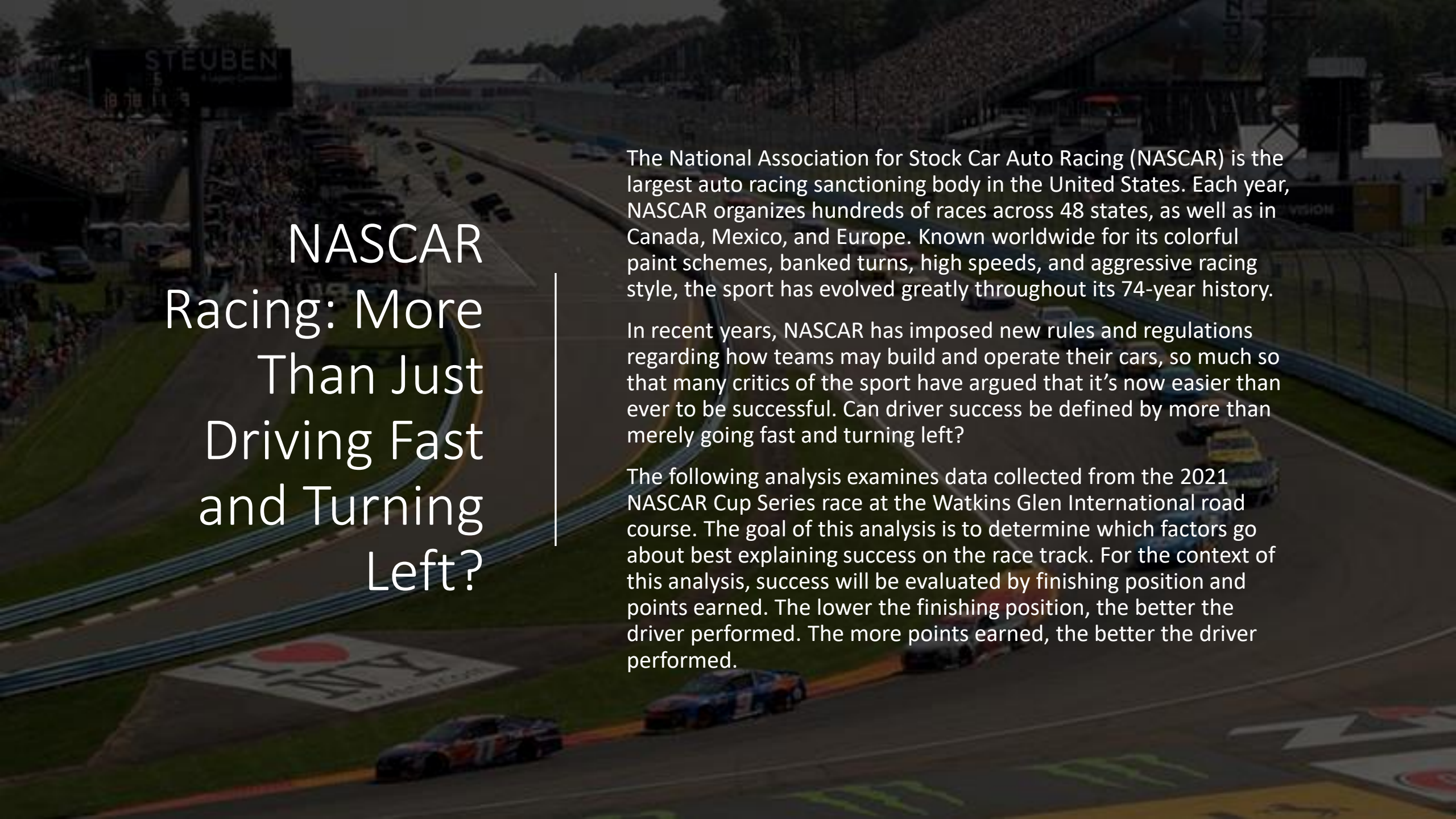
NASCAR Racing: More Than Just Driving Fast and Turning Left?

Blake Pappas



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The National Association for Stock Car Auto Racing (NASCAR) is the largest auto racing sanctioning body in the United States. Each year, NASCAR organizes hundreds of races across 48 states, as well as in Canada, Mexico, and Europe. Known worldwide for its colorful paint schemes, banked turns, high speeds, and aggressive racing style, the sport has evolved greatly throughout its 74-year history.

In recent years, NASCAR has imposed new rules and regulations regarding how teams may build and operate their cars, so much so that many critics of the sport have argued that it's now easier than ever to be successful. Can driver success be defined by more than merely going fast and turning left?

The following analysis examines data collected from the 2021 NASCAR Cup Series race at the Watkins Glen International road course. The goal of this analysis is to determine which factors go about best explaining success on the race track. For the context of this analysis, success will be evaluated by finishing position and points earned. The lower the finishing position, the better the driver performed. The more points earned, the better the driver performed.

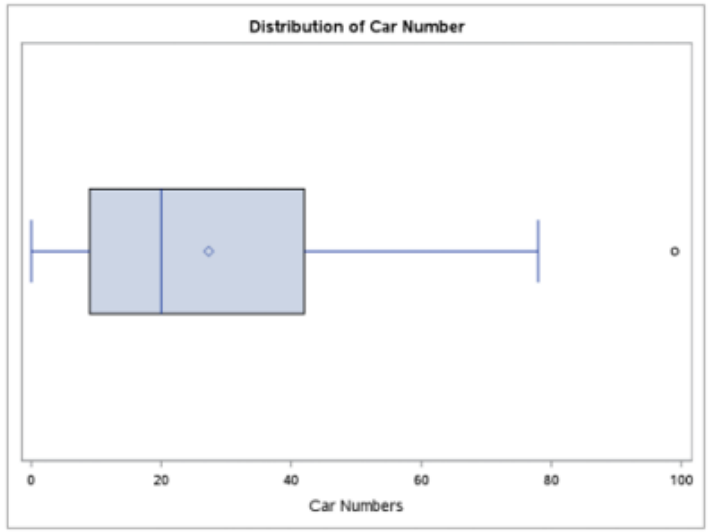
WATKINS_GLEN: Condensed Master Data Table

