



# FSA Quiz 2019

Results & Answer Key

Rank	Team	University	Score	Total Time
1	HAWKS Racing e. V.	Hochschule für Angewandte Wissenschaften Hamburg	161,4	1463
2	Oxford Brookes Racing	Oxford Brookes University	157,1	1709
3	Raftar Formula Racing	Indian Institute of Technology Madras	152,3	1531
4	Rennstall Esslingen	Hochschule Esslingen	148,0	1796
5	FSUPV Team	Universitat Politècnica de València	143,8	2248
6	Bodensee Racing Team	Fachhochschule Konstanz	140,7	1748
7	Lund Formula Student	Lund University	138,0	2273
8	Formula Technion	Technion - Israel Institute of Technology	137,9	2219
9	Southampton University Formula Student Team	University of Southampton	137,6	1283
10	AAU Racing	Aalborg University	137,5	2148
11	Formula Student Team Darmstadt	Hochschule Darmstadt, UAS	137,1	1545
12	UPBracingTeam e.V.	Universität Paderborn	135,6	1988
13	Eleven O Six Racing Team	Helmut Schmidt Universität / Universität der Bundeswehr Hamburg	134,2	1855
14	Infinity Racing - Rennteam der Hochschule Kempten e.V.	UAS Kempten	131,9	1557
15	Formula Student Team Weingarten	University of Applied Sciences Ravensburg-Weingarten	131,7	1371
16	CAT-Racing	Fachhochschule Coburg	131,3	1520
17	Baltic Racing	Fachhochschule Stralsund	130,6	1897
18	LUMotorsport	Loughborough University	130,0	1916
19	joanneum racing graz	Fachhochschule Joanneum Graz	129,8	1369
20	Formula Student Oulu	University of Oulu	129,1	2130
21	Akademische Motorsportgruppe Darmstadt e.V.	Technische Universität Darmstadt	128,9	1913
22	Seagulls Luebeck	Technische Hochschule Lübeck	127,9	1446
23	Prom Racing	National Technical University of Athens	127,2	1934
24	Dynamics e.V.	Ostbayerische Technische Hochschule Regensburg	127,1	1588
25	FaSTTUBE	Technische Universität Berlin	126,5	1789
26	HSNR Racing	Hochschule Niederrhein	125,9	2532
27	STES's STALLION MOTORSPORT	Smt. Kashibai Navale College of Engineering	125,8	1255
28	Aixtreme Racing	Fachhochschule Aachen	125,7	1574
29	Global Formula Racing (US)	Oregon State University	125,6	1792
30	Rennteam Uni Stuttgart	Universität Stuttgart	124,1	1586
31	Campus Motorsport Hannover	Fachhochschule Hannover	123,4	2172
32	DJS Racing	Dwarkadas. J. Sanghvi College of Engineering	123,1	1420
33	GET racing Dortmund e.V.	Technische Universität Dortmund	122,9	2497
34	UniBo Motorsport	Alma Mater Studiorum - Università di Bologna	121,5	1550
35	High-Octane Motorsports e.V.	Friedrich-Alexander-Universität Erlangen-Nürnberg	121,3	1672
36	E-Team Squadra Corse	Università di Pisa	120,8	2253
37	ARUS Andalucía Racing	University of Seville	120,6	2177
38	HHN Racing e.V.	Hochschule Heilbronn	120,0	2542
39	THM Motorsport	Technische Hochschule Mittelhessen	119,5	2079
40	municHMotorsport	Fachhochschule München	118,5	1567
41	RUB Motorsport	Ruhr-Universität Bochum	117,7	1479
42	University of Leeds	University of Leeds	117,3	1930
43	Rennschmiede Pforzheim	Hochschule Pforzheim	116,7	1508
44	Full Blue Racing	University of Cambridge	116,6	1636
45	Centaurus Racing Team	University of Thessaly	116,1	1875
46	BME Motorsport	Budapest University of Technology and Economics	116,0	2012
47	OS.Car Racing Team	FH Campus Wien	114,0	1861
48	Zips Racing	The University of Akron	113,9	2384
49	ISAT Formula Team	University of Burgundy - ISAT	113,6	1761
50	Einstein Motorsport	Fachhochschule Ulm	112,5	1907
51	PUT Motorsport	Poznan University of Technology	111,6	1722
52	TU Brno Racing	Brno University of Technology	111,6	1659
53	TU Graz Racing Team	Technische Universität Graz	111,2	1775
54	Veloce Racing	Vishwakarma Institute of Technology	111,1	1638
55	UBRacing	University of Birmingham	108,8	1595
56	Scuderia Tor Vergata	Università degli Studi di Roma Tor Vergata	108,4	1192
57	UMD Racing e.V.	Otto-von-Guericke-Universität Magdeburg	108,4	1633
58	Tampere UAS Motorsport	TAMK University of Applied Sciences	107,3	2162
59	LiU Formula Student	Linköping University	106,4	2537
60	Formula ETS	École de Technologie Supérieure	106,2	1620
61	Ecurie Piston Sport Auto	Ecole Centrale de Lyon	105,9	1765
62	High Speed Karlsruhe	Hochschule Karlsruhe - Technik und Wirtschaft	105,7	2123
63	Arrabona Racing Team	Széchenyi István University	104,1	2077
64	War Eagle Motorsports	Auburn University	103,5	1680
65	MoRe Modena Racing	University of Modena and Reggio Emilia	103,2	2583
66	KA-Racelng Combustion	Karlsruhe Institute of Technology	101,7	2212
67	Formula Student KPI	National Technical University of Ukraine "Kyiv Polytechnic Institute""	100,6	2824
68	Bauman Racing	Bauman Moscow State Technical University	100,4	2443
69	Firenze Race Team	Università degli Studi di Firenze	100,1	1499
70	KEFO Motorsport	Kecskemét College	98,7	1300
71	Pravega Racing	VIT University - Vellore	98,1	1743
72	Unical Reparto Corse	Università della Calabria	96,0	1755
73	Team Bath Racing	University of Bath	94,1	1722
74	METU Formula Racing	Middle East Technical University	92,4	2083

