Forces & Motion-Part 6

SAFE STOPPING DISTANCE

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THINKING DISTANCE

The distance a vehicle travel during the reaction time of applying brakes.

CONCEPT LEARNING

The reaction time of an average person is 250 ms. Find the distance a car travel during this time period if the speed of the car is,

i) 72 km/h
ii) 108 km/h
iii) 180 km/h

FACTORS AFFECTING THINKING DISTANCE

TIRED/SLEEPY

Tiredness / Sleepiness slows the reaction time.

UNDER THE INFLUENCE OF ALCOHOL OR DRUGS

Alcohol & drugs slow the reaction time

POOR VISIBILITY

If the road is not clear (ex: fog), it takes longer time to respond to a danger.
Reaction time increases.

SPEED OF THE VEHICLE

The higher the car's speed, the further the car will travel during thinking time.

BRAKING DISTANCE

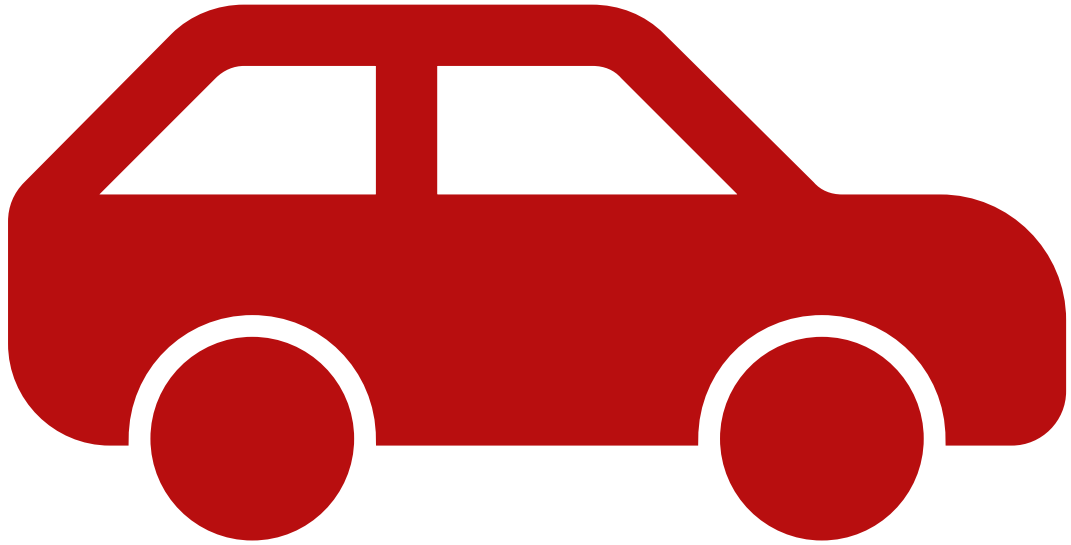
THE DISTANCE A VEHICLE TRAVELS DURING THE TIME OF APPLYING BRAKES TO PREVENT A DANGER.