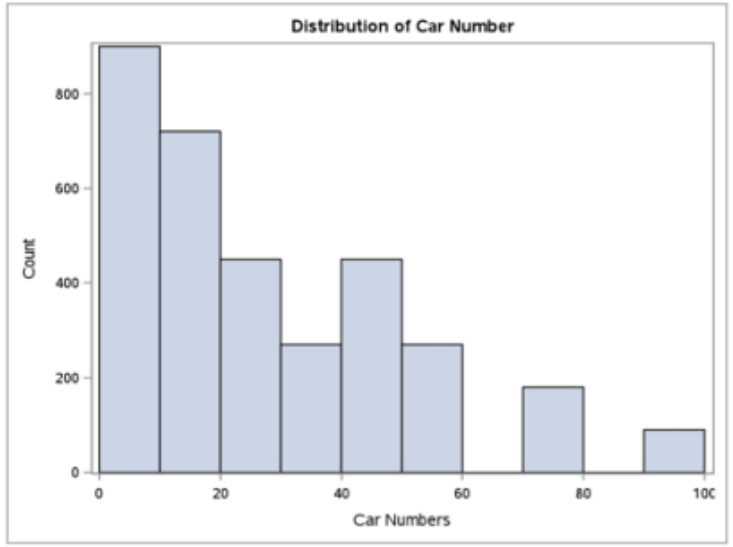
	car_number	driver	manufacturer	team	sponsor	start	finish	points	lap	lap_time	lap_speed	running_position
1	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	1	76.753	114.914	4
2	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	2	73.503	119.995	3
3	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	3	73.377	120.201	3
4	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	4	73.26	120.393	3
5	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	5	73.502	119.997	3
6	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	6	73.681	119.705	3
7	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	7	74.546	118.316	3
8	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	8	74.067	119.081	3
9	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	9	74.446	118.475	3
10	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	10	74.904	117.751	2
11	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	11	173.885	50.723	2
12	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	12	207.772	42.45	2
13	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	13	75.01	117.584	2
14	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	14	73.483	120.028	2
15	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	15	73.861	119.413	2
16	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	16	73.972	119.234	2
17	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	17	74.322	118.673	2
18	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	18	74.225	118.828	2
19	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	19	74.548	118.313	2
20	5	Kyle Larson	Chevrolet	Hendrick Motorsports	HendrickCars.com	4	1	56	20	74.328	118.663	2

VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

car_number

Description: The driver's car number
Data Type: numeric
Minimum: 0
1st Quartile: 9
Median: 20
Mean: 27.32
3rd Quartile: 42
Maximum: 99





VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

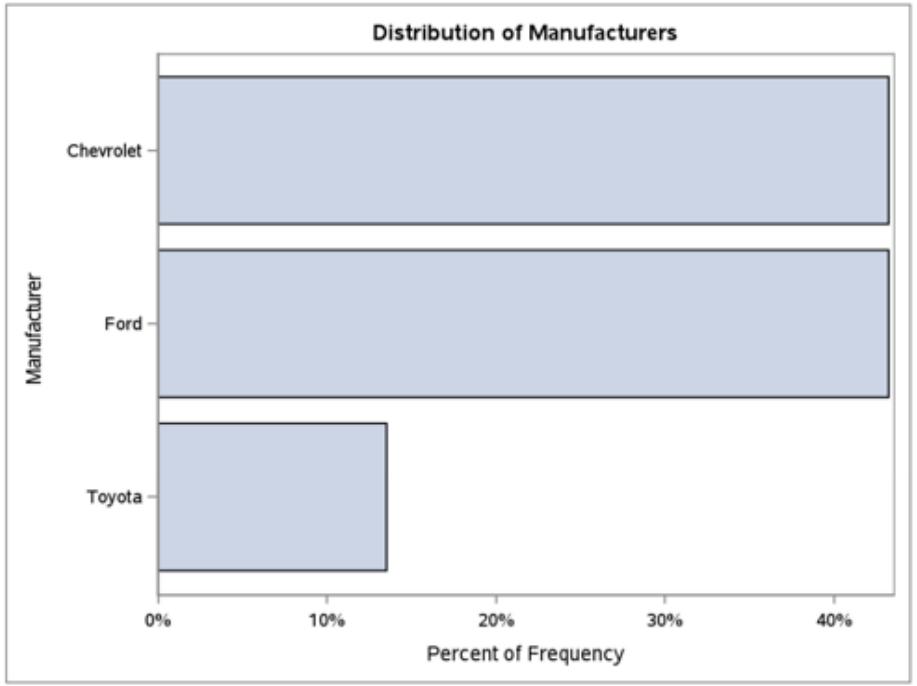
driver

Description: The first and last name of the driver
Data Type: character
Number of Unique Drivers: 37
Drivers: Kyle Larson, Chase Elliott, Martin Truex Jr., Kyle Busch, Denny Hamlin, William Byron, Christopher Bell, Kevin Harvick, Chase Briscoe, Tyler Reddick, Matt DiBenedetto, Ross Chastain, Kurt Busch, Ryan Blaney, Austin Dillon, Aric Almirola, Chris Buescher, Cole Custer, Ricky Stenhouse Jr., Alex Bowman, Michael McDowell, Joey Logano, Bubba Wallace, Corey LaJoie, Ryan Newman, Anthony Alfredo, Erik Jones, Ryan Preece, Justin Haley, Kyle Tilley, Daniel Suarez, Quin Houff, Josh Bilicki, RC Enerson, Brad Keselowski, Garrett Smithley, James Davison

VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

manufacturer

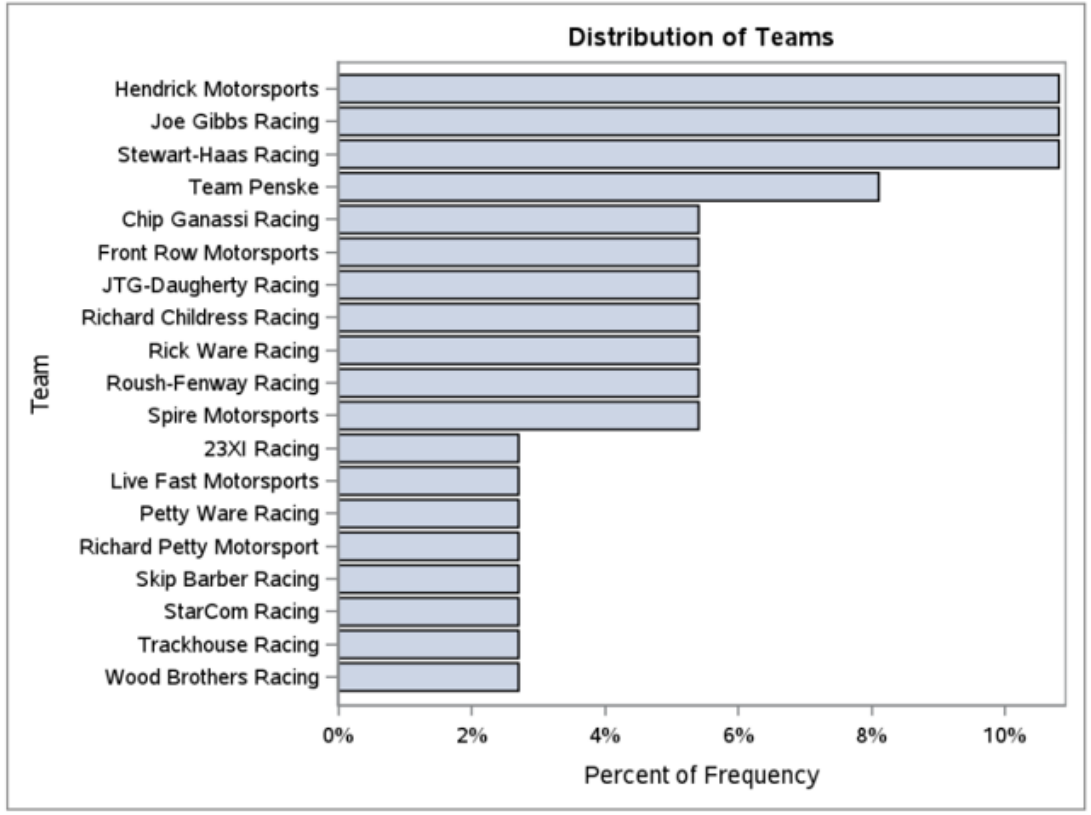
Description: The make of the car
Data Type: character
Number of Unique Manufacturers: 3
Manufacturers: Chevrolet, Toyota, Ford



VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

team

Description: The motorsport team to which the driver belongs
Data Type: character
Number of Unique Teams: 19
Teams: Hendrick Motorsports, Joe Gibbs Racing, Stewart-Haas Racing, Richard Childress Racing, Wood Brothers Racing, Chip Ganassi Racing, Team Penske, Roush-Fenway Racing, JTG-Daugherty Racing, Front Row Motorsports, 23XI Racing, Spire Motorsports, Richard Petty Motorsports, Live Fast Motorsports, Trackhouse Racing, StarCom Racing, Rick Ware Racing, Skip Barber Racing, Petty Ware Racing



VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

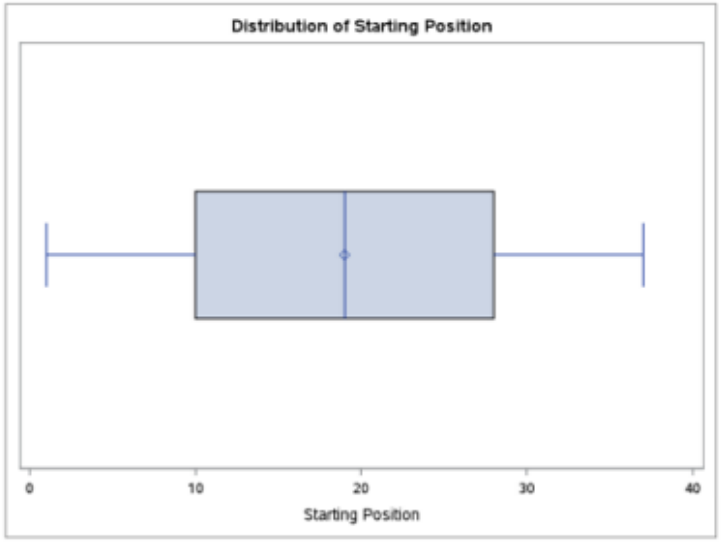
sponsor

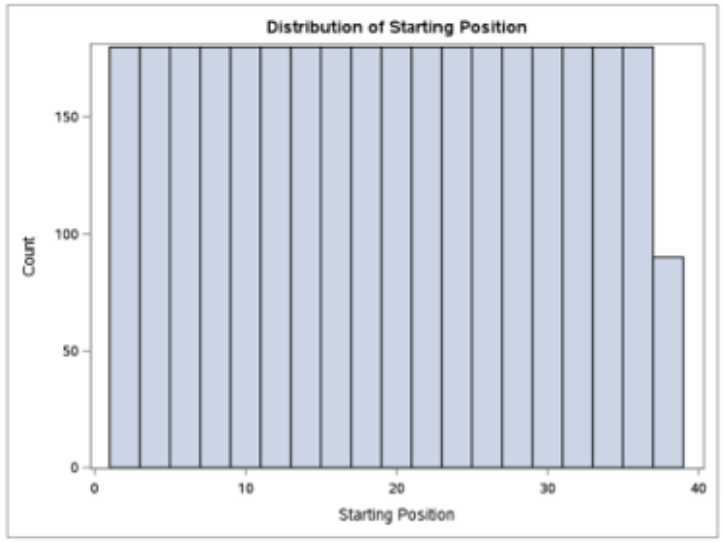
Description: The driver's primary sponsor(s) of the driver's race car
Data Type: character
Number of Unique Sponsors: 36
Sponsors: HendrickCars.com, NAPA Auto Parts, Reser's Fine Foods, Snickers, FedEx Express, Axalta, STANLEY, Busch Light Apple, HighPoint.com, Chevrolet Accessories, Menards/Moen, MyMcDonald's Rewards, Monster Energy, DEX Imaging, Cowboy Channel, Go Bowling, socios.com, HaasTooling.com, Kroger/Bush's Beans, Ally, CarParts.com, Verizon 5G, Toyota, Nations Guard, Bence Motor Sales, Clean Harbors, Kleenex, Fraternal Order of Eagles, Bremont Chronometers, Good Sam, Fare/Share, Insurance King, Lucas Oil School of Racing, Wabash National, Skip Barber Racing, Nurtec ODT

VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

start

Description: The position where the driver started the race
Data Type: numeric
Minimum: 1
1st Quartile: 10
Median: 19
Mean: 19
3rd Quartile: 28
Maximum: 37

