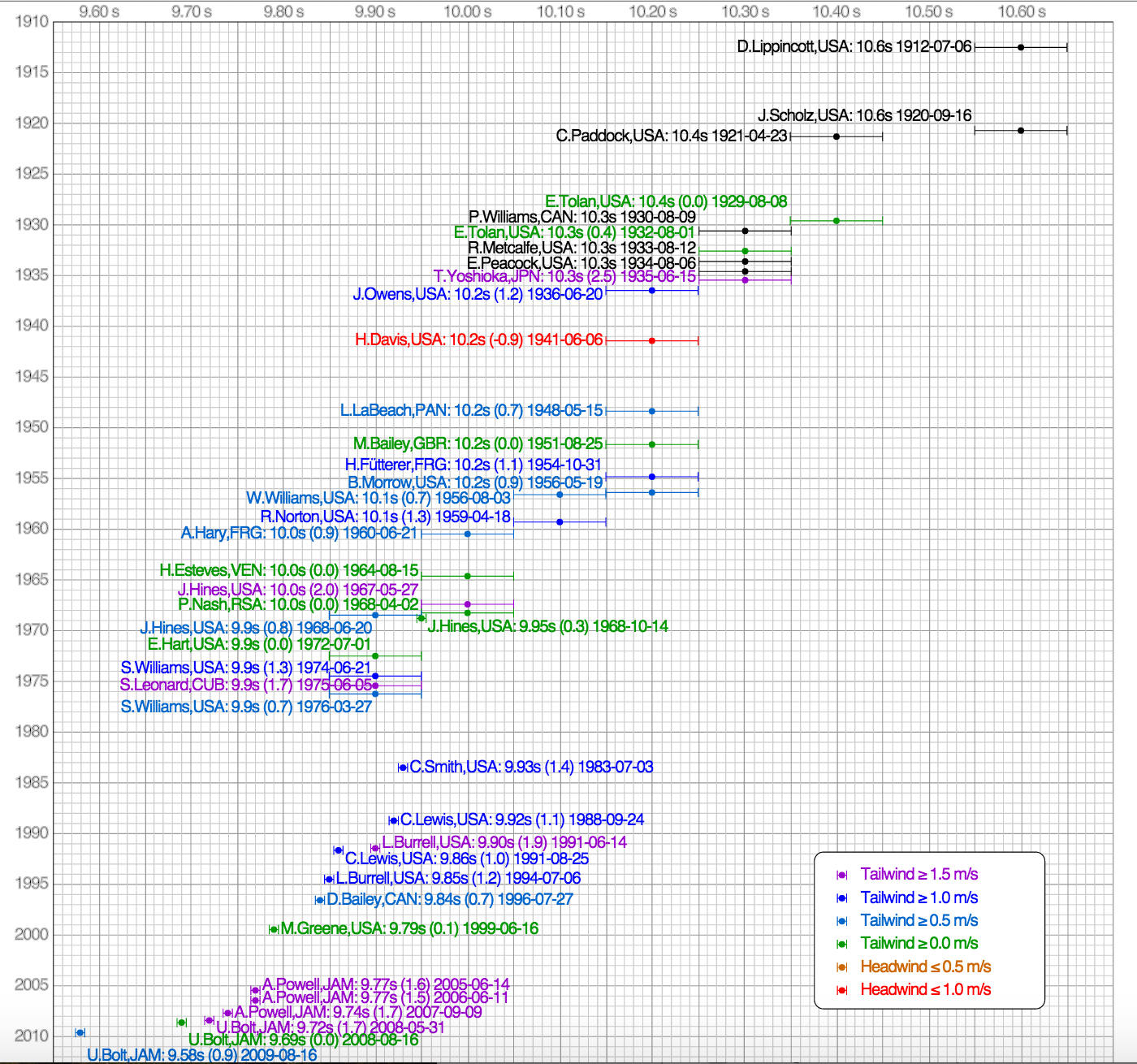
**Graph to show men’s 100-metre world record progression**