75	Polytech North Capital Motorsport	Peter the Great St. Petersburg Polytechnic University	92,4	2253
76	Dynamis PRC	Politecnico di Milano	91,7	1567
77	Gear Shifters	Birla Institute of Science and Technology Pilani - Dubai	90,0	2486
78	Aristotle Racing Team	Aristotle University of Thessaloniki	90,0	3339
79	PWR Racing Team	Wroclaw University of Technology	88,5	1407
80	UVigo Motorsport	Universidad de Vigo	87,0	1714
81	Panther Racing	University of Pittsburgh	85,4	1306
82	UNI Maribor Grand Prix Engineering	University of Maribor	85,3	1694
83	Formula Manipal	Manipal Academy of Higher Education	85,2	1555
84	Metz Racing Team	Ecole Nationale d'Ingénieurs de Metz	84,3	2101
85	University of Strathclyde Motorsport	University of Strathclyde	83,1	1429
86	PolSI Racing	Silesian University of Technology	82,9	2023
87	CTU CarTech	Czech Technical University in Prague	81,4	1732
88	NUST Formula Student Team	National University of Sciences and Technology - Karachi	81,4	2308
89	Clear River Racing	Karlstad University	80,9	2101
90	Hyperion Racing	Pillai Institute of Information Technology	80,9	2983
91	Formula UC3M	University Carlos III of Madrid	80,7	1928
92	GreenLion Racing	Bergische Universität Wuppertal	80,0	3289
93	Cerber Motorsport	Białystok University of Technology	77,4	1217
94	Scuderia Mensa HS RheinMain Racing	Hochschule RheinMain	76,7	1517
95	Road Arrow Team	University of Belgrade (Универзитет у Београду)	75,7	1964
96	SPCE Racing	Sardar Patel College of Engineering	75,6	1620
97	YTU Racing	Yıldırım Technical University	75,2	1863
98	Racing Team Pilsen	University of West Bohemia	74,2	1949
99	HAN Formula Student Team	HAN University of Applied Sciences	74,1	2322
100	Polimarche Racing Team	Marche Polytechnic University	74,0	2220
101	ATHENE RacingTeam	Universität der Bundeswehr München	73,0	1974
102	Wrench Welders Racing	Symbiosis Institute of Technology	72,0	2386
103	INITIAL	King Mongkut's Institute of Technology Ladkrabang	70,4	2313
104	Democritus Racing Team (DRT)	Democritus University of Thrace	70,0	8308
105	Team Octane Racing	College of Engineering Pune	67,4	1655
106	ZHCET Formula Racing	Aligarh Muslim University	66,2	1582
107	ISEL Formula Student	Instituto Superior de Engenharia de Lisboa	65,4	2338
108	University Of Hertfordshire	University Of Hertfordshire	65,4	1319
109	Rhein-Mosel-Motorsport	Koblenz University of Applied Science	64,6	2008
110	Hacettepe Racing	Hacettepe University	63,1	1667
111	Neftegaz Engineering	Tyumen Industrial University	62,5	1921
112	VIA-Hunters Racing Team	VIA University College	62,4	1981
113	PRz Racing Team	Rzeszów University of Technology	62,4	1963
