Mathematics: the ultimate fortune teller

Marcus du Sautoy University of Oxford

- **1** 3 6 10 15 21 28
- 1 1 2 3 5 8 13 21
- 1 2 4 8 16
- · 2 9 10 11 13 16
- 2 3 5 7 11 13 17 19

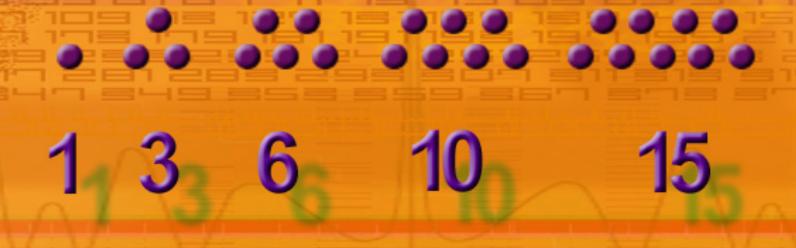
1 3 6 10 15 21 28 36 45

The Triangular Numbers

• 1 1 2 3 5 8 13 21

- 1 2 4 8 16
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- **2** 3 5 7 11 13 17 19

Triangular Numbers



1 3 6 10 15 21 28 36 45

The Triangular Numbers

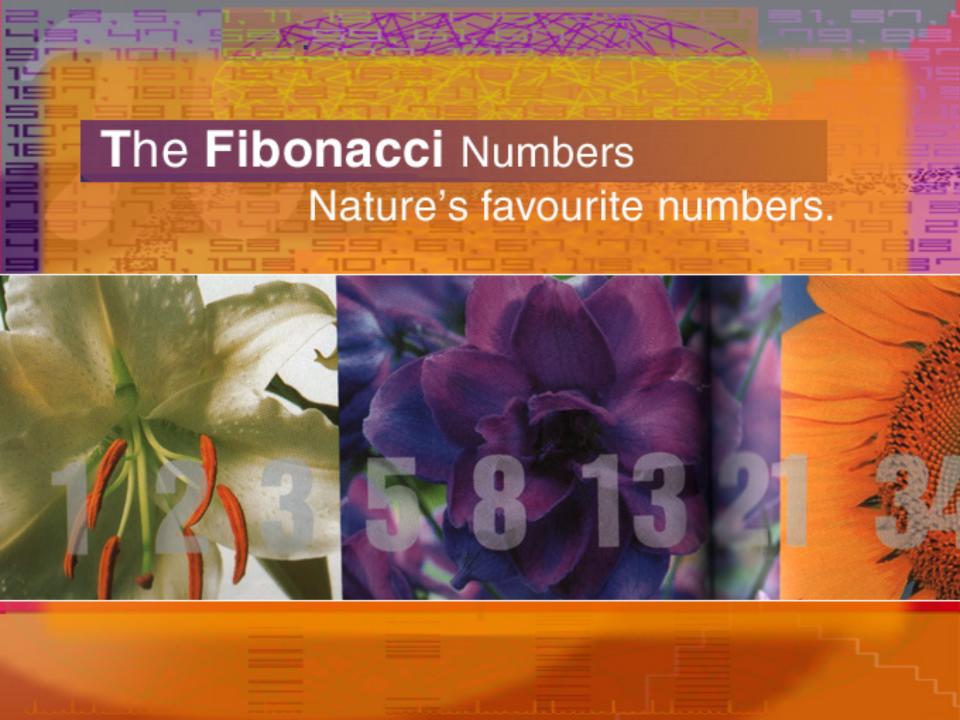
• 1 1 2 3 5 8 13 21

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- **1** 3 6 10 15 21 28 36 45
 - The Triangular Numbers
- 1 1 2 3 5 8 13 21 34 55

The Fibonacci Numbers

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 - The Triangular Numbers
- 1 1 2 3 5 8 13 7 The Fibonacci Numbers
 1 2 4 8 16 31 57
 The Circle Division Numbers 1 1 2 3 5 8 13 21 34 55

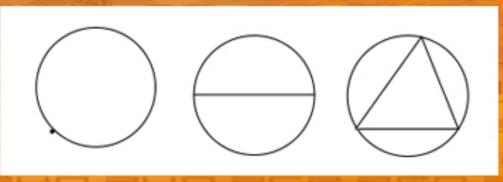
1 2 4 8 16 31 57

- · 2 9 10 11 13 16
- 2 3 5 7 11 13 17 19

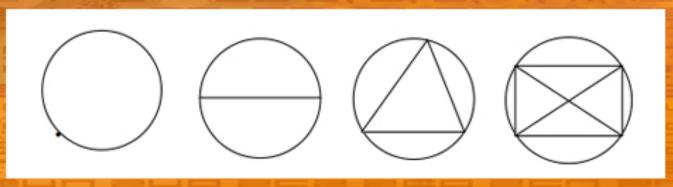




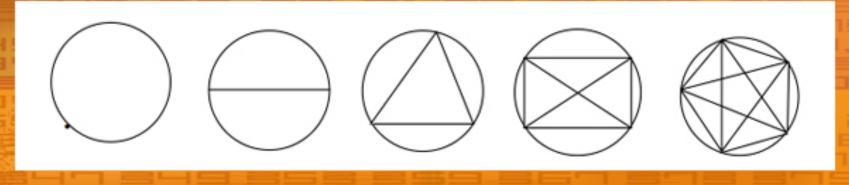
1 2



1, 2, 4,



1, 2, 4, 8,



1, 2, 4, 8, 16,



31



$$R = \frac{n^4 - 6n^3 + 23n^2 - 18n + 24}{24}$$

- 3 6 10 15 21 28 36 45
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- 1 2 4 8 16 31 57
- 9 10 11 13 16 26
 - National Lottery 28th September
- 2 3 5 7 11 13 17 19 ...