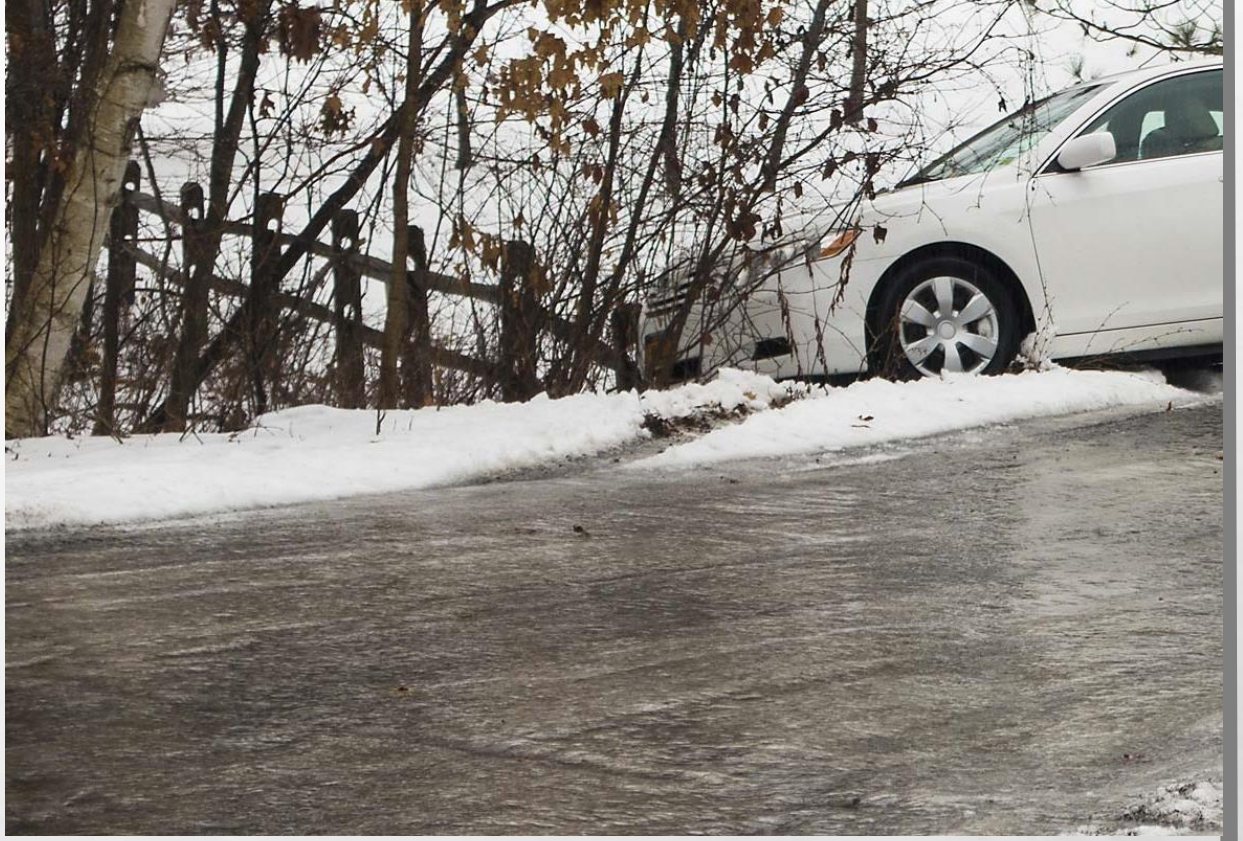
What is ABS?

ABS-ANTI-LOCK BRAKING SYSTEM

ABS is an automated system which monitors the rotation of the wheels when applying brakes and prevent skidding.

