

# 11+

- Verbal Reasoning
- Comprehension
- Maths
- Non-Verbal Reasoning

# CGP

# The 11+ Practice Test Papers

For the CEM (Durham University) test

The  
Answer Book

**Pack 3**

**Practise • Prepare • Pass**  
Everything your child needs for 11+ success

## Using these Practice Tests

These practice tests are similar in format and style of questions to a typical 11+ test from the University of Durham CEM. The real test will look a little different and may contain question types that don't appear in these practice papers.

### **Preparing to take the tests**

Find out whether your child will be taking the real test in multiple-choice or write-in format. To practise multiple-choice questions, they should mark their answers on the multiple-choice answer sheets provided by drawing a horizontal pencil line through the correct box. To practise write-in questions, they should mark their answers in pencil on the question paper. If they make a mistake, they should rub it out before marking their new answer.

Encourage your child to work under test conditions for some realistic practice. They shouldn't be distracted by anything going on around them or ask you questions once the test begins. Remind them to read the questions, work quickly but carefully and make sensible guesses for questions they can't answer.

### **Taking the tests**

The tests are split into individually timed sections — the time allowed for each section is written on the paper. There's an example question at the start of each section, which isn't timed. Once your child has read the example, allow them the correct amount of time to answer the questions. If they don't quite finish in that time, draw a line under the last question they answered in the time limit and then move on to the next section. At the end, encourage them to go back and answer the questions they missed — it's a good way to get some extra practice.

## What your child's score means

### **Marking the tests**

Set A (Paper 1 and Paper 2) forms one complete test, and Set B (Paper 1 and Paper 2) forms another. You should give one mark for each correct answer, and then work out your child's total score out of 175. It's really important to go through any wrong answers with your child — use the explanations in this answer book to show them how to find the right answer.

**Your child should be aiming to score 140 or more overall (that's around 80%).  
The pass mark of the actual test will vary from school to school.**

### **What to do next**

The score may help you pinpoint specific topics that your child needs to work at or skills they need to practise. For example, if your child scored 60%, got nearly all the questions right but didn't quite finish the test, they need to work faster next time. If they scored 60%, got to the end of the paper but got 40% of the questions wrong, they need to brush up on their accuracy. You can follow this up with some practice in the areas they find tricky, and then set another practice test.

# Set A — Paper 1

## Section 1: Verbal Reasoning — Comprehension An Alphabet for the Blind

1. B

In the passage, it says that Louis was "raised in Coupvray, a small village to the east of Paris".

2. C

In the passage, it says that Braille "tried to cut a piece of leather with a sharp tool. The leather resisted, and the tool slipped, plunging into Braille's eye." No one had intended for this to happen; it was an accident.

3. D

"permanent darkness" refers to what Braille sees.

4. A

'to learn by rote' means 'to learn things off by heart', and the passage states that Braille astonished "his teacher, Antoine Becheret, with his ability to recite the previous day's lessons."

5. C

In the passage, it says "Haüy's system had its shortcomings: the letters were not raised high enough to be easily deciphered and this process of reading was time-consuming."

6. D

In the passage, it says that night writing "allowed a soldier to interpret a command by touch." Touch is a form of non-verbal communication. It was for soldiers, which shows it was intended for military use.

7. A

In the passage, it says that Barbier "adapted" night writing to sonography.

8. D

In the passage, it says that the dots "represented sounds". Therefore it cannot be true that sonography disregarded sounds.

9. B

In the passage, it says "a great many dots were required", which indicates that words could be very long.

10. C

In the passage, it says "everyone was interested in the potential of sonography."

11. B

In the passage, it says sonography "ignored conventional spelling rules since the dots only represented sounds".

12. D

In the passage, it says that in Barbier's sonography "the dots only represented sounds", whereas some of the characters Braille used were "a letter of the alphabet".

13. C

In the passage, it says "Each cell comprised two columns and each column was long enough to accommodate up to three dots." Therefore, there is room in each cell for up to six dots.

14. A

In the passage, it says "the school's director allowed Braille to introduce the new system to his pupils." Braille was a pupil at the Royal Institute for Blind Youth.

15. C

Braille enabled blind children to read more easily, which gave them greater access to learning material.

16. A

In the passage, it says that "Braille can be found on everything from medicines to cash machines". Medicines are non-electrical items.

17. D

'resisted' means 'didn't give way'.

18. D

'learning by rote' is when you memorise something by repeating it lots of times until you can recall it without any prompts.

19. C

'contemporaries' are people who are roughly the same age as each other.

20. A

'Word soon spread' means people became aware of something.

## Section 2: Verbal Reasoning — Synonyms

1. plan

Both words mean 'a design'.

2. ponder

Both words mean 'to consider'.

3. lead

Both words mean 'to be in charge of'.

4. deploy

Both words mean 'to station'.

5. impertinent

Both words mean 'rude'.

**6. aloof**

Both words mean 'stand-offish'.

**7. calamity**

Both words mean 'catastrophe'.

**8. attentive**

Both words mean 'observant'.

**9. incoherent**

Both words mean 'jumbled'.

**10. astute**

Both words mean 'sharp-witted'.

**11. furore**

Both words mean 'uproar'.

**12. obnoxious**

Both words mean 'horrible'.

**13. foil**

Both words mean 'to prevent from succeeding'.

**14. altercation**

Both words mean 'a disagreement'.

**15. scrupulous**

Both words mean 'fussy'.

**16. gravitas**

Both words mean 'solemnity'.

**17. shorten**

Both words mean 'to make shorter'.

**Section 3: Verbal Reasoning**  
**— Shuffled Sentences**

**1. under**

The words can be rearranged into the sentence 'Rollerblading down school corridors is strictly forbidden.'

**2. except**

The words can be rearranged into the sentence 'The competition accepts entries from children and adults.'

**3. two**

The words can be rearranged into the sentence 'Turn the device on by flicking the big switch.'

**4. fly**

The words can be rearranged into the sentence 'A spider is making a web in the corner.'

**5. would**

The words can be rearranged into the sentence 'There is a monster in Loch Ness according to legend.'

**6. until**

The words can be rearranged into the sentence 'Christmas cakes should be made up to three months before Christmas.'

**7. if**

The words can be rearranged into the sentence 'Television channels make money from televising a variety of adverts.'

**8. will**

The words can be rearranged into the sentence 'A frown is usually an indication that a person is unhappy.'

**9. I**

The words can be rearranged into the sentence 'Ask for help if you are not sure what to do.'

**10. up**

The words can be rearranged into the sentence 'The children screamed when the lights suddenly went out.'

**11. you**

The words can be rearranged into the sentence 'Remember to wear sun cream when going out in the sun.'

**12. never**

The words can be rearranged into the sentence 'Bingo is a game of chance with no guarantee of winning.'

**13. a**

The words can be rearranged into the sentence 'My parents make every effort to recycle their rubbish.'

**14. siren**

The words can be rearranged into the sentence 'The security guard threatened to call the police.'

**15. when**

The words can be rearranged into the sentence 'The end of the lesson was marked by the bell.'