Guess the *next* number 1 3 6 10 15 21 28 36 45 The Triangular Numbers

- 1 1 2 3 5 8 13 21 34 55

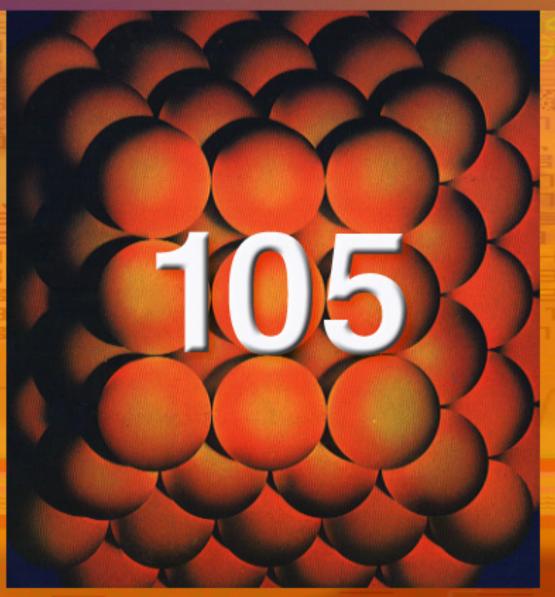
 The Fibonacci Numbers
- 1 2 4 8 16 31 57

The Circle Division Numbers

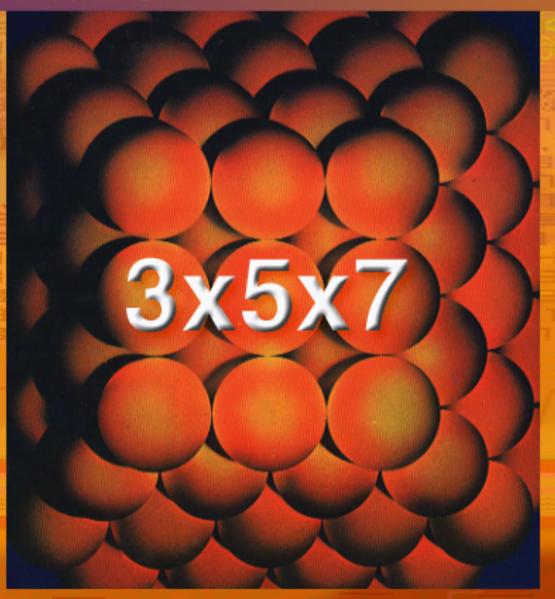
- · 2 9 10 11 13 16 26
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- **2** 3 5 7 11 13 17 19 23 29.....

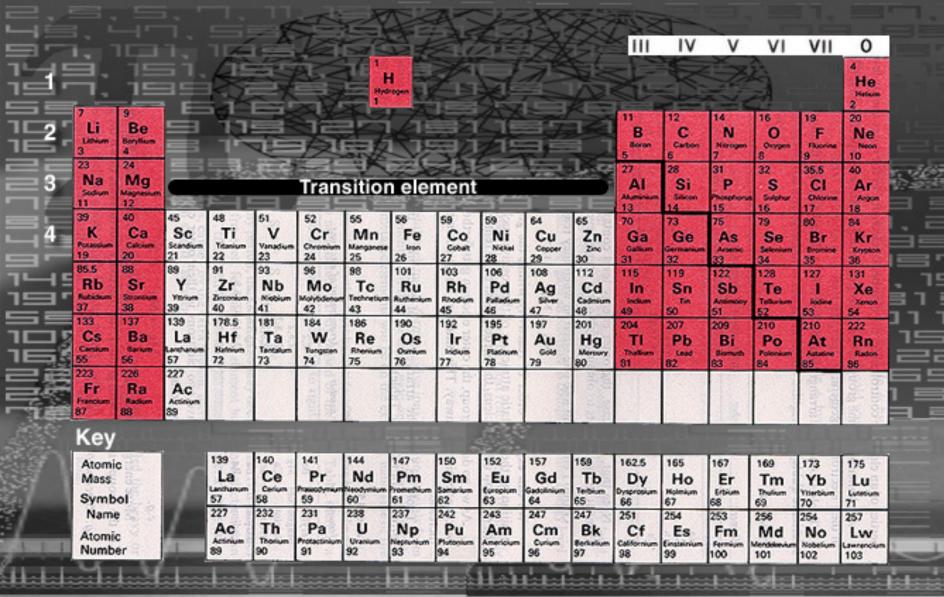
The Prime Numbers

The Atoms of Arithmetic



The Atoms of Arithmetic





The Periodic Table



57,885,161 2

In 2013 a new record was set by the Great Internet Mersenne Prime Search

This prime has over 17 million digits.

www.mersenne.org

Guess the *next* number 1 3 6 10 15 21 28 36 45 The Triangular Numbers

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 The Fibonacci Numbers
- 1 2 4 8 16 31 57

