DO NOT OPEN THIS BOOKLET UNTIL INSTRUCTED.

45 QUESTIONS

TIME ALLOWED: 1 HOUR

STUDENT'S NAME:

Read the instructions on the ANSWER SHEET and fill in your NAME, SCHOOL and OTHER INFORMATION

Use a 2B or B pencil.
Do NOT use a pen.
Rub out any mistakes completely.

You MUST record your answers on the ANSWER SHEET

Mark only ONE answer for each question.
Your score will be the number of correct answers
Marks are NOT deducted for incorrect answers.

There are 45 MULTIPLE-CHOICE QUESTIONS (1–45).
Use the information provided to choose the BEST answer from the four possible options.
On your ANSWER SHEET fill in the oval that matches your answer.

You may use a calculator and a ruler.
1. The photograph shows a woman standing next to a large truck. The woman is 1.8 m tall.

What is the approximate height (in metres) of the truck to the tip of its tray?

(A) 3  (B) 5  (C) 7  (D) 9

2. Jade drew four diagrams to show the shadow made by a post in her backyard over one day.

She was facing north when she drew each diagram.

Which option correctly sequences the diagrams from morning to evening?

(A) S, Q, R, P  (B) R, P, Q, S  (C) Q, R, S, P  (D) P, R, Q, S

3. Amy was viewing cells using a microscope. The diagram represents what she saw when the cells were magnified 100 times.

Which diagram shows what Amy would see if she magnified the same cells 400 times?

(A)  (B)  (C)  (D)  

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4. For a lever to be balanced, the moments of the forces acting on each arm must be equal and opposite.

The moment of a force acting on a lever arm is defined by:

\[ M = m \times g \times d \]

where:

- \( M \) = moment of each force (Nm)
- \( m \) = mass of the object (kg)
- \( g \) = acceleration due to Earth's gravity (9.8 m/s\(^2\))
- \( d \) = distance of the object from the fulcrum (m).

What must the value of \( X \) be for this lever to be balanced?

(A) 125 (B) 100 (C) 80 (D) 78.4

5. Jane used a digital stopwatch to record the time her friend Ella took to run laps. The diagram represents the time on the stopwatch as Ella completed her first lap. The time is given in hours, minutes, seconds, and hundredths of a second.

Jane left the stopwatch going.

What would be the reading on the stopwatch half a second after Ella completed her first lap?

(A) 52.58 (B) 52.78 (C) 53.18 (D) 57.28
6. A cyclone is a weather system that produces very strong winds that spiral inwards.

The photographs show cyclones that occurred in the Southern Hemisphere and cyclones that occurred in the Northern Hemisphere.

<table>
<thead>
<tr>
<th>Southern Hemisphere Cyclones</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image 1]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Northern Hemisphere Cyclones</th>
</tr>
</thead>
</table>

Based on the examples given, in which hemisphere did each of the following cyclones occur?

<table>
<thead>
<tr>
<th>P</th>
<th>Q</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image 7]</td>
<td>![Image 8]</td>
<td>![Image 9]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>P</th>
<th>Q</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>Northern</td>
<td>Southern</td>
</tr>
<tr>
<td>(B)</td>
<td>Southern</td>
<td>Northern</td>
</tr>
<tr>
<td>(C)</td>
<td>Northern</td>
<td>Southern</td>
</tr>
<tr>
<td>(D)</td>
<td>Northern</td>
<td>Northern</td>
</tr>
</tbody>
</table>
7. Jeremy has a lamp that uses three halogen globes at a time. He can use any combination of halogen globes, but the total power usage for the lamp must not exceed 100 watts.

<table>
<thead>
<tr>
<th>Halogen globes</th>
<th>Power (watts)</th>
<th>Light output (lumens)</th>
</tr>
</thead>
<tbody>
<tr>
<td>type 1</td>
<td>28</td>
<td>400</td>
</tr>
<tr>
<td>type 2</td>
<td>42</td>
<td>700</td>
</tr>
<tr>
<td>type 3</td>
<td>53</td>
<td>900</td>
</tr>
</tbody>
</table>

Which combination of three halogen globes will give the greatest amount of light output without exceeding the 100 watt power limit?

