

FORCES & MOTION: ROAD SAFETY

OBJECTIVES

- Understand the meaning of and influences on thinking distance (all)
- Understand the influences on braking distance (most)

SUCCESS CRITERIA

- Successfully carry out thinking distance task
- Correctly answer questions on thinking distance and braking distance

IF THESE ARE THE ANSWERS, WHAT ARE THE QUESTIONS?

- 1) $F=ma$
- 2) Newtons
- 3) The force of attraction between a mass and a planet
- 4) Act in opposite pairs

When a driver has to brake, it takes time for her to react. In that fraction of a second, the car can travel a long way...



This is called the THINKING DISTANCE

A driver's reaction time is normally about 0.7 s.

When do you think this time might be slower?

DRUG



SLEEPY



A car is travelling at 20 m/s.

The driver has a reaction time of 0.7 seconds.

How far does she travel *before* she starts to break (in metres)?



14 m

Test your thinking time

1. Working in pairs, one student holds a 50 cm or 100 cm ruler vertically, so that its bottom (0 cm) is just above the open hand of the other person.
2. Drop the ruler without warning and note the scale reading at which he/she catches it.
3. Swap over
4. Use the table below to estimate your thinking time.

scale reading (in cm)	thinking time (in s)
10	0.14
20	0.20
30	0.24
40	0.28
50	0.32
100	0.45

A person's thinking time is usually about 0.6–0.7 seconds. Your estimate is likely to be less than this. Suggest why.

The BRAKING distance is the distance that the car will travel AFTER the brake has been pressed.

The braking distance increases when?

1. When the car is travelling faster.
2. If the car is heavier
3. If the road surface is wet or smooth. (On a wet surface, the braking distance is about TWICE that when it is dry).
4. If the car is poorly maintained - with worn brakes or tyres - there will be less grip on the road.