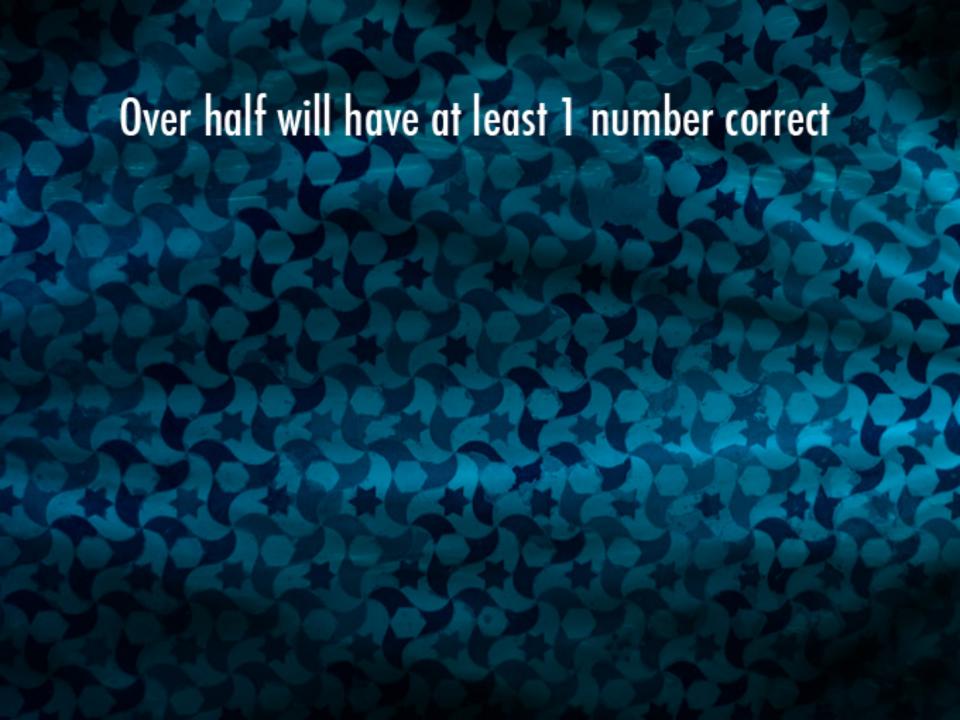
The Circle Division Numbers

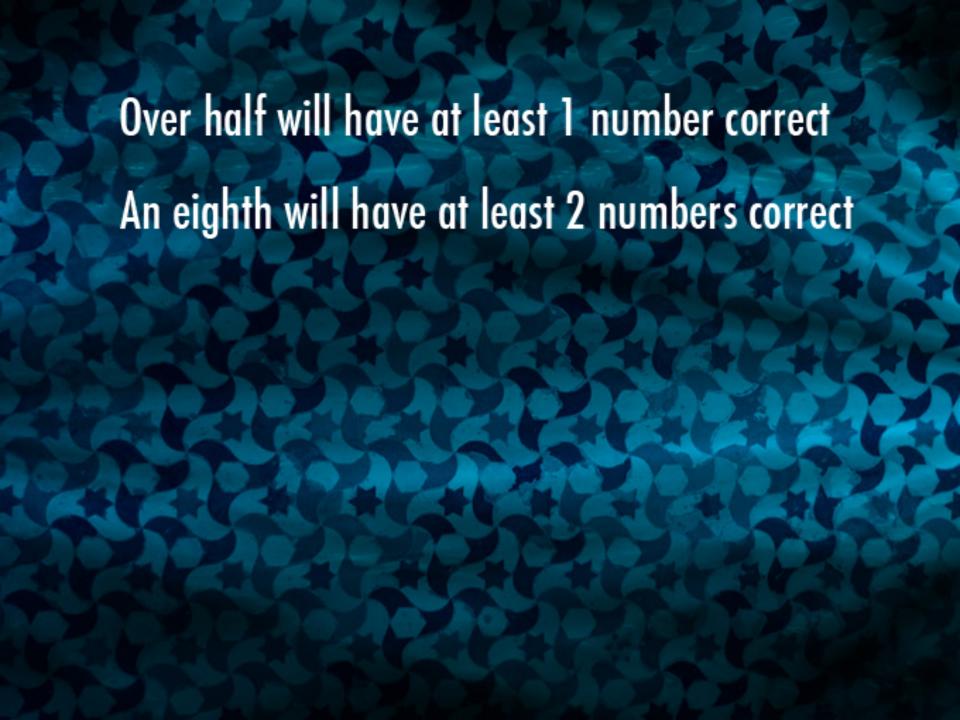
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The Prime Numbers

Pick 6 numbers

2	3	4	5	6	7
9	10	11	12	13	14
16	17	18	19	20	21
23	24	25	26	27	28
30	31	32	33	34	35
37	38	39	40	41	42
44	45	46	47	48	49
	9 	9 10 16 17 23 24 30 31 37 38	9 10 11 16 17 18 23 24 25 30 31 32	9 10 11 12 16 17 18 19 23 24 25 26 30 31 32 33	9 10 11 12 13 16 17 18 19 20 23 24 25 26 27 30 31 32 33 34 37 38 39 40 41





Over half will have at least 1 number correct An eighth will have at least 2 numbers correct 1 in 57 will have at least 3 numbers correct

Over half will have at least 1 number correct An eighth will have at least 2 numbers correct 1 in 57 will have at least 3 numbers correct 1 in 1032 will have at least 4 numbers correct Over half will have at least 1 number correct An eighth will have at least 2 numbers correct 1 in 57 will have at least 3 numbers correct 1 in 1032 will have at least 4 numbers correct 1 in 55,491 will have at least 5 numbers correct Over half will have at least 1 number correct An eighth will have at least 2 numbers correct 1 in 57 will have at least 3 numbers correct 1 in 1032 will have at least 4 numbers correct 1 in 55,491 will have at least 5 numbers correct 1 in 13,983,816 will have all 6 numbers correct

On the 9th week of the National Lottery in the UK on the 14 January 1995
133 people hit the jackpot but only won
£122,510 each.

7 17 23 32 38 42 48



About one half of all possible choices

of lottery numbers have consecutive numbers

21 22 the previous week

30 31 the following week

Over 10,000 a week in the UK choose

1 2 3 4 5 6

which shows how clever the UK population is...