114	Rochester Institute of Technology	Rochester Institute of Technology	62,4	2103
115	Formula Racing Miskolc	University of Miskolc	62,2	2303
116	Camber Racing	SRM University	61,6	1675
117	FH-Dortmund Race-Ing.	Fachhochschule Dortmund	60,6	3256
118	UPT Racing Team	Universitatea Politehnica Timișoara	60,3	1382
119	Togliatti Racing Team	Togliatti State University	60,0	2506
120	FESB Racing	University of Split	59,0	1820
121	Team Defianz Racing	Delhi Technological University	57,3	1508
122	Vishwaracers	Vishwakarma Institute Information Technology	56,9	1584
123	Oakland University Formula SAE	Oakland University	56,8	1499
124	UToronto Racing	University of Toronto	56,7	1570
125	Team HARE	University of Huddersfield	53,9	1867
126	Estaca Formula Team	ESTACA - Paris-Saclay	52,4	2245
127	Sapienza Corse	Università degli Studi di Roma "La Sapienza"	50,0	31025
128	UniNa Corse - Squadra Corse "Federico II""	Università degli Studi di Napoli Federico II	47,1	1443
129	NED Racers	NED University of Engineering and Technology	45,1	1992
130	Illuminati Racers	Lovely Professional University	44,2	1743
131	STES Racing	Sinhgad Technical Education Society	43,4	1652
132	Kafr El Sheikh Racing Team	Kafrelsheikh University	42,4	2277
133	PGRacing Team	Gdańsk University of Technology	41,5	1809
134	Poliba Corse	Politecnico di Bari	40,0	2460
135	UniBS Motorsport	University of Brescia	40,0	2495
136	Resonance Racing	AISSMS (All India Shri Shivaji Memorial Society's) College of Engineering	37,7	1082
137	FS TUL Racing	Technical University of Liberec	35,6	2055
138	KU Motorsports	Kingston University	35,6	1018
139	Formula URJC	Universidad Rey Juan Carlos	33,4	1737
140	Gear Shifters	Birla Institute of Science and Technology Pilani - Dubai	30,0	2280
141	Formula Student ONPU	Odessa Polytechnic National State University	30,0	2590
142	UPCT Racing Team	Universidad Politécnica de Cartagena	27,1	486
143	TEIWM Racing	Technological Educational Institute of Western Macedonia	23,3	2008
144	UJI Motorsport FS Team	Universitat Jaume I	23,1	1846
145	Usurt	Ural State University of Railway Transport	21,3	2069
146	T.U.Iasi Racing Team	The "Gheorghe Asachi" Technical University of Iasi	20,8	1004
147	TU-Sofia Racing Team	Technical University of Sofia	20,0	1953
148	Shukhov Racing Team	Belgorod state technological university named after V. G. Shukhov	20,0	2101
149	Team RGIT	Rajiv Gandhi Institute of Technology - Mumbai	20,0	2728
150	TEAM MH-08 RACING	Rajendra Mane College of Engineering and Technology	20,0	16999
151	MMU Racing	Manchester Metropolitan University	10,0	31908

