



Unit: Driving Skills

Theme 1: Hazards

There are many hazards for drivers. The aim of this theme is to lead pupils to the conclusion that on-road driving can be as hazardous as driving on a race circuit – indeed, normal road drivers face a higher number of hazards than racing drivers on a race circuit.

The lists below show examples of all the different types of hazards that on-road drivers face. These are not finite lists.

Activity 1a: Think of a hazard...

Driver induced hazards

- Driving under the influence of drink or drugs (even some medicines)
- Driving when feeling ill or tired
- Being distracted (mobile phones, other passengers, etc)
- Driving when vehicle suffers mechanical failures (worn-out brakes or tyres, screen wipers or lights not working, etc).

Hazards from other road users

Drivers need to anticipate the actions of other road users, especially those of:

- Young children – their actions are often unpredictable and they have little sense of danger
- Elderly – poor eyesight or hearing and ill health can result in bad judgement of traffic speed and distance. Slower mobility also needs to be taken into consideration.
- Learner Drivers – they often brake suddenly or manoeuvre without warning
- All pedestrians – e.g. crossing the road, especially at night
- Cyclists – can wobble or lose balance
- Motorcyclists – sometimes travel fast and can be difficult to see
- Emergency vehicles – travel fast, not necessarily following road rules
- Other drivers – under the influence of alcohol or drugs, unfit, aggressive or risk-taking.

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Road environment hazards

- Road works or other obstacles
- Debris on the road, potholes, chippings, cracks, etc
- Sharp corners
- Parked cars (obscuring vision of other road users)
- Road signs hidden/obscured from vision
- Junctions without clear priority
- Malfunctioning/not working traffic lights, pedestrian crossings, etc
- Unprotected level crossings
- Badly lit/unlit country roads/lanes
- Animals on the road, especially in country areas.

Weather hazards

- Wet or icy roads
- Flooded road surface
- Fog
- Snow
- Strong winds
- Sun low on the horizon.

Mechanical failures

- Broken down vehicles in unexpected places
- Own car mechanical failures.



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Theme 2: In-car protection

Activity 2a: Protection for racing drivers

Safety in racing – the only thing that matters more than winning

Below are some of the safety features found in Formula BMW racing cars.

- Racing drivers in single-seater racing cars have the protection of a survival cell. This cell is a kind of capsule, extending from in front of the driver's feet to a point behind the fuel tank, at the back.
- Cockpit openings are large enough to make driver extraction easier in the event of a crash.
- Drivers can be rescued whilst still strapped to their seat in a Formula BMW race car. This safety feature is called the Formula Rescue Seat (FORS). If necessary, a driver can be removed from the car and transported together with the seat shell. Due to its non-metallic materials, the seat even allows for x-rays and CT scans. This reduces the scope for accidental errors by the rescue team, ensures that the driver's spinal column is not subjected to any further strain, saves valuable time and, potentially, lives.
- Crash structures on the front and rear of the car increase its deformation length and thus absorb energy in the event of an impact.
- Advanced aluminium honeycomb construction material reduces the potential for suspension components penetrating the driver survival cell.
- High cockpit sides protect the driver's head from side impacts.
- The roll bar protects the driver in the event of a somersault.
- Head and neck support safety systems prevent whiplash to the driver's head.
- The wheel retention tethers are designed to keep the wheels on the car in the event of an accident, and to limit the possible injuries to drivers, spectators or course marshals.
- The risk of fire, after a crash, has been seriously decreased by the introduction of flexible tanks.
- Drivers protect themselves against fire by wearing special fireproof clothing. This includes underwear, balaclava, overalls, gloves and boots.
- Racing drivers' crash helmets adhere to strict safety regulations and are equipped with an emergency air supply in case of a fire accident.

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Activity 2b: Protection for on-road drivers and passengers

Safety on the road

- Racing cars are built to a very high standard to help keep safe racing drivers in the event of a crash. On-road cars also have safety features that provide protection for the driver and the passengers, if they are involved in a collision. Car manufacturers consider safety an important issue, especially as more and more people take this into account when choosing a car. Different car models offer varying safety features.
- Seatbelts are required by law to be worn by all car occupants – front or back. They offer protection in the event of a crash. The lap and diagonal seatbelts are the most effective.
- Children must be safely strapped in the car, using a child restraint appropriate for their size and weight. You can find more information about seatbelts and child restraints at the website: **www.childcarseats.org.uk**.
- Crash structures at the front and rear of cars, also known as crumple zones, absorb energy in the event of an impact protecting the car occupants. For this reason, people must never travel in the boot of estate cars.
- Airbags offer additional protection but must not be used with babies or very young children at the front of the car. Some cars are equipped with side as well as frontal airbags.
- Head restraints in cars provide head and neck support and can prevent whiplash in the event of a crash. They need to be fitted correctly, however, with the maximum padding being placed at the centre of the head.
- Increased consideration is being given nowadays to the protection of people outside the car. This has resulted in the abolition of bull bars for on-road cars and improved car design, with no extruding parts, minimising the damage to pedestrians in the event of a crash.
- The best protection drivers can offer to themselves, their passengers and other road users, is to drive carefully and responsibly, obeying the Highway Code rules.

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Theme 3: Speed matters

Activity 3c. Stopping distances and speed

What affects stopping distances

Driver reaction time/thinking distance:

- tiredness
- ill health
- alcohol
- drugs (prescribed and illegal)
- lack of concentration/distractions (passengers talking, mobile phones, etc)
- age (reflexes can become slower).

Car braking distance:

- condition of brakes
- condition of tyres
- car weight (the heavier the car, the longer it takes to stop)
- slippery road surface (grease, overheated asphalt, loose chippings)
- ice
- rain
- snow.

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Stopping distance scenarios – Answers

- A) A Formula driver is flagged to stop because there is a crash ahead that has blocked the track. At the time the flag is shown, the car is moving at a speed of 180km per hour. The driver's reaction time is 0.25 seconds. If the car's braking distance is 130 metres, what is the total stopping distance?

Thinking distance: 12.5 metres

Braking distance: 130 metres

Stopping distance: 142.5 metres

- B) A race driver driving at 120km per hour needs to come off the track into the pit lane because of a mechanical problem. There is a speed limit of 60mph in the pit area. How many km/hour does the driver need to reduce the car speed, to make sure it is down to the pit limit before entering the pit?

Pit speed limit in kilometres: (1 mile = 1.609 km) 96.54 km/hour

Speed reduction needed (km/hour): 23.46 km/hour

- C) A driver exits a motorway at the maximum legal speed (70mph). There is a deceleration lane 50m long before reaching a road with a speed limit of 40mph. The driver's reaction time is 0.75 seconds. Will the driver manage to reach the 40mph road without breaking the speed limit?

Thinking distance (travelling at 70mph): **23.5 metres**

Car braking distance (the same as braking from 30mph to 0): **14 metres**

Total distance needed to reach 40mph: 37.5 metres

Answer: Yes, the driver can reach the 40mph road without breaking the speed limit.

- D) A driver needs to do an emergency stop to avoid hitting a child running into the road, about 10 metres ahead of him. The car is moving at a speed of 30mph. The driver's reaction time is 0.8 seconds. Will the driver manage to stop without hitting the child?

Thinking distance: 10.73 metres

Car braking distance: 14 metres

Stopping distance: 24.73 metres

Answer: The car would hit the child even before the driver had time to think to brake!