**Section 4: Verbal Reasoning**  
**— Cloze**

**1. artefact**

'The Rosetta Stone is an important **artefact** from Ancient Egypt.'

**2. fragment**

'It is a large **fragment** of stone with decrees written on it.'

**3. different**

'These decrees are written in three **different** languages'

4. **searched**

'Archaeologists have **searched** the area where it was found'

5. **success**

'but with no **success**'

6. **importance**

'The stone is of great **importance**'

7. **Experts**

**Experts** were able to use the Ancient Greek'

8. **decipher**

'to **decipher** the meaning of the hieroglyphs'

9. **soldier**

'a **soldier** in the French Army.'

10. **continuously**

'The stone has been on display in the British Museum almost **continuously** since 1802.'

11. **bombed**

'it would get damaged if the museum was **bombed**.'

12. **whether**

'There is debate over **whether** the stone should stay in Britain or go back to Egypt.'

13. **returned**

'the stone should be **returned** to Egypt'

14. **argue**

'Others **argue** that the stone does not belong to one particular country'

15. **piece**

'but is instead a **piece** of global history.'

16. **global**

'but is instead a piece of **global** history.'

17. **popular**

'the stone is the most **popular** item in the British Museum'

### Section 5: Non-Verbal Reasoning

1. **B**

Along each row, the large shape stays the same. Each small shape (four-pointed star, five-pointed star, or square) only appears once in each column.

2. **B**

The middle grid square of each column is made by combining the top and bottom grid squares. The area where the two shapes overlap turns black.

3. **C**

The first grid square of each row is made by combining the second and third grid squares of the row. The top grid square of each column is made by combining the middle and bottom grid squares of the column.

4. **D**

Working from left to right, the triangle moves down in each grid square. Each position of the circle inside the rectangle (top, middle or bottom) only appears once in each row or column. When the circle is at the top, it is white, when it is in the middle it is grey, and when it is at the bottom it is black.

5. **C**

Working from left to right, an extra line topped with a small rectangle is added in each grid square and the shading of each triangle alternates between grey and white. In the first two columns, the grey triangle is always in front of the lines and the white triangle is always behind them. In the third column the white triangle is always in front of the lines and the grey triangle is always behind them.

6. **C**

The figure has been rotated 315 degrees clockwise (or 45 degrees anticlockwise). In option A, the black shape has gained a side. In option B, the black shape is rotated incorrectly. In option D, the black shape is in the wrong position.

7. **C**

The figure has been rotated 90 degrees clockwise. Option A is a different shape. Options B and D are rotated reflections.

8. **B**

The figure has been rotated 315 degrees clockwise (or 45 degrees anticlockwise). In option A, the grey square has been rotated incorrectly. Option C is the wrong shape. In option D, the grey shape has gained a side.

9. **D**

The figure has been rotated 135 degrees clockwise. In option A, the arrow is pointing in the wrong direction. Option B is a rotated reflection. In option C, the black and grey triangles have swapped shadings.

10. **C**

The figure has been rotated 90 degrees clockwise. In option A, the black shield shape is the wrong way round. Option B is a reflection. In option D, the black shape has changed to a square and the figure has been reflected.

11. **B**

The figure has been rotated 270 degrees clockwise (or 90 degrees anticlockwise). Option A is a rotated reflection. In option C, the grey shapes are in the wrong positions inside the large white shape. In option D, the cross has been rotated incorrectly.

12. C

The large white shape loses a side. The number of black circles increases by one.

13. C

The small shape and the large shape swap position, size and shading. The shading then rotates 90 degrees clockwise.

14. E

The arrows change from passing through each corner of the shape to passing through the middle of each side. Each arrowhead rotates 180 degrees separately.

15. D

The small shape rotates 90 degrees anticlockwise and gets bigger.

16. B

The large and small shapes swap shadings and the small shapes move behind the large shape. The figure rotates 90 degrees clockwise. (The examples don't make the direction of rotation clear, but from the available answer options it must be clockwise.)

## Section 6: Numerical Reasoning

1. 4 km/h

Work out what each division on the speedometer represents. There is one division halfway between 8 km/h and 12 km/h, so that division represents 10 km/h. The arrow is halfway between 8 and 10, so it is pointing to 9 km/h. The top speed is 13 km/h, so it can go an extra  $13 - 9 = 4$  km/h faster.

2. 6

A prime number is only divisible by 1 and itself. Other than 2, there are no even primes. 9 is divisible by 3, and 15 is divisible by 5. All the other odd numbers between 4 and 20 are prime — 5, 7, 11, 13, 17, 19. So there are 6 prime numbers between 4 and 20.

3. 6

One fifth of 35 is  $35 \div 5 = 7$ , so two fifths of 35 is  $7 \times 2 = 14$ . So Tommy has 14 pancakes. One seventh of 14 is  $14 \div 7 = 2$ , so three sevenths of 14 is  $2 \times 3 = 6$ . So Tommy gives Len 6 pancakes.

4. 24.75 s

Johnny's finishing time is rounded to the nearest tenth, so his time is anywhere between 24.75 and 24.85 seconds. The shortest of these times is 24.75 s.

5. 1400

You're multiplying two numbers by 14 — you've got '57 lots of 14' plus '43 lots of 14'. So the calculation is just  $(57 + 43) \times 14 = 100 \times 14 = 1400$ .

6. 1725

Convert quarter past six into the 24-hour clock. It's the evening, so add 12 hours to the hour:  $6 + 12 = 18$ . So Dan needs to arrive by 1815. Look at the row for Redcliff Bay. The 1829 bus is too late and the bus before that does not stop at Redcliff Bay. So Dan needs to take the bus that leaves Ham Green at 1725 and arrives at Redcliff Bay at 1800.

7.  $\frac{1}{4}$

The total number of balls in the bag is  $36 + 12 = 48$ . There are 12 green balls, so the fraction of green balls is  $\frac{12}{48}$ , which is the same as  $\frac{1}{4}$ .

8. D

A is in the right place — it has the same face at each end (so it's a prism), and it has 6 faces altogether (which is even). B is in the right place — it is a triangle-based pyramid, which has 4 faces. C is in the right place — it is a pentagonal prism, which has 7 faces. E is in the right place — it is a square-based pyramid, which has 5 faces. D is in the wrong place — it is a triangular prism, not a pyramid, and it has 5 faces, so should be sorted into the same section as shape C.

9. 128

Count up six hours in one hour steps, and each time double the number of bacteria. If Kirsten starts with 2 bacteria, then after one hour this doubles to 4. After two hours there are 8, after three hours there are 16, after four hours there are 32, after five hours there are 64, and after six hours there are 128 bacteria.

10. 30°

The angles in a triangle add up to 180°. One of the angles is a right angle, i.e. 90°, so the other two angles add up to  $180^\circ - 90^\circ = 90^\circ$ . So  $x + 2x = 90^\circ$ .  $3x = 90^\circ$ , so  $x = 90^\circ \div 3 = 30^\circ$ .

## Set A — Paper 2

### Section 1: Non-Verbal Reasoning

1. F

Shape F has been rotated 90 degrees anticlockwise in the plane of the page. Then it has been rotated 90 degrees left-to-right.