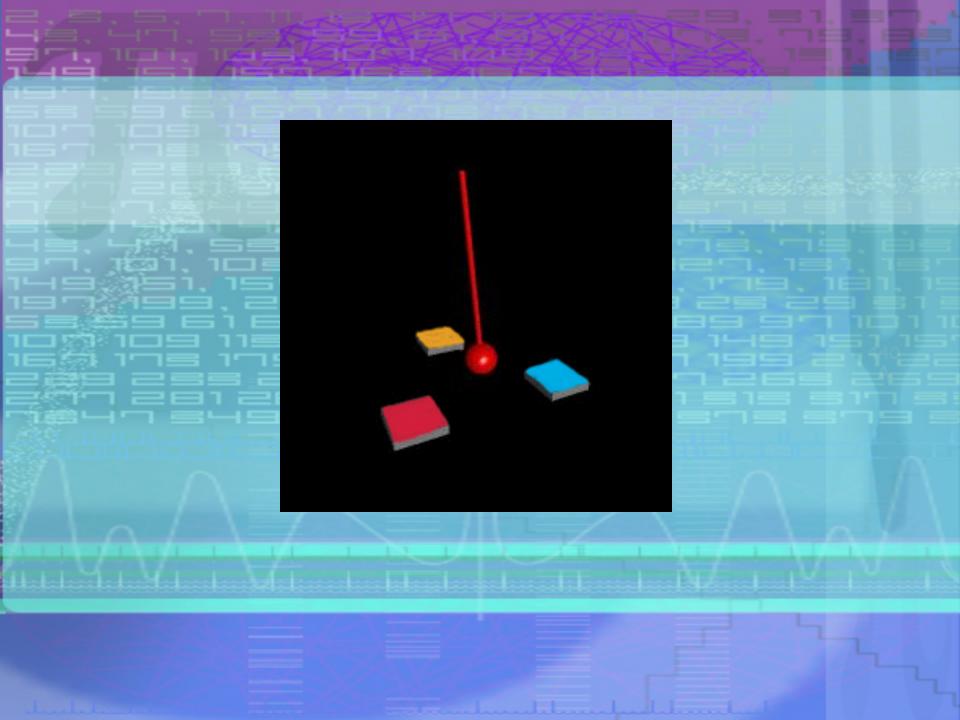


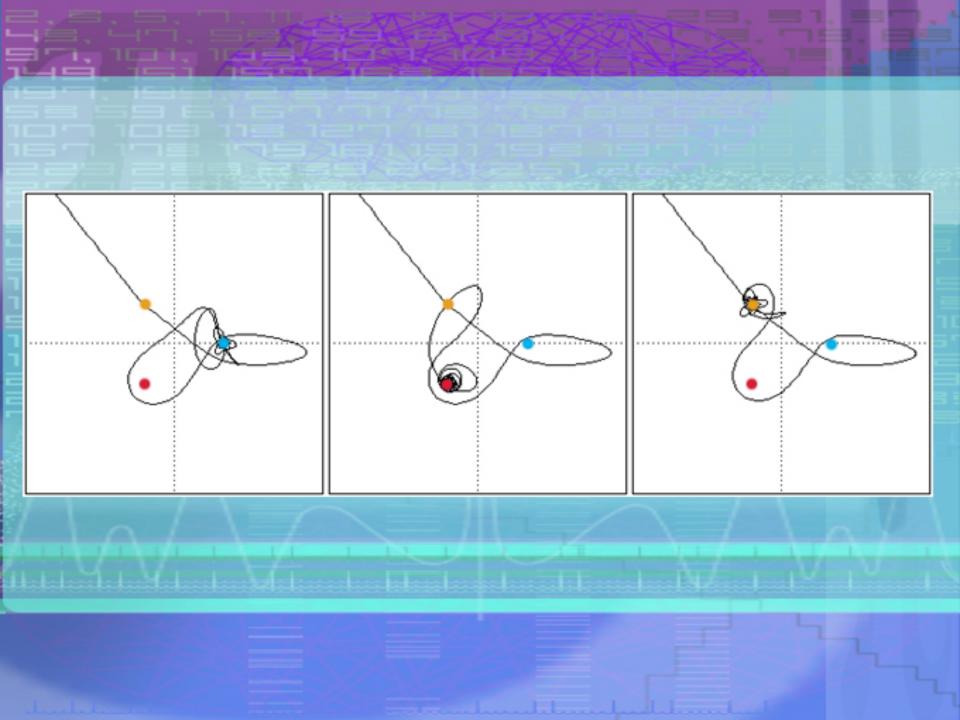
Henri Poincaré (1854-1912) - the father of chaos