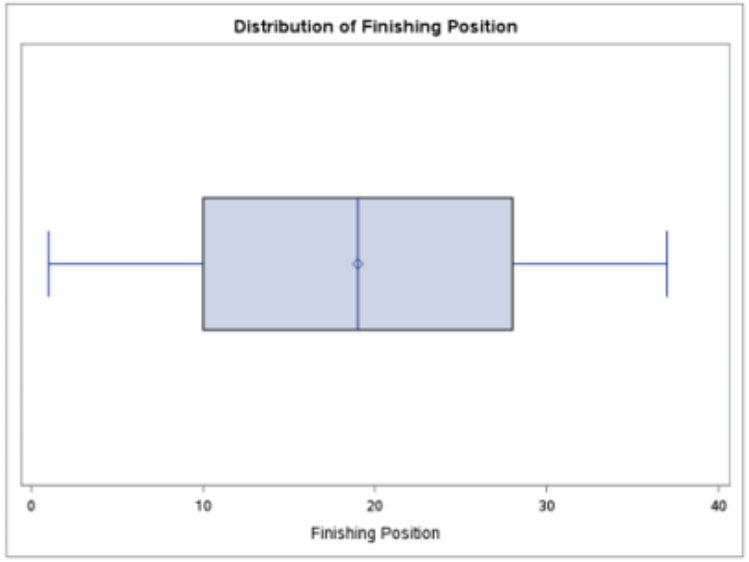


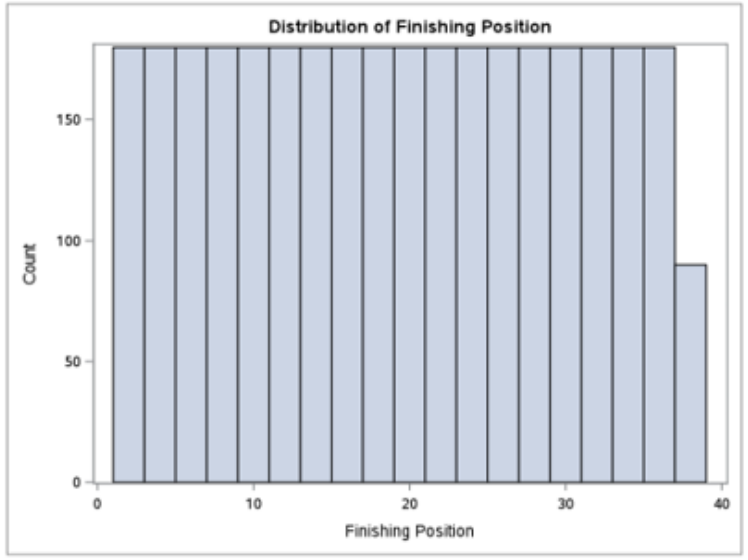


VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

finish

Description: The position where the driver finished the race
Data Type: numeric
Minimum: 1
1st Quartile: 10
Median: 19
Mean: 19
3rd Quartile: 28
Maximum: 37

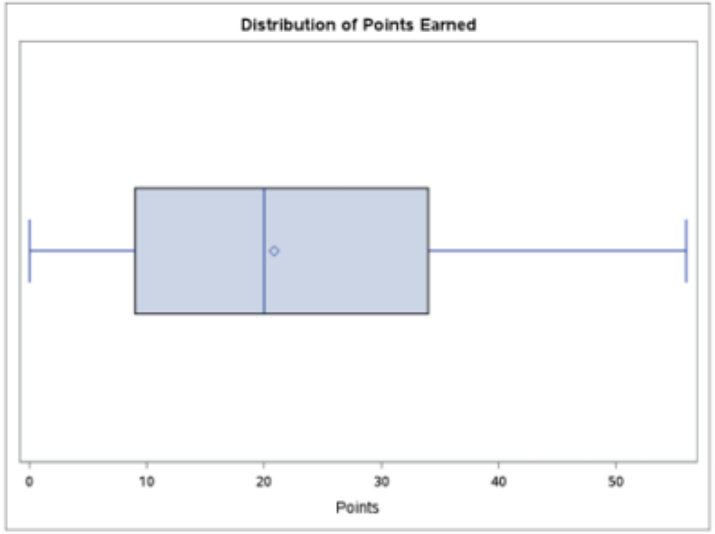


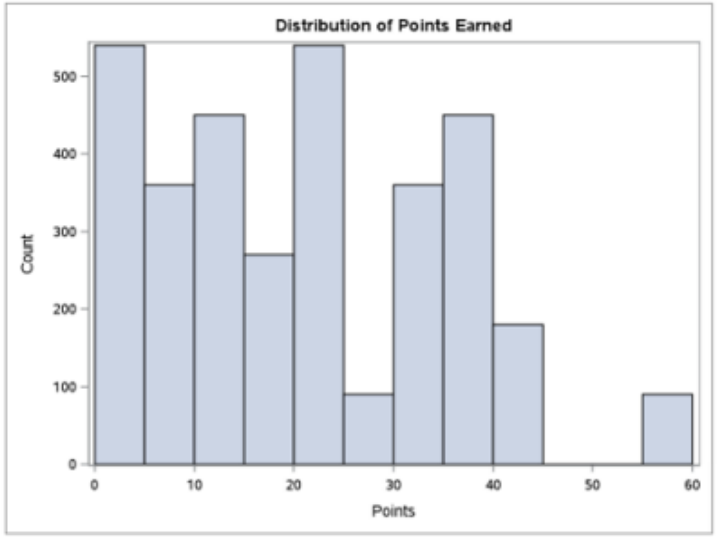


VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

points

Description: The total number of points that the driver earned throughout the race
Data Type: numeric
Minimum: 0
1st Quartile: 9
Median: 20
Mean: 20.86
3rd Quartile: 34
Maximum: 56

