page 98

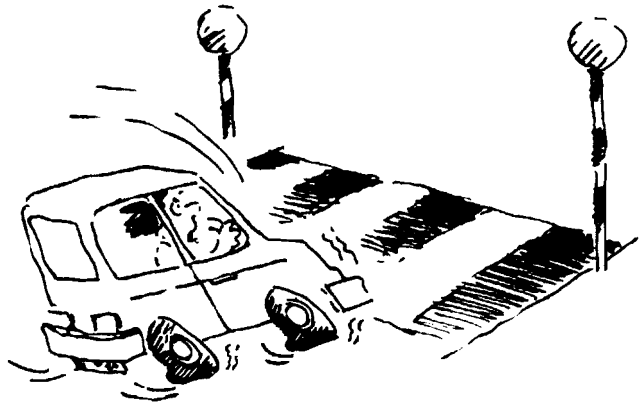
Friction and road safety

Extension Sheet

The data in the table are from the Highway Code. The data are for a car in good condition on a dry road with an alert driver.

speed of car	*Thinking distance m*	*Braking distance m*	*Overall stopping distance m*
5 m/s (11 mph)		2	
10 m/s (22 mph)	7	8	15
15 m/s (34 mph)		18	
20 m/s (45 mph)	14	32	46
25 m/s (56 mph)		50	
30 m/s (67 mph)	21	72	93

1. What is meant by 'thinking distance'?
2. From the table, calculate the reaction time of this driver.
3. How would this be affected if the driver was tired?
4. What else affects his reaction time?
5. Calculate the thinking distance at a speed of 15 m/s. Add it to the table:
6. What is meant by 'braking distance'?
7. How would it change if the road was wet?
8. What other factors affect the braking distance?
9. Looking down the 'braking distance' column, what pattern can you see? What happens to the braking distance if the speed is doubled? Can you explain this?
10. Complete the rest of the table.



11. **On graph paper**, plot a graph of 'thinking distance' against 'speed'. Draw the line of best fit, and label it.
12. On the same axes, plot a graph of 'braking distance' against 'speed'. Draw the line of best fit, and label it.
13. A car travels at 27 m/s (60 mph). Use your graph to find:
    a) the thinking distance,
    b) the braking distance,
    c) the total stopping distance.
14. On the same axes, sketch (and label) graphs for:
    a) The thinking distances if the driver has drunk alcohol.
    b) The braking distances if the tyres are worn.
15. When the driver brakes, the car's kinetic energy is not lost. What happens to it?