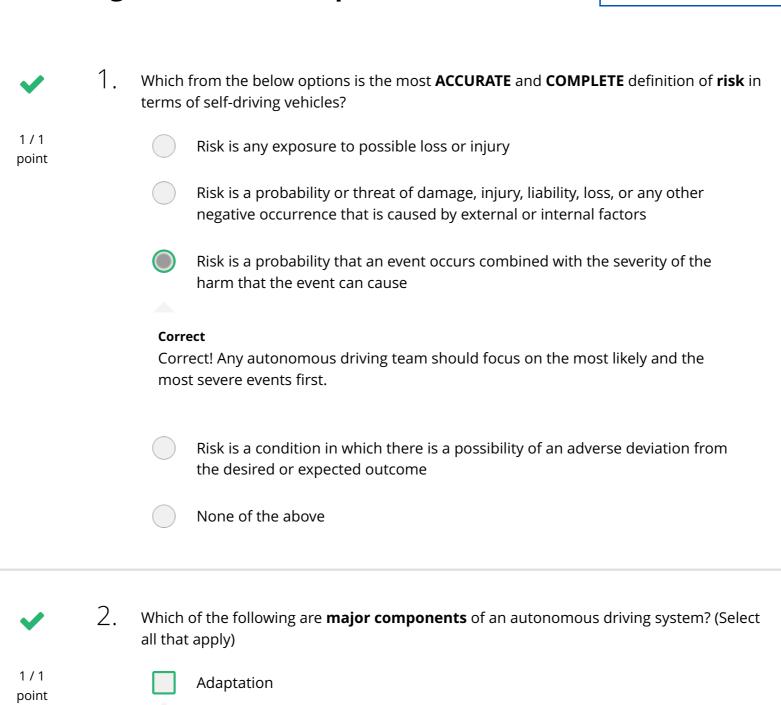


# Congratulations! You passed!

Next Item



Un-selected is correct

Control

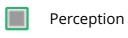
Correct

Correct! This aspect of the autonomous driving system is extremely important. A mistake in this components can lead to failures and crashes.

Planning

Correct

Correct! This aspect of the autonomous driving system is extremely important. A mistake in this components can lead to failures and crashes.



#### Correct

Correct! This aspect of the autonomous driving system is extremely important. A mistake in this components can lead to failures and crashes.



**Un-selected is correct** 



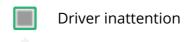
What are the most common categories of autonomous vehicle **hazard sources**? (Select all that apply)



Perception and planning

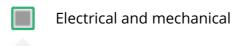
#### Correct

Correct! This is a major hazard source.



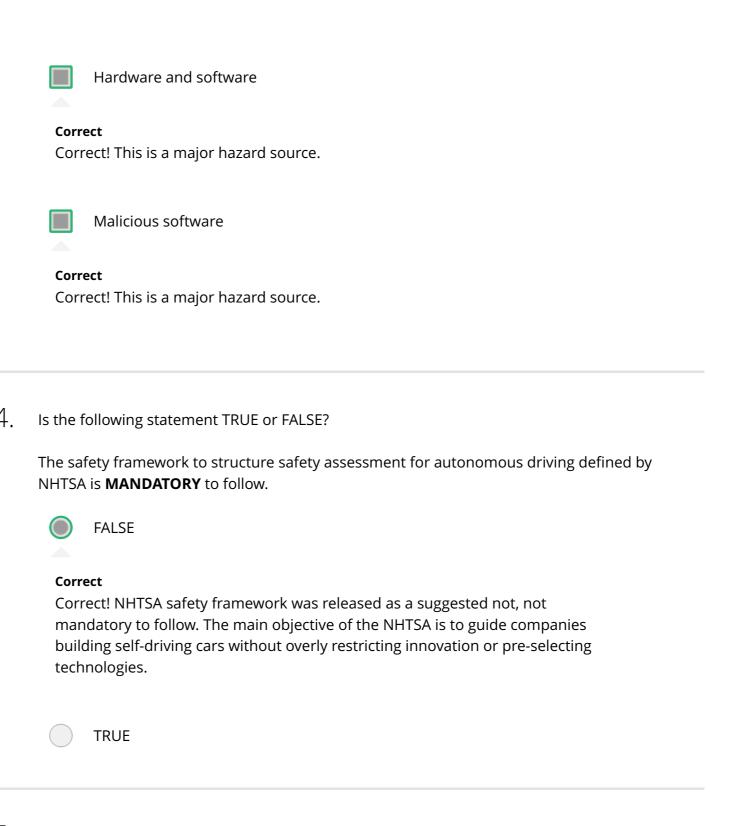
# Correct

Correct! This is a major hazard source.



## Correct

Correct! This is a major hazard source.





1/1

point

5. Which categories are included in the **safety framework** to structure safety assessment for autonomous driving defined by NHTSA? (Select all that apply)

1 / 1 point

Well-organized software development process

#### Correct

Correct! This is what any autonomous driving company should focus on according to NHTSA.



Testing and crash mitigation

### Correct

Correct! This is what any autonomous driving company should focus on according to NHTSA.



Autonomy design

## Correct

Correct! This is what any autonomous driving company should focus on according to NHTSA.



Digital vehicle model design

**Un-selected is correct** 



6. Which actions are needed to be performed **in the event of an accident** by an autonomous vehicle? (Select all that apply)

1/1 point



Locking all doors

**Un-selected is correct** 



Returning car to a safe state

### Correct

Correct! An autonomous vehicle's post crash behavior should include returning the car to a safe state, for example, stopping.