2. E

Shape E has been rotated 90 degrees anticlockwise in the plane of the page. Then it has been rotated 90 degrees left-to-right.

3. A

Shape A has been rotated 90 degrees anticlockwise in the plane of the page.

4. C

Shape C has been rotated 180 degrees, top-to-bottom.

5. B

Shape B has been rotated 180 degrees left-to-right. Then it has been rotated 90 degrees towards you, top-to-bottom.

6. D

Shape D has been rotated 90 degrees towards you, top-to-bottom.

7. D

Option A is ruled out because there is only one white circle on the net. Option B is ruled out because the grey arrow and the grey stripes must be on opposite sides. Option C is ruled out because the black face and the black diagonal stripe must be on opposite sides.

8. C

Option A is ruled out because the 'H' shape and the grey face must be on opposite sides. Option B is ruled out because the white shape and the grey shape must be on opposite sides. Option D is ruled out because the white face and the black circle must be on opposite sides.

9. A

Option B is ruled out because there is only one black rectangle on the net. Option C is ruled out because the white face and the black rectangle must be on opposite sides. Option D is ruled out because the grey face and the black cross shape must be on opposite sides.

10. A

Option B is ruled out because the white face and the two black stripes must be on opposite sides. Option C is ruled out because the arrow should point at the longest side of the grey rectangle. Option D is ruled out because the arrow and the spiral must be on opposite sides.

11. D

There are four blocks visible from above, which rules out options A and C. There are three blocks visible at the front of the figure, which rules out option B.

12. B

There are five blocks visible from above, which rules out options C and D. The three blocks visible at the front of the figure are arranged diagonally, which rules out option A.

13. C

There are five blocks visible from above, which rules out option D. There is a line of three blocks on the left, which rules out option A. There are two blocks at the back, which rules out option B.

14. A

There are six blocks visible from above, which rules out option C. There are four blocks visible on the left-hand side, which rules out option B. There is only one block at the back, which rules out option D.

15. C

The right-hand block of set C rotates 180 degrees left-to-right, then 90 degrees clockwise in the plane of the page, to become the back block of the figure on the left. The left-hand block of the set rotates 180 degrees in the plane of the page, then 90 degrees away from you, top-to-bottom. It moves partly underneath the other block to become the front block of the figure.

16. A

The left-hand block of set A moves to become the back right block of the figure on the left. One of the right-hand blocks of the set moves to become the front right block of the figure. The final block of the set rotates 180 degrees in the plane of the page, then 90 degrees away from you, top-to-bottom. It then moves partly underneath the front right block.

17. C

The bottom left-hand block of set C rotates 90 degrees left-to-right and becomes the block at the back of the figure on the left. The right-hand block of the set rotates 90 degrees in the plane of the page and moves underneath the first block. The cube at the top of the set moves to the front of the figure, in the middle.

18. B

The top block of set B moves to become the block at the back of the figure on the left. The bottom left block of the set rotates 90 degrees anticlockwise in the plane of the page, then 90 degrees away from you, top-to-bottom. It then moves partly under the back block. The bottom right block of the set rotates 90 degrees top-to-bottom and moves to the front of the figure, on the right.

19. B

The bottom right block of set B rotates 180 degrees top-to-bottom and becomes the back right block of the figure on the left. The bottom left block of the set rotates 90 degrees in the plane of the page and becomes the back left block of the figure. The top block of set B rotates 90 degrees anticlockwise in the plane of the page, then 90 degrees left-to-right. It then moves to become the front block of the figure.

20. A

The top block of set A rotates 90 degrees away from you top-to-bottom and becomes the bottom right block of the figure on the left. The bottom right block of the set rotates 180 degrees in the plane of the page, then 90 degrees away from you, top-to-bottom. It then becomes the bottom left block of the figure. The bottom left block of the set rotates 90 degrees in the plane of the page and becomes the top block of the figure.

## Section 2: Verbal Reasoning

### — Cloze

- visited**  
'If you have ever **visited** Northern Ireland'
- situated**  
'It is **situated** on the northeastern coast'
- managed**  
'owned and **managed** by the National Trust.'
- consists**  
'The Giant's Causeway **consists** of unusual'
- shaped**  
'hexagonally **shaped** columns of rock.'
- formed**  
'These columns **formed** millions of years ago'
- prefer**  
'However, some people **prefer** a different explanation'
- challenged**  
'Finn McCool was **challenged** to a fight'
- accepted**  
'Finn **accepted** and built the causeway'
- over**  
'to go **over** to Scotland.'
- ran**  
'he **ran** away in fear.'
- dress**  
'he asked his wife to **dress** him up as a baby.'
- searching**  
'When Benandonner came **searching** for him'
- supposed**  
'he **supposed** that its father'
- enormous**  
'must be absolutely **enormous**.'
- destroying**  
'Benandonner ran home, **destroying** the causeway'
- remains**  
'the Giant's Causeway **remains** one of'
- popular**  
'the most **popular** tourist destinations in Northern Ireland.'

## Section 3: Numerical Reasoning

### 1 a) Leslie

They all threw '24 metres something', so you need to look at the tenths — Jane, Olé and Sophie's distances all have 3 tenths, but Rich and Leslie's distances have 4 tenths, so they threw further. Then look at the hundredths — Rich threw 24 metres, 4 tenths and 0 hundredths, but Leslie threw 24 metres, 4 tenths and 1 hundredth. So Leslie threw the javelin furthest.

### 1 b) 0.42 m

Leslie's triple jump was 11.39 m. Rich's triple jump was 10.97 m. Subtract to find the difference:  
 $11.39 - 10.97 = 0.42$  m.

### 1 c) 7.01 seconds

Jane's time was 79.36 s, Sophie's time was 72.35 s. Subtract to find the difference:  $79.36 - 72.35 = 7.01$  (you can use partitioning or the column method to do this subtraction).

### 1 d) Olé

You don't need to work out the combined distance for each pupil here. The distances for the javelin are all very close together — the difference between the longest and shortest distance is less than 0.1 m. The distances for the triple jump are much more spread out, so you can tell that the highest combined distance will just be whoever had the longest triple jump distance, which was Olé.

### 2 a) 7.5 kg

Each bin represents 2 kg, so each quarter of a bin is worth  $2 \div 4 = 0.5$  kg. There are  $3\frac{3}{4}$  bins representing plastic, so in March Viktoria's household recycled  $3 \times 2$  kg +  $3 \times 0.5$  kg = 7.5 kg of plastic.

### 2 b) 2.5 kg

You know from part a) that each quarter of a bin is worth 0.5 kg. There are  $1\frac{1}{4}$  more bins representing glass than metal. So Viktoria's household recycled  $2 + 0.5 = 2.5$  kg more glass than metal.

### 2 c) Paper

There are  $16\frac{1}{2}$  bins in total.  $\frac{1}{3}$  of this is  $16.5 \div 3$ .  
 $16.5 = 15 + 1.5$ .  
 $15 \div 3 = 5$ , and  $1.5 \div 3 = 0.5$ . So  $16.5 \div 3 = 5 + 0.5 = 5.5$ .  
So you're looking for the row with  $5\frac{1}{2}$  bins. This is paper.