FACTORS AFFECTING BRAKING DISTANCE

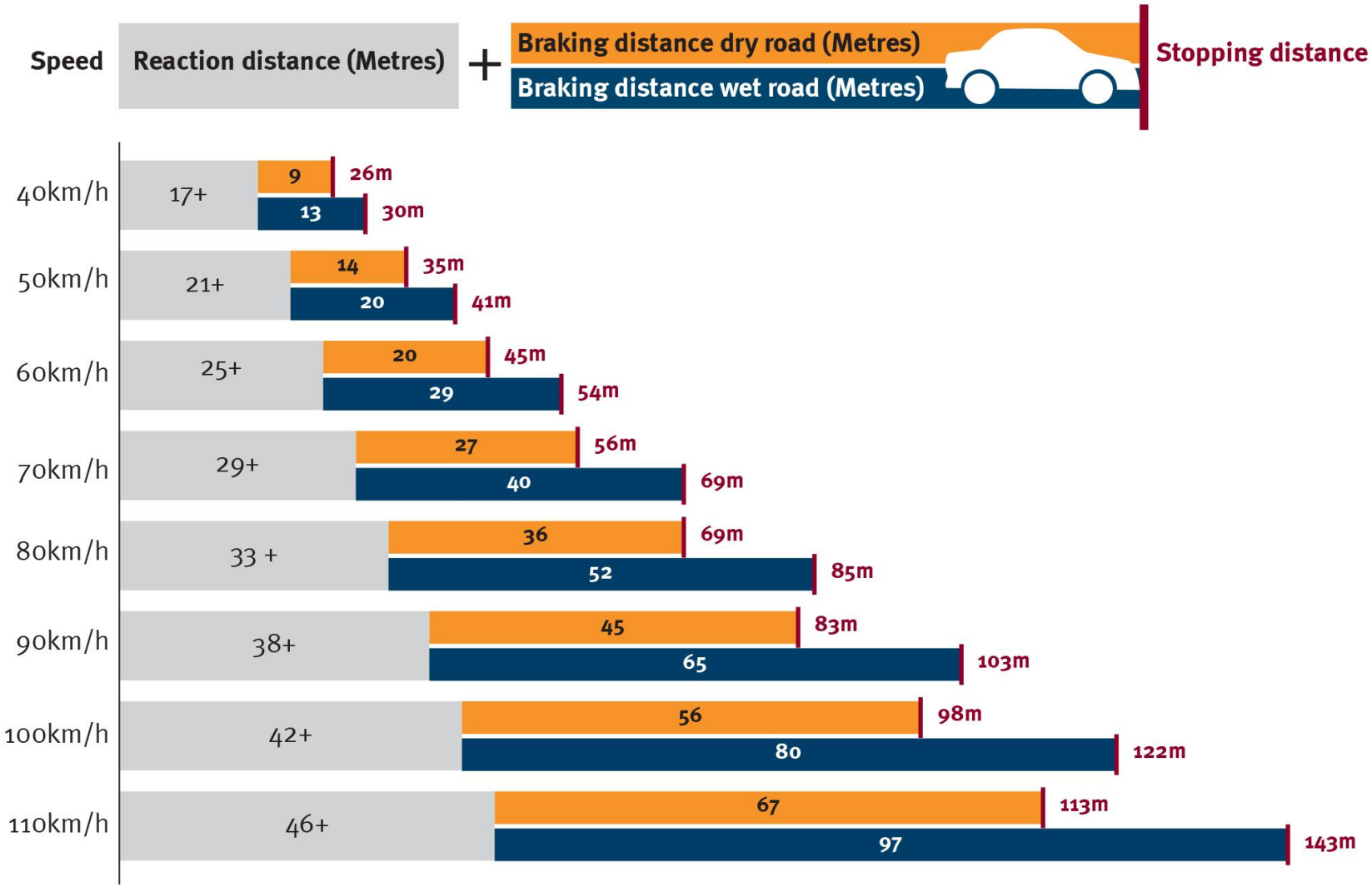


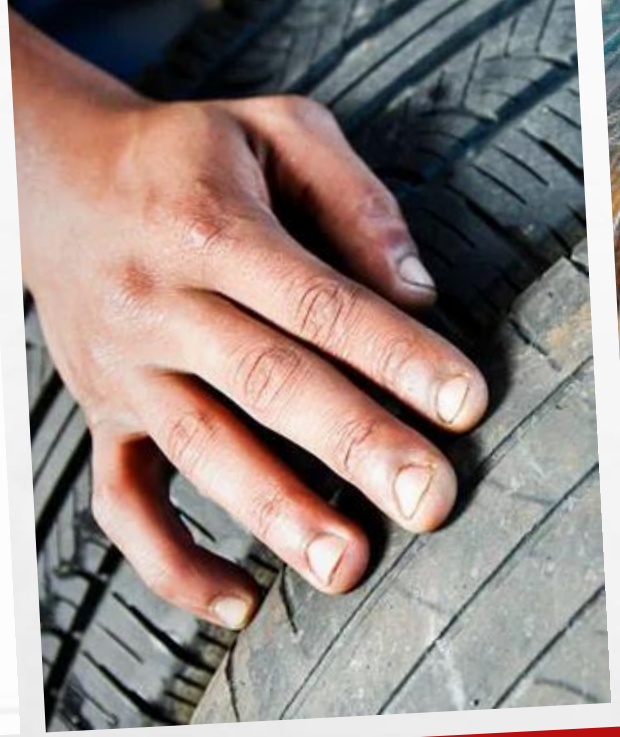


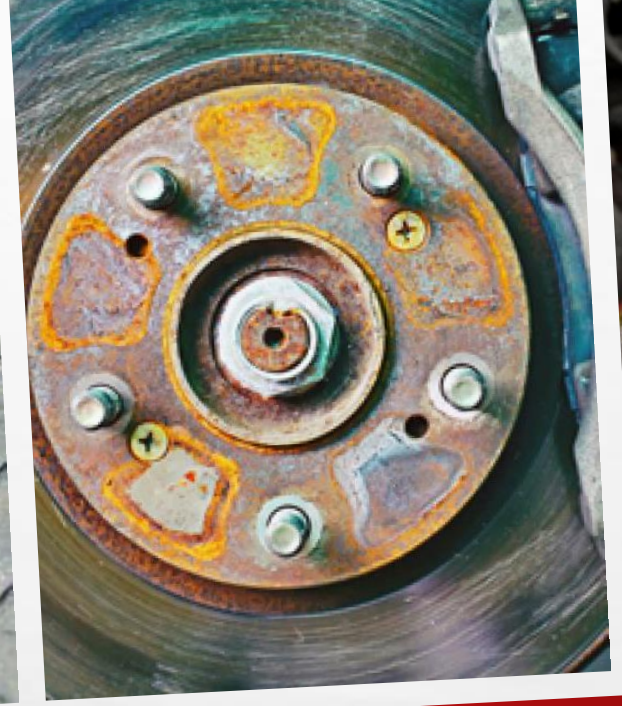
WET ROADS/ICY ROADS

If the roads are wet/icy/slippery (less friction).The tires skid on the road when applying brakes.
The braking distance increases.

How long it takes to stop (driving an average family car)







CONDITION OF THE BRAKES AND TIRES

If the brakes are in poor condition or tires are worn out(low tread depth), it takes longer time to stop the car by braking. So braking distance increases.