Data recording to a black box

# Correct

Correct! An autonomous vehicle needs to have an automated data recording function or black box recorder. It is very helpful to have this crash data to analyze and design systems that can avoid this specific kind of crash in the future.



Securing fuel pumps

## Correct

Correct! Securing fuel pumps in the event of a crash is critical for preventing further potentially dangerous situations.



Alerting first responders

#### Correct

Correct! An autonomous vehicle should quickly alert first responders in the event of an accident.



/. What are the **most common** accident scenarios? (Select all that apply)



Intersection

## Correct

Correct! All the correct accident scenarios from this question account for over 84% of all crashes.



Rollover

# **Un-selected is correct**



Road departure

# Correct

Correct! All the correct accident scenarios from this question account for over 84% of all crashes.



Rear-end

#### Correct

Correct! All the correct accident scenarios from this question account for over 84% of all crashes.



Crosswalk

8,800,000,000 miles / 100 vehicles = 88,000,000 miles per vehicle

**Correct Response** 

Correct!

88,000,000 miles / 25 miles per hr = 3,520,000 hrs per vehicle

24 hours \* 365 days = 8,760 hrs in a year

3,520,000 hrs / 8,760 hrs in a year = 401.8 years

It would take at least 400 years to validate the required level of safety with a fleet of 100 vehicles traveling 24x7. That's why testing is being done today on thousands of vehicles simultaneously.



1/1 point 10. Given that an autonomous vehicle failure has happened and based on this tree, **what is the probability** that the failure happened because of Vehicle Control Algorithm Failure OR Inadequate Car Drivers? Please give your answer with the precision of 3 decimal places.

Please use this probabilistic fault tree for your computation:

Probabilistic Fault Tree.png

0.382

# **Correct Response**

Correct! The operations used to propagate the probabilities on probabilistic fault trees upwards are the same as the rules of probability when events follow set theory. So, the OR probabilities would be the sum of children node probabilities, assuming independence of the events.



1/1

point

1. Given that the autonomous vehicle failure has happened, and based on this tree, **what is the probability** that the failure happened because of Software Failure AND Extreme Weather Conditions at the same time? Please give your answer with the precision of 3 decimal places.

Please use the probabilistic fault tree from the previous question for your computation:

Probabilistic Fault Tree.png

0.001

## **Correct Response**

Correct! The operations used to propagate the probabilities on probabilistic fault trees upwards are the same as the rules of probability when events follow set theory. So, the AND probabilities would be the product of children node probabilities, assuming independence of the events



1/1 point

12. A computer vision algorithm is responsible for extracting meaningful data from the onboard camera. A computer vision failure restricts the vehicle's ability to navigate the environment around it, hence a problem with this system is a serious failure. However, LiDAR and radar sense similar environment data, so a computer vision failure does not leave the vehicle completely blind. A Computer vision algorithm failure can be considered a somewhat severe failure as it decreases vehicle sensing ability and it gets a severity score of 5. This could happen regularly in low light situations, hence the occurrence number is assigned 4. Computer vision algorithm failure is fairly detectable in majority of the situations, so the detectability score is 3.

What is the risk priority number for a Computer vision algorithm failure according to FMEA and based on the description above? Your answer should be an integer.

60

## **Correct Response**

Correct! The risk priority number is a product of the severity, frequency and detectability of an event. Each feature of the risk priority number is assessed on the scale from 1 to 10, where 10 is being the most severe, the most frequent and the most difficult to detect.



13. There are failures listed below. Which failures should we focus on **solving first** according to FMEA?

1/1 point

GPS synchronization failure (risk priority score of 300)



Vehicle motion prediction failure (risk priority score of 150)



Vehicle driving onto a gravel road (risk priority score of 400)

	Correct	
	Correct! The higher the risk priority score is, the higher priority of this failure is.	
		Computer vision algorithm failure (risk priority score of 60)
		Computer vision algorithm failure (risk priority score of oo)
	14. Which of the following options is the most ACCURATE and COMPLETE definition of functional safety in terms of self-driving vehicles?	
•		
1/1		Functional cafety is the process of avaiding unreasonable risk of harm to a
point		Functional safety is the process of avoiding unreasonable risk of harm to a living thing.
		Functional safety is the detection of a potentially dangerous condition resulting
		in the activation of a protective or corrective device or mechanism to prevent
		hazardous events arising or providing mitigation to reduce the consequence of
		the hazardous event
	Correct Correct!	
	Con	ect:
		Functional safety is a deterministic algorithm outlining the procedures that are
		carried out to prevent hazardous events from happening or minimizing the
		harm caused by hazardous events to the vehicle passengers and third parties
		involved in the situation
		Functional safety is a part of the vehicle operation management aimed to
		minimizing hazards, risks, accidents and near misses
		None of the above
	15 Which	of the following standards defines <b>functional safety terms</b> and <b>activities for</b>
		ical and electronic systems within motor vehicles?
1 / 1 point		ISO/TC 204
P 3c		100 20004
		ISO 39001
		ISO/PAS 21448
		ISO 26262

# Correct

Correct! The ISO 26262 standard defines functional safety terms and activities for electrical and electronic systems within motor vehicles, and as such addresses the hardware and software hazards that can affect autonomous vehicle safety.



None of the above