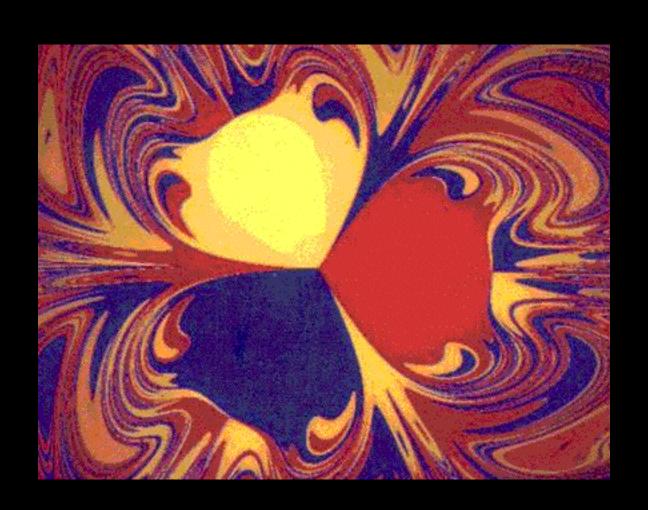
















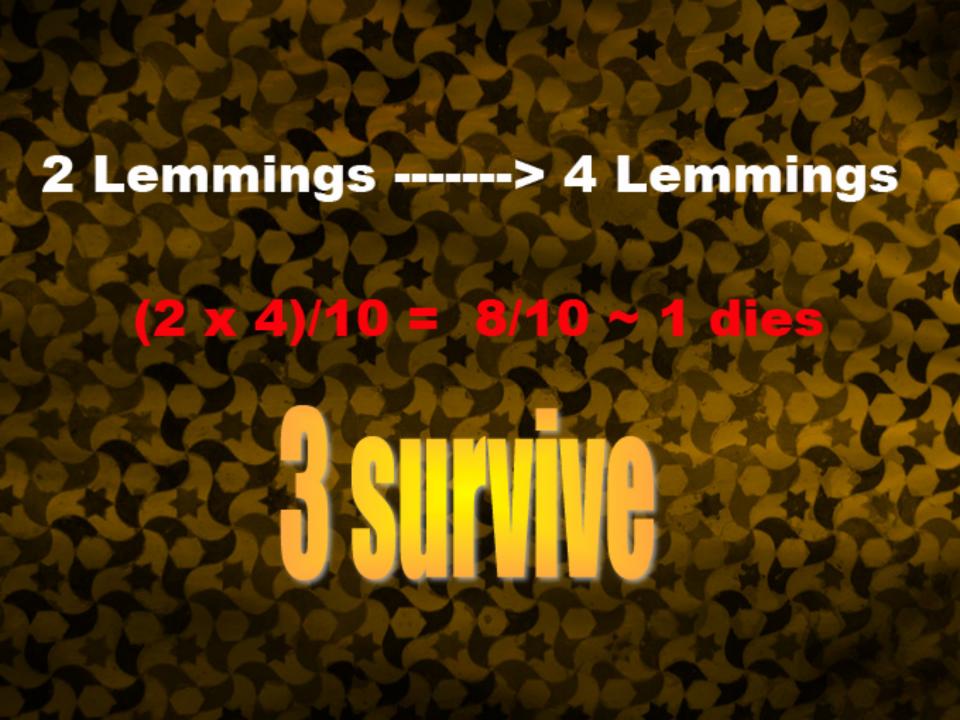


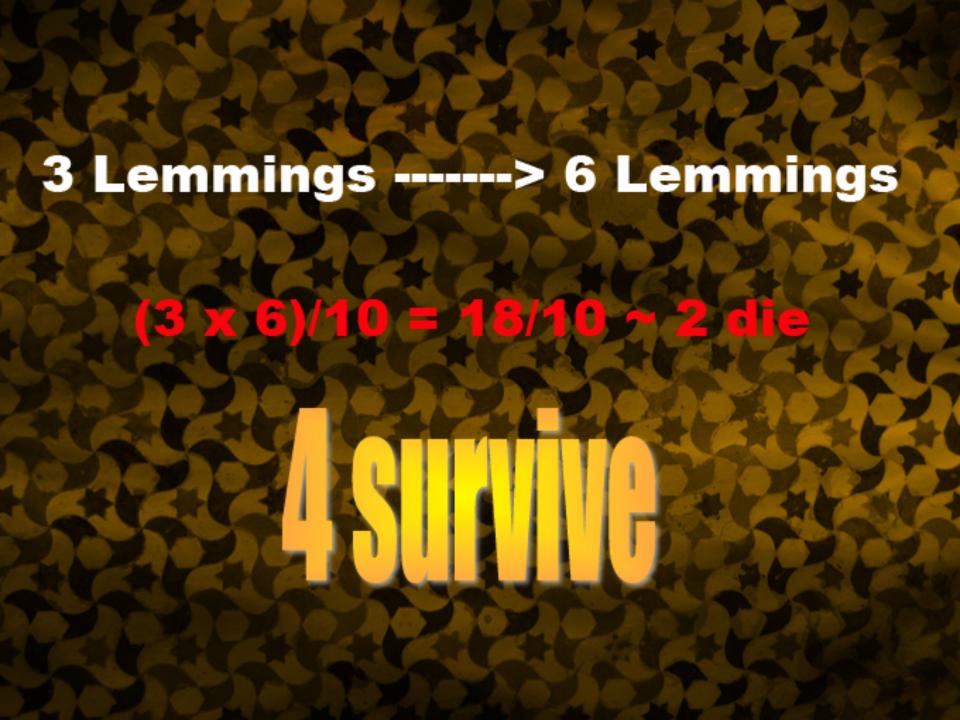


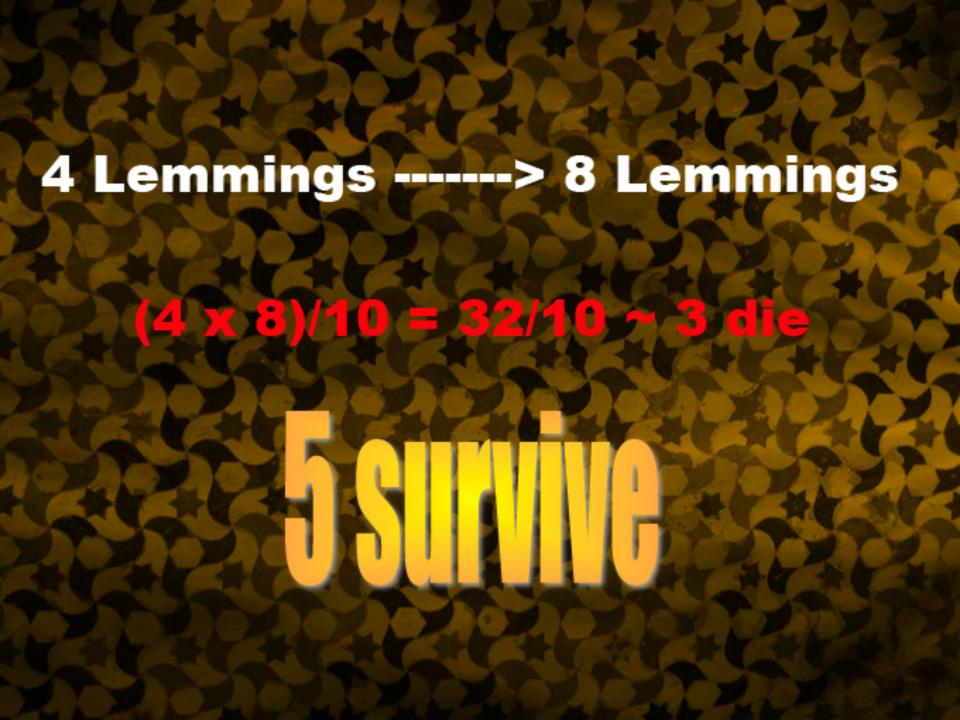
lemmings this season lemmings next season