### 2 d) Paper

In March, the most common type of waste recycled is paper — it has the most pictures of bins in the pictogram. In April, all the mass recycled stays the same except for metal. There is now  $3 \times 2 + 3 = 9$  kg of metal recycled. This still isn't more than paper, so paper is the most common type of waste in April too.



2 e)  $4\frac{1}{2}$

An extra 3 kg would be represented by an extra  $1\frac{1}{2}$  bins ( $2\text{ kg} \times 1\frac{1}{2} = 3\text{ kg}$ ). There are already 3 bins, so in April metal would be represented by  $3 + 1\frac{1}{2} = 4\frac{1}{2}$  bins.

3 a) 1 hour

The time that they were stopped for lunch is represented by a straight horizontal line on the graph. This is between the times 2 hours and 3 hours on the horizontal axis. So they stopped for 1 hour.

3 b) 2 km

They stopped for lunch between the times 2 hours and 3 hours. So you can read off the vertical axis to see that they walked 4 km before stopping for lunch. After lunch, they walked  $10 - 4 = 6$  km. So they walked  $6 - 4 = 2$  km further on the way back.

3 c) 16:35

They started at 10:35 and were out for 6 hours, so they got back at 16:35.

3 d) 15:05

Reading 8 km off the graph shows that they reached this point after walking for 4 and a half hours. They started at 10:35, so 4 hours after this is 14:35. Half an hour after this is 15:05 (you can do this using partitioning).

4 a) 300 kg

If 45 kg is  $\frac{3}{20}$ , then  $\frac{1}{20}$  of the sales is  $45 \div 3 = 15$  kg. So the week's sales total was  $15 \times 20 = 300$  kg.

4 b)  $54^\circ$

You want to work out  $\frac{3}{20}$  of  $360^\circ$ .  $\frac{1}{20}$  of  $360^\circ$  is  $360 \div 20 = 18$  (you can write out the division to work this out). So  $\frac{3}{20}$  is  $3 \times 18 = 54^\circ$ .

4 c) 75 kg

Belgian Brie makes up  $\frac{1}{4}$  of the pie chart (because it's a right angle), so Julio sold  $300 \div 4 = 75$  kg of Belgian Brie (you can work this out by dividing by dividing 300 by 2, then dividing by 2 again).

4 d) C

75% is the same as saying 75 out of 100. 110 experts were asked, but only 75 recommended the cheese — as a percentage, this is less than 75%.

5 a) 40%

Each section is the same size, so begin by counting up the total number of sections (10) and the number of sections that contain a heart (4). So the fraction of sections that contain a heart is  $\frac{4}{10} = 40\%$ .

5 b) 30%

There are 10 sections, and there are 3 grey non-heart sections. So the fraction of grey non-heart sections is  $\frac{3}{10} = 30\%$ .

5 c) 2

The fraction of the spinner's sections that are white heart sections is now  $\frac{2}{5}$ . Multiplying the numerator and denominator by 2 gives  $\frac{4}{10}$ , so 4 out of the 10 sections should be white and contain a heart. There are already 2 of these, so Doug needs to add 2 more hearts.

5 d) 5

From part c) you know that he adds hearts to 2 white sections. You have no information about the number of hearts added to the grey sections, so he can add hearts to all the remaining grey sections. There are 3 of these, so in total he can add up to  $2 + 3 = 5$  hearts.

6 a)  $270\text{ cm}^2$

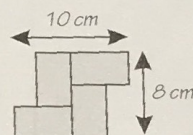
Work out the area of one tile:  $5 \times 3 = 15\text{ cm}^2$ . Counting the tiles, you'll see there are 18. So the total area of the border is the area of one tile multiplied by the number of tiles:  $15 \times 18 = 270\text{ cm}^2$  (you can do this using partitioning or long multiplication).

6 b) 78 cm

Along the perimeter of the inside of the border, you can see the lengths of 14 whole tiles, and 4 partial tiles. The total length of the 14 whole ones is  $14 \times 5 = 70$  cm. The edge of the partial tile is the length minus the width, i.e.  $5 - 3 = 2$  cm. There are 4, so in total it's  $4 \times 2 = 8$  cm. So the perimeter is  $70 + 8 = 78$  cm.

6 c) 36 cm

The whole pattern is 2 tile lengths wide, so its top edge is  $2 \times 5 = 10$  cm wide. Its height is the same as one length and one width of a tile, so it is  $3 + 5 = 8$  cm high.



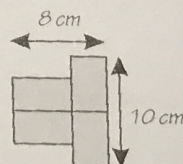
So the total perimeter is  $2 \times (10 + 8) = 2 \times 18 = 36$  cm.

6 d) 0

It has no lines of symmetry.

6 e) C

This pattern is 10 cm high and 8 cm wide.  $2 \times (8 + 10) = 2 \times 18 = 36$  cm, the same as the first shape.



7 a) 4

You want the week number or numbers with the smallest difference between the top and bottom plotted points. Looking at the graph, you can see that this is week 4.

7 b) 6 points

Reading the graph for Burns you can see that in week 3 their house points total is halfway between 4 and 8, which is 6.

7 c) 8 points

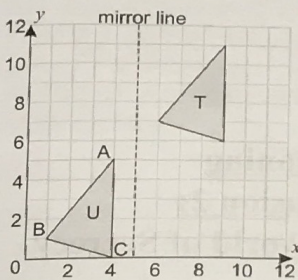
The total number of points that Alling scored over the four weeks is  $6 + 4 + 8 + 14 = 32$  points. Divide this by the number of weeks to find the mean:  $32 \div 4 = 8$  points.

7 d) Alling, Catchpole and Diamond

The total number of points awarded in week 1 is  $16 + 12 + 10 + 6 + 4 = 48$  points. To find the three that add up to 28, it's easier to find the two that add up to  $48 - 28 = 20$ , and discard them. 16 and 4 is the only pair that add up to 20. So the three houses whose scores add up to 28 are those that scored 12, 10 and 6 — i.e. Alling, Catchpole and Diamond.

8 a) (1, 1)

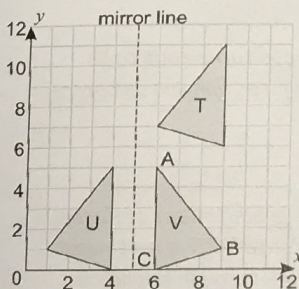
Moving triangle T five squares to the left and six squares down looks like this:



So point B now has the coordinates (1, 1).

8 b) (6, 0)

Reflecting triangle U in the mirror line looks like this:



So point C now has the coordinates (6, 0).

8 c) Kite

You can see from the diagram in part b) that U and V join together to form a quadrilateral. It has two pairs of adjacent sides that are the same length which are not parallel. So it is a kite.

8 d)  $71^\circ$

Angle BAC is  $38^\circ$ , so the other two angles add up to  $180^\circ - 38^\circ = 142^\circ$ . It is an isosceles triangle, so the other two angles are equal. So divide by 2:  $142 \div 2 = 71^\circ$ .