Rank	Team	University	Score	Total Time
1	Formula Student Team Delft	TU Delft	197,5	2142
2	Elbflorace	Technische Universität Dresden	192,8	2116
3	TUfast Racing Team e-Technology	Technical University of Munich	191,3	2017
4	Team wob-racing.	Ostfalia University of Applied Sciences	187,2	2129
5	Ecurie Aix Formula Student Team RWTH Aachen e.V.	Rheinisch-Westfälische Technische Hochschule Aachen	187,2	2449
6	AMZ Racing Team	ETH Zürich	183,1	1766
7	Superior Engineering FS Ljubljana	University of Ljubljana	181,3	2292
8	TU Darmstadt Racing Team e.V.	Technische Universität Darmstadt	180,7	2131
9	Team Starcraft e.V.	Technische Universität Ilmenau	177,8	2139
10	eMotorsports Cologne	Technische Hochschule Köln	173,0	1563
11	HorsePower Hannover e.V.	Leibniz Universität Hannover	171,8	2513
12	FSB Racing Team Electric	University of Zagreb	171,3	1621
13	raceyard	Fachhochschule Kiel	171,1	2914
14	Axlr&r Formula Racing	Indian Institute of Technology Delhi	170,3	1590
15	Revolve NTNU	Norwegian University of Science and Technology	166,3	1854
16	Racetech Racing Team TU Bergakademie Freiberg e.V.	Technische Universität Bergakademie Freiberg	166,3	2052
17	Green Voltage Racing	Technische Universität Clausthal	165,8	1657
18	CURE	Duale Hochschule Baden-Württemberg - Mannheim	164,0	2378
19	FS Team Tallinn	Tallinn TU UAS	163,5	1815
20	Team Spark	University of Iceland	162,7	2887
21	UPC ecoRacing	Escola Superior d'Enginyeries Industrial, Aeroespacial i Audiovisual de Terrassa (UPC)	161,4	1741
22	ETSEIB Motorsport	Escola Técnica Superior d'Enginyeria Industrial de Barcelona	160,9	2053
23	Global Formula Racing (DE)	Duale Hochschule Baden-Württemberg Ravensburg	159,6	1626
24	e-ignition Hamburg	Technische Universität Hamburg-Harburg	158,7	1823
25	Lausanne Racing Team	École Polytechnique Fédérale de Lausanne	158,5	2101
26	FaSTTUBe	Technische Universität Berlin	157,6	3114
27	eMOTION RACING HRW	Hochschule Ruhr West - UAS	156,7	2416
28	F-Agle Trento Racing Team	Università degli Studi di Trento	155,1	2542
29	STUBA Green Team	Slovak University of Technology in Bratislava	153,0	2547
30	GreenTeam Uni Stuttgart	Universität Stuttgart	151,8	2085
31	BME Formula Racing Team (FSE)	Budapest University of Technology and Economics	150,9	1844
32	ARUS-e	University of Seville	150,2	2362
33	Strohm + Söhne e.V.	Georg-Simon-Ohm-Hochschule Nürnberg	148,9	1889
34	Dynamics Electric	Ostbayerische Technische Hochschule Regensburg	148,4	1890
35	Blue Flash	Hochschule für angewandte Wissenschaft und Kunst Hildesheim/Holzminde/Göttingen	147,4	1830
36	Aristotle University Racing Team Electric	Aristotle University of Thessaloniki	147,3	2886
37	UoP Racing	University of Patras	147,2	2025
38	Schanzer Racing Electric e.V.	Technische Hochschule Ingolstadt	147,0	2569
39	Herkules Racing Team Kassel	Universität Kassel	146,3	2174
40	Orion Racing India	K. J. Somaiya College of Engineering	146,2	1790
41	Kaiserslautern Racing Team	Technische Universität Kaiserslautern	145,9	2180
42	FST Lisboa	Instituto Superior Técnico - U. T. Lisboa	145,8	2093
43	KA-Racing Electric	Karlsruhe Institute of Technology	145,6	2445
44	SquadraCorse PoliTo	Politecnico di Torino	144,5	2279
45	eForce FEE Prague Formula	Czech Technical University in Prague	144,3	2534
46	IIT Bombay Racing Team	Indian Institutes of Technology - Bombay	143,9	2273
47	WHZ Racing Team	Westfälische Hochschule Zwickau	143,6	1547
48	Formula Electric Belgium	KU Leuven - Group T Campus	142,1	2608
49	Running Snail Racing Team	Ostbayerische Technische Hochschule Amberg-Weiden (OTH)	140,7	2108