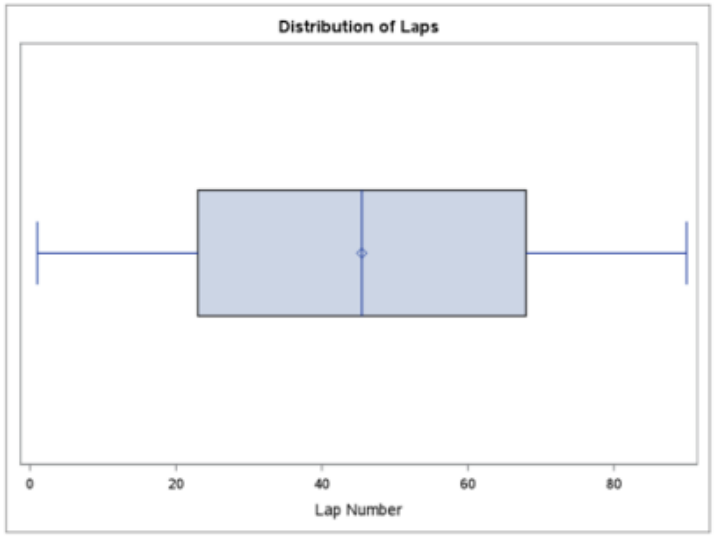


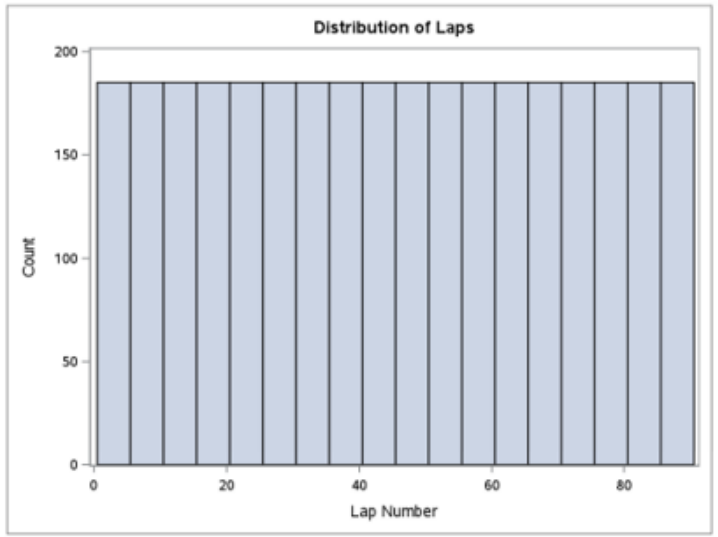


VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

lap

Description: The lap number in the race
Data Type: numeric
Minimum: 1
1st Quartile: 23
Median: 45.5
Mean: 45.5
3rd Quartile: 68
Maximum: 90

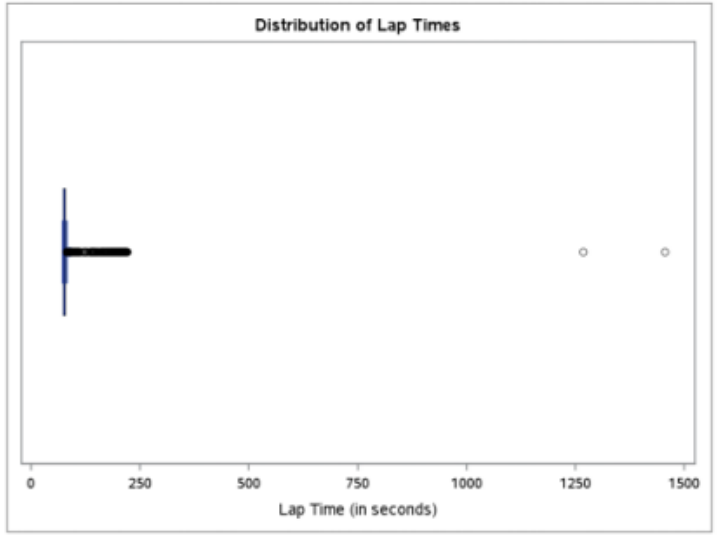


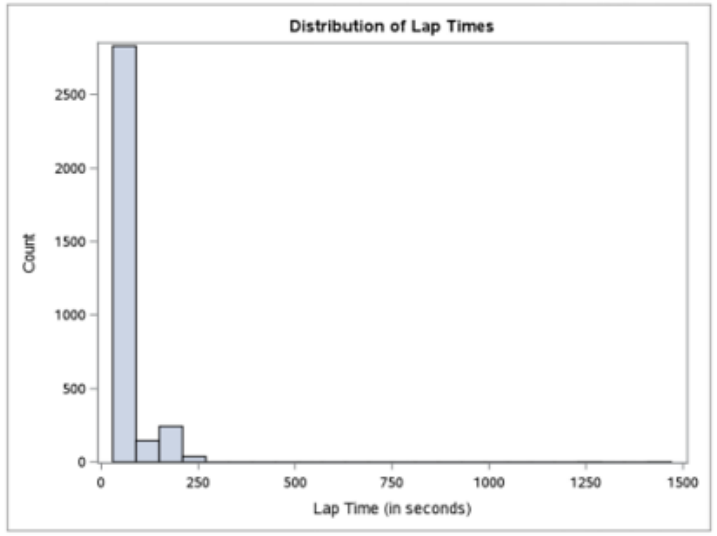


VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

lap_time

Description: The overall time of the lap (in seconds)
Data Type: numeric
Minimum: 72.63
1st Quartile: 75.08
Median: 75.83
Mean: 88.93
3rd Quartile: 77.78
Maximum: 1,456.19

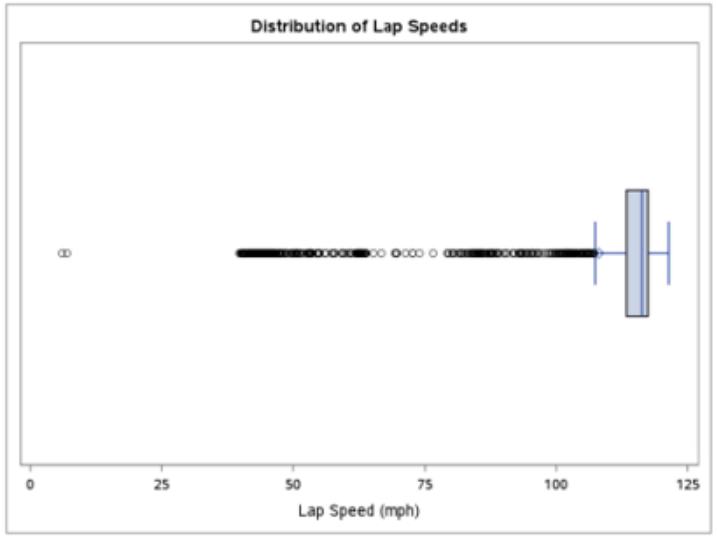


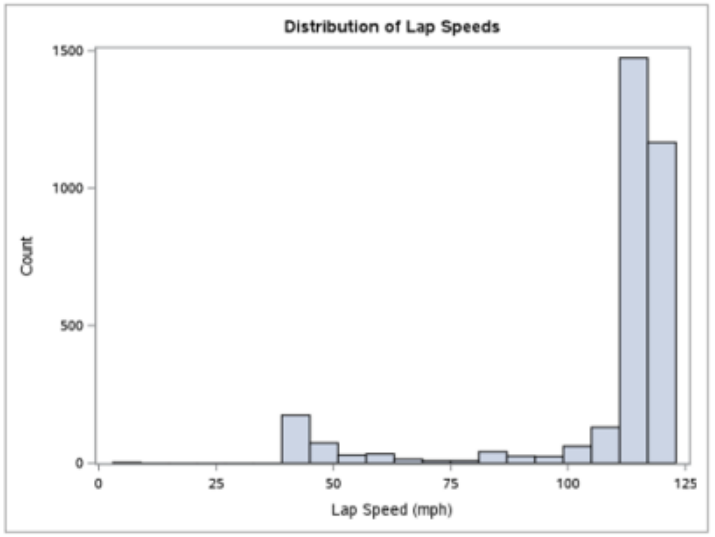


VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

lap_speed

Description: The overall speed of the lap (in miles per hour)
Data Type: numeric
Minimum: 6.06
1st Quartile: 113.40
Median: 116.31
Mean: 108.08
3rd Quartile: 117.48
Maximum: 121.43

