Name:

ROAD TO ZERO

SPEED, PHYSICS AND CRASHES

Activity 3: Exploring side-on crashes and Newton's Laws of Motion

Introduction

The next activities challenge you to make use of Newton's three Laws of Motion:

Newton's 1st law: Objects at rest or in uniform motion stay at rest or continue to move in straight lines unless there's an external force acting on them

Newton's 2nd law: Force is equal to the change in momentum per change in time ($\vec{F}=m\vec{a}$)

Newton's 3rd law: For every action, there is an equal but opposite reaction

1. Watch the videos Side-On Crash with tree.

In these videos, you will see two cars travelling at 30 km/h and 50 km/h collide side-ways with a tree.

2. Respond to the prompts below, by referring to Newton's three Laws above.

You are now being challenged to make use of the language and concepts of physics to describe what happens during a crash and make inferences about the impact to the human body.

a. In these videos, the _____ remains stationary while the _____ is in motion.

b. In both cases, let's say the cars are travelling east along the road. In the space below, draw a force diagram labelling all the forces you think are acting on the car and the road. Remember that the car is moving in a forward direction so take care with the length of the arrows representing the forces.

Select box to insert image from your device.

c. The car would continue in this direction unless ...

d. When the driver sees that the car is headed for a tree, the driver ...

e. **Extension:** Describe what happens to the motion of the car as the driver brakes. You should refer to the change in speed and direction of the car and could incorporate your understanding of acceleration. Remember, acceleration is a vector.

f. Shortly after the car has crashed into the tree, the paramedics arrive on the scene. Shade and annotate the impact to the driver that the paramedics need to be aware of for both crashes.

g. **Extension:** Use Newton's 3rd law to explain the forces acting on the car the moment that it hits the tree.
Note: Simplify your diagram by referring to horizontal forces.

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