What is Formula 1?
What is Formula 1?
Highest class of single seater auto racing
What is Formula 1?

Highest class of single seater auto racing
Way better than IndyCar/NASCAR*

* Personal opinion. Might not align with your views. Let's not go to war over this. #peace #nonviolence
Totally crap history overview.
History

• **1946:** Formula One was started by the Fédération Internationale de l'Automobile's (FIA).
  ○ “Formula” refers to the set of rules which everyone has to follow.
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  - Only 6 races were counted towards the championship.
  - Alpha Romeo destroyed its competition.
History

Alpha Romeo 158
History

Alpha Romeo 158

Ferrari SF71H
History

- **1953**: Argentina hosted the first race outside Europe.
History

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- **1958**: The first race in Africa (Morocco).
History

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- **1958:** The first race in Africa (Morocco).
- **1985:** First race in Australia.
History

- **1953**: Argentina hosted the first race outside Europe.
- **1958**: The first race in Africa (Morocco).
- **1985**: First race in Australia.
- **1994**: Ayrton Senna and Roland Ratzenberger died in the San Marino race. This prompted F1 to improve car safety standards.
History
Let’s first address some misconceptions.
Wait. You are Indian. Why aren’t you talking about cricket?
Wait. You are Indian. Why aren’t you talking about cricket?

Psych! This is a presentation on cricket.
Introduction to Cricket

- Cricket is a bat and ball game played between 2 teams.
Introduction to Cricket

- Cricket is a bat and ball game played between 2 teams.

Not just about the car.


But F1 drivers just need to drive a car. They aren’t athletes.
But F1 drivers just need to drive a car. They aren’t athletes.

They drive in upto 50°C temperatures. Sweat upto 3L a race.
But F1 drivers just need to drive a car. They aren’t athletes.

They drive in upto 50°C temperatures. Sweat upto 3L a race. Handle G-Force of upto 5g. More than a space shuttle launch.
But F1 drivers just need to drive a car. They aren’t athletes.

They drive in upto 50°C temperatures. Sweat upto 3L a race. Handle G-Force of upto 5g. More than a space shuttle launch. Heart rate is approximately 170 bpm for 2 hours.
F1 is boring. Cars just go around in circles.
F1 is boring. Cars just go around in circles.

The tracks are not circular! Varying speeds, bumps and corners.
What do you need to know in order to watch F1 today.
Overview

10 teams
Overview

20 drivers
Overview

20 drivers
Overview

21 races. 5 continents.
Each race is called a Grand Prix.

<table>
<thead>
<tr>
<th>Country</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Mar 25</td>
<td>Melbourne</td>
</tr>
<tr>
<td>Bahrain</td>
<td>Apr 8</td>
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<td>Apr 15</td>
<td>Shanghai</td>
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<td>Azerbaijan</td>
<td>Apr 29</td>
<td>Baku</td>
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<td>Sep 2</td>
<td>Monza</td>
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<tr>
<td>Singapore</td>
<td>Sep 16</td>
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<tr>
<td>Russia</td>
<td>Sep 30</td>
<td>Sochi</td>
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<td>Abu Dhabi</td>
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Overview

Each race finish gives you points.

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<td>3rd</td>
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<td>6th</td>
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<tr>
<td>7th</td>
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<td>8th</td>
<td>4 pts</td>
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<tr>
<td>9th</td>
<td>2 pts</td>
</tr>
<tr>
<td>10th</td>
<td>1 pt</td>
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Overview

Each race finish gives you points. Driver with the most points at the end wins the World Championship.

2018 Standings

<table>
<thead>
<tr>
<th>Rank</th>
<th>Driver</th>
<th>Points</th>
<th>Wins</th>
<th>Podiums</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L. Hamilton</td>
<td>188</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>S. Vettel</td>
<td>171</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>K. Räikkönen</td>
<td>131</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>V. Bottas</td>
<td>122</td>
<td>0</td>
<td>5</td>
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<tr>
<td>5</td>
<td>D. Ricciardo</td>
<td>106</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
Overview

Each race finish gives you points. Driver with the most points at the end wins the World Championship.
### Overview

Team with the most points wins the Constructors Championship.