(A) three 28 watt globes  
(B) two 28 watt globes and one 42 watt globe  
(C) two 28 watt globes and one 53 watt globe  
(D) one 28 watt globe, one 42 watt globe and one 53 watt globe

8. Sports drinks are supposed to provide a balance of electrolytes (salts), fluids and sugars needed by the body during and after exercise.

Scientists investigated the effect of the electrolyte concentration in sports drinks on the volume of urine produced by the athletes drinking them.

Some athletes were given sports drinks with varying electrolyte concentrations. Each athlete drank only one type of sports drink. After performing the same exercises, the volume of urine produced by each athlete over 24 hours was recorded.

Which variable should have been kept constant in this investigation?

(A) concentration of the urine produced  
(B) electrolyte concentration in the sports drink  
(C) volume of the urine produced  
(D) volume of the sports drink provided
For questions 9 to 11 use the information below.

Water can be soft or hard based on its mineral content. ‘Hard’ water contains a significant amount of dissolved minerals whereas ‘soft’ water does not.

A type of hardness that can be removed by boiling is called temporary hardness. Hardness that cannot be removed by boiling is called permanent hardness.

Soft water forms a lather (many soap bubbles) when used with soap. Hard water produces little or no lather.

Lawrence had five different water samples. He placed 20 mL of each water sample into separate test tubes. He added five drops of soap solution to each test tube and shook each test tube for 30 seconds.

The diagram shows his results.

![Diagram showing lather and soapy water in test tubes 1 to 5.]

9. Based on his results, which test tubes contain soft water?
   - (A) test tubes 1 and 2
   - (C) test tubes 2 and 5
   - (B) test tubes 1 and 4
   - (D) test tubes 3 and 5

10. What would be a fair test to determine whether the water samples have temporary or permanent hardness?
    - (A) Boil all water samples and then retest them.
    - (B) Boil all soft water samples and then retest them.
    - (C) Boil all hard water samples and then retest them.
    - (D) Boil all water samples to remove any minerals in them.

11. Lawrence took the water samples in test tubes 2 and 3 and boiled them. When he shook them, test tube 2 produced the same amount of lather as test tube 1, and test tube 3 produced the same amount of lather as test tube 5.

    What conclusion can Lawrence make about the water in test tubes 2 and 3?

<table>
<thead>
<tr>
<th>Test tube 2 contained</th>
<th>Test tube 3 contained</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) temporary hard water.</td>
<td>soft water.</td>
</tr>
<tr>
<td>(B) temporary hard water.</td>
<td>permanent hard water.</td>
</tr>
<tr>
<td>(C) permanent hard water.</td>
<td>temporary hard water.</td>
</tr>
<tr>
<td>(D) permanent hard water.</td>
<td>soft water.</td>
</tr>
</tbody>
</table>
For questions 12 and 13 use the information below.

This diagram shows the processes involved in the formation and breakdown of sedimentary, metamorphic and igneous rocks.

12. Limestone is a sedimentary rock that can be changed into marble, a metamorphic rock.

What process(es) is involved in changing limestone into marble?

(A) melting  (C) weathering and erosion  (B) heat and pressure  (D) compacting and cementing

13. What do all three types of rock have in common?

(A) All types of rock were originally metamorphic rocks.
(B) Heat and pressure will change all types of rock.
(C) They were all formed by melting a type of rock.
(D) They can all be weathered and eroded.
14. Fossils are found in sedimentary rocks. Sedimentary rocks form in layers. The layer closest to the surface is usually the youngest layer of rock, so it contains the youngest fossils.

The diagrams below show columns of rock taken from four locations in the same area.

![Diagram of four locations with different fossil layers]

Which of these layers of rock is the youngest?

(A) [Diagram of a column with the youngest fossil layer]
(B) [Diagram of a column with the second youngest fossil layer]
(C) [Diagram of a column with the third youngest fossil layer]
(D) [Diagram of a column with the oldest fossil layer]

15. Electricity can flow through a circuit when there is a supply of electrical energy by a dry cell, and there is an unbroken path for the electricity to follow. A light globe in a circuit glows when electricity flows through it.

Liam wired up this circuit. All the light globes in the circuit were glowing.