50	Elefant Racing e.V.	Universität Bayreuth	138,9	2234
51	SDU - Vikings Racing Team	University of Southern Denmark	138,0	1638
52	T.U.C. Racing e.V.	Technische Universität Chemnitz	136,5	2123
53	Deefholt Dynamics e.V.	Fachhochschule für Wirtschaft und Technik	135,2	2330
54	Tecnun eRacing	TECNUN - University of Navarra	134,7	2346
55	DHBW Engineering Stuttgart	Duale Hochschule Baden-Württemberg Stuttgart	131,9	1687
56	IRT electric	Fachhochschule Osnabrück	129,9	1996
57	BRS Motorsport e.V.	Hochschule Bonn-Rhein-Sieg	129,7	1848
58	LUMU e-Racing Team	Liverpool John Moores University	129,6	1663
59	Mainfranken Racing	UAS Würzburg-Schweinfurt	129,2	1974
60	Evolution Racing Team Saar	Saarland University	127,7	3075
61	Campus Tirol Motorsport	Leopold-Franzens-Universität Innsbruck	126,1	2059
62	Chalmers Formula Student	Chalmers University of Technology	125,4	3345
63	Bern Formula Student	Bern University of Applied Sciences	125,3	1794
64	TUW Racing	Technische Universität Wien	124,6	2071
65	Lions Racing Team e.V.	Technische Universität Braunschweig	124,4	2139
66	UPM Racing	Universidad Politécnica de Madrid (UPM)	122,8	2166
67	ISAT Formula Team	University of Burgundy - ISAT	122,4	2205
68	STES's Stallion Motorsport Electric	Smt. Kashibai Navale College of Engineering	120,5	1635
69	Ben-Gurion Racing	Ben-Gurion University of the Negev	120,0	2830
70	StarkStrom Augsburg	Hochschule für angewandte Wissenschaften Augsburg	115,6	2580
71	Metropolia Motorsport	Helsinki Metropolia University of Applied Sciences	114,7	1566
72	Fast Charge	Università degli Studi di Roma "La Sapienza"	113,8	3174
73	Fast Forest	Deggendorf Institute of Technology	112,8	2381
74	OWL Racing-Team	Hochschule Ostwestfalen-Lippe	111,7	4271
75	LA eRacing e.V.	Hochschule Landshut	110,3	2770
76	e-Tech Racing	Escola d'Enginyeria de Barcelona Est. EEBE	106,1	2583
77	Delta Racing	Hochschule Mannheim	102,2	2213
78	Technikum Mittweida Motorsport	Hochschule für Technik und Wirtschaft Mittweida	100,2	1894
79	Formula Manipal Electric	Manipal Academy of Higher Education	97,7	1645
80	AGH Racing Electric	AGH University of Science and Technology	94,8	1992
81	Speeding Scientists Siegen e.V.	Universität Siegen	94,6	2480
82	E-Team Duisburg-Essen	Universität Duisburg-Essen	91,7	2850
83	HofSpannung Motorsport e.V.	Hochschule für Angewandte Wissenschaften Hof	91,3	1972
84	Bremery Racing	Universität Bremen	90,2	2829
85	VUB Racing	Vrije Universiteit Brussel	87,9	1555
86	Team Ojas	VIT University - Vellore	87,5	1309
87	Team Bath Racing Electric	University of Bath	86,8	1694
88	ION Racing	University of Stavanger	86,8	2396
89	Proton Dynamic	Warsaw University of Technology	86,5	2481
90	Unipr Racing Team	Università degli Studi di Parma	85,6	1826
91	Falcon E Racing	University of Moratuwa	84,4	2043
92	KTH Formula Student	KTH Royal Institute of Technology	79,0	1542
93	E-Motion Rennteam Aalen e.V.	Hochschule Aalen - Technik und Wirtschaft	78,1	1636
94	YTU Racing	Yildiz Technical University	74,4	2143
95	Aalto Formula Team	Aalto University	69,7	1690
96	Sopiana-e Motorsport	University of Pécs	67,8	2252
97	ERURacing	Erciyes University	62,4	2514
98	Cairo Uni Racing Team	Cairo University	61,8	1919
99	Beelectric	Istanbul Technical University	61,3	1842
100	UniBo Motorsport Electric	Alma Mater Studiorum - Università di Bologna	55,8	1087
101	HHN eRacing	Hochschule Heilbronn	32,5	1401
102	SRT Electric	Belgorod state technological university named after V. G. Shukhov	31,5	2708