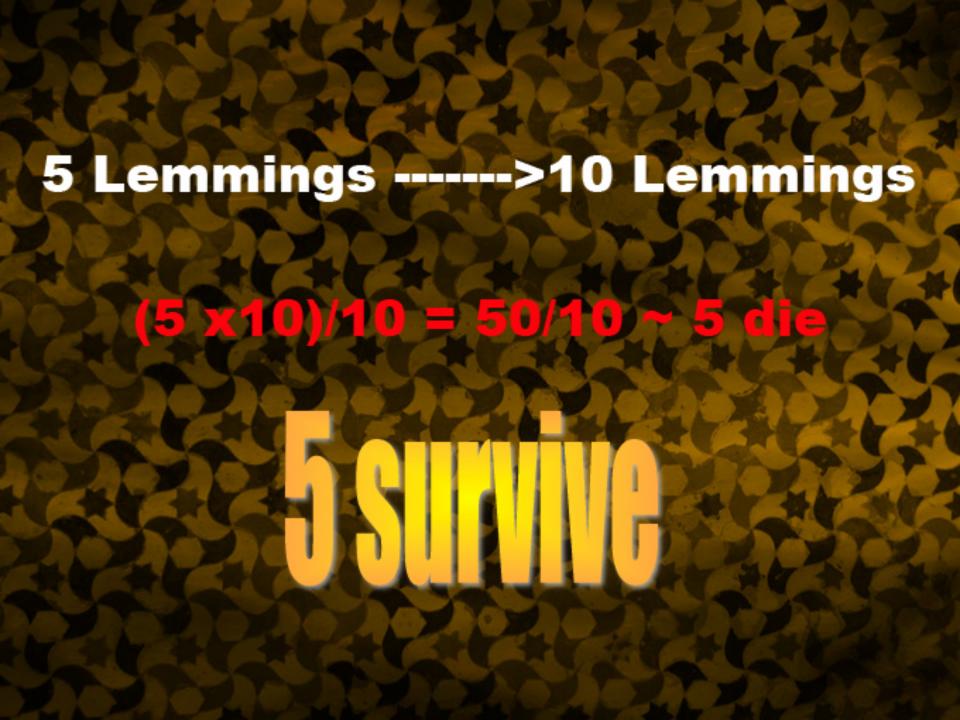
But there is not enough food so

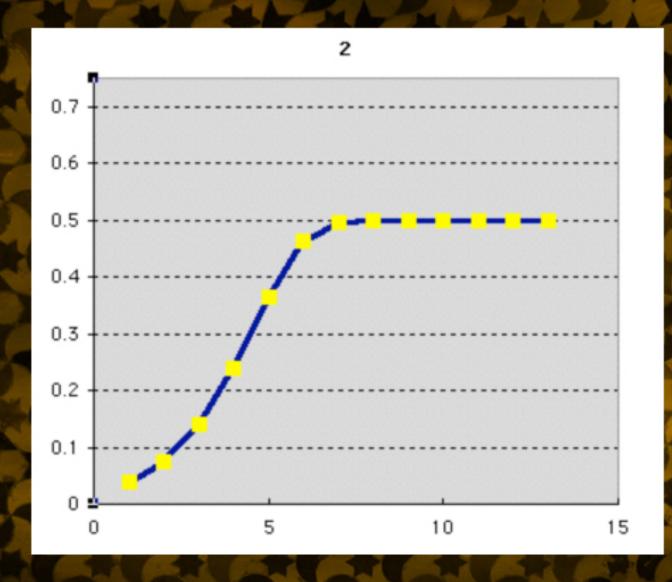
will not survive









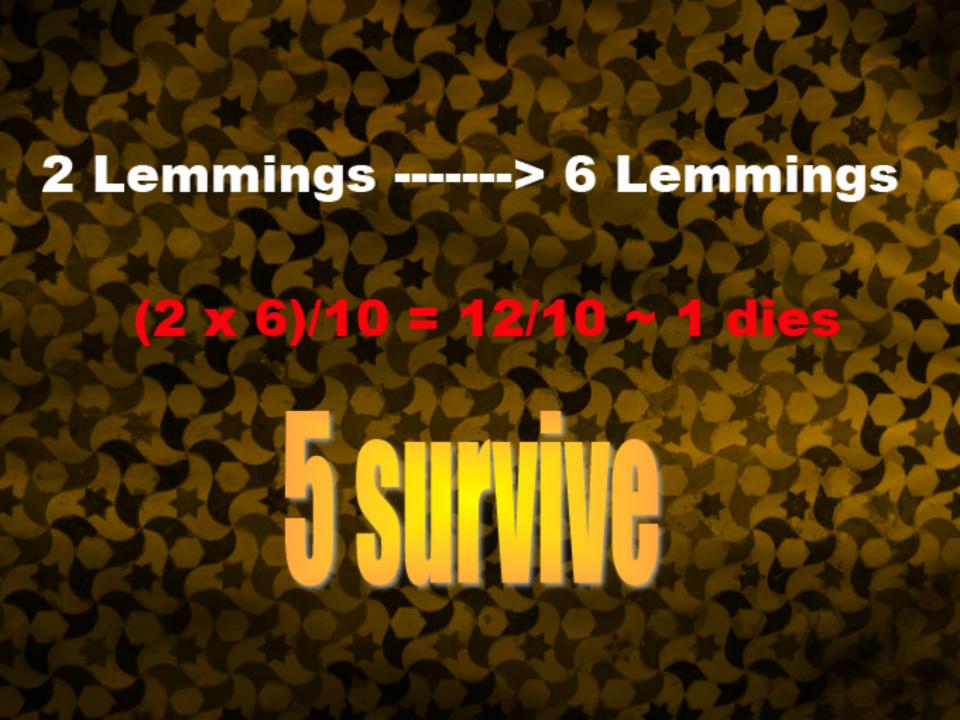