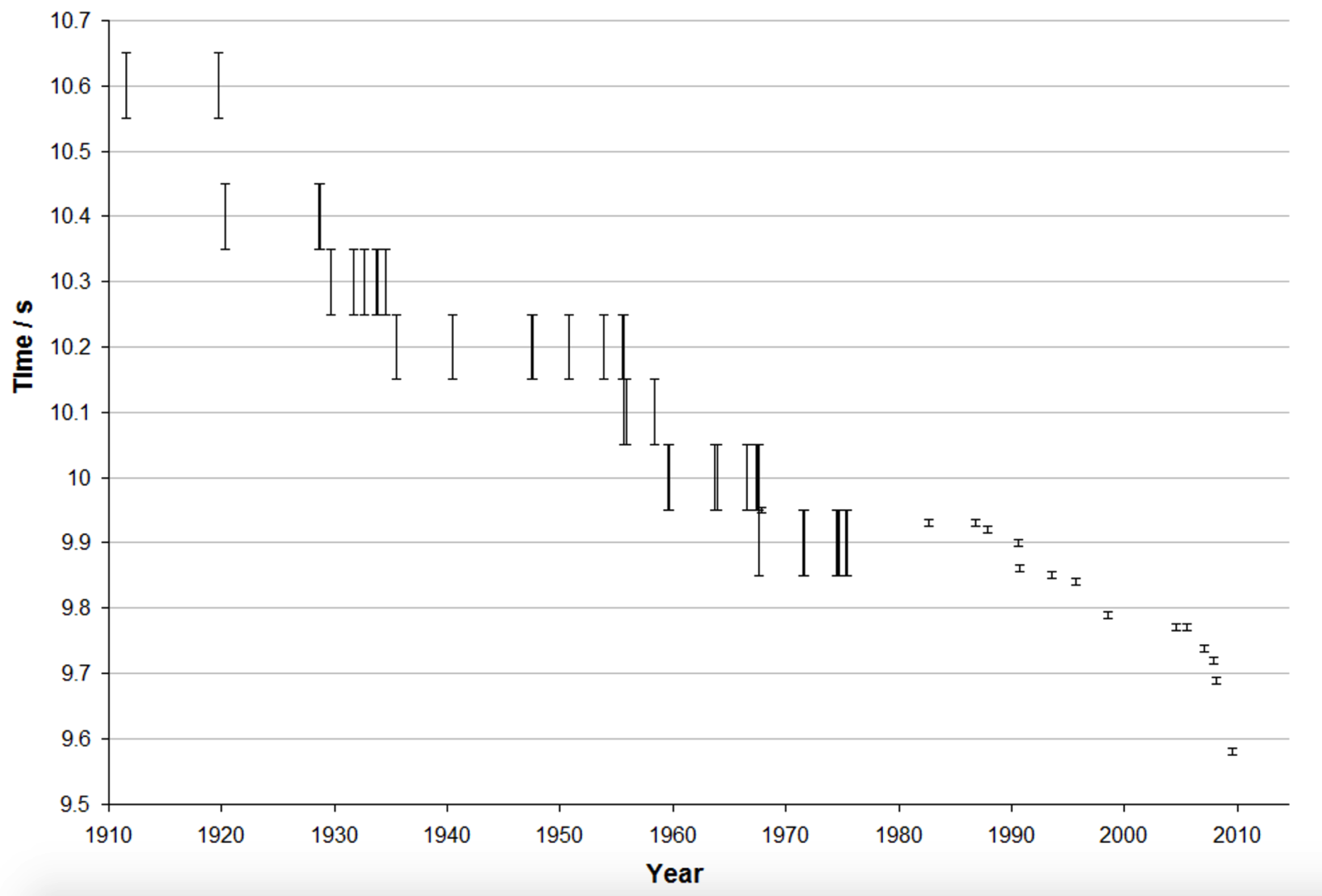
*By Cmglee - own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=17975990*

