

Literacy & Numeracy for Probability and Statistics Teaching in Ireland

Workshop 5



An Phríomh-Oifig Staidrimh
Central Statistics Office

Outcomes when tossing two Coins

	H	T
H	H, H	H, T
T	T, T	T, T



Bernie O'Donoghue

Learning Intentions

- Rationale for Probability&Statistics in the mathematics syllabus and for professional career
- Understand the Language of Probability
- Appreciate Probability&Statistics for L&N Development

Mapping Numeracy to Mathematics

Stand 3 Number

**Think and communicate
quantitatively**

Strand 1 Statistics and Probability

Make sense of data

Strand 2 Geometry and Trigonometry

Have spatial awareness

Strand 4&5 Algebra & Functions

**Understand patterns and
sequences**

Solve problems

Data Deluge

THE JOY OF
STATS

with Professor **Hans Rosling**

Rationale

there is criticism in relation to the inclusion of some new topics, such as in statistics, at the expense of others, such as parts of the calculus section, which have not been retained.

Maths in Practice Report and Recommendations June 2014, p.10

Rationale for Literacy and Numeracy

Arthur Benjamin: Teach statistics before calculus!



ARTHUR **BENJAMIN**



0:18 / 2:58





PUPILS COLLABORATE
LEARNING FOR THE
FUTURE
MANAGEMENT
LEADERSHIP SKILLS

SCHOOL SELF-EVALUATION GUIDELINES 2016-2020

Post-Primary

Figure 2.1: THE SIX-STEP SCHOOL SELF-EVALUATION PROCESS



Statistics as a Problem Solving Process

communicate mathematics verbally and in written form

explain findings

justify conclusions

Literacy

explore patterns and formulate conjectures

apply their knowledge and skills to solve problems in
familiar and unfamiliar contexts

Numeracy

analyse information presented verbally and translate it into
mathematical form

devise, select and use appropriate mathematical models,
formulae or techniques to process information and to draw
relevant conclusions.

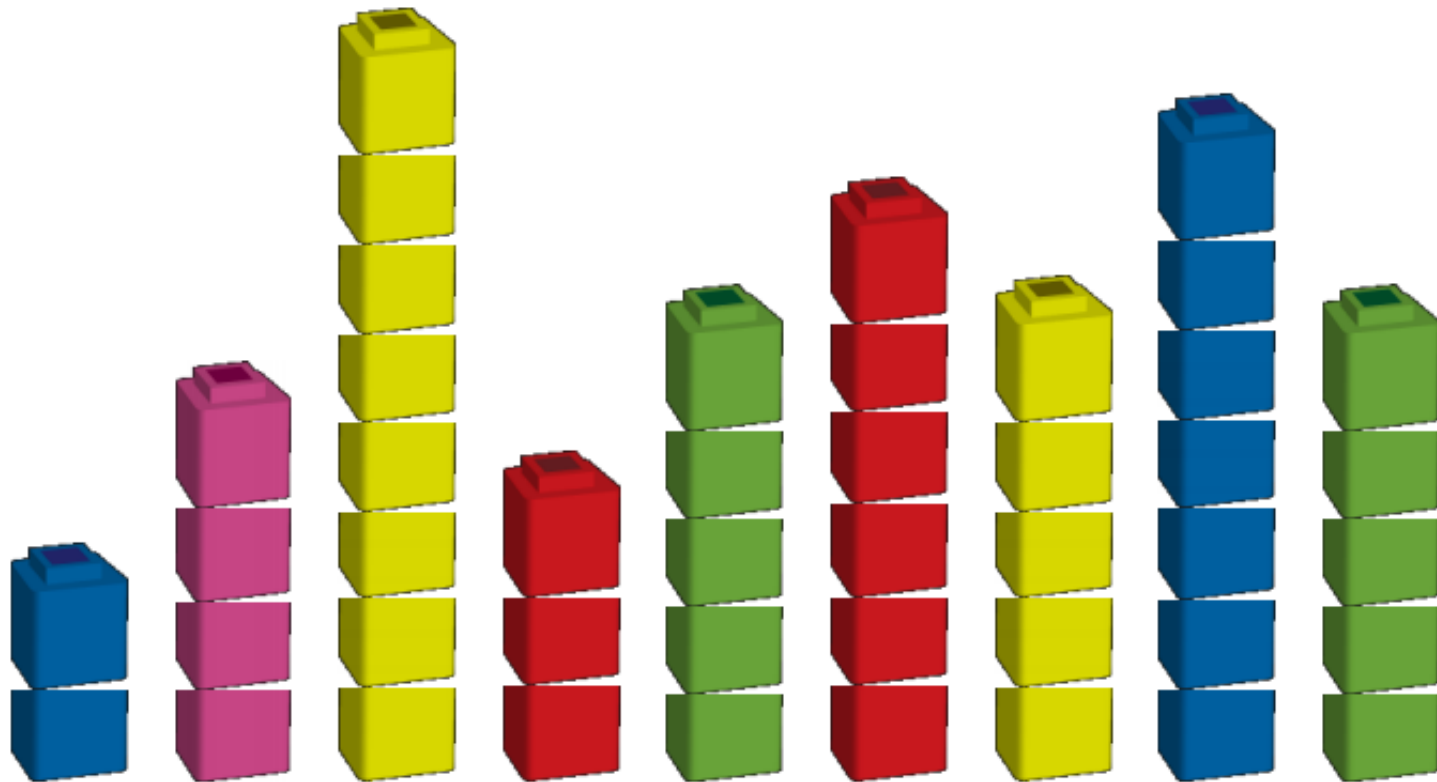
**Literacy and
Numeracy**

What does the mean mean?