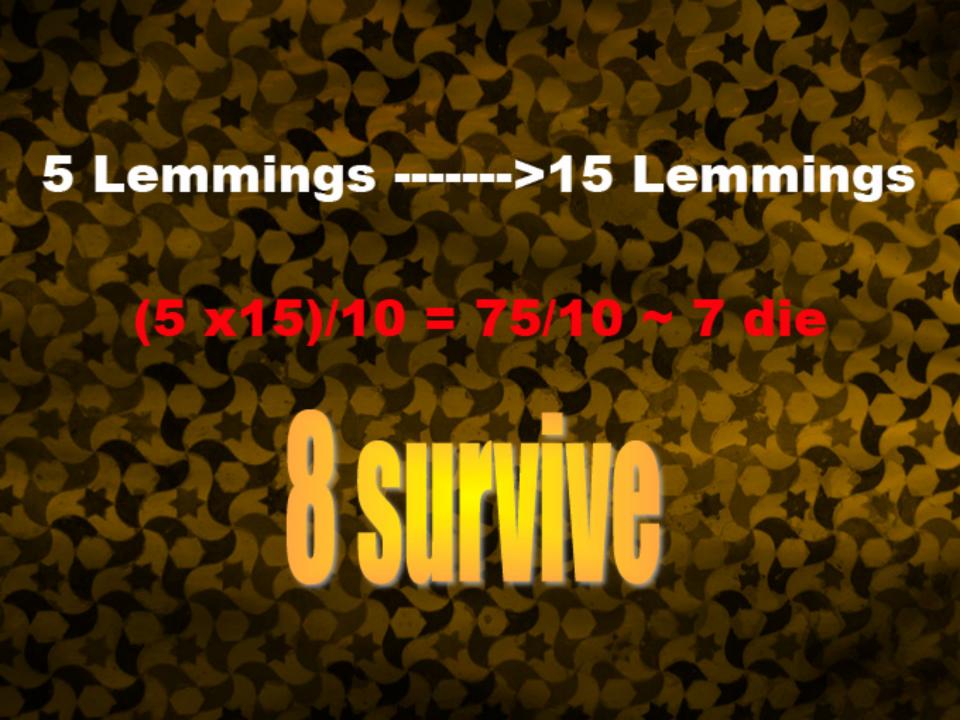
population doubles

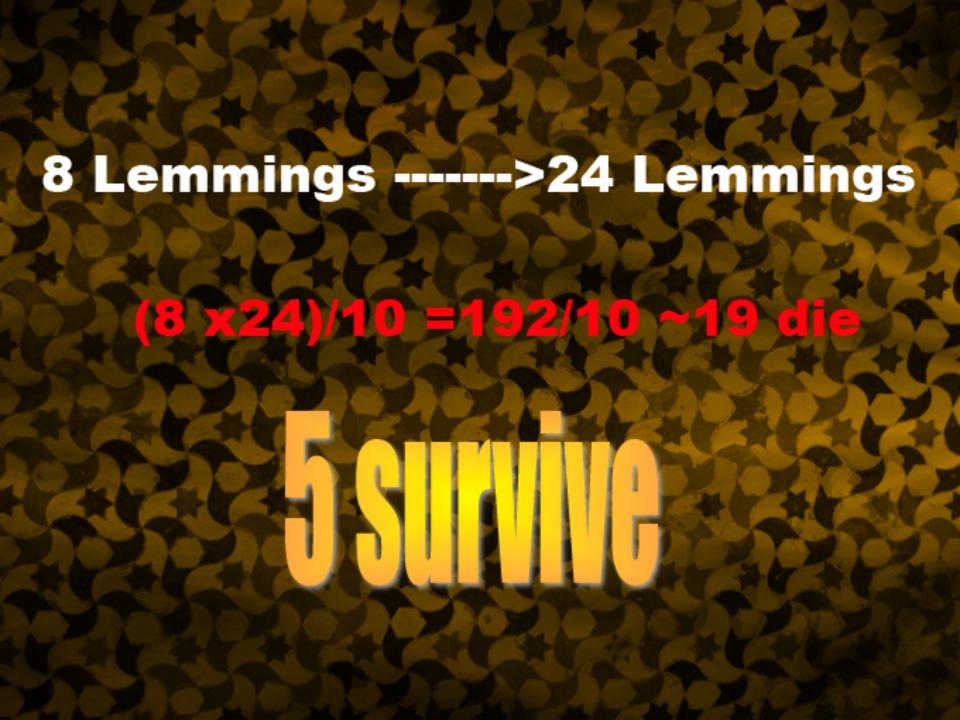
lemmings this season lemmings next season