![Circuit diagram with light globes and dry cell]

Then two light globes went out while the two other light globes kept glowing.

Which two light globes went out?

(A) 1 and 2  (B) 2 and 3  (C) 3 and 4  (D) 1 and 4
16. When a ray of light hits a surface, the angle at which it hits the surface is measured from a line called the 'normal'. The normal is an imaginary line drawn at right angles to the surface.

The angle of incidence ($i$) equals the angle of reflection ($r$).

![Diagram of light reflection](image)

**KEY**
- ray of light
- $i$ angle of incidence
- $r$ angle of reflection

Which of the following correctly shows a light ray reflected by a flat mirror?

(A)  
(B)  
(C)  
(D)

17. Annie added 50 g of soil to 100 mL of water. She shook the mixture for a few minutes.

She used the following steps to separate the soluble materials in the soil from the insoluble materials.

She filtered the mixture and collected the filtrate that went through the filter paper. She then evaporated all the water from the filtrate and found that she had 0.5 g of solid matter remaining.

From this experiment she can conclude that the soil contains:

<table>
<thead>
<tr>
<th>Soluble material</th>
<th>Insoluble material</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) 0.5%</td>
<td>50.0%</td>
</tr>
<tr>
<td>(B) 0.5%</td>
<td>99.5%</td>
</tr>
<tr>
<td>(C) 1.0%</td>
<td>99.0%</td>
</tr>
<tr>
<td>(D) 10.0%</td>
<td>90.0%</td>
</tr>
</tbody>
</table>
For questions 18 to 21 use the information below.

A family set out on a trip in their car. They travelled on a single straight road.

The graph shows the distance of the car from home over a period of time.

18. How many kilometres did the family travel during the first 5 minutes of the trip?

(A) 5
(B) 6
(C) 7
(D) 11

19. How many kilometres did the family travel from home to Lakesview?

(A) 23
(B) 20
(C) 15
(D) 13

20. How long did it take the family to travel from Riverview to Lakesview?

(A) 10 minutes
(B) 13 minutes
(C) 20 minutes
(D) 30 minutes

21. Which option describes the motion of the car during time period X?

(A) It was not moving.
(B) It was slowing down.
(C) It was going back towards home.
(D) It was travelling at a constant speed.
22. The half-life of a radioactive element is the time it takes for half of the radioactive atoms in a sample of the element to change to atoms of other elements.

The graph shows the amount of radioactive atoms present in a sample of a radioactive element over a period of time.

What is the half-life of this radioactive element?

(A) 1 minute  (B) 2 minutes  (C) 3 minutes  (D) 4 minutes
For questions 23 to 25 use the information below.

The graph shows the solubility of copper sulfate and sodium chloride in water at different temperatures.

23. What is the solubility of copper sulfate at 60 °C?
   (A) 82 g/100 mL   (B) 40 g/100 mL   (C) 37 g/100 mL   (D) 35 g/100 mL

24. At what temperature do both substances have the same solubility?
   (A) 0 °C   (B) 37 °C   (C) 48 °C   (D) 56 °C

25. Would it be possible to dissolve 50 g of sodium chloride in 100 mL of water?
   (A) Yes, as long as the water temperature is 75 °C.
   (B) Yes, as long as there is no copper sulfate mixed with the water.
   (C) No, because copper sulfate would prevent it from dissolving.
   (D) No, as a maximum of about 40 g can dissolve in that amount of water.

26. The volume of blood pumped out by the left ventricle of the heart in one beat is called the stroke volume.

The volume of blood pumped out by the left ventricle of the heart in one minute is called the cardiac output.

\[
\text{Cardiac Output} = \text{Stroke Volume} \times \text{Pulse}
\]

An athlete has a cardiac output of 4.8 litres (L) of blood per minute and a pulse of 60 beats per minute.

What is this athlete’s approximate stroke volume?
   (A) 0.8 mL   (B) 0.288 mL   (C) 80 mL   (D) 268 mL
27. The diagram shows some structures on the body of a fish.