9 a) 41

Each shape in the sequence gains another 4 sticks. There are 29 sticks in the 7th shape, so there will be  $29 + 4 = 33$  in the 8th,  $33 + 4 = 37$  in the 9th, and  $37 + 4 = 41$  sticks in the 10th shape.

9 b) 25

The number of diagonal sticks goes up by 1 each time, and it's the same as the shape number. So in the 25th shape there will be 25 diagonal sticks.

9 c)  $4n + 1$

In each shape number, the number of sticks goes up by 4. So the formula must be related to  $4n$ . The first shape has 5 sticks, so if  $n = 1$ , then  $4n = 4$ , so you need to add 1 to get the correct number of sticks. So the formula is  $4n + 1$ . (You could also just try each of the options and see which one works for all the terms.)

9 d) 20.05 m

Using the formula from part c), the 100th pattern will have  $4 \times 100 + 1 = 401$  sticks. Each stick is 5 cm long, so their total length is  $5 \times 401 = 2005$  cm.  $1 \text{ m} = 100 \text{ cm}$ , so this is  $2005 \div 100 = 20.05 \text{ m}$ .

10 a)  $6x + 30$

The room has 2 sides of length 7 and 2 sides of length  $3x + 8$ . The two sides of length 7 add up to 14, and the 2 sides of length  $3x + 8$  add up to:

$$(3x + 8) + (3x + 8) = 6x + 16.$$

So the perimeter is  $14 + (6x + 16) = 6x + 30$ .

10 b) 1:6

The rug is  $\frac{1}{7}$  of the room, and the carpet makes up the rest of it, so the carpet is  $1 - \frac{1}{7} = \frac{6}{7}$  of the room. So the ratio of rug to carpet is  $\frac{1}{7} : \frac{6}{7}$ . Multiplying both sides by 7 gives the simplified ratio 1:6.

10 c)  $3x + 8$

The area of the room is the length multiplied by the width, so it's  $7(3x + 8)$ . The rug is  $\frac{1}{7}$  of this area, so it's  $\frac{1}{7} \times 7(3x + 8)$ , which is just  $3x + 8$ .

10 d) 1

You know from part c) that the area of the patio is  $(3x + 8) \text{ m}^2$ . This is equal to  $11 \text{ m}^2$ .

So  $3x + 8 = 11$ . Subtracting 8 from both sides of the equation gives  $3x = 3$ . So  $x = 1$ .

## Set B — Paper 1

### Section 1: Verbal Reasoning — Comprehension 1: An extract from 'The Wind in the Willows'

1. C

In the passage, it states, "The animals did not hold with villages", which means they are wary of villages.

2. B

In the passage, it says "the track, that had in time become a path and then had developed into a lane, now handed them over to the charge of a well-metalled road." "well metalled" means 'paved'. The road is a sign of civilisation because it shows they are approaching a more developed area.

3. D

In the passage, the Rat says "We shall slip through all right, without any bother or unpleasantness".

4. B

We know it's dark because "nightfall" has "beset the little village". The Rat and the Mole can see the cottage windows as "squares of a dusky orange-red".

5. A

"casements" is another word for windows. In the passage, it says "Most of the low latticed windows were innocent of blinds." This means that most of the windows don't have blinds, so the Rat and the Mole can look inside.

6. A

"unconsciousness" indicates that the inhabitants are unaware, and "observation" means the activity of watching. Therefore, the inhabitants don't know that the Rat and the Mole are watching them.

7. C

The author uses the metaphor of a theatre to describe a cottage. At each cottage, the Rat and the Mole can watch the events going on inside, as if it were a performance at the theatre. Therefore, the Rat and the Mole are going from one cottage to the next.

8. D

In the passage, it says "Close against the white blind hung a bird-cage, clearly silhouetted". A silhouette is the outline of an object or its shadow.

9. A

In the passage, it says that the bird "seemed so near to them as to be easily stroked, had they tried". However, we know that the Rat and the Mole are on the other side of the window to the bird. They cannot actually reach out and touch it.

10. C

Transfixed means 'motionless with wonder'. In the passage, it says "a small sting of frozen sleet on the skin woke them as from a dream". This dreamlike state implies that the Rat and the Mole are transfixed by the silhouette of the bird.

11. C

In the passage, it says "the stretch that we know is bound to end, some time, in the rattle of the door-latch, the sudden firelight, and the sight of familiar things greeting us as long-absent travellers from far over-sea." It is "the rattle of the door-latch" that tells us they will walk through the door.

12. B

In the passage, it says "As for the Rat, he was walking a little way ahead, as his habit was". The fact that this was the Rat's "habit" means that this is something he usually did.

13. B

"frequented" means 'visited'.

14. C

"wistfulness" means 'longing'.

15. D

"pulsated" means 'beat'.

16. A

"inciting" means 'stirring up'.

### Section 2: Verbal Reasoning — Comprehension 2: Area 51 — a World of Secrecy

1. C

"airborne" means 'in the air'. In the passage, it says that Area 51 is a "United States Air Force facility". An air force is part of the armed forces that fights or defends in the air.

2. B

In the passage, it says that the "objects turned out to be planes that were flying at greater heights than the onlookers had ever seen before".

3. A

In the passage, it says that Area 51 is southwest of Rachel. In the third paragraph, it says that Route 375 is northwest of Las Vegas, and that Route 375 runs through Rachel. So, Las Vegas must be east of Area 51.

4. C

In the second paragraph, it says "a map with Area 51 marked on it" was first declassified in 2013. In the fourth paragraph, it says that "One of the most famous alleged UFO sightings associated with Area 51 occurred eight years before the base was even built." The passage then states that this sighting was in 1947. This means that Area 51 was built in 1955. 2013 is 58 years after 1955.

5. **A**

In the passage, it says that Groom Lake, Homey Airport, Watertown and Paradise Ranch were all names for Area 51. It then says, "The latter was a semi-serious attempt to attract employees to work at the base." The phrase "The latter" refers to the last name in the list — Paradise Ranch.

6. **B**

In the third paragraph it says that Route 375 "had received so much attention from UFO-seeking tourists that in 1996, Nevada state officials renamed it the 'Extraterrestrial Highway.'" The attention it received shows that the place had a reputation as a UFO hotspot.

7. **C**

In the passage, it says that Area 51 is to "the east of the Nevada National Security Site" and "southwest of the small town of Rachel". Therefore, it must be true that the town of Rachel is northeast of the Nevada National Security Site.

8. **B**

The passage says that it is possible to head northwest from Las Vegas to join Route 375, but it does not say at which point the road from Las Vegas meets Route 375.

9. **C**

In the second paragraph, it says that the location of Area 51 is "common knowledge". It goes on to say "However, it was only in 2013 that a map with Area 51 marked on it was first declassified", which indicates that people knew about Area 51 before 2013.

10. **D**

We know that Area 51 is a United States Air Force Facility. The passage also says that "flying saucers usually turn out to be military aircraft". This means that planes are often confused for UFOs.

