Short Track Speed Skating

Short Track Speed Skating is a race conducted on a 111m circuit with 4-6 racers competing for the win. There are several high-profile races at the World Championships, World Cup, European Championships, and Olympic Games. This data set looks at 500m races where athletes try to complete 4.5 laps ahead of their competitors. Athletes tend to be crowded together competing for space on the track on every turn leading to chaotic situations and dangerous crashes.

The data set we will be investigating has 5125 rows where each row is a race performance from an athlete at a high-profile race. In addition to event and personal information, each row contains the splits and placing of the athlete for each lap of the race. We will be looking at the whole race as well as the splits from laps. The full data set can be found at short\_track.csv.

Answer the following questions based on the histogram and table found below



|  |  |
| --- | --- |
| Min | 39.94s |
| Q1 | 41.56s |
| Median | 42.19s |
| Mean | 43.63s |
| Q3 | 43.14s |
| Max | 101.82s |
| SD | 5.76s |

1. Characterize the shape of the histogram and approximate where the median would fall?

The shape of the histogram is right-skewed and the arrow on the graph above is the approximate median

1. Find the boundaries of where outliers begin and label with arrows on the histogram if possible.
2. Are there any outliers that fall on the low end of the times?

|  |  |  |  |
| --- | --- | --- | --- |
| Lap | 1 | 3 | 5 |
| Min | 6.52s | 8.00s | 8.24s |
| Q1 | 6.93s | 8.39s | 8.73s |
| Median | 7.09s | 8.52s | 8.90s |
| Mean | 7.15s | 8.95s | 9.55s |
| Q3 | 7.27s | 8.72s | 9.18s |
| Max | 23.87s | 51.87s | 50.68s |
| SD | 0.729s | 2.536s | 3.157s |

1. Watch the video below and think about why the maximum lap and total times might be so large. <https://www.youtube.com/watch?v=fAADWfJO2qM&t=109s>

Crashes and other incidents lead to skaters falling and losing all momentum. Having to get up and start skating after fall leads to a much slower time on either the lap or overall time.

1. Why might the standard deviation increase in later laps? (Note that the first lap is counted from the start to the finish line and is only half of the track).

2 options, either skaters gain separation from each other as the laps increase leading to more deviation, Or as more laps happen there is more opportunities for crashes which lead to significantly slower times in subsequent laps.

1. Which lap has the largest interquartile range?

Lap 1: 7.27s – 6.93s = 0.34s

Lap 3: 8.72s – 8.39s = 0.33s

Lap 5: 9.18s – 8.73s = 0.45s

Lap 5, possibly because of fatigue and crashes

1. Why are the mean overall and lap times higher than the median overall and lap times?

Because there are many outliers and high values that push the mean lap times up more than the median lap times

Notable Performances:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Time | Lap 1 | Lap 3 | Lap 5 |
| JR Celski  (Former WR) | 39.937s | 6.72s | 8.10s | 8.44s |
| Victor An  (Olympic Gold) | 41.312s | 7.00s | 8.51s | 8.52s |
| Shaolin Sandor Liu (Fastest Lap) | 40.523s | 7.21s | 8.00s | 8.46s |
| Wu Dajing  (2014 World Champ) | 40.526s | 6.72s | 8.23s | 8.64s |

Pick a Notable performance or 2 from above for the following questions:

1. Using z-score, what is the relatively strongest lap of your selected athlete?

JR Celski: Lap 1: (6.72 – 7.15)/0.729 = 0.5898, Lap 3: (8.10 – 8.95)/2.536 = 0.3352,

Lap 5: (8.44 – 9.55)/3.157 = 0.3516, Lap 1 has the lowest/highest z-score

Victor An: Lap 1: (7.00 – 7.15)/0.729 = 0.2058, Lap 3: (8.51 – 8.95)/2.536 = 0.1735,

Lap 5: (8.52 – 9.55)/3.157 = 0.3263, Lap 5 has the lowest/highest z-score

Shaolin Sandor Liu: Lap 1:

Wu Dajing: Lap 1:

1. Where does your selected athlete fall using z-score for their overall time?
2. For an athlete with an overall time of 51.25s, and lap 1, 3, and 5 times of 9.22s, 8.54s, 14.49s, are any of these times considered outliers? Why or why not?