**Which of these is true regarding cranking your engine in the pit?**

- It is sufficient to have passed mechanical inspection
- All driven wheels must be removed
- You need the supervision of a staff member
- All wheels must be removed

**Correctness:**

C: 66%

E: 87%

**Hint:**

-

**Skidpad scoring:**

Your team's best runtime is 6.25s, the overall best time is 5s.

How many points do you score?

Please use the following format: 12.34

Answer

**Correctness:**

C: 66%

E: 78%

**Hint:**

-dynamic score = 0; finish score = 3.5

**What is true regarding the Brake Over-Travel Switch (BOTS)?**

- The brake test is considered passed if the BOTS has opened the shutdown circuit as long as all wheels have locked up and the vehicle stopped in a straight line
- It has to be wired in parallel to the inertia switch as part of the shutdown system
- It may be reset by the driver when he comes to a stop for the endurance drivers' change
- It has to open the shutdown circuit if there is a leak in the rear braking circuit, even if the balance bar is set to 80% front

**Correctness:**

C: 73%

E: 90%

**Hint:**

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**Your driver pushes the brake pedal and the accelerator pedal at the same time. Which statement is correct?**

- The BSPD must be supplied from the low voltage master switch only
- Above a brake pressure of 20 bar the car traction system will shut down anyway
- At the earliest the car traction system will shut down after one second
- Above a brake pressure of 30 bar the car traction system will shut down if 4kW power is delivered to the electric motors (EV) or the throttle position is more than 5% over idle position (CV)

**Correctness:**

C: 71%

E: 90%

**Hint:**

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**UL94-V0 rating cannot be granted if...**

- Combustion up to 25mm before the holding clamp
- Flame height = 21 mm
- First flame application time = 10s, first burning time = 5s, second flame application time = 10s, second burning time = 9s
- First flame application time = 10s, first burning time = 9s, second flame application time = 10s, second burning time = 8s, the total burning time of all 10 flame applications in the set did not exceed 45s
- Dripping of burning specimens including ignition of cotton batting

**Correctness:**

C: 60%

E: 80%

**Hint:**

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**Concerning aerodynamic devices which statement is not compliant to the rules?**

- All aerodynamic devices must be able to withstand a force of 150 N distributed over a certain surface
- A rear wing rearward of the driver head restraint is permitted if it's lower than 0.9 m from the ground
- Aerodynamic devices mounted forward than 800 mm from the fronts of the front tire are prohibited
- All aerodynamic devices in front of the front axle and extending further outboard than the most inboard point of the front tire/wheel must be higher than 250 mm from the Ground.

**Correctness:**

C: 50%

E: 55%

**Hint:**

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### Your car is the ultimate accelerating machine

and is able to lift the front tires off the track during the first section of the acceleration event!

Your wheelbase is the required minimum, your weight distribution with driver is 70 % rear and you are using the latest tires with a friction coefficient of  $\mu=2$  (CoF).

What is the minimum possible height of your center of gravity of your car to show the mentioned behaviour?

Answer in [m], rounded to 0.01



Please use the following format: 12.34

Answer

### Correctness:

C: 52%

E: 76%

### Hint:

- Calculate the sum of moments around the CG
- Front axle load = 0;

**You do an acceleration run.**

Your car constantly accelerates with  $10 \text{ m/s}^2$ . After 10 meters your engine / motor(s) die and deliver no power any more. Your car then constantly de-accelerates with  $0.2 \text{ m/s}^2$ .

How far do you make it from the start?

Answer in whole [m]

Please use the following format: 12.34

Answer

**Correctness:**

C: 68%

E: 86%

**Hint:**

-use the timeless formula for constant acceleration:

$$v = \sqrt{2 \cdot \text{acc} \cdot \text{dist}}$$

Your car has a suspension geometry with zero caster, camber and toe.

The tire contact patch is assumed to be linear, the contact force distribution is assumed to be triangular (see image). How much steering torque applied on the steering wheel is required to move the steering from the center position during standstill?