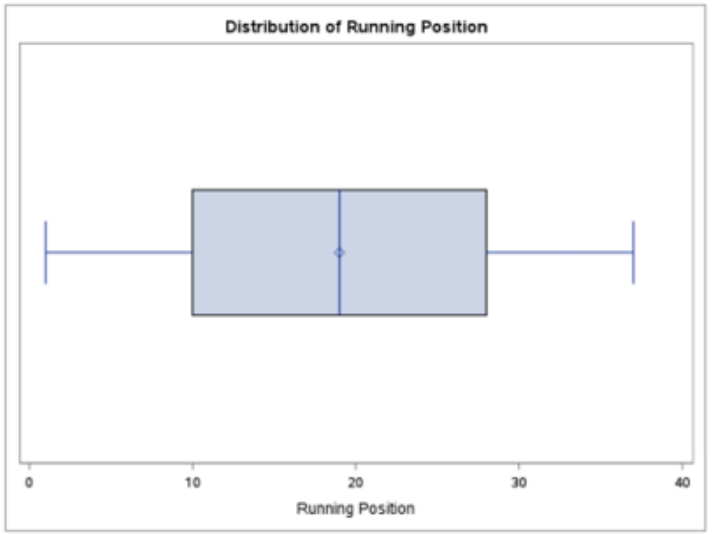


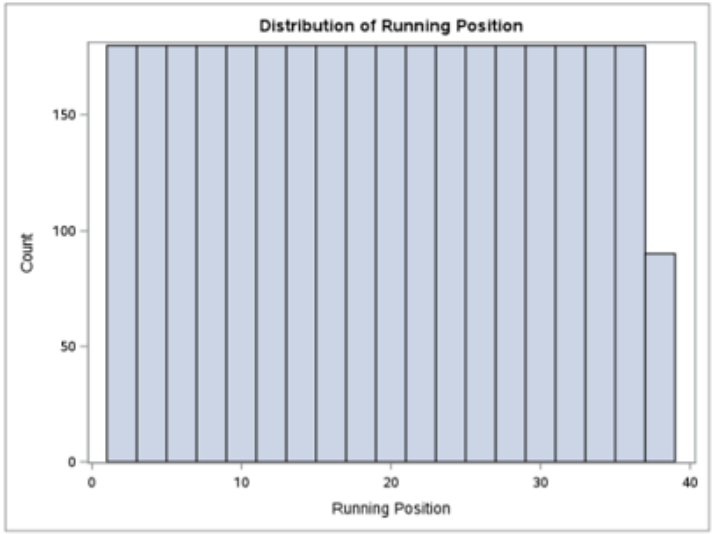


VARIABLE DESCRIPTIONS, STATISTICS, AND DISTRIBUTIONS

running_position

Description: The position the driver was scored in for that lap
Data Type: numeric
Minimum: 1
1st Quartile: 10
Median: 19
Mean: 19
3rd Quartile: 28
Maximum: 37





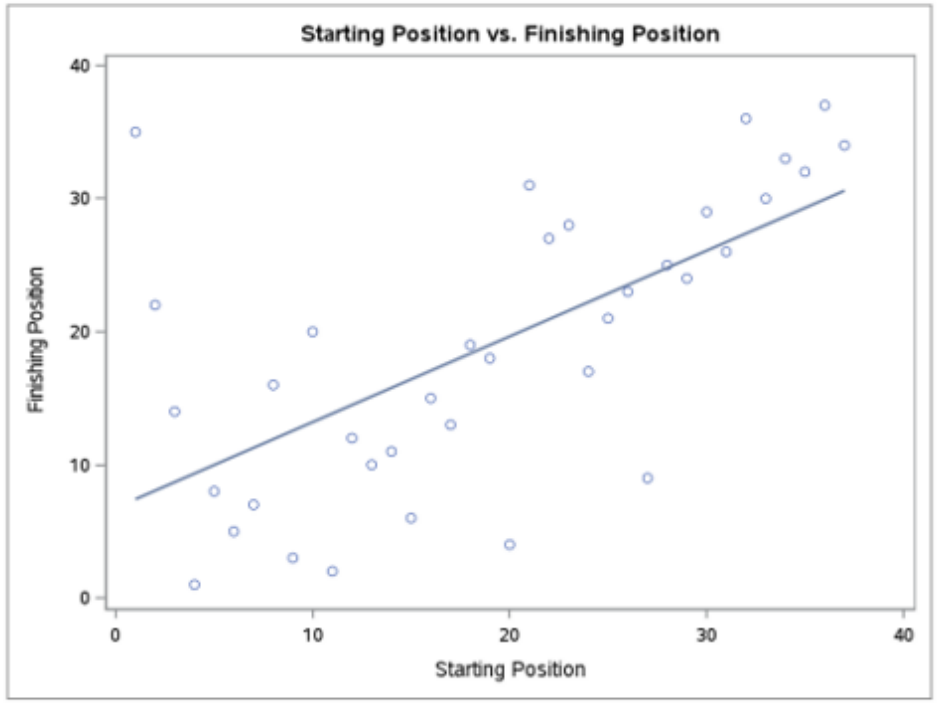
VARIABLE ANALYSIS

Start vs. Finish

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	1748.85159	1748.85159	24.79	<.0001
Error	35	2469.14841	70.54710		
Corrected Total	36	4218.00000			