2, 4, 8, 3, 5, 6, 5, 7, 5

What does the mean mean?

Fair & Unfair Allocations

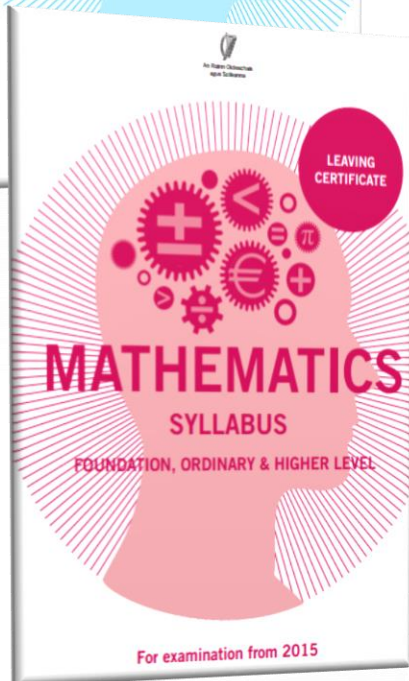
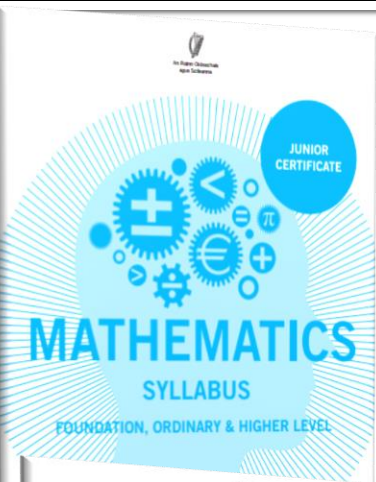


What is probability?

ratio of the number of chances of a specific event to the total number of chances possible.

Algebra Syllabus: Literacy and Numeracy

- encounter the language and concepts of probability.



Probability Literacy: Quiz

Outcome

Event

Sample Space

Independent Events

Successive Random Events

Probability Literacy: Quiz

Outcome

A result of a random process

Event

Set of outcomes of interest

Sample Space

Set of all possible outcomes

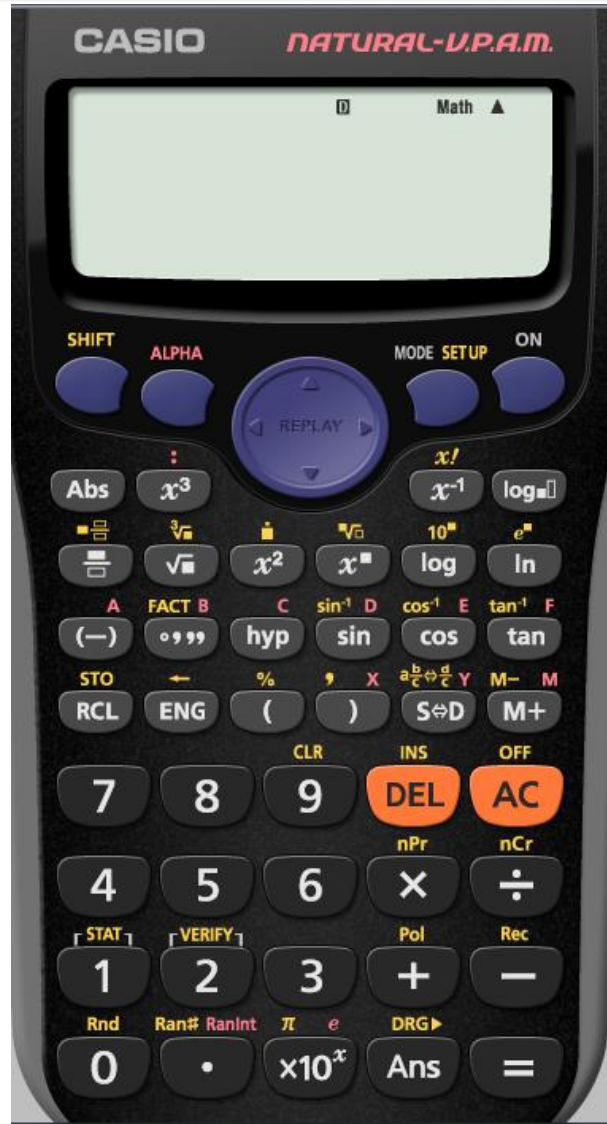
Independent events

The outcome of one event does not affect the outcome of another event

Successive Random Events

Events that occur in sequence

Numeracy in the Classroom: Random Number Generator



From Syllabus to Student Task

Question 6

(suggested maximum time: 10 minutes)
A bag contains red disks, blue disks and white disks. In an experiment, each student in a class of 24 takes out a disk, records the colour and replaces it. This is repeated ten times. The results from the class are recorded in the table below.