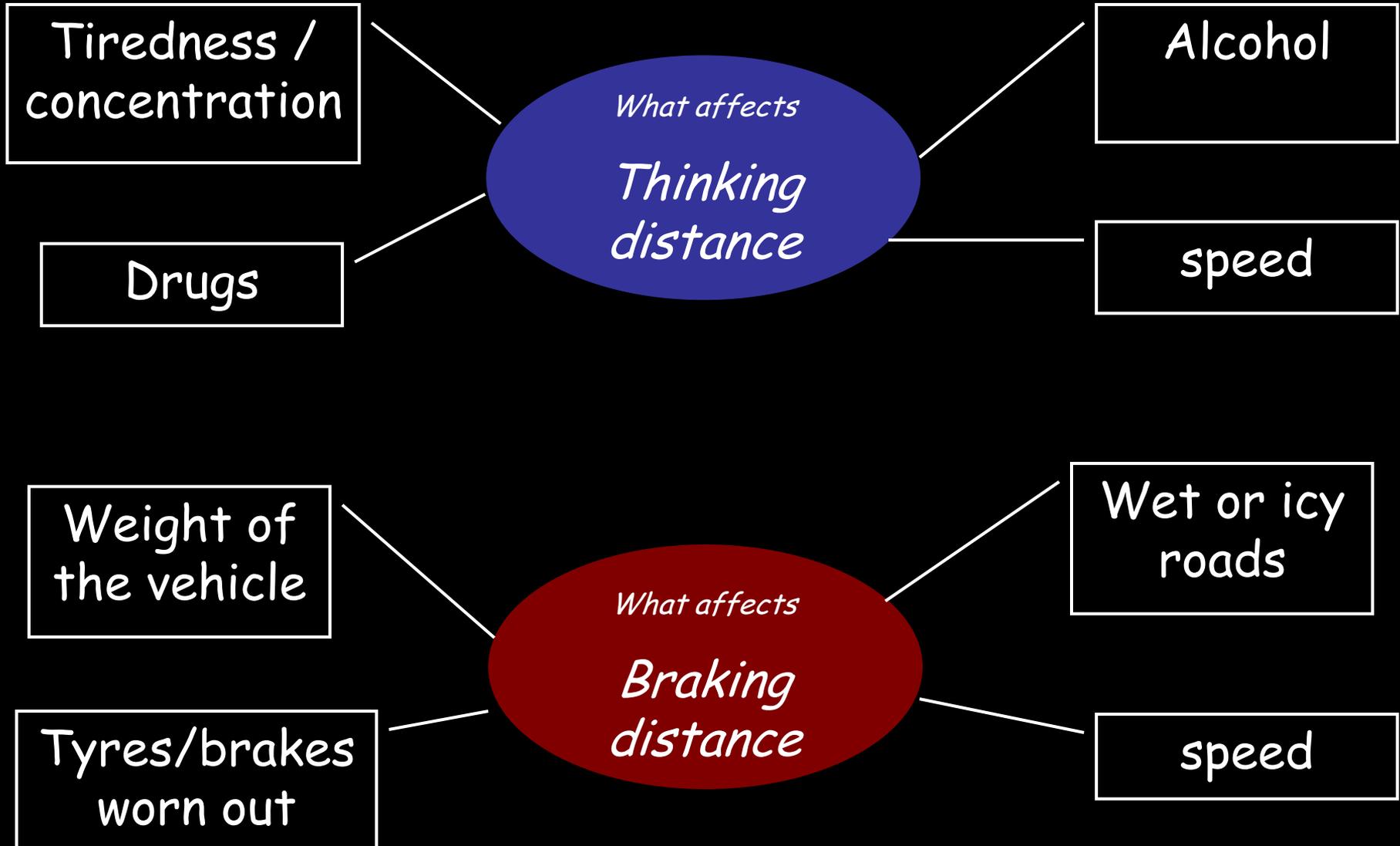


TOTAL STOPPING DISTANCE = THINKING DISTANCE + BRAKING DISTANCE.

Formula 1 drivers use tyres with very little tread when the track surface is dry and tyres with more tread when the surface is wet.

Suggest why.

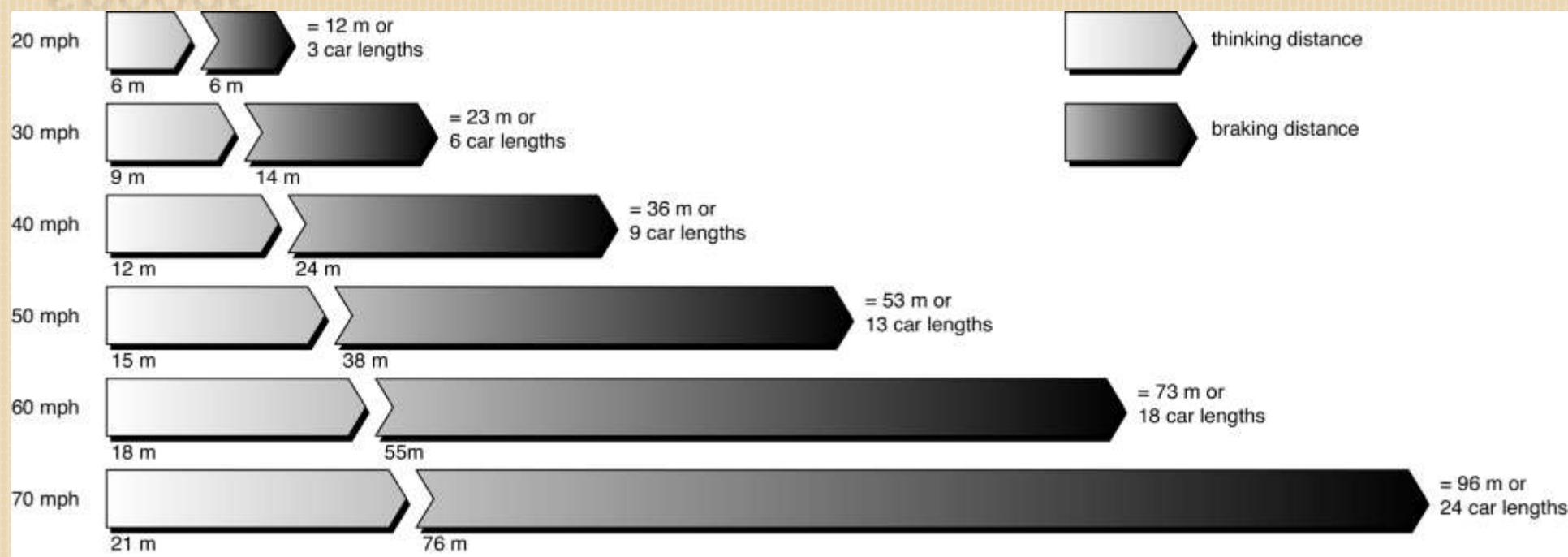
Stopping a car...



EFFECTS OF SNOW AND ICE

- × Watch the movie clip and be thinking about the physics....
- × http://www.youtube.com/watch?v=S16SRq0_1ZA

Thinking and stopping distances at different speeds



What do you notice?

So thinking distance as well as braking distance increases with speed

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- × Why do you think speed limits are important?
 - + Did you notice the difference in stopping distance between a car travelling at 30 mph and a car travelling at 40 mph?

CARRY OUT WORKSHEETS (P3 C7 AND P3 C8)

- × Extension questions if you are finished:
 - + Why should a car be a greater distance behind the car in front on a motorway than on a road in town?
 - + Which force is created when break pads are activated to slow a car down. Explain how break pads work (you might need the text book).
 - + Evaluate the level of safety of a car wheel tread of 1.6mm against a tread of of 1mm

PLENARY

- × Imagine you are asked to prepare a road safety advert about speed and stopping distance
- × Write down 5 key points that you would include in the ad