#### 2018 Standings

<table>
<thead>
<tr>
<th>Rank</th>
<th>Driver</th>
<th>Points</th>
<th>Wins</th>
<th>Podiums</th>
</tr>
</thead>
<tbody>
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<tr>
<td>2</td>
<td>S. Vettel</td>
<td>171</td>
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<td>K. Räikkönen</td>
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<tr>
<td>4</td>
<td>V. Bottas</td>
<td>122</td>
<td>0</td>
<td>5</td>
</tr>
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<td>D. Ricciardo</td>
<td>106</td>
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</table>

<table>
<thead>
<tr>
<th>Rank</th>
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<th>Podiums</th>
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<td>302</td>
<td>4</td>
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<td>3</td>
<td>Red Bull</td>
<td>211</td>
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<tr>
<td>4</td>
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<td>80</td>
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<td>Force India</td>
<td>59</td>
<td>0</td>
<td>1</td>
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</table>
Let’s look at the Canadian Grand Prix to understand what happens during each race.
Race Weekend
Race Weekend

Every race has events spread across 3 days.
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- **Friday**: 2 practice sessions of 90 min each.
Race Weekend

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- **Saturday**: 1 practice session of 60 min.
Race Weekend

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- **Friday**: 2 practice sessions of 90 min each.
- **Saturday**: 1 practice session of 60 min.

A driver must take part in at least 1 practice session to be eligible for the race.
Race Weekend

- **Saturday**: 3 Qualifying sessions to determine the starting positions on track.
  - Q1: 18 minutes. All 20 cars compete. Slowest 5 cars are eliminated.
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Race Weekend

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  - Q1: 18 minutes. All 20 cars compete. Slowest 5 cars are eliminated.
  - Q2: 15 minutes. 15 cars compete. Slowest 5 cars are eliminated.
  - Q3: 12 minutes. Decides the final ordering for the top 10 cars.
Race Weekend

1. Virage Senna
2. Wall of Champions AKA Quebec Wall
3. 4.
5.
6.
7. 8.
9.
10. L’Epingle
11. 12.
13. Casino Straight AKA Droit du Casino
14.
Importance of Qualifying
## Importance of Qualifying

<table>
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<tr>
<th>1</th>
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<tr>
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<td>Nico HULKENBERG</td>
<td>Renault Sport Formula One Team</td>
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<td>1:12.635</td>
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<td>Marcus ERICSSON</td>
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<td>20</td>
<td>Romain GROSJEAN</td>
<td>Haas F1 Team</td>
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</table>
Race Weekend

- **Sunday**: Race day!
  - Cars line up on the grid.
Race Weekend

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  - 1 formation lap to warm the tyres.
Race Weekend

- **Sunday**: Race day!
  - Cars line up on the grid.
  - 1 formation lap to warm the tyres.
  - It’s lights out and away we go!
Race Weekend
What happens if there is an accident?
First let’s look at F1’s obsession with flags
Flags

- 10 different types.
Flags

- 10 different types.
Flags

- **Chequered Flag**: Hooray! You have crossed the finish line
Flags

- **Chequered Flag:** Hooray! You have crossed the finish line
- **Yellow Flag:** Indicates danger.
  - 1 yellow flag: warns driver to slow down
  - 2 yellow flags: drivers must slow down
  - No overtaking!
Flags

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Flags

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Flags

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- **Black Flag**: Tells driver that they have been excluded from the race.
Flags

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- **Green Flag**: All good to race again.
- **Blue Flag**: Tells driver he isn’t good enough. Warns the driver that he is about to be lapped and to let the faster car overtake.
- **Black Flag**: Tells driver that they have been excluded from the race.
- **Red Flag**: Indicates that the session has been stopped. Maybe due to accident or poor race conditions.
Safety Cars