In pairs:

* What was Donald Lippincot’s world record time, set in 1912?
* What is Usain Bolt’s current world record time, set in 2009?
* Write down information about three world records set before 1977
* Write down information about three world records set after 1977
* **What do the ‘whiskers’ mean?**

If it helps, an alternative graph of the same data is on the other side

Same data, different representation …



*source: http://en.academic.ru/*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  |  |  |  | | --- | --- | --- | --- | | **Time** | **Athlete** | **Nationality** | **Date** | | 10.6 | Donald Lippincott | United States | July 6, 1912 | | Jackson Scholz | United States | September 16, 1920 | | 10.4 | Charlie Paddock | United States | April 23, 1921 | | Eddie Tolan | United States | August 8, 1929 | | 10.3 | Percy Williams | Canada | August 9, 1930 | | Eddie Tolan | United States | August 1, 1932 | | Eulace Peacock | United States | August 6, 1934 | | Chris Berger | Netherlands | August 26, 1934 | | Takayoshi Yoshioka | Japan | June 15, 1935 | | 10.2 | Jesse Owens | United States | June 20, 1936 | | Harold Davis | United States | June 6, 1941 | | Lloyd LaBeach | Panama | May 15, 1948 | | Barney Ewell | United States | July 9, 1948 | | McDonald Bailey | Great Britain | August 25, 1951 | | Heinz Fütterer | West Germany | October 31, 1954 | | Bobby Morrow | United States | May 19, 1956 | | Ira Murchison | United States | June 1, 1956 | | 10.1 | Willie Williams | United States | August 3, 1956 | | Ira Murchison | United States | August 4, 1956 | | Leamon King | United States | October 20, 1956 | | Ray Norton | United States | April 18, 1959 | | 10.0 | Armin Hary | West Germany | June 21, 1960 | | Harry Jerome | Canada | July 15, 1960 | | Horacio Esteves | Venezuela | August 15, 1964 | | Bob Hayes | United States | October 15, 1964 | | Jim Hines | United States | May 27, 1967 | | Enrique Figuerola | Cuba | June 17, 1967 | | Paul Nash | South Africa | April 2, 1968 | | Oliver Ford | United States | May 31, 1968 | | Charles Greene | United States | June 20, 1968 | | Roger Bambuck | France | June 20, 1968 | | 9.9 | Jim Hines | United States | June 20, 1968 | | Ronnie Ray Smith | United States | June 20, 1968 | | Charles Greene | United States | June 20, 1968 | | Eddie Hart | United States | July 1, 1972 | | Rey Robinson | United States | July 1, 1972 | | Steve Williams | United States | June 21, 1974 | | Silvio Leonard | Cuba | June 5, 1975 | | Harvey Glance | United States | April 3, 1976 | | Don Quarrie | Jamaica | May 22, 1976 | |  | |  |  |  |  | | --- | --- | --- | --- | | **Time** | **Athlete** | **Nationality** | **Date** | | 9.93 | Calvin Smith | United States | July 3, 1983 | | 9.92 | Carl Lewis | United States | September 24, 1988 | | 9.90 | Leroy Burrell | United States | June 14, 1991 | | 9.86 | Carl Lewis | United States | August 25, 1991 | | 9.85 | Leroy Burrell | United States | July 6, 1994 | | 9.84 | Donovan Bailey | Canada | July 27, 1996 | | 9.79 | Maurice Greene | United States | June 16, 1999 | | 9.77 | Asafa Powell | Jamaica | June 14, 2005 | | 9.74 | Asafa Powell | Jamaica | September 9, 2007 | | 9.72 | Usain Bolt | Jamaica | May 31, 2008 | | 9.69 | Usain Bolt | Jamaica | August 16, 2008 | | 9.58 | Usain Bolt | Jamaica | August 16, 2009 |   *source: en.wikipedia.org* |

