



# Quiz Keys 2023



## Autocross Scoring

Competing in the FSA 2023 autocross event, your team achieves the following run times:

Run	Time	Cones (DOO)
1	01:06.37	0
2	01:04.28	0
3	01:05.62	0
4	01:02.41	1

The fastest time in your class is 00:58.49

What is your final autocross score?

Round your result to the nearest integer.

- 72 points
- 57 points
- 83 points
- 56 points

## Power for Popcorn

Late in the evening at the FSA campsite, your team is using just one electric socket to supply all appliances with power.

This socket has a single phase with 230V AC (RMS) and a 16A fuse.

The lights in your team tent use 100W.

Cooking dinner for the hungry team on an electric stove uses 2500W.

Six laptops, to prepare static events tomorrow, are plugged into the chargers at 65W each.

A very hungry team member wants to make some popcorn in the microwave using 800W.

How many laptops does he have to unplug to not blow the fuse by drawing too much power?

(All appliances draw real power only, consider a "perfect" fuse which will not trip when plugging in / starting an appliance but will trip exactly at the specified power rating in the time it takes the popcorn to cook)

- 2
- 0
- the fuse will blow even if all laptops are unplugged.
- 4

## Coil Spring Design

You want to manufacture your own suspension coil springs to get exactly the right spring rate for your car.

You have a spring steel wire with a diameter of 8mm and a shear modulus of 80GPa.

The final spring should have an inside diameter of 50mm.

How many active coils must your spring have to give you a spring rate of 42N/mm?

Round your result to one decimal place

Please use the following format: 12.34

Answer

## VSV

Your team is very motivated to get the car ready for the VSV.

At 23:30, all preparations are finished.

and you decide to immediately film the video and upload it to the FSA homepage and celebrate this success.

You also send the video to the rest of your team members, who are not present, to share the wonderful moment.

The next morning, a few team members contact you, wanting to film the video again, because they think it will fail upon review.

Which of them is right?

- The submission may fail, because it was filmed at night, running under low visibility conditions.
- The submission may fail, because after the car stops at the end of the video, the loud cheering of the present team members is embarrassing.
- The submission may fail, because not all 4 wheels are locking, when braking at the end.
- The submission may fail, because the car is not painted yet.

## Business Scoring

What is the scoring of the BPP based on?

- On the score given by the head judge
- On the sum of the scores given by each of the judges
- On the score given by the responsible BPP room judge
- On the average of the scores given by each of the judges

## Business Plan Pitch Video

How long does the BPPV (Business Plan Pitch Video) have to be?

- at least 20 seconds, maximum 40 seconds
- a maximum of 35 seconds
- must not be longer than 30 seconds
- the length doesn't matter

## Flags on Track

What does the red and yellow striped flag indicate?

- Danger, the driver must slow down, something has happened beyond the flag station, no overtaking unless directed by the track marshals.
- The driver must pull into the driver change area for a mechanical inspection of the vehicle, something has been observed that requires a closer inspection.
- The driver must come to an immediate safe and controlled stop on the track and must follow track marshals' directions.
- The track is slippery or something is on the racing surface that should not be there. The driver must be prepared for evasive maneuvers to avoid the situation.



## Bonded Joints

Which of the following statements regarding the connection of components is correct?

- Bonded joints without a mechanical backup are not permitted.
- Only bonded joints that can be proven with an FEM simulation are accepted.
- At bonded joints a 50 % reduction shall be applied to all nominal and tested adhesive values and bonded joints in the primary structure must be shown in the SES.
- Only values from data sheets may be used for calculations for bonded joints.

## Tube Bending Radius

The FSA cat wants to make the main hoop for its race car by itself this year.

To do this, it is using the thinnest-walled tube at the lowest allowed cross-section made of S355JR material available to it (according to the rules).

What is the minimum inner radius of the finished bend in millimeters?

Round the result to the nearest integer.

- 75mm
- 82mm
- 90mm
- 63mm

## Skid Pad Scoring

As every year, all teams arrived late to the FSA skid pad event, and only you and two other cars managed to put down a time.

Your time was 4.926s, the other two cars did 5.103s and 4.756s.

What is your skid pad score?

Round your result to one decimal place.

61.5

58.0

12.8

48.9

## Bending Beam

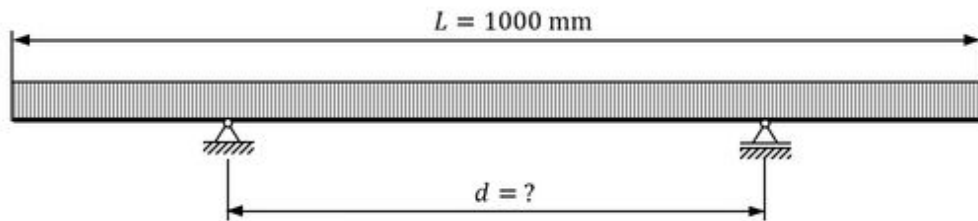
For the beam in the sketch below, find the optimum distance  $d$  in millimeters between the two supports so that the maximum of the bending stress anywhere in the beam is minimal.

The beam is loaded by a constant line load acting in a downwards direction.

Consider that the system is symmetric and that the beam has a constant cross-section and is made from homogenous linear-elastic material.

Round your result to one decimal place.

(Hint: consider only the point in each section where you expect the highest bending stress)



- 616.1mm
- 585.8mm
- 535.3mm
- 858.5mm

## Business Finalists Score

What is the lowest possible score for BPP finalists at FSA?

- 71 points
- 70 points
- highest non-finalist score
- 75 points

## Document Review Failed

What happens if the uploaded document is set to "failed" by an official during the SES document review?

- The team leader must write an apology email and upload the new document within 24 hours in order to avoid penalties.
- The team has to upload a corrected version within 168 hours in order not to be de-registered from the event.
- The team will receive 10 penalty points, which will be added to the total score.
- The team has to upload a corrected version within two weeks in order to avoid penalties.

## Front Impact Attenuator Systems

What is true regarding the Anti Intrusion Plate (AIP), the Impact Attenuator (IA) and its surroundings?

- A rectangular 350x380mm AIP may be attached to the front bulkhead using 15 M6 grade 8.8 bolts
- If a standard aluminium honeycomb IA is bonded to a 4mm thick aluminium AIP, there is no circumstance where officials can require additional physical testing or changes to the design
- A rectangular 350x380mm AIP may be attached to the front bulkhead using 4 M10 grade 12.9 bolts if equivalent strength to the required number of M8 grade 8.8 bolts can be shown
- No part of any IA may be above 350mm from the ground during the tech inspection

## Frequencies

At which dominant frequency is a four-cylinder in-line engine with standard flat-plane crankshaft vibrating at an engine speed of 4500 rpm?

Assume that it is perfectly balanced through counter-weights located on the crankshaft.

Give the result in Hz, rounded to the nearest integer.

- 75Hz
- 300Hz
- 4500Hz
- 150Hz



## Tractive System Accumulator Container

What is true regarding the requirements of the Tractive System Accumulator Container (TSAC)?

- If the TSAC lid is used to hold the cell stacks in place, it is not sufficient to show equivalency to the requirements in EV 5.5.4, but further calculations have to be made in order to show compliance
- For any TSAC made using sandwich materials, a separate grounded aluminium layer must be included
- If located in front of the front roll hoop, it may alternatively be shielded from collisions by the front bulkhead support structure according to T 3.14.
- It must be made of fire-resistant materials, which when tested according to the UL 94 V test procedure are allowed to drip flaming particles that ignite the cotton below the test sample



Thank you for joining FSA quiz!