- In case of double yellow flags, there are two possible ways of dealing with it.
Safety Cars

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  - **Virtual Safety Car:** Called if things are not that serious. Drivers are required to reduce their speeds to match a safety car (virtual).
Safety Cars

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  - **Virtual Safety Car:** Called if things are not that serious. Drivers are required to reduce their speeds to match a safety car (virtual).
  - **Safety Car:** When things are serious. All cars must line up behind the safety car.
Safety Cars

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  - **Virtual Safety Car:** Called if things are not that serious. Drivers are required to reduce their speeds to match a safety car (virtual).
  - **Safety Car:** When things are serious. All cars must line up behind the safety car.

No overtaking in any of the two cases!
Safety Cars
Number of Laps

Each race has several laps depending upon the track length.

The number of laps will be equal to the least number which exceeds a distance of 305 km (260 km for Monaco). However, should two hours elapse before the scheduled race distance is completed, the leader will be shown the chequered flag when he crosses the line.
Number of Laps

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The number of laps will be equal to the least number which exceeds a distance of 305 km (260 km for Monaco). However, should two hours elapse before the scheduled race distance is completed, the leader will be shown the chequered flag when he crosses the line.

Canadian Grand Prix track is 4.361 km long. Therefore, the race has 70 laps.
Pit Stops

During each race, a car will go into the pit lane one or more times to change tyres/ do any repairs on the car.
Annual F1 Pop Quiz

How long should it take to change all 4 tyres on a car?

a. 10 sec
b. 10 min
c. 1 hour
d. Can’t do it. I am a CS grad student
Pit Stops

1.92 SECONDS
An exhausting diversion
An exhausting diversion
Tyres
Tyres

- Really important!
Tyres

- Really important!
- All tyres are supplied by Pirelli.
Tyres

- Really important!
- All tyres are supplied by Pirelli.
- Two categories of tyres:
  - Dry weather compounds
  - Wet weather compounds
Annual F1 Pop Quiz
Annual F1 Pop Quiz

How many types of tyres were there during the 2011 season?

a. 6
b. 7
c. 8
d. 9
Annual F1 Pop Quiz

How many types of tyres were there during the 2011 season?

a. 6
b. 7
c. 8
d. 9
Annual F1 Pop Quiz

How many types of tyres were there during the 2014 season?

a. 6
b. 7
c. 8
d. 9
Annual F1 Pop Quiz

How many types of tyres were there during the 2014 season?

a. 6
b. 7
c. 8
d. 9
Annual F1 Pop Quiz

How many types of tyres were there during the 2016 season?

a. 6
b. 7
c. 8
d. 9
Annual F1 Pop Quiz

How many types of tyres were there during the 2018 season?

a. 6
b. 7
c. 8
d. 9
Annual F1 Pop Quiz

How many types of tyres were there during the 2018 season?

a. 6
b. 7
c. 8
d. 9
THAT DOESN’T MAKE SENSE

BUT KEEP GOING
Tyres

- Softest: Faster, Shorter life
- Soft: Harder, Slower, Longer life
- Medium: Normal, Moderate life
- Hard: Slower, Longer life
- Superhard: Slowest, Longest life
Tyres

- Hypersoft: Softer, Faster, Shorter life
- Ultra Soft: Softer, Faster
- Soft: Softer, Faster
- Medium: Softer
- Hard: Harder, Slower
- Superhard: Harder, Slower, Longer life

Wet: Inter

Soft: Inter
Tyres
Simplified anatomy of a F1 car
Simplified anatomy of a F1 car

WHAT’S IN THE CAR?
Inside a F1 car

- 6 major components.
Inside a F1 car

- 6 major components.
- Each team can develop/obtain the components as long as they satisfy the guidelines.
Inside a F1 car