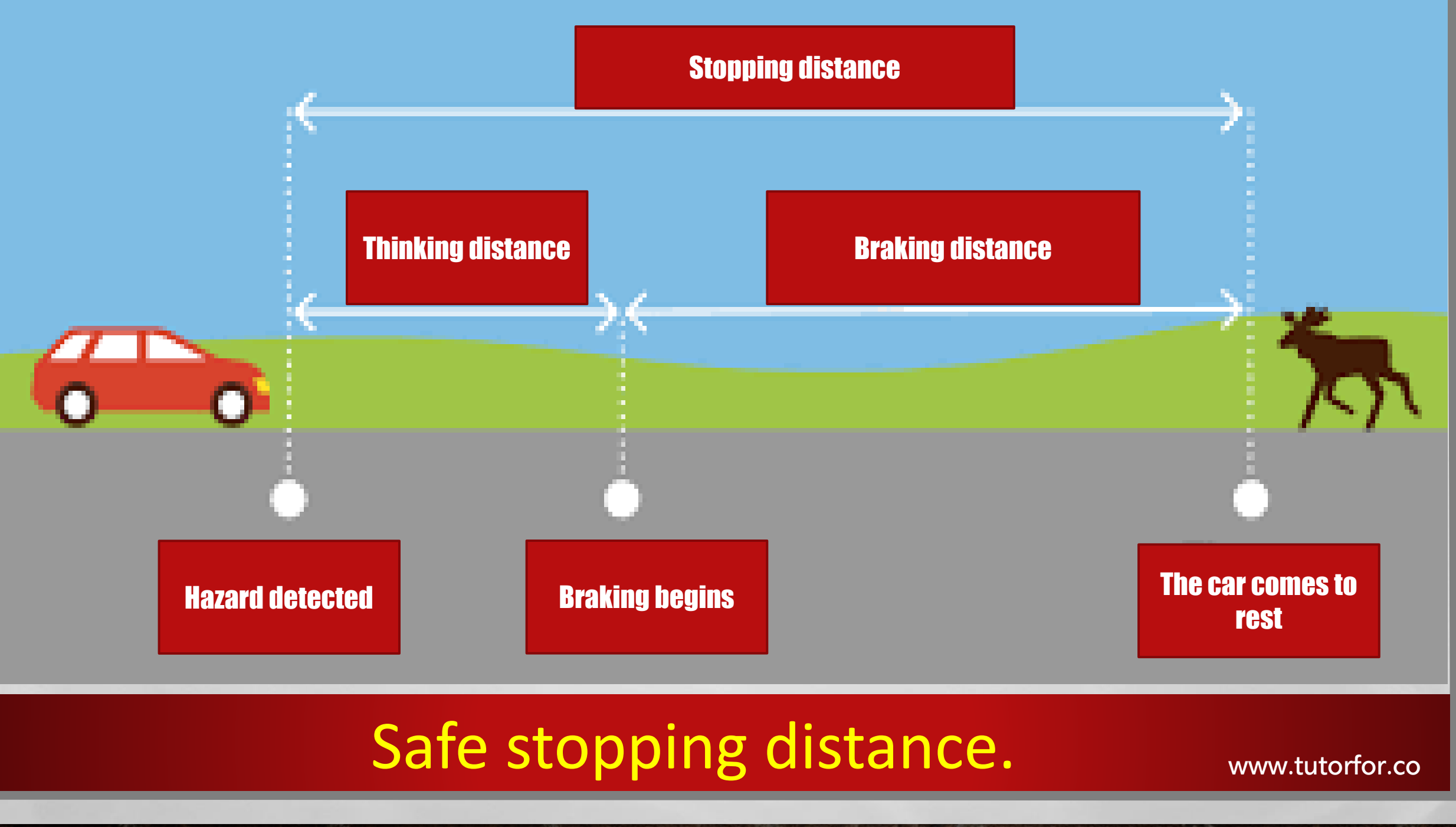
SPEED OF THE VEHICLE

The higher the car's speed, the further the car will travel during the time of applying brakes.