Root MSE	8.39923	R-Square	0.4146
Dependent Mean	19.00000	Adj R-Sq	0.3979
Coeff Var	44.20648		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	6.76577	2.81860	2.40	0.0218
Start	1	0.64391	0.12933	4.98	<.0001



$$Finish = 6.76577 + 0.64391 \text{ x } Start$$

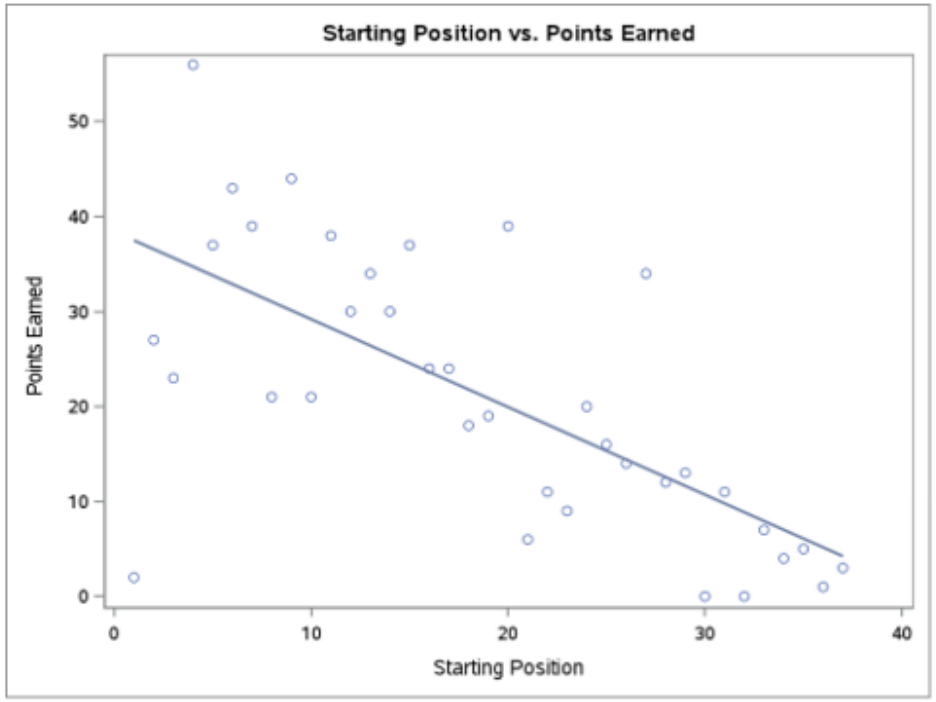
VARIABLE ANALYSIS

Start vs. Points

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	3600.42888	3600.42888	30.34	<.0001
Error	35	4153.89545	118.68273		
Corrected Total	36	7754.32432			

Root MSE	10.89416	R-Square	0.4643
Dependent Mean	20.86486	Adj R-Sq	0.4490
Coeff Var	52.21294		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	38.41892	3.65584	10.51	<.0001
Start	1	-0.92390	0.16774	-5.51	<.0001



$$Points = 38.41892 - 0.92390 \times Start$$

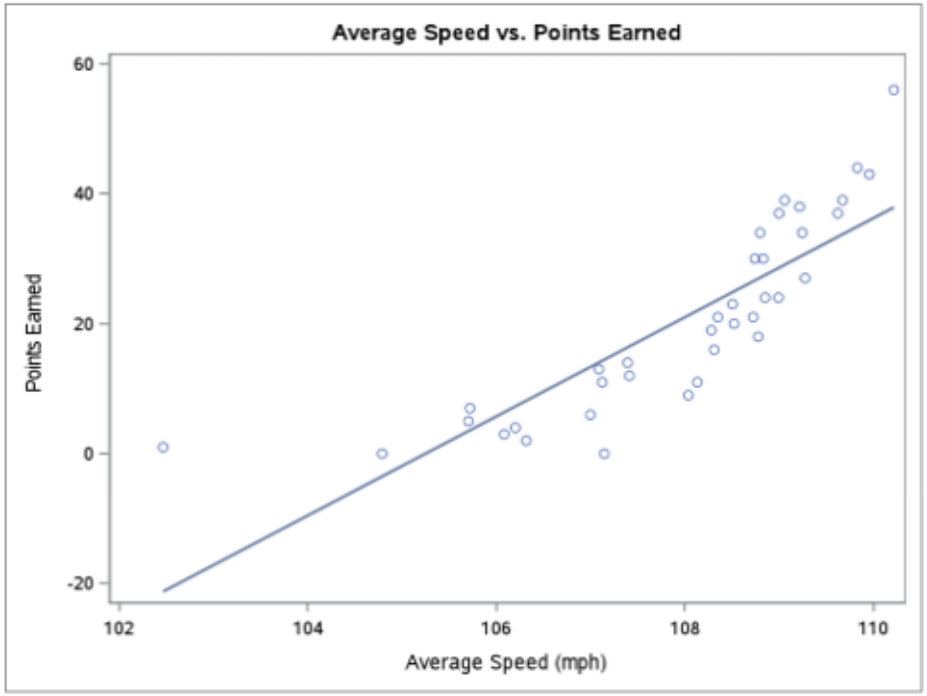
VARIABLE ANALYSIS

Average Speed vs. Points

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	5529.82615	5529.82615	87.01	<.0001
Error	35	2224.49817	63.55709		
Corrected Total	36	7754.32432			

Root MSE	7.97227	R-Square	0.7131
Dependent Mean	20.86486	Adj R-Sq	0.7049
Coeff Var	38.20907		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-802.86564	88.32004	-9.09	<.0001
Average_Speed	1	7.62818	0.81780	9.33	<.0001



$$Points = -802.86564 + 7.62818 \times Average\_Speed$$

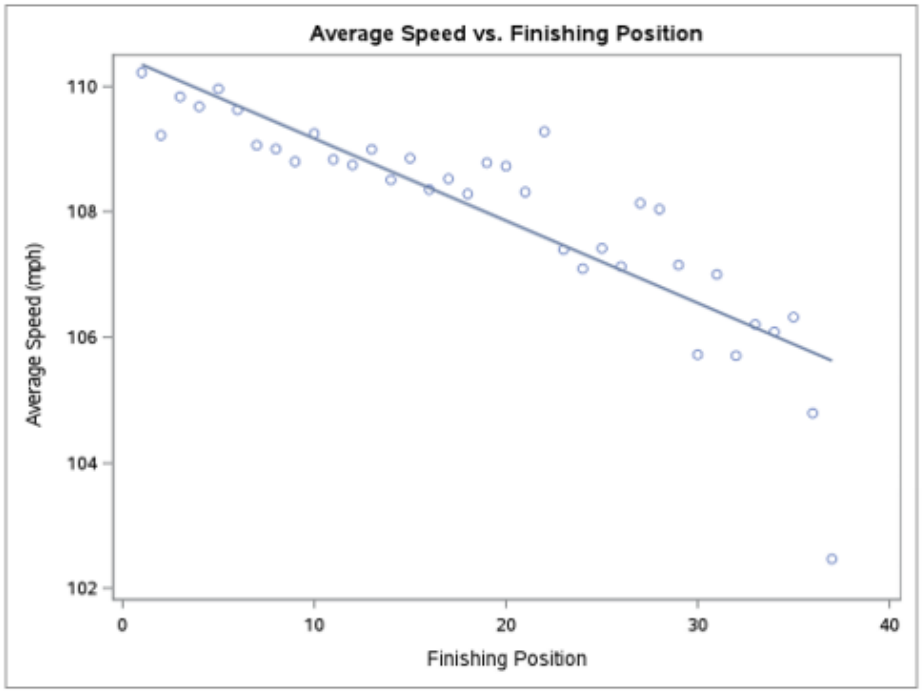
VARIABLE ANALYSIS

Average Speed vs. Finish

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	3217.95948	3217.95948	112.62	<.0001
Error	35	1000.04052	28.57259		
Corrected Total	36	4218.00000			