Tire width  $w$ : 7 inch

Control rod arm  $e$ : 95mm

Pinion meshing diameter  $d$ : 34mm

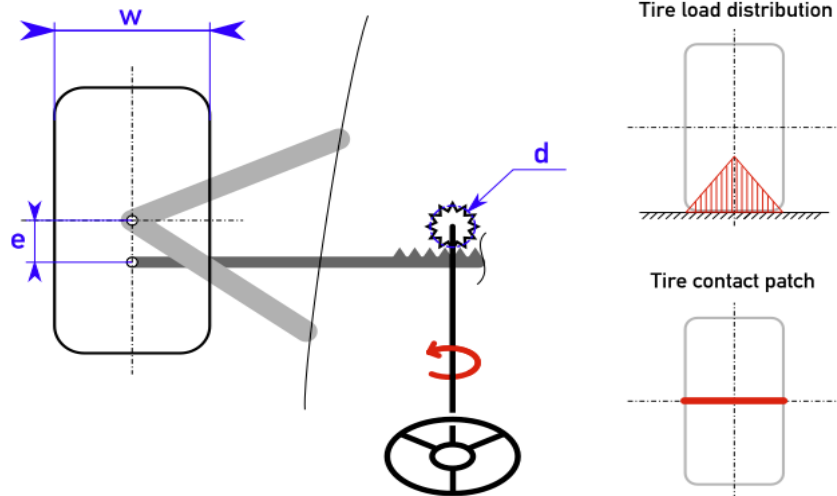
Weight of car /w driver: 227kg

Weight distribution /w driver: 48% Front

Static tire  $\mu$ : 1.5 (CoF)

$g = 9.81 \text{ m/s}^2$

Answer in [Nm], rounded to .1



Please use the following format: 12.34

Answer

**Correctness:**

C: 9%

E: 18%

**Hint:**

- The triangular load can be replaced by a vector at  $1/3 * 1/2w$  distance from the center
- For EV, the values were 272kg and 48% rear. -> 11.0 Nm

**You build an AutoX track on your testing ground. Which elements are not conformant to the rules?**

- 45° turn with a diameter of 20 m and a track width of 2.75 m
- Hairpin turn with an inner diameter of 6 m and a track width of 3.5 m
- Slalom with constant spacing of 10 m
- Straight with a length of 70 m and a track width of 4 m

**Correctness:**

C: 72%

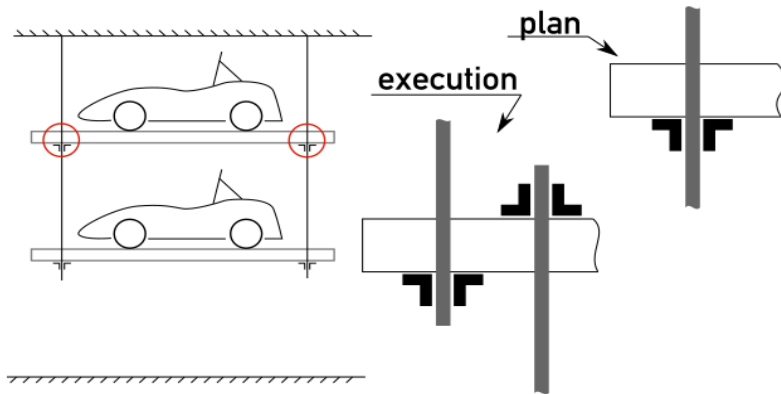
E: 90%

**Hint:**

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**You plan a nice display for your race cars in your shop**

consisting of platforms suspended on steel tie rods. All parts are delivered as designed, but you notice that the assembly was done differently. Is this a problem?



- Yes, because the tie rods might be overloaded
- Yes, because the nuts might be overloaded
- Yes, because some of the nuts are loaded in the wrong direction
- Yes, because the ceiling mounts might be overloaded
- No, all parts are still bearing their design loads