### **Section 3: Verbal Reasoning**

#### **— Antonyms**

1. **ignorant**

'knowledgeable' means 'educated', whereas 'ignorant' means 'uneducated'.

2. **reprimand**

'praise' means 'commend', whereas 'reprimand' means 'tell off'.

3. **heartless**

'sensitive' means 'sympathetic', whereas 'heartless' means 'uncaring'.

4. **irrational**

'logical' means 'using reason', whereas 'irrational' means 'without reason'.

5. **adjacent**

'distant' means 'far', whereas 'adjacent' means 'next to'.

6. **detrimental**

'beneficial' means 'having a positive impact', whereas 'detrimental' means 'having a negative impact'.

7. **demise**

'rise' means 'progression', whereas 'demise' means 'downfall'.

8. **sparse**

'abundant' means 'plentiful', whereas 'sparse' means 'limited'.

9. **impassive**

'emotional' means 'showing feeling', whereas 'impassive' means 'not showing feeling'.

10. **obstinate**

'flexible' means 'adaptable', whereas 'obstinate' means 'stubborn'.

11. **endangered**

'safe' means 'free from danger', whereas 'endangered' means 'at risk'.

12. **dishonest**

'candid' means 'truthful', whereas 'dishonest' means 'false'.

13. **durable**

'durable' means 'strong', whereas 'weak' means 'fragile'.

14. **erudite**

'uneducated' means 'having a poor level of education', whereas 'erudite' means 'showing great knowledge'.

15. **conventional**

'eccentric' means 'peculiar', whereas 'conventional' means 'normal'.

16. **convoluted**

'direct' means 'straightforward', whereas 'convoluted' means 'confusing'.

17. **timorous**

'confident' means 'self-assured', whereas 'timorous' means 'apprehensive'.

18. **hospitable**

'hostile' means 'unfriendly', whereas 'hospitable' means 'welcoming'.

19. **irrelevant**

'essential' means 'necessary', whereas 'irrelevant' means 'unimportant'.

20. **unaccustomed**

'familiar' means 'acquainted', whereas 'unaccustomed' means 'unacquainted'.

## Section 4: Verbal Reasoning

### — Multiple Meanings

**1. trip**

'trip' can mean 'an expedition' or 'to slip'.

**2. long**

'long' can mean 'something of great length' or 'to want something intensely'.

**3. slight**

'slight' can mean 'thin' or 'to insult'.

**4. party**

'party' can mean 'a social event' or 'a group of people'.

**5. wound**

'wound' can mean 'damage to the body' or 'coiled'.

**6. soil**

'soil' can mean 'dirt' or 'to make dirty'.

**7. kid**

'kid' can mean 'a young person' or 'to tease'.

**8. grave**

'grave' can mean 'sombre' or 'burial chamber'.

**9. issue**

'issue' can mean 'to give out' or 'difficulty'.

**10. drum**

'drum' can mean 'to hit' or 'a container'.

**11. tart**

'tart' can mean 'a pastry-based dessert' or 'sour'.

**12. console**

'console' can mean 'a control panel' or 'to show sympathy'.

## Section 5: Non-Verbal Reasoning

**1. B**

In option A, one of the triangles has been reflected downwards. Option C is identical to the original figure. Option D has been rotated 90 degrees.

**2. D**

Options A and C have been rotated. Option B is the wrong shape.

**3. B**

Option A has been rotated. Option C has been reflected downwards. Option D is the wrong shape.

**4. A**

Option B has been reflected downwards. In option C, the triangle and the ellipse are in the wrong positions. In option D, the triangle has not been reflected.

**5. C**

Option A has been reflected and rotated. Options B and D have been rotated.

**6. D**

Option A is the wrong shape. Option B has been rotated. Option C is identical to the original figure.

**7. B**

Option A has been reflected downwards. Options C and D have been rotated.

**8. A**

Option B has been rotated. Option C has the wrong shape in the centre and the shading is wrong. In option D, the shading is wrong.

**9. C**

Option A has been rotated. In options B and D, the stripes have swapped positions (so the thinner stripe is nearer the centre of the oval).

**10. D**

Option A has not been reflected — only the layering has changed. Option B has been rotated. In option C, the grey and black parallelograms have swapped places but they have not been reflected.

**11. B**

The figure in each hexagon is reflected across the middle of the hexagonal grid.

**12. C**

Moving in a clockwise direction from the top middle hexagon, the figure gets larger and rotates 90 degrees anticlockwise each time.

**13. C**

The hexagonal grid has a vertical and a horizontal line of symmetry. Option C is an upwards reflection of the bottom-right hexagon, and a sideways reflection of the top-left hexagon.

**14. E**

Moving in a clockwise direction from the bottom-left hexagon, one small circle is added each time. The shading of the new circle alternates between white and black. The white circles are always closest to the centre of the grid and the black circles are always furthest from the centre of the grid.

15. A

The hexagons on opposite sides of the hexagonal grid are identical.

16. B

Moving around the grid in a clockwise direction, the positions of the small hexagons alternate between left and right. Their shading changes in the sequence: horizontal hatching, vertical hatching, cross-hatching.

17. F

The outer hexagons form an alternating sequence around the grid.

18. D

Going in an anticlockwise direction from the top hexagon, the number of lines increases by one each time. The black dot moves anticlockwise around the corners of the hexagons.

19. D

In all other figures, the arrow points towards the straight side of the large white shape.

20. B

In all other figures, the small black shape overlaps the edge of the white heart.

21. B

In all other figures, the shape is divided into four triangles.

22. E

In all other figures, the dotted line is a line of symmetry.

23. C

In all other figures, the two shapes have the same shading.

24. D

In all other figures, the black point of the star is one position clockwise from the white point next to the arrowhead.

25. D

In all other figures, the missing section from the large square matches the small shape on the right, rotated 90 degrees anticlockwise. (In D, it matches the shape on the left.)

26. A

In all other figures, the arrow points in the same direction as the hatching in the circle.

27. C

In each series square, the triangle rotates 90 degrees anticlockwise and the square rotates 45 degrees.

28. C

In each series square, one line of a large hexagon is added in a clockwise direction. The shading of the circle alternates between black and white.

29. C

The shape at the front moves to the back in the next series square. The shading of the circle alternates between grey and white.

30. A

In each series square, the large outer shape alternates between a square and a circle. The star moves clockwise around the outer shape. The shadings of the star and the three dots alternate between black and white. (In option D, the star has rotated 180 degrees.)

31. C

The squares in this series are in two pairs. In each pair, the number of points on the star doubles and dots appear at the ends of the new points.

32. D

The circle moves clockwise around the corners of the series squares. The star rotates 180 degrees in each series square. The areas where the three shapes overlap are black. The areas where two of the shapes overlap are grey.

33. A

In each series square, the shading of the triangles and the dots alternates between black and white. One dot is added to the figure in each series square. The dots alternate between being added in the next empty triangle anticlockwise and the next empty triangle clockwise.

34. A

In each series square, the white stripe that was underneath the raindrop in the previous square turns grey. The raindrop moves to a different white stripe.

35. D

In each series square, the hatching reflects across. The small shape gains a side in each series square, and its shading alternates between black and white.