- 6 major components.
- Each team can develop/obtain the components as long as they satisfy the guidelines.
- Teams only have a limited number of components for a particular season. If they exceed that number, they get a penalty.
Inside a F1 car

<table>
<thead>
<tr>
<th></th>
<th>ICE</th>
<th>TC</th>
<th>MGU-H</th>
<th>ES</th>
<th>MGU-K</th>
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<td>![MGU-K Icon]</td>
<td>![Battery Icon]</td>
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</table>
Inside a F1 car

The Power Unit

CE
ICE
TC
ES
MGU-H
MGU-K
Steering wheel
PPRESS A BUTTON
something awesome has to happen!!
The art of overtaking.
Car Aerodynamics

Downforce
Car Aerodynamics

Drag
Imagine Car A is trying to overtake Car B on a straight.
Dirty Air

- Imagine Car A is trying to overtake Car B on a corner.
Drag Reduction System (DRS)

- If Car A is within 1 second of Car B when entering a particular region of the track, it can activate DRS to get a temporary speed boost.
Drag Reduction System (DRS)
Now that we know all the important things, let’s look at some strategies.
Overtaking Strategies

- DRS + Slipstream = OP
- Late Braking
Overtaking Strategies
Tyre selection

- Depending on where you start on the grid, tyre selection dictates how many pit stops a car will make.
Tyre selection

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  - If you are starting in front, you might want to go on the softer compound tyres.
Tyre selection

- Depending on where you start on the grid, tyre selection dictates how many pit stops a car will make.
  - If you are starting in front, you might want to go for the softer compound tyres.
  - If you are starting at the end, you might want to go for the harder compound tyres.
Undercut

Pits earlier
Undercut
Undercut

Pits later

Key Elements

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<tbody>
<tr>
<td>Sector 1</td>
<td>Sector 2</td>
<td>Sector 3</td>
<td>Start / Finish</td>
<td>Grandstands</td>
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</tbody>
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Undercut
Free Pit Stop

- A pit stop usually costs time.
Free Pit Stop

- A pit stop usually costs time.
- But depending on the situation, you can get a free pit stop if there is a safety car.
A bit of teamwork

- Each team has two drivers.
A bit of teamwork

- Each team has two drivers.
- The team can strategically make
  - One driver pass the other
  - Pit one car hoping to achieve an undercut
Car Setup

- Drivers can manually set their cars up depending on what they see during practice.
  - They can go for more downforce if the track has a lot of turns.
Car Setup

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  - They can go for more downforce if the track has a lot of turns
  - They can change front and rear wing angles for responsive turning.
Car Setup

- Drivers can manually set their cars up depending on what they see during practice.
  - They can go for more downforce if the track has a lot of turns
  - They can change front and rear wing angles for responsive turning.
  - Change suspension - hardness/softness
Penalties

- Drivers can be assessed penalties if they break the rules.
Penalties

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- **Grid Penalties:** Drop down grid position.
Penalties

- Drivers can be assessed penalties if they break the rules.
- **Grid Penalties:** Drop down grid position.
- **Race Penalties:** Extra time added to your race / You are asked to stop in the pits for a certain amount of time.
F1 technology in real life

- Use of carbon fiber
F1 technology in real life

- Use of carbon fiber
- Using brakes to generate energy
F1 technology in real life

- Use of carbon fiber
- Using brakes to generate energy
- Traction control
F1 technology in real life

- Use of carbon fiber
- Using brakes to generate energy
- Traction control
- Improved suspension
Best Race Last Year
Time for some iconic F1 tracks/corners.
Iconic tracks/corners

- Eau Rouge, Spa, Belgium Grand Prix
Iconic tracks/corners

- Circuit de Monaco, Monaco Grand Prix
Iconic tracks/corners

- Monza, Italian Grand Prix
Excited to watch a race?
You don’t have to wait that long.
Hungarian Grand Prix. This Weekend!
Hope this wasn’t too long. It’s time for some questions.