This key can be used to identify some types of fish.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>a. Whisker-like barbels on head</td>
<td>channel catfish</td>
</tr>
<tr>
<td></td>
<td>b. NO whisker-like barbels on head</td>
<td>go to 2</td>
</tr>
<tr>
<td>2</td>
<td>a. Body elongated, more than twice as long as it is tall</td>
<td>go to 3</td>
</tr>
<tr>
<td></td>
<td>b. Body NOT more than twice as long as it is tall</td>
<td>bluegill</td>
</tr>
<tr>
<td>3</td>
<td>a. First five rays of dorsal fin are like spikes</td>
<td>brook stickleback</td>
</tr>
<tr>
<td></td>
<td>b. First five rays of dorsal fin are NOT like spikes</td>
<td>go to 4</td>
</tr>
<tr>
<td>4</td>
<td>a. One dorsal fin</td>
<td>lake herring</td>
</tr>
<tr>
<td></td>
<td>b. Two dorsal fins</td>
<td>watercress darter</td>
</tr>
</tbody>
</table>

The photographs show a common carp and a watercress darter.

common carp

watercress darter

Which feature CANNOT be used to distinguish between these two fish?

(A) body colouring
(B) shape of caudal fin
(C) number of anal fins
(D) number of dorsal fins
28. When sugars are heated, they turn brown and change flavour. This is called caramelising.

Sucrose caramelises from 160 °C. Fructose caramelises from 110 °C. Maltose caramelises from 180 °C.

Which combination of statements is correct?

<table>
<thead>
<tr>
<th></th>
<th>At 156 °C</th>
<th>At 186 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>only sucrose will caramelise.</td>
<td>only maltose will caramelise.</td>
</tr>
<tr>
<td>(B)</td>
<td>only sucrose and fructose will caramelise.</td>
<td>all three sugars will caramelise.</td>
</tr>
<tr>
<td>(C)</td>
<td>only fructose will not caramelise.</td>
<td>all three sugars will caramelise.</td>
</tr>
<tr>
<td>(D)</td>
<td>only fructose and sucrose will not caramelise.</td>
<td>only maltose will not caramelise.</td>
</tr>
</tbody>
</table>

For questions 29 and 30 use the information below.

Geostationary satellites are placed 36 000 km above Earth to allow for live telecasts from one region on Earth to another. Geostationary satellites remain in the same position above the equator as they orbit Earth.

29. How long would it take a geostationary satellite to orbit Earth?

(A) one hour
(B) one day
(C) six months
(D) one year

30. Radio telescopes on Earth communicate with geostationary satellites using radio waves which travel at 300 000 kilometres per second. A radio telescope is positioned directly underneath a geostationary satellite. Assuming no interference or delays, how long would it take for a signal to be transmitted from, and return to, the radio telescope?

(A) 0.12 seconds
(B) 0.24 seconds
(C) 8.3 seconds
(D) 16.6 seconds
31. Alloys are solid mixtures made by melting two or more metals together and then allowing the mixture to cool.

Solder is an alloy of the metals lead and tin.

The temperature at which a sample of solder melts depends on the ratio of lead and tin in the sample.

This is shown in the graph.

What is the melting point (°C) of solder made up of 70% lead?

(A) 183  (B) 192  (C) 250  (D) 327
32. An inverter is a component used in computer chips. It reverses the value (0 or 1) at the input. The following symbol and table represent an inverter and its function.

<table>
<thead>
<tr>
<th>Inverter</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Jason constructed the following circuit using 5 inverters.

Input → Output P → Output Q

If the input is a '1' what are the outputs at P and Q?

<table>
<thead>
<tr>
<th>Output P</th>
<th>Output Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) 0</td>
<td>0</td>
</tr>
<tr>
<td>(B) 0</td>
<td>1</td>
</tr>
<tr>
<td>(C) 1</td>
<td>0</td>
</tr>
<tr>
<td>(D) 1</td>
<td>1</td>
</tr>
</tbody>
</table>

33. When a piezoceramic material is squeezed or stretched by a force, it produces a small electrical voltage. This voltage can then be used to switch another electrical circuit on or off.

For which of the following functions in cars can this property be used?

(A) triggering air bags in a collision
(B) increasing the radio volume in noisy traffic
(C) switching on headlights in poor light
(D) turning on windscreen wipers in the rain
For questions 34 and 35 use the information below.