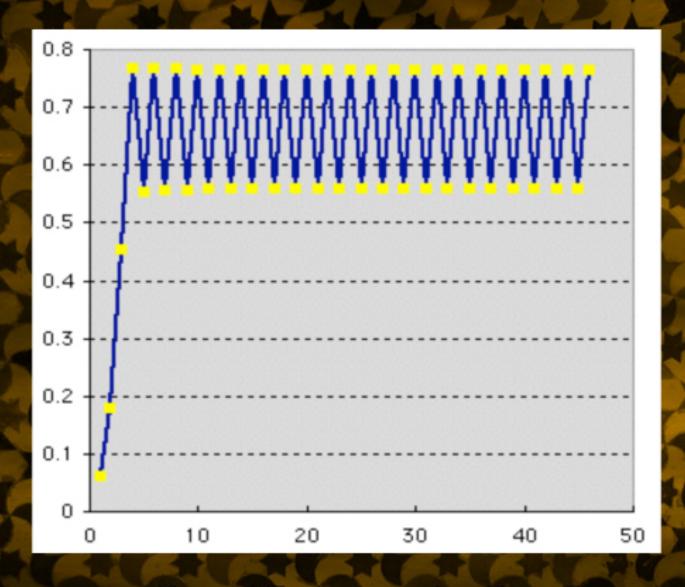
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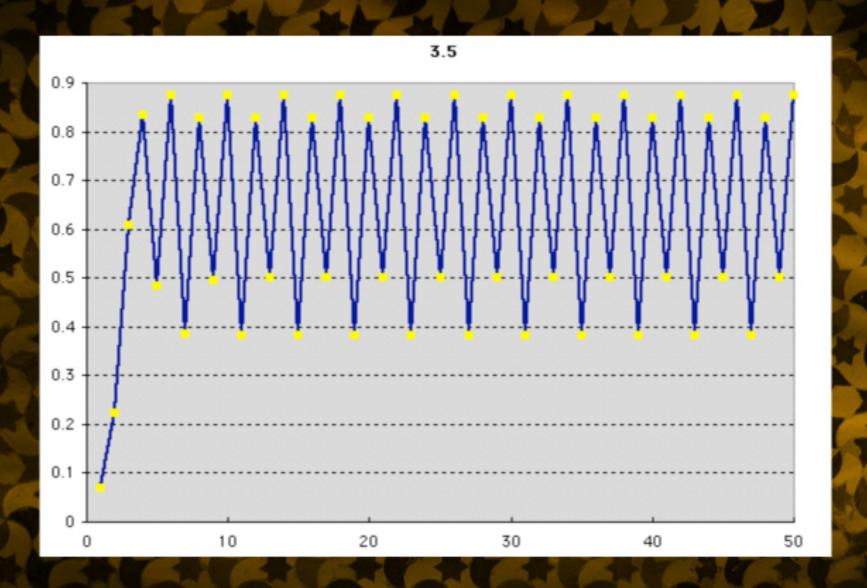




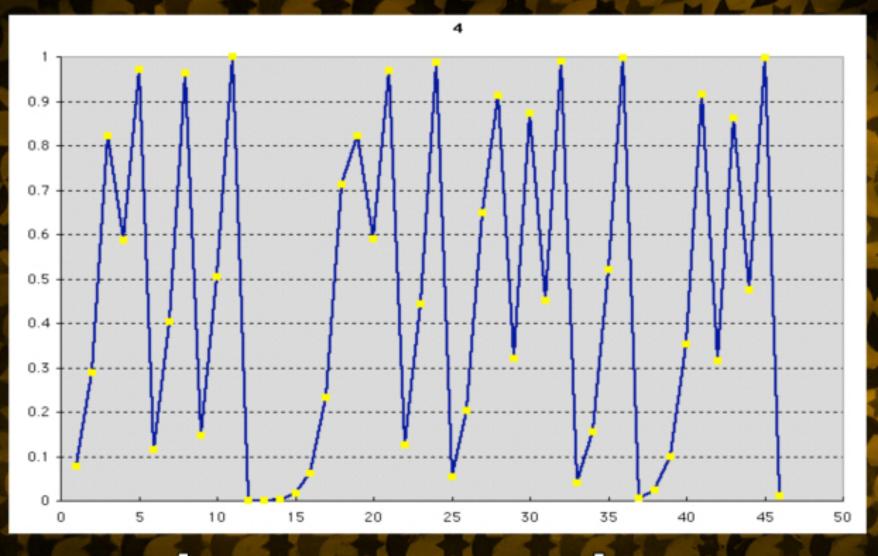




population triples

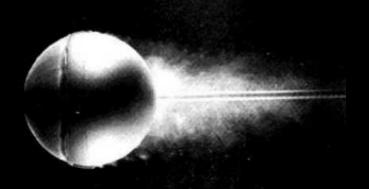


population increases by factor of 3.5

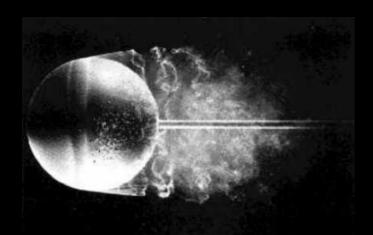


chaos ensues when population quadruples





High speed = chaotic turbulence



Low speed = laminar flow

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