Colour	Red	Blue	White	Total
Frequency	123	78	39	
Relative frequency: $\frac{\text{frequency}}{\text{total}}$				
% of total (Relative frequency $\times 100$)				

- (a) In your opinion, why is the number for red greater than for blue or white?

- (b) Complete the table above.
- (c) Use the results from the table above to estimate the probability of getting each colour when a disk is taken from the bag.

Colour	Red	Blue	White
Probability			

- (d) Anne says that she thinks there are ten disks in the bag. Is this a reasonable suggestion? Explain your answer.

- (e) Based on the information in the table, how many disks of each colour do you think are in the bag?

Topic	Description of topic	Learning outcomes
1.1 Counting	Students learn about Listing outcomes of experiments in a systematic way, such as in a table, using sample spaces, tree diagrams.	Students should be able to – list all possible outcomes of an experiment – apply the fundamental principle of counting
1.2 Concepts of probability	The probability of an event occurring: students progress from informal to formal descriptions of probability. Predicting and determining probabilities. Difference between experimental and theoretical probability.	– decide whether an everyday event is likely or unlikely to occur – recognise that probability is a measure on a scale of 0-1 of how likely an event is to occur – use set theory to discuss experiments, outcomes, sample spaces – use the language of probability to discuss events, including those with equally likely outcomes – estimate probabilities from experimental data – recognise that, if an experiment is repeated, there will be different outcomes and that increasing the number of times an experiment is repeated generally leads to better estimates of probability – associate the probability of an event with its long-run, relative frequency
1.3 Outcomes of simple random processes	Finding the probability of equally likely outcomes.	– construct sample spaces for two independent events – apply the principle that, in the case of equally likely outcomes, the probability is given by the number of outcomes of interest divided by the total number of outcomes (examples using coins, dice, spinners, containers with different coloured objects, playing cards, sports results, etc.) – use binary / counting methods to solve problems involving successive random events where only two possible outcomes apply to each event

Literacy & Numeracy: Assessment

(c) Three coins are tossed. Each coin gives either a head or a tail.

- (i) Write down all the possible outcomes. For example, “H, T, H” or “head, tail, head” is one possible outcome.
- (ii) Find the probability that the result is three tails.
- (iii) Find the probability that the result includes no more than one head.
- (iv) Find the probability that the result has at least one head.

LCOL2006,Q6(c)

Pauline flips a fair coin 3 times, and records the outcomes.
She writes *H* for each head and *T* for each tail.

- (i) Complete the table below to show all of the possible outcomes.
Two outcomes have already been filled in for you.

JCHL, 2014, Q1

<i>H H H</i>	
<i>H H T</i>	

- (ii) Find the probability of getting two heads and one tail.
- (iii) Jamie says: “You have the same probability of getting three heads as you do of getting two heads and one tail.”
Do you agree with Jamie? Give a reason for your answer.

Why toss coins? Numeracy

*Places with the fewest men per
100 women in 2015*

	MEN PER 100 WOMEN
Martinique	84.5
Latvia	84.8
Lithuania	85.3
Curaçao	85.6
Guadeloupe	86.0
Ukraine	86.3
Armenia	86.5
Russia	86.8
Belarus	86.8
Estonia	88.0
El Salvador	88.4
Hong Kong	88.5
Portugal	89.9
Aruba	90.6
Hungary	90.8
WORLD	101.8

Note: Bold red text indicates former Soviet republics.

Source: United Nations, DESA. World Population Prospects: The 2015 Revision.

PEW RESEARCH CENTER



An Phríomh-Oifig Staidrimh
Central Statistics Office

Numeracy: Real Life Context

- ☒ All Ireland Series
- ☒ LEAGUE

Select # of Games To Show
To 10



ANTRIM	W	L	L	L	L	L	D	W	W	W
ARMAGH	W	L	D	L	L	L	W	D	D	L
CARLOW	W	L	D	L	W	L	L	W	L	W
CAVAN	D	L	L	W	L	D	W	L	W	W
CLARE	L	W	D	L	W	W	W	L	W	W
CORK	W	L	D	L	W	W	L	L	W	W
DERRY	W	L	D	L	W	W	W	L	L	D
DONEGAL	D	W	L	L	W	L	W	D	W	L
DOWN	W	L	L	L	L	L	L	L	L	L
DUBLIN	D	D	W	W	D	W	W	W	W	W
FERMANAGH	L	L	W	L	W	L	W	D	D	L
GALWAY	W	W	D	L	W	D	W	L	D	D
KERRY	L	L	W	L	W	W	W	L	W	W
KILDARE	L	W	W	L	W	L	W	L	W	W
LAOIS	L	W	L	L	W	W	L	W	L	L

Evaluation