The volume of air in a person's lungs was measured for 1 minute while they were breathing normally. The volume of air was then measured while the person took deep breaths for 30 seconds.

The results are shown in this graph.

34. How many times did the person inhale in the first 20 seconds?
   (A) 4  (B) 5  (C) 10  (D) 15

35. What was the greatest difference in air volume inhaled between normal breathing and deep breathing?
   (A) 1.3 L  (B) 2.0 L  (C) 2.3 L  (D) 4.9 L

36. The melting point of ice is 0 °C. The boiling point of water is 100 °C.

Trong did a research project about the melting point and boiling point of different substances.

The table summarises the information he gathered.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Melting point (°C)</th>
<th>Boiling point (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>caustic soda</td>
<td>318</td>
<td>1388</td>
</tr>
<tr>
<td>table salt</td>
<td>801</td>
<td>1413</td>
</tr>
<tr>
<td>oxygen</td>
<td>−218</td>
<td>−183</td>
</tr>
<tr>
<td>gold</td>
<td>1064</td>
<td>2856</td>
</tr>
</tbody>
</table>

Which statement is supported by this information?

(A) Oxygen can never be a solid.
(B) Table salt is a liquid at temperatures below 801 °C.
(C) There is no common temperature at which all four substances are liquid.
(D) Solid gold becomes a liquid at a temperature above that at which caustic soda becomes a gas.
37. Model 1 shows a chemical compound with the formula \(WX_4\).
Model 2 shows a chemical compound with the formula \(Y_2Z\).

![Model 1 and Model 2](image)

Which of the following models represents a chemical compound with the formula \(WZ\)?

(A) ![Model A](image)  
(B) ![Model B](image)  
(C) ![Model C](image)  
(D) ![Model D](image)

38. The weight of an object is the force acting on the object due to gravity. The weight force is calculated by multiplying an object’s mass by the acceleration due to gravity.

The acceleration due to gravity on Earth is approximately 9.8 m/s\(^2\).

The acceleration due to gravity on the Moon is approximately 1.6 m/s\(^2\).

Ryan stood on bathroom scales on Earth and this is what he saw.

![Bathroom Scales on Earth](image)

What would the scales show if Ryan were standing on the same scales on the Moon?

(A) ![Scales on Earth](image)  
(B) ![Scales on Earth](image)  
(C) ![Scales on Earth](image)  
(D) ![Scales on Earth](image)
For questions 39 and 40 use the information below.

When an earthquake occurs, several types of shock waves are formed. Two of these shock waves are called P-waves and S-waves. These waves travel at different speeds.

The graph is used to determine the distance from a recording station to the epicentre (the point on Earth's surface directly above where an earthquake occurs) of an earthquake.

39. An earthquake recording station detected the arrival of a P-wave at 6:35 am. The earthquake occurred 4000 km from the recording station.

At what time did the earthquake occur?

(A) 6:47 am  
(B) 6:42 am  
(C) 6:28 am  
(D) 6:22 am  

40. A different earthquake's first P-wave arrived at a recording station at 3:10 am. The first S-wave arrived at 3:16 am.

What is the approximate distance from the recording station to the epicentre of the earthquake?

(A) 1600 km  
(B) 3400 km  
(C) 4500 km  
(D) 6400 km
41. Yeast are single-celled organisms that convert sugar into carbon dioxide gas.

When yeast is mixed with sugar and water, the mixture produces foam, showing that carbon dioxide gas is being produced.

Ryan set up an experiment to investigate the effect of temperature on the rate at which foam is produced.

Which option identifies the variables in Ryan’s experiment?

<table>
<thead>
<tr>
<th>Variable that caused the result</th>
<th>Variable measured and recorded as result</th>
<th>Variables that should have been kept the same</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) amount of water</td>
<td>type of sugar used</td>
<td>water temperature, volume of bottle</td>
</tr>
<tr>
<td>(B) water temperature</td>
<td>height of foam produced</td>
<td>amount of water, yeast and sugar</td>
</tr>
<tr>
<td>(C) height of foam produced</td>
<td>amount of yeast</td>
<td>volume of bottle, amount of yeast</td>
</tr>
<tr>
<td>(D) amount of yeast</td>
<td>water temperature</td>
<td>volume of bottle, amount of sugar</td>
</tr>
</tbody>
</table>
42. Lara lives in south-eastern Australia. Her sister Maria is on holidays in Italy.