36. B

The squares in this series are in two pairs. In each pair, the shaded region in the first square gets bigger and becomes the shape in the second.

37. C

In each series square, the small black central shape moves to the bottom right corner of the large outer square. Any small shapes already on the outer square move one corner anticlockwise around the square. A new small black shape appears in the centre of the large square.

## Set B — Paper 2

### Section 1: Verbal Reasoning — Odd One Out

1. **umpire**

The other three are all pieces of sports equipment.

2. **type**

The other three describe writing by hand.

3. **rose**

The other three are parts of a plant.

4. **rise**

The other three describe how something turns to the right or left.

5. **swallow**

The other three mean 'to grind with the teeth'.

6. **windy**

The other three refer to temperature.

7. **note**

The other three are ways of asking for something.

8. **lake**

The other three are parts of a river.

9. **pencil**

The other three are spread over a surface to leave a mark.

10. **dream**

The other three all mean 'to sleep'.

11. **story**

The other three are all genres.

12. **door**

The other three are all types of enclosure.

### Section 2: Verbal Reasoning — Cloze

1. **devastating**

'a **devastating** fire tore through the streets'

2. **broke**

'The fire **broke** out in a bakery'

3. **Back**

'**Back** then, many buildings were made of wood'

4. **made**

'many buildings were **made** of wood'

5. **spread**

'the fire quickly started to **spread**'

6. **effect**

'The weather also had an **effect**'

7. **long**

'before too **long**, the fire was roaring'

8. **fled**

'Many people **fled** their homes'

9. **few**

'Very **few** people are known to have perished'

10. **case**

'this is only the **case**'

11. **common**

'it was **common** for deaths of the poor to go unrecorded'

12. **raged**

'The fire **raged** for four days'

13. **destroying**

'**destroying** the City of London.'

14. **engulfed**

'buildings were **engulfed** by the flames'

15. **entirely**

'central London had to be almost **entirely** rebuilt.'

16. **commemorating**

'a monument **commemorating**'

17. **known**

'what is now **known** as the Great Fire of London'

18. **years**

'the spot where the fire started all those **years** ago.'

### Section 3: Numerical Reasoning

1. **426 m**

To find the difference in height, just subtract the smaller number from the larger. The difference is  $3776 - 3350$ .

You can work this out using the partitioning method.

Break 3350 into 3000, 300, and 50.

$$3776 - 3000 = 776$$

$$776 - 300 = 476$$

$$476 - 50 = 426.$$

**2. metres**

Depth is a distance, so you want one of the distance measurements — i.e. either metres or kilometres. Out of these, metres is the most sensible choice, as pools aren't anywhere near as deep as a kilometre (1000 m).

**3. 6**

The remainder must be less than 8, otherwise the 'extra' 8 in the remainder would increase the 'whole number' part of the result by 1. So the only option is 6.

**4. 4%**

100% of the money is being divided between 25 people.  
 $100\% \div 25 = 4\%$ .

**5 a) £160.00**

The trick is to spot that the price of one shirt and one tie added together is £20. 8 shirts and 8 ties will cost 8 times this amount, so  $£20 \times 8 = £160$ .

**5 b) 6**

2 shirts cost  $2 \times £17.50 = £35$  (you can find this by partitioning £17.50 into £17 + £0.50). Subtract the cost of the 2 shirts from the total amount he spends to find the total cost of the ties:  $£50 - £35 = £15$ . Now divide this by the cost of one tie to find the number he buys. £15 breaks down into £10 + £5.  
 $£10 \div £2.50 = 4$ , and  $£5 \div £2.50 = 2$ , so he buys  $4 + 2 = 6$  ties.

**6 a) Blue**

The bar for 'Blue' is the tallest, so it is the most common colour.

**6 b) 10%**

In total, there were  $4 + 8 + 3 + 10 + 5 = 30$  bikes. 3 of these were orange, which is  $\frac{3}{30}$  as a fraction. Dividing the numerator and denominator by 3 simplifies this to  $\frac{1}{10}$ . As a percentage, this is 10%.

**6 c) 2:5**

There were 4 red bikes and 10 blue bikes. As a ratio, this is 4:10. Dividing both values by 2 simplifies this to 2:5.

**6 d) 48°**

$\frac{4}{30}$  of the cars were red. There are  $360^\circ$  in a full circle,  $\frac{1}{30}$  of this is  $360^\circ \div 30 = 12^\circ$ , so  $\frac{4}{30}$  is  $4 \times 12^\circ = 48^\circ$ .

**7. 6**

2 litres = 2000 ml.  $6 \times 3 = 18$ , so  $6 \times 300 \text{ ml} = 1800 \text{ ml}$ . So 6 glasses can be filled, with 200 ml remaining.

**8 a)  $\frac{7}{20}$**

35% is equivalent to  $\frac{35}{100}$ . Dividing the numerator and denominator by 5 simplifies this to  $\frac{7}{20}$ .

**8 b) 140**

You're asked to find 35% of 400.  
Divide 400 by 100 to find 1%:  $400 \div 100 = 4$ .  
So  $35\% = 35 \times 1\% = 35 \times 4 = 140$ .

**8 c) £60**

Greg gets 50p each time someone plays. On this day, this was a total of  $400 \times 50\text{p} = 20\,000\text{p} = £200$  (you could also have worked this out by noticing that 50p is  $\frac{1}{2}$  of £1, so  $400 \times 50\text{p}$  will be  $\frac{1}{2}$  of £400). From part b), you know that 140 people threw the ball through the hoop, so Greg gave away prizes worth  $140 \times £1 = £140$ . So his total profit was  $£200 - £140 = £60$ .

**9 a) 10**

The perimeter of the park is  $625 + 625 + 112.5 + 112.5$ .  
 $625 + 625 = 1250$  and  $112.5 + 112.5 = 225$  (you can use partitioning to find these if you need to).  
So the perimeter is  $1250 + 225 = 1475$ .  
Divide to find the number of laps:  
 $14\,750 \div 1475 = 10$  (because  $14\,750 = 1475 \times 10$  — notice that it has the extra zero on the end.)

**9 b) £1.25**

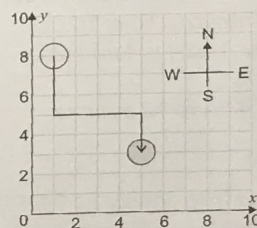
Jacob does 10 laps, so each lap is worth:  
 $£12.50 \div 10 = £1.25$ .

**9 c) 1 hour 58 minutes**

1 km = 1000 m, so Jacob runs  $14\,750 \div 1000 = 14.75$  km.  
Each kilometre takes 8 minutes, so he runs for  $14.75 \times 8$  minutes in total.  
14.75 breaks down into  $10 + 4 + 0.75$   
 $10 \times 8 = 80$ ,  $4 \times 8 = 32$  and  $0.75 \times 8 = 6$  (remember that 0.75 is the same as  $\frac{3}{4}$ ).  
So  $14.75 \times 8 = 80 + 32 + 6 = 118$ .  
2 hours is 120 minutes, so 118 minutes is 2 minutes less than 2 hours. So Jacob ran for 1 hour 58 minutes.

