Rio roulette wheel reportedly hits seven straight 19s, and, yes, this is really rare
By John Katsilometes
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Before we specify what this statistic is based on, the odds of it happening are 114 billion to 1.

Those are the odds against a roulette wheel hitting the same number on seven consecutive spins. But that did happen, or certainly appears to have happened, at the Rio at 8:32 p.m. Monday as pro poker player Jeff Romano took a photo of a roulette wheel display screen showing **the No. 19 hitting on seven straight spins**. The string was broken when the wheel landed on 15, then hit 19 once more for a run of **eight 19s in nine spins**.

The display screen lists the most recent 16 numbers on which the ball lands on a roulette table. Four of the numbers in Romano's photo are 20, meaning that in this particular stretch, two numbers were landed upon 75 percent of the time. The string started with a green zero, followed by 20-20-23-5-20-20, then the run of 19s.

The website Beyond the Best crunched the numbers and calculated the odds of the 19s hitting seven times in succession as 114 billion to 1. Contacted this afternoon to ask for verification of the event and if the wheel has since been tested to make sure it is properly balanced and calibrated, Caesars Entertainment officials had not yet learned of the event.

We're awaiting word on what is certainly one of the rarest documented roulette runs in the city's history.

Source: http://www.lasvegassun.com/blogs/kats-report/2012/jun/19/rio-wheel-reportedly-hits-seven-straight-19s-and-y/

A roulette wheel has 38 possible outcomes. If each of the outcomes are equally likely, and if the outcomes are independent of one another, then the probability of the number 19 hitting on 7 straight spins would be:

$$\left(\frac{1}{38}\right)^7 = \frac{1}{38^7} = \frac{1}{114{,}415{,}582{,}592} \approx 0.000000000009$$

So yes, the odds of a single (fair) roulette wheel hitting 19 on 7 straight spins is 114 billion to 1.

But we don't have a single roulette wheel. Let's make some assumptions to figure out how many roulette spins might occur in a single day. Let's assume:

- There are 2,000 casinos in America
- Each casino has 5 roulette wheels (that gives us 10,000 roulette wheels in America)
- Casinos are open 24 hours per day and roulette is played non-stop
- A single spin takes about 2 minutes -- let's say 7 spins every 15 minutes; 28 per hour; 672 per day. That gives us 6,720,000 roulette spins in America each day (672 spins per day x 10,000 wheels). Each day in America, then, we would have 960,000 groups of 7 roulette spins.

The probability of any roulette wheel in America hitting 19 on 7 straight spins would be:

$$(960{,}000)\frac{1}{38^7} = \frac{960{,}000}{114{,}415{,}582{,}592} = \frac{7500}{893{,}871{,}739} \approx \frac{1}{119{,}183}$$

So we would expect a roulette wheel to hit 19 on 7 straight spins once every 119,183 days. That's once every 326 years.

And that assumes that we're only interested in separate groups of 7 spins. In other words, if the first spin did not show a 19, then we'd still spin 6 more times and ignore the results. If we don't do that -- if we allow a streak of 7 straight spins to happen at any time, then we'd have... I'm not sure how many attempts. Let me try to figure this out.

If a casino only had 7 spins per day, that would be a single attempt at a streak of 7 straight spins
If a casino had 8 spins per day, that would be 2 attempts (spins 1-7, 2-8).
If a casino had 9 spins per day, that would be 3 attempts (spins 1-7, 2-8, 3-9).
If a casino had 14 spins per day, that would be 8 attempts (spins 1-7, 2-8, 3-9, 4-10, 5-11, 6-12, 7-13, 8-14)
If a casino had n spins per day, that would be n-6 attempts per day.
So with our assumption that each casino spins each roulette wheel 672 times each day, that would give us 666 attempts to hit the number 19 seven straight times.
Multiply this by the number of casinos and roulette wheels to give us 6,660,000 attempts in America each day.

The probability, then, that any roulette wheel in America hits the number 19 on 7 straight spins would be:

$$(6{,}660{,}000)\frac{1}{38^7} = \frac{6{,}660{,}000}{114{,}415{,}582{,}592} = \frac{208{,}125}{3{,}575{,}486{,}956} \approx \frac{1}{17{,}180}$$

Which is about once every 47 years.

Now were we really only interested in hitting the number 19 on 7 straight spins? Wouldn't we have been just as impressed with any result coming up on 7 straight spins? If so, then the odds change even more.

The odds of a roulette wheel hitting 19 on 7 straight spins were 114 billion to 1. What are the odds of a roulette wheel hitting any number on 7 straight spins?

Let's pretend we're at a roulette wheel and the first spin comes up... 16. At this point, we're interested in getting 6 more 16s (in order to get a streak of 7 straight). So the probability of this happening -- of getting six more of whatever value we got first -- would be:

$$\left(\frac{1}{38}\right)^6 = \frac{1}{38^6} = \frac{1}{3{,}010{,}936{,}384} \approx 0.0000000003$$

The odds are just over 3 billion to 1 that a single roulette wheel gets a single number 7 spins in a row.

Multiplying this by the 6,660,000 attempts in America each day gives us:

$$(6{,}660{,}000)\frac{1}{38^6} = \frac{6{,}660{,}000}{3{,}010{,}936{,}384} = \frac{208{,}125}{94{,}091{,}762} \approx 0.022 \approx \frac{1}{452}$$

We would expect a casino somewhere in America to hit the same number 7 spins in a row about once every 452 days (or 15 months).