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Coincidence in Runs and Clusters

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May, 2012
Slides at www.StatLit.org/pdf/2012Schield-eCOTS-6up.pdf

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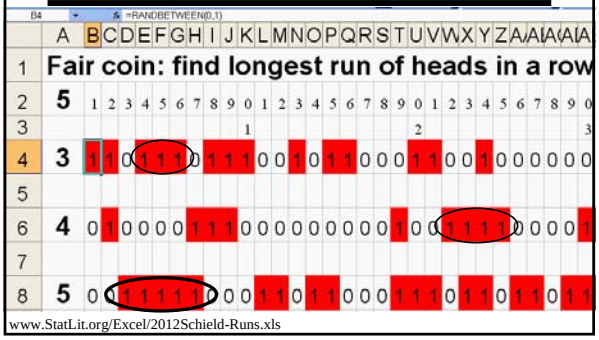
Coincidence?

May 2012

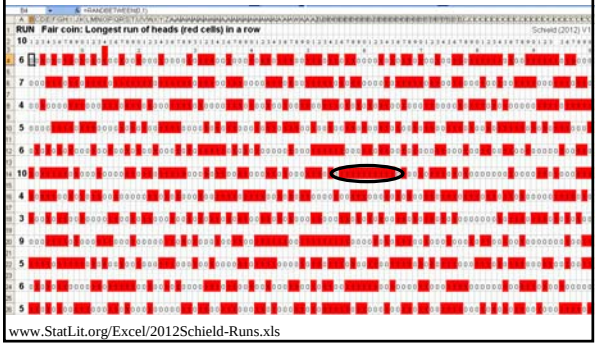
Run of Heads (Red Cells): Chance of 5 Touching: 1 in 32 (2^5)



www.StatLit.org/Excel/2012Schield-Runs.xls

May 2012

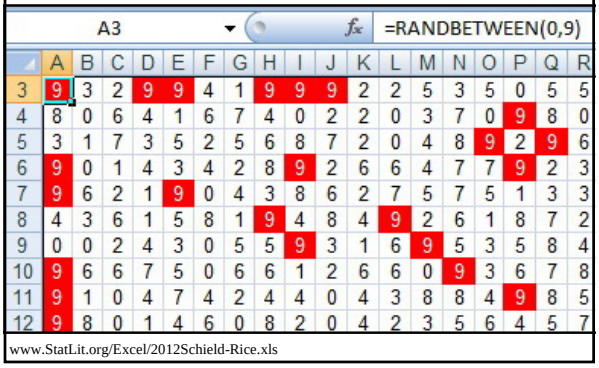
Run of 10 heads (Ones): Chance = 1 in 1,024 (2^10)



www.StatLit.org/Excel/2012Schield-Runs.xls

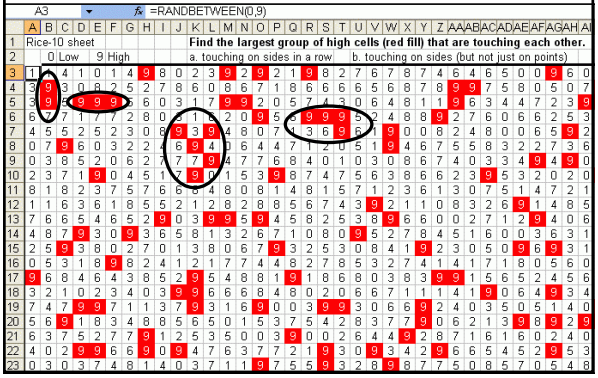
May 2012

Clusters of Rice Chance of Red: One in 10



www.StatLit.org/Excel/2012Schield-Rice.xls

Chance of a Red Cell: 1 in 10 Chance Two Reds Touch: 1 in 100



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Runs and clusters are much more likely than expected!

When students press F9, they often get:

RUNS	CLUSTERS
a run of 10 heads:	a cluster of six squares:
one chance in 2^10	one chance in 10^6
a "thousand-year flood" every year	a "million-year flood" every year

They get unlikely results every time!

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Runs and clusters are much more likely than expected!!!

WHY?

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Explanation #1

What is the chance of that?

I. The question is ambiguous?

- Before or after the fact (ex post vs. ex ante)
- Specific place or anywhere
- Painting the target before or after the shooting

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Explanation #2

Law of Very-Large Numbers:

'Impossible': almost certain given enough tries

The Law of Very-Large Numbers isn't covered in most intro-stats courses where the focus is on sampling error in small samples.

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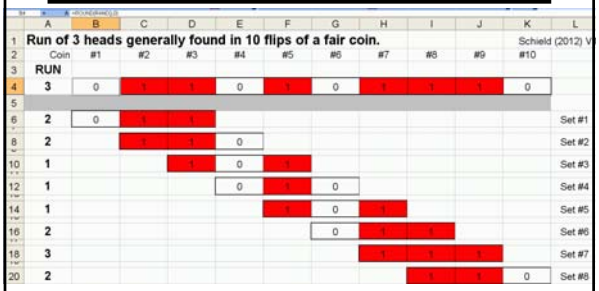
#3 Compression: Flipping 10 coins. Almost the same as 24: 8 sets of 3



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Students must "see" that coincidences:

are much more common than expected

1. **involve an ambiguity (ex-ante/ex-post)**
2. **involve the Law of Very-Large Numbers**
3. **involve compression**
4. **may still be signs of causation.**

Example: Cholera outbreak in London around a particular pump.