Lara woke up at six o'clock one Sunday morning and saw the full moon setting just above the western horizon. She sent a text message to Maria to say how beautiful the full moon looked. Within a minute, she received a reply from Maria saying that she could see the Moon too.

What was the approximate time where Maria was and in which direction did she have to look to see the Moon?

<table>
<thead>
<tr>
<th>For Maria it was</th>
<th>To see the Moon, Maria had to look to the</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Sunday afternoon.</td>
<td>west.</td>
</tr>
<tr>
<td>(B) Sunday afternoon.</td>
<td>east.</td>
</tr>
<tr>
<td>(C) Saturday evening.</td>
<td>west.</td>
</tr>
<tr>
<td>(D) Saturday evening.</td>
<td>east.</td>
</tr>
</tbody>
</table>
43. Scientists use chemical equations to summarise chemical changes. The equation shows the number and type of atoms in each reactant, as well as the number and type of atoms in each product.

The diagram represents a chemical change involving two types of atoms, hydrogen (H) and oxygen (O).

\[
\text{Reactants} \quad \text{Products} \\
\text{2H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}
\]

The diagram below represents a chemical change involving phosphorus (P) and chlorine (Cl) atoms.

\[
P + 3\text{Cl}_2 \rightarrow \text{P}_2\text{Cl}_6
\]

Which equation represents this chemical change?

(A) \(2\text{P} + 3\text{Cl} \rightarrow 2\text{PCl}_3\)  
(B) \(\text{P}_2 \rightarrow 3\text{Cl}_2 \rightarrow \text{P}_2\text{Cl}_6\)  
(C) \(\text{P}_2 + \text{Cl}_2 \rightarrow \text{P}_2\text{Cl}_6\)  
(D) \(2\text{P} + 3\text{Cl}_2 \rightarrow 2\text{PCl}_3\)

44. Kinetic energy is the energy of motion. The faster an object moves, the greater its kinetic energy.

During a roller-coaster ride, the amount of kinetic energy of the roller-coaster car changes as it moves along the track.

The diagram below shows a roller-coaster car moving from left to right. Four different points during the motion of the roller-coaster car are identified. At point (1) the car is barely moving.

Which statement is correct?

(A) The car has maximum kinetic energy at point (1).
(B) The car has more kinetic energy at point (2) than it has at point (3).
(C) The car has minimum kinetic energy at point (3).
(D) The car has more kinetic energy at point (4) than it has at point (1).
45. Biologists estimate the size of a population of living organisms in an area using a technique called capture-recapture sampling.

They trap animals, mark them, and then release the marked animals back into the environment.

Some time later, biologists go back to the same area and set traps for the same kind of animals. A second group of animals is captured, some of which were the ones caught and marked in the first capture.

They use this formula to estimate the animal population in the area studied.

\[
\text{Total number} = \frac{\text{number in the first capture} \times \text{total number in the second capture}}{\text{number marked in the second capture}}
\]

The diagrams represent the results of one capture-recapture sampling of cockroaches in an area.

![First capture and marking of cockroaches](image)

![Second capture of cockroaches](image)

**KEY**

- trap
- marked cockroach

What is the estimated number of cockroaches in this area?

(A) 18  
(B) 40  
(C) 45  
(D) 58
Acknowledgment
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Sources

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<table>
<thead>
<tr>
<th>Country</th>
<th>Year Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Year 7</td>
</tr>
<tr>
<td>Brunei</td>
<td>Form 1</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Year 8</td>
</tr>
<tr>
<td>Malaysia</td>
<td>Form 1</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Year 8</td>
</tr>
<tr>
<td>Pacific Region</td>
<td>Year 8</td>
</tr>
<tr>
<td>Singapore</td>
<td>Primary 6</td>
</tr>
<tr>
<td>South Africa</td>
<td>Grade 7</td>
</tr>
</tbody>
</table>