**100 metres**

The US athlete, Jesse Owens, once broke four different world records within 45 minutes at the same athletics event. A year later, during the 1936 Berlin Olympics, he won four gold medals.

|  |  |
| --- | --- |
| *Public domain* | 1. What was the lower bound of Owens’ record 100-metre time? 2. What was the upper bound of his time? 3. Write the error interval for Jesse Owens’ 1936 world record 4. Write the error interval for Willie Williams’ 1956 world record 5. Write the error interval for Donovan Bailey’s 1996 world record 6. June 20 1968 is known as the ‘Night of Speed’ as three runners broke the world record at the same event. Was this the first time that a person had run 100 metres in less than 10 seconds? Explain your answer. |

*Need more practice before moving on? Write down some more error intervals using the information in the tables.*

|  |  |
| --- | --- |
| **Tallest and shortest**  The tallest man who ever lived, Robert Wadlow, was **2.72 metres tall to the nearest centimetre**. Write the error interval for his height.  The shortest man who has ever lived, Chandra Bahadur Dangi, was **54.6 centimetres tall to the nearest millimetre**. Write the error interval for his height. | **Mount Everest**  When Mount Everest was first surveyed during the Great Trigonometric Survey of the 1850s, it was found to be exactly 29,000 feet high.  It had taken years to find this result, and the surveyors were worried that people would think they had only estimated. So instead, they announced that Everest’s height was 29,002 feet.  Imagine that **29,000** had been estimated **to the** **nearest 1000 feet**. What would the highest and lowest possible heights be? Write the error interval for this measurement.  (Mount Everest is now thought to be 29,029 feet high) |
| **Kitchen cabinets**  A kitchen cabinet has a width of **600 mm ±2 mm**. Write the error interval for the width of the cabinet.  Georgina is designing a new kitchen. She wants to place 5 of these cabinets alongside each other on a wall that is 3 metres long. Will the cabinets fit? Explain your reasoning. | **Van**  A van can safely transport a load of 800 kg.  Andy is using the van to carry sacks of sand.  Each sack has a mass of **25 kg to the nearest kg**.  How many sacks of sand can Andy transport safely?  Explain your thinking. |

**Fibonacci Rectangle**

5 cm

8 cm

The Fibonacci number sequence starts with the numbers 1, 1, …

Each term is found by adding the two previous terms.

The sequence continues as follows: 1, 1, 2, 3, 5, 8, 13, 21, …

The dimensions of a rectangle are measured to the nearest centimetre.

It is noted that they are two consecutive Fibonacci numbers: 5 cm and 8 cm.

**Problem**

* Find the upper bound for the **area** of the rectangle
* Find the lower bound for the area of the rectangle
* Find the **difference** between the upper and lower bounds for the area of the rectangle.
* Use your answer to form a **conjecture**. Explore further. Write down your results.
* Place the following statements in order to **prove** the conjecture

|  |
| --- |
| The bounds of *b* are *b* – 0.5 and *b* + 0.5 |
| The difference between the bounds of the area is  (*ab* + 0.5*a* + 0.5*b* + 0.25) – (*ab* – 0.5*a* – 0.5*b* + 0.25) = 0.5*a* + 0.5*a* + 0.5*b* + 0.5*b* = *a* + *b* |
| The upper bound of the area is (*a* + 0.5)(*b* + 0.5) = *ab* + 0.5*a* + 0.5*b* + 0.25 |
| The bounds of *a* are *a* – 0.5 and *a* + 0.5 |
| Since *a* and *b* are two Fibonacci numbers then *a* + *b* is the next Fibonacci number |
| Let *a* and *b* be two consecutive Fibonacci numbers that are the dimensions of a rectangle |
| The lower bound of the area is (*a* – 0.5)(*b* – 0.5) = *ab* – 0.5*a* – 0.5*b* + 0.25 |