# Mathematics: the ultimate fortune teller 

Marcus du Sautoy
University of Oxford

$\left(\begin{array}{llllllll}14 & -2 & 5 & 7 & 11 & 13 & 17 & 19\end{array} \ldots\right.$

Guess the next number

| -1 | 3 | 6 | 10 | 15 | 21 | 28 | 36 | 45 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |

The Triangular Numbers

| 1 | 1 | 2 | 3 | 5 | 8 | 13 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |

- 124816
- $2 \quad 9 \quad 10 \quad 11 \quad 13 \quad 16 \ldots \ldots$
$\begin{array}{lllllllll}-2 & 3 & 5 & 7 & 11 & 13 & 17 & 19 & \ldots\end{array}$


## Triangular Numbers



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$\begin{array}{llllllllll}-1 & 1 & 2 & 3 & 5 & 8 & 13 & 21 & 34 & 55\end{array}$
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- $1 \begin{array}{lllllll} & 2 & 4 & 8 & 16 & 31 & 57\end{array} \ldots$

The Circle Division Numbers

- $2 \quad 9 \quad 10 \quad 11 \quad 13 \quad 16 \ldots \ldots$
$\cdot \begin{array}{llllllll}-2 & 3 & 5 & 7 & 11 & 13 & 17 & 19\end{array} \ldots$.



## Circle Division Numbers <br> Circle Division Numbers

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# Circle Division Numbers 1 <br>  

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## Circle Division Numbers

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## Circle Division Numbers <br>  <br> rs



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1 & 2 & 4 & 8 & 16
\end{array}
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Circle Division Numbers


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National Lottery 28th September
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National Lottery 28th September

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The Prime Numbers

The Atoms of Arith metic



The Atoms of Arithmetic



## Record Breaking Primes

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

This prime has over 17 million digits.

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The Prime Numbers

Pick 6 numbers

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| 36 | 37 | 38 | 39 | 40 | 41 | 42 |
| 43 | 44 | 45 | 46 | 47 | 48 | 49 |

Over half will have at least I number correct

Over half will have at least I number correct
An eighth will have at least 2 numbers correct

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

Over half will have at least I number correct
An eighth will have at least 2 numbers correct
1 in 57 will have af least 3 numbers correct
1 in 1032 will have at least 4 numbers correct

Over half will have at least I number correct
An eighth will have at least 2 numbers correct
1 in 57 will have af 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 I number correct
An eighth will have at least 2 numbers correct
1 in 57 will have af 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
l in $13,983,816$ will have all 6 numbers correct

On the 9th week of the National Lotitery in the UK on the 14 January 1995 133 people hit the jackpot

## but only won <br> £122,510 each.

$$
123456789
$$

$\begin{array}{llllllllll}10 & 11 & 12 & 13 & 14 & 15 & 16 & 17 & 18 & 19\end{array}$
$\begin{array}{llllllllll}20 & 21 & 22 & 23 & 24 & 25 & 26 & 27 & 28 & 29\end{array}$
$\begin{array}{lllllllllll}30 & 31 & 32 & 33 & 34 & 35 & 36 & 37 & 38 & 39\end{array}$
$\begin{array}{llllllllll}40 & 41 & 42 & 43 & 44 & 45 & 46 & 47 & 48 & 49\end{array}$

## About one half of all possible choices

## of lottery numbers have consecutive numbers

## 30 <br> 31 <br> the following week

## Over 10,000 a week in the UK choose

## 000

 which shows how clever the UK population is...

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

## (4)





Which of these animals throws themselves over a cliff in a mass suicide pack every four years?

## allistrat aliabe iclem




## lemmings this season

## lemmings next season

## But there is not enough food so

## will not survive

## 2 Lemmings $\rightarrow 4$ Lemmings

## 3 Lemmings $\rightarrow 6$ Lemmings

## 4 Lemmings $\rightarrow 8$ Lemmings

## 5 Lemmings $->10$ Lemmings

## lemmings this season

## lemmings next season

## But there is not enough food so

## will not survive

## 2 Lemmings $\rightarrow>$ Lemmings

## 5 Lemmings $->15$ Lemmings

$$
(b x i) x+70
$$

## 8 Lemmings $->24$ Lemmings

## $(8 x-2) 40=70+7+19 \cdot 0$



# population triples 


population increases by factor of 3.5

chaos ensues when population quadruples

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