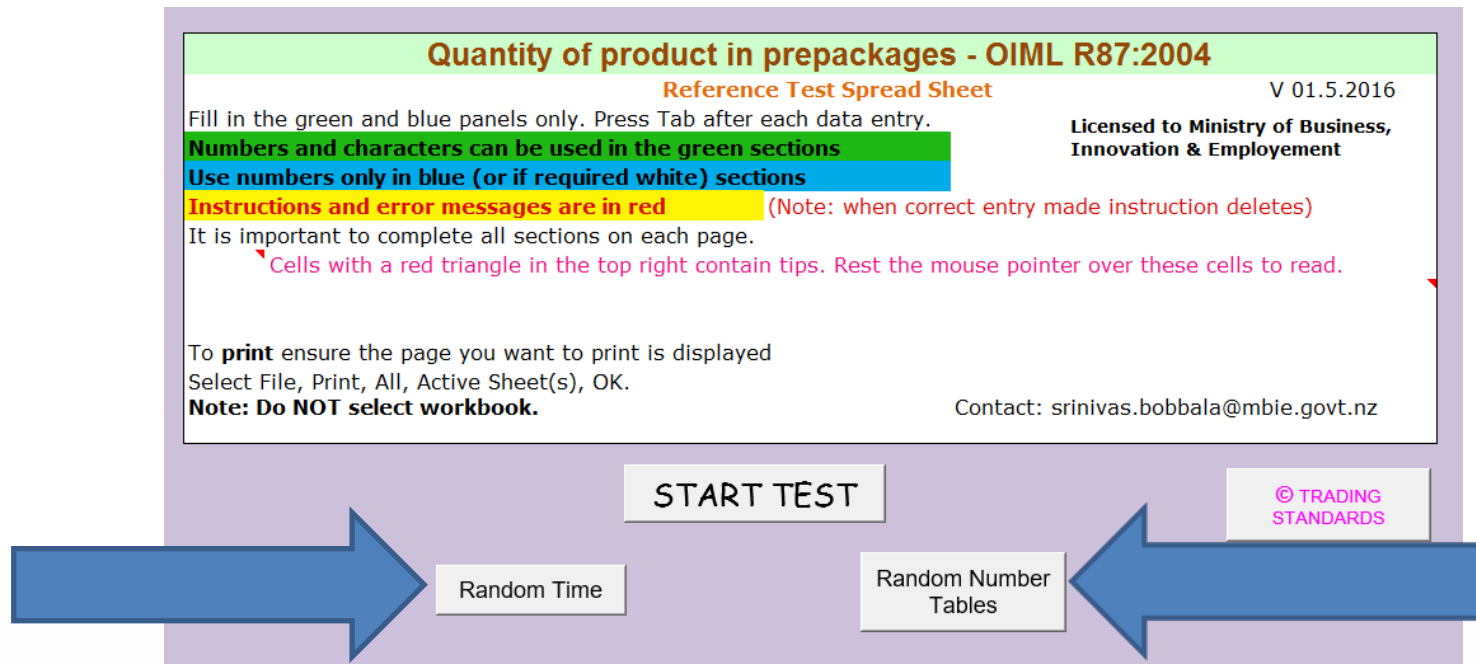
List your times into chronological order and begin taking the required samples

Random sampling

- Now that you have possession of the samples you are another step closer to being able to complete the reference test
- Ps there is good news on the next slide...

Random sampling

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



The screenshot shows the 'Quantity of product in prepackages - OIML R87:2004' Reference Test Spread Sheet. The interface includes a title bar, a header section with instructions, a main content area with colored panels for data entry, and a footer with navigation buttons. A large blue arrow points from the 'Random Time' button to the 'START TEST' button, and another large blue arrow points from the 'Random Number Tables' button to the 'START TEST' button.

Quantity of product in prepackages - OIML R87:2004
Reference Test Spread Sheet V 01.5.2016
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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

START TEST

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Random Time **Random Number Tables**