**Correctness:**

C: 48%

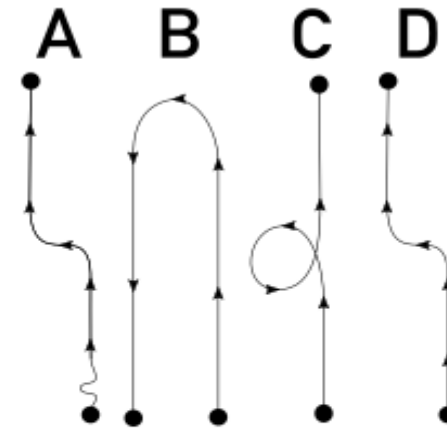
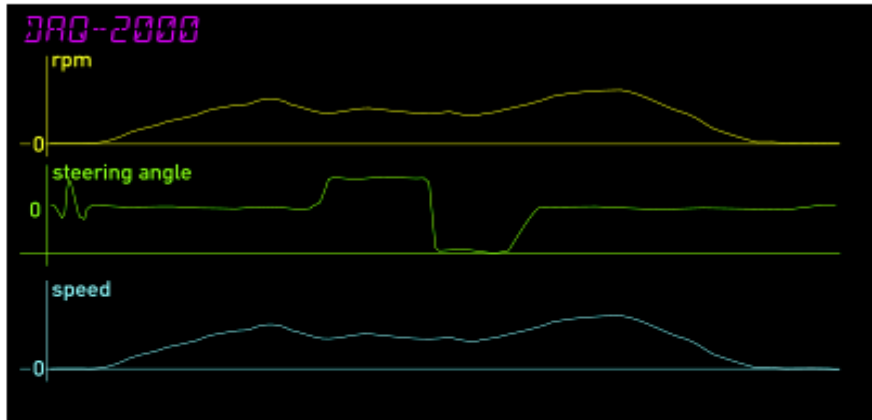
E: 74%

**Hint:**

- See

[https://en.wikipedia.org/wiki/Hyatt\\_Regency\\_walkway\\_collapse#Investigation](https://en.wikipedia.org/wiki/Hyatt_Regency_walkway_collapse#Investigation)

Which driving trajectory fits the data shown in the diagram?



- B
- C
- D
- A

**Correctness:**

C: 7%

E: 15%

**Hint:**

-The speed is zero during the first steering maneuver.

- For CV class A and D were swapped



**Which statement regarding the shutdown buttons is false?**

- The shutdown buttons must be connected in series to the low voltage master switch
- The buttons must be clearly marked by the international electric symbol
- The minimum diameter of the cockpit mounted shutdown button is 24mm
- At a minimum, two shutdown buttons must be installed

**Correctness:**

C: 80%

**Hint:**

-

**What is true regarding the management of unintentionally spilled fluids?**

- Fuel that is spilled during refueling must be directed into a catch can with at least 900ml volume
- The vent of a separate hydraulic shifting system must be connected to the engine oil catch can
- Engine oil that leaks from a broken seal must be caught by an undertray to prevent oil spills on the track and environmental pollution
- If there is more than one local lowest point in the enclosed structure between the chassis and the ground, a minimum of 3 venting holes is necessary.

**Correctness:**

C: 53%

**Hint:**

-

**What is true regarding the mechanical configuration of the tractive system energy storage?**

- Holes in the container are only allowed if they are necessary for the venting of explosive gas
- Fasteners to attach pouch cells to the container must comply with rule T10
- The mounting of the accumulator cells to the container must withstand 40 g acceleration in vertical direction
- Vertical walls must be made from steel 0.9 mm thick or aluminium 2.3 mm thick only

**Correctness:**

E: 45%

**Hint:**

-

**Your battery pack is built from 4 Stacks of 103 Cells each (103S4P)**

Each stack has a capacity of 1.20 kWh and an internal resistance of 320 mOhm. If all cells are charged & balanced to 3.80V and behave equally, which current do you draw at 30 kW power output from the pack?

Answer in [A] rounded to .1

Please use the following format: 12.34

Answer

**Correctness:**

E: 55%

**Hint:**

- Model the system as voltage source, series resistance and load
- derive the sum of voltages in the circuit, expressed through currents
- solve the quadratic equation for I

**Under which conditions are outboard wheel motors allowed?**

- The activation of the shutdown circuit occurs at max 1s after the TS wiring is damaged
- The shutdown circuit is activated if the TS wiring is damaged
- TS wiring will not touch the chassis regardless of where it is damaged
- The TS wiring is of a length enough not to be damaged even if the wheel is displaced (e.g. break of a tie rod)

**Correctness:**

E: 87%

**Hint:**

-

**Which Statement regarding the Ready to drive sound is true?**

- The sound level is measured in dBC
- No animal voices may be used
- The ready to drive sound must be 4s long, with a tolerance of +/- 0.25s
- A sound level of 85 dBA is conformant to the rules

**Correctness:**

E: 49%

**Hint:**

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