STOPPING DISTANCE

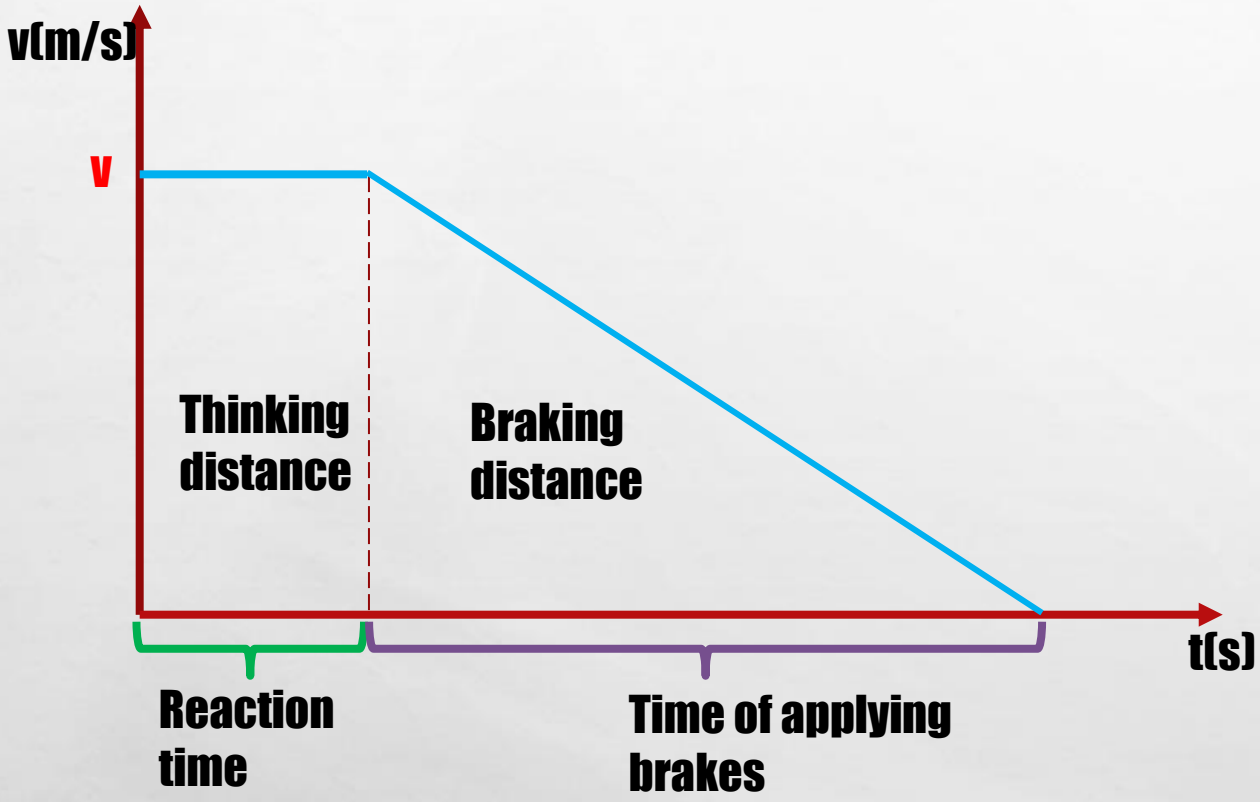
The sum of thinking distance and braking distance is called the stopping distance.

Stopping distance = Thinking distance + Braking distance



Safe stopping distance.