Root MSE	5.34533	R-Square	0.7629
Dependent Mean	19.00000	Adj R-Sq	0.7561
Coeff Var	28.13333		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	647.37616	59.21777	10.93	<.0001
Average_Speed	1	-5.81910	0.54833	-10.61	<.0001



$$Finish = 647.37616 - 5.81910 \times Average\_Speed$$

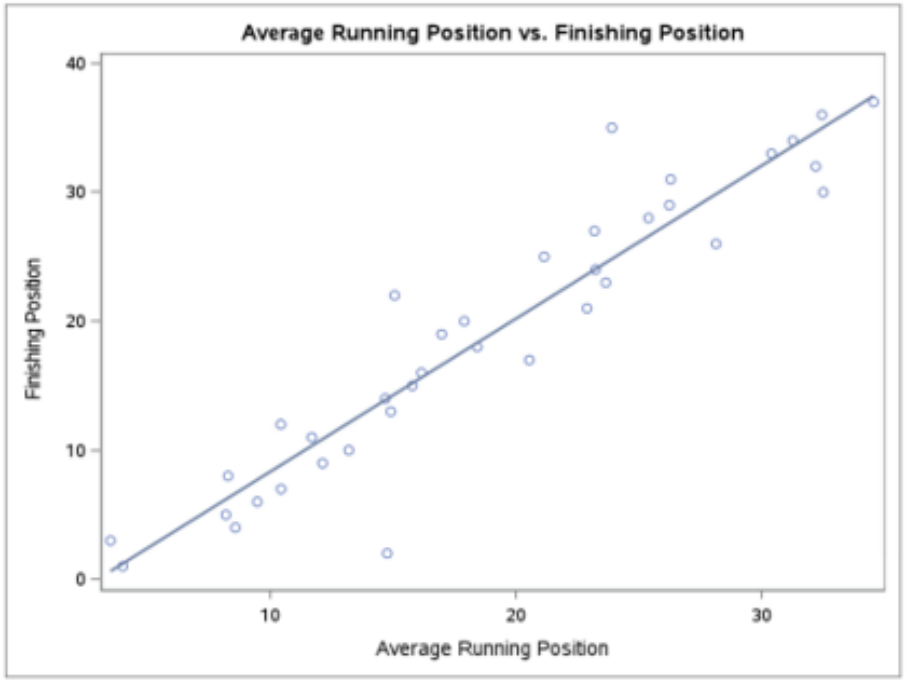
VARIABLE ANALYSIS

Average Running Position vs. Finish

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	3748.73880	3748.73880	279.60	<.0001
Error	35	469.26120	13.40746		
Corrected Total	36	4218.00000			

Root MSE	3.66162	R-Square	0.8887
Dependent Mean	19.00000	Adj R-Sq	0.8856
Coeff Var	19.27169		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-3.55638	1.47718	-2.41	0.0215
Average_Running_Position	1	1.18718	0.07100	16.72	<.0001



$$Finish = -3.55638 + 1.18718 \times Average\_Running\_Position$$

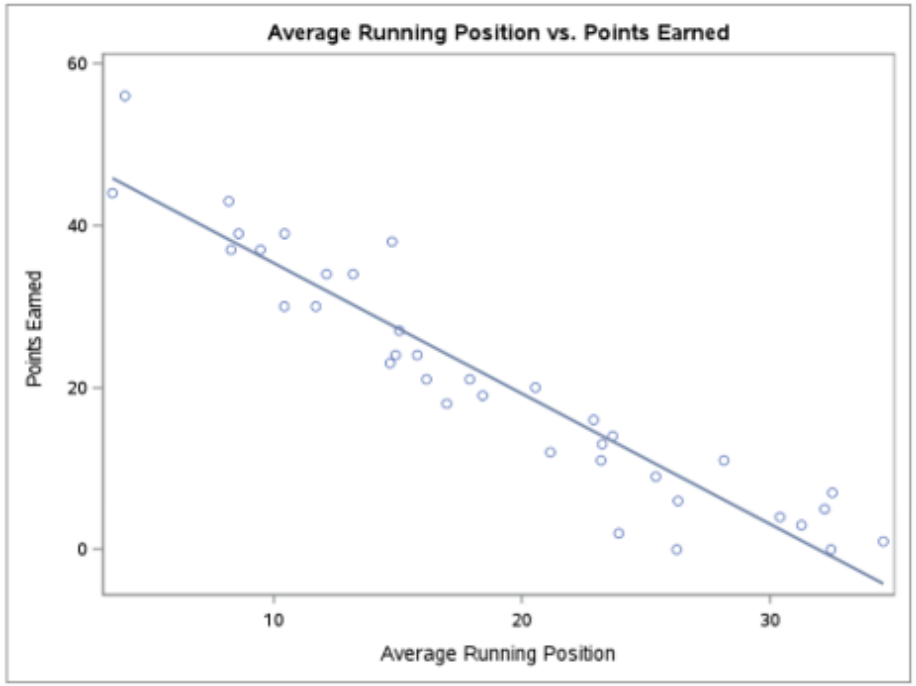
VARIABLE ANALYSIS

Average Running Position vs. Points

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	6914.12262	6914.12262	288.02	<.0001
Error	35	840.20170	24.00576		
Corrected Total	36	7754.32432			

Root MSE	4.89957	R-Square	0.8916
Dependent Mean	20.86486	Adj R-Sq	0.8886
Coeff Var	23.48238		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	51.49828	1.97660	26.05	<.0001
Average_Running_Position	1	-1.61228	0.09500	-16.97	<.0001



$$Points = 51.49828 - 1.61228 \times Average\_Running\_Position$$