INVESTIGATION 3

BAC and you

In recent years there has been an effort to inform people about how much alcohol they drink and how alcohol affects what they do after drinking. Alcohol is involved in 50% of deaths for drivers aged between 21 and 25 years. Blood alcohol concentration (BAC) is a measure of how much alcohol is in your blood. It is measured in grams of alcohol per 100 millilitres of blood.

To have a BAC of 0.00 you must have no alcohol in your bloodstream. The legal BAC limit is 0.05, but any alcohol in your bloodstream will have an effect on your ability to drive safely, and is potentially a risk to public safety.

Alcohol affects people differently and the formulas for estimating BAC are:

$$\text{BAC}_{\text{male}} = \frac{(10N - 7.5H)}{6.8M} \quad \text{and} \quad \text{BAC}_{\text{female}} = \frac{(10N - 7.5H)}{5.5M}$$

where N is the number of standard drinks consumed, H is the number of hours of drinking and M is the person's mass in kilograms.

QUESTIONS

1 Investigate the effect each of the following has on a BAC reading.

a Body size

b Body fat

c Gender

d Food

e Fitness

When authorities say a driver must stay under 0.05, that actually means that the driver must have a limit of five hundredths of alcohol in their blood stream. Anything greater than 0.05 will cause a driver to lose their licence if they are caught drink-driving.

2 A BAC of just 0.05 means the risk of having a crash is doubled compared with a driver with zero BAC. What is the place value of the 5 in the above statistic?

Because people come in all different shapes and sizes, there isn't an exact rule for working out the BAC level of a particular person. A general rule of thumb is that for every 1 mL of alcohol consumed, the blood alcohol content will by raised by 0.0015%.

The following formula can be used to approximate the number of hours you need to wait before driving if you've been drinking alcohol.

$$\text{Number of hours} = \frac{\text{BAC}}{0.015}$$

3 Complete the table by estimating the number of hours you need to wait before driving. (Round answers to 2 decimal places.)

BAC reading	Approximate number of hours to wait before driving
0.1	
0.2	
0.3	
0.4	
0.5	

4 How long (to the nearest whole number of hours) would it take for a person with a reading of 0.25 to have their BAC reduced to zero?

5 Create a pamphlet that informs people about the risk associated with drink driving. You should include facts that are from the Transit Accident Commission (TAC). Use the TAC weblink in your eBookPLUS.

What is a standard drink?

A standard drink is any drink that contains approximately 10 grams of alcohol. Ethanol is the chemical name of pure alcohol. Use the label on the bottle, can or cask to find out how many standard drinks there are inside the container. There are five main types of alcoholic beverages: spirits, champagne, wines, regular beer and light beer.

1 standard drink = 10 grams of ethanol = 12.5 mL of ethanol

The main reason for using standard drinks is so that you can keep track of how much alcohol you have consumed. *It takes roughly one hour for your body to break down one standard drink.*

Here is a formula that you can use to calculate the number of standard drinks in each beverage:

Standard drinks = drink volume (L) × % alcohol × 0.789 (kg/L) (specific gravity of ethanol)

Most glasses are not a standard size, so it is extremely difficult to know the volume.

6 Complete the table, converting the different drinks to standard drinks.

	Type of drink	Name of drink size	Volume of drink size	Percentage of alcohol by volume	Standard drinks to 1 decimal place
a	Beer	Pot	285 mL	4.9%	1.1 standard drink
b	Beer	Stubby/can	375 mL	4.9%	
c	Spirit	Shot/nip	30 mL	40%	
d	Premixed spirit	Can/bottle	375 mL	5%	
e	Port/Sherry	Glass	60 mL	18%	
f	Wine	Glass	170 mL	11.5%	
g	Champagne	Flute	180 mL	12%	

KEY SKILL 6

Formulas

TAKE A LOOK BACK AT **BOOK 1, PP. 6, 16**

For a car to be allowed on the road, the car must be considered to be roadworthy. To test if a car is roadworthy, a check is done by a mechanic to test that the car can be driven safely. A large focus within the roadworthy check is the tyres. Tyres are the only parts of the car touching the ground. They must provide grip so that the car handles and brakes safely.

Stopping distances

For an average-size car with good tyres, the minimum controlled stopping distance in metres can be found by using the formula:

$$D = \frac{0.35s}{f}$$

where: s is the speed of the car in kilometres per hour

f is the coefficient of friction of the road surface.

The higher the coefficient of friction, the better the grip and the shorter the stopping distance. The value of friction will vary depending on the state of the tyres and the condition of the road. If the speed of the car is high, this will increase the stopping distance.

WORKED EXAMPLE

What is the stopping distance of a car travelling at 60 kilometres per hour on dry asphalt, which has a coefficient of friction of 0.8?

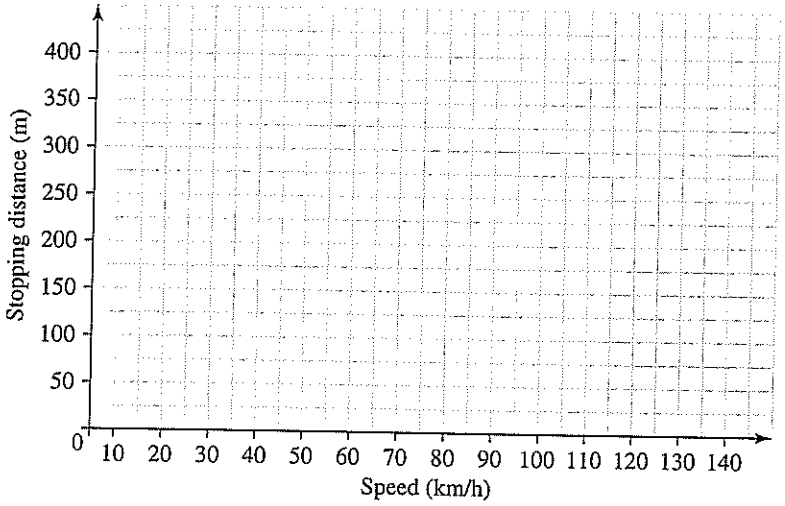
THINK	WRITE
Speed, $s = 60$ km/h Coefficient of friction, $f = 0.8$	$D = \frac{0.35s}{f}$ $= \frac{0.35 \times 60}{0.8}$
Calculate.	$= 26.25$ m

QUESTIONS

1 Complete the table of stopping distances.

Icy road ($f = 0.1$)		Wet road ($f = 0.4$)		Dry road ($f = 0.8$)	
Speed (km/h)	Stopping distance (m)	Speed (km/h)	Stopping distance (m)	Speed (km/h)	Stopping distance (m)
10	$= \frac{0.35 \times 10}{0.1}$	10		10	
20		20		20	
40		40		40	
80		80		80	
100		100		100	

2 Complete the graph of stopping distances for each of the three types of road conditions.



3 Use your graph in Question **2** to complete the following table, then check your answers using the formula.

Speed (km/h)	Stopping distance on a dry road (m)	Stopping distance on a wet road (m)	Stopping distance on an icy road (m)
15			
35			
65			
85			