v-t graph of the stopping distance

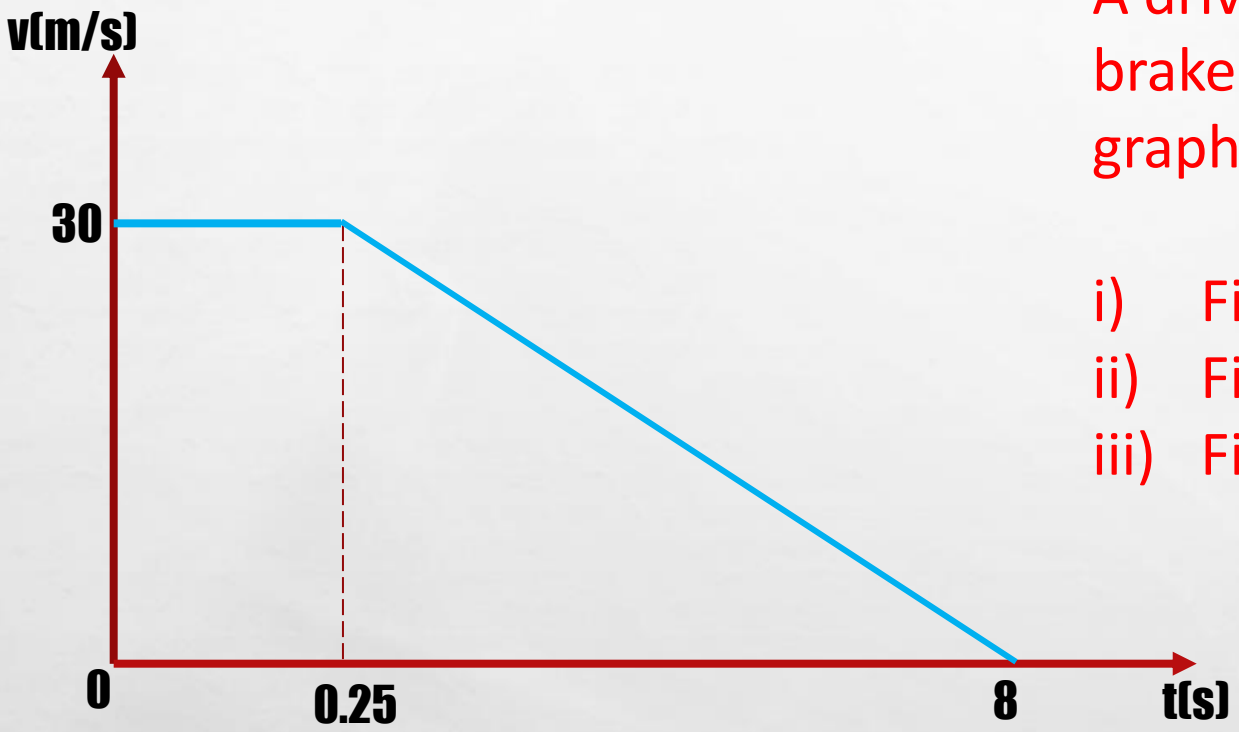


Thinking distance can be found using the area of the rectangle under v-t graph.

Braking distance can be found using the area of the triangle under v-t graph.

Stopping distance can be found using the area of the trapezium under v-t graph.

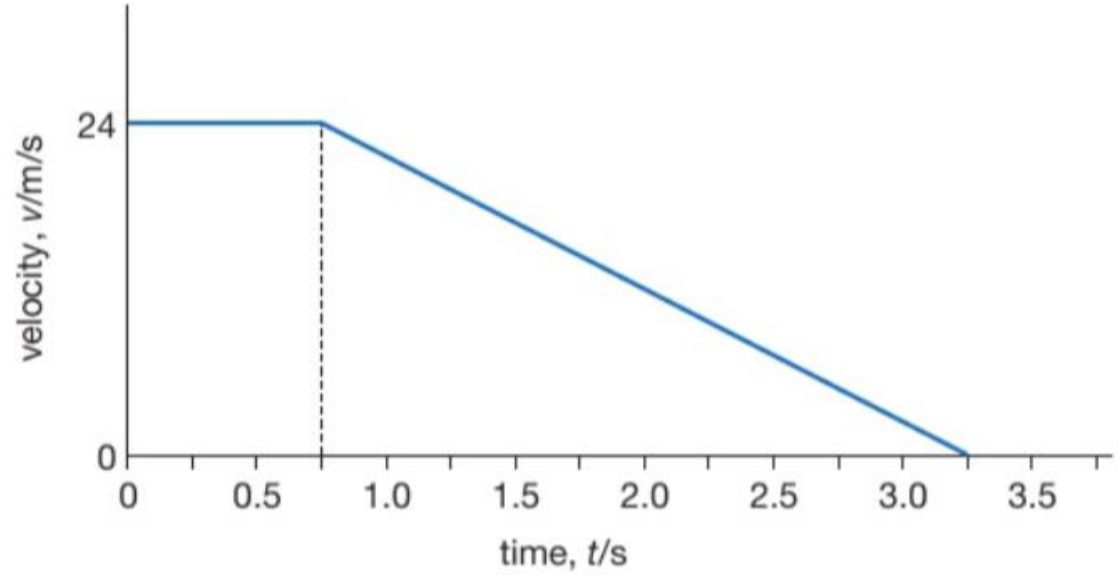
Concept Learning



A driver saw a danger and applied the brakes to stop the car. The following v-t graph shows the motion of the car.

i) Find the thinking distance.
ii) Find the braking distance.
iii) Find the stopping distance.

The diagram below shows the velocity–time graph for a car travelling from the moment that the driver sees an object blocking the road ahead.



Use the graph to find out:

a how long the driver takes to react to seeing the obstacle (reaction time)

b how far the car travels in this reaction time

c how long it takes to bring the car to a halt once the driver starts braking

d the total distance the car travels before stopping.

Next : *Sky divers & Terminal velocity*