**10 a) (5, 3)**

Following the instructions will give you the path shown below:

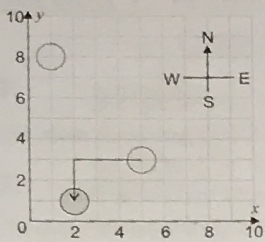


So you will end up at the point (5, 3).



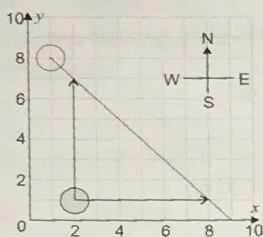
### 10 b) 3 squares west, 2 squares south

Moving 3 squares west will take you to (2, 3), and then moving 2 squares south will take you to (2, 1).



### 10 c) 6

The line on the diagram below shows the points which are directly south east of the counter's original position:



Moving 6 squares north, or 6 squares east, or any combination of 6 north and east movements between the arrows shown on the diagram will take the counter to a position on this line.

### 11. 54 cm<sup>3</sup>

The volume of one cube is  $3 \times 3 \times 3 = 27 \text{ cm}^3$ .  
So the volume of the cuboid is  $2 \times 27 = 54 \text{ cm}^3$ .

### 12 a) 27 minutes

Sara passed checkpoint E at 12:49. Trish passed it at 13:16. 12:49 to 13:00 is 11 minutes, and 13:00 to 13:16 is 16 minutes, so Trish passed the checkpoint  $11 + 16 = 27$  minutes after Sara.

### 12 b) 4 hours 12 minutes

Ruby passed checkpoint B at 09:52, and reached point F at 14:04. From 09:52 to 10:00 is 8 minutes. From 10:00 to 14:00 is 4 hours. From 14:00 to 14:04 is 4 minutes. Adding all these together gives:  
 $8 \text{ minutes} + 4 \text{ hours} + 4 \text{ minutes} = 4 \text{ hours } 12 \text{ minutes}$ .

### 12 c) 37 minutes

Ruby finished the race at 14:04, and Trish finished at 14:41. So the difference between them was  $41 - 4 = 37$  minutes.

### 13 a) £30

Rachel gets an extra £15, so that means Rachel and Sam share equally  $£75 - £15 = £60$ .  
 $£60$  shared equally is  $£60 \div 2 = £30$ .  
So Sam gets £30 and Rachel gets  $£30 + £15 = £45$ .

### 13 b) 2:3

The ratio of the amount that Sam gets to the amount that Rachel gets is £30 : £45. Dividing both sides by £15 to simplify gives 2 : 3.

### 14 a) 7 °C

Find 11:00 on the horizontal axis, then read up to the line and across to find the value on the vertical axis. This is halfway between 6 and 8, so the temperature was 7 °C.

### 14 b) 16:00

The coldest temperature is the lowest point on the graph. This is 4 °C at 16:00.

### 14 c) 15:00-16:00

You're looking for the time period that has the biggest height difference between the two plotted points. This is 15:00-16:00.

### 14 d) 9 °C

Reading from the graph, the recorded temperatures in °C between 10:00 and 14:00 were: 6, 7, 9, 12, 11. To find the mean, add the temperatures together and divide by the number of hours, 5.  $6 + 7 + 9 + 12 + 11 = 45$ .  $45 \div 5 = 9$ , so the mean temperature is 9 °C.

### 15. 2020

Mr Alokwe will change his car in 2017, 2020, 2023...  
Mr Clitheroe will change his car in 2016, 2018, 2020...  
So they will both change their car in 2020.  
Alternatively, you could find the lowest common multiple of 2 and 3 (which is 6), so it'll be 6 years after 2014.

### 16. 24

You need to add the fractions to find the fraction of pets that aren't canaries, so write all the fractions so that they have the same denominator:

$$\frac{5}{8} = \frac{15}{24}$$

$$\frac{1}{3} = \frac{8}{24}$$

So Karen's pets that aren't canaries are

$$\frac{15}{24} + \frac{8}{24} = \frac{23}{24} \text{ of all of her pets.}$$

So  $\frac{1}{24}$  of her pets are canaries.

She has just 1 canary, so she has 24 pets in total.

### 17 a) C

49 is a square number ( $49 = 7 \times 7$ ), and an odd number. It does not divide exactly into 90. So it should go into the region where only 'square numbers' and 'odd numbers' overlap, but not 'factors of 90'.

### 17 b) 9

The value you're looking for is a factor of 90, so can't be more than 90. The only odd square numbers less than 90 are 1, 9, 25, 49 and 81. 25, 49 and 81 aren't factors of 90, so the largest number in section F is 9.

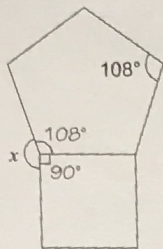
17 c) 1

All of the odd numbers will be sorted into B, C, E or F. So you'll be left with the even numbers: 2, 4, 6, 8, 10.

2, 6 and 10 are factors of 90, so these will be sorted into G. 4 is square, so will be sorted into A. The only one left over is 8. This doesn't satisfy any of the descriptions, so is the only one that won't be sorted into the diagram.

18. 162°

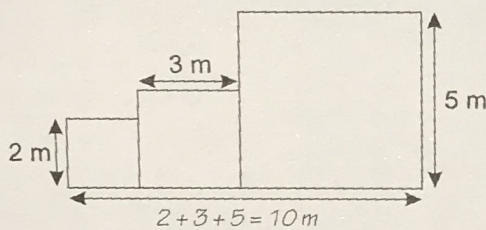
Angles round a point add up to 360°. The angle inside the square is 90°, and the angle inside the pentagon is 108°.



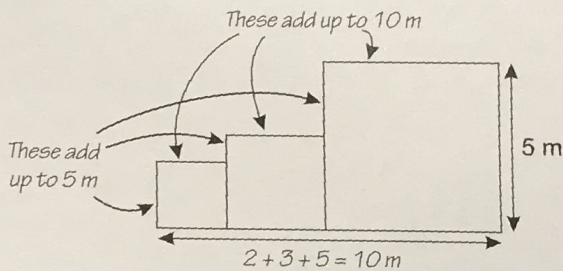
Subtract these two angles from 360° to find x. So x is  $360 - 90 - 108 = 162^\circ$  (use partitioning to help).

19 a) 30 m

You know a side length of every square, so you can find the length of the bottom edge of the whole shape:



You could write out every side and add them up, but it's easier if you spot that the horizontal top sides add up to 10 m and the missing vertical sides add up to 5 m:



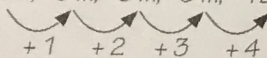
So the perimeter is just  $10 + 10 + 5 + 5 = 30$  m.

19 b) 38 m<sup>2</sup>

The area is  $2 \times 2 + 3 \times 3 + 5 \times 5 = 4 + 9 + 25 = 38$  m<sup>2</sup>.

19 c) 23 m

The sequence of side lengths is: 2 m, 3 m, 5 m, 8 m, 12 m



So to get each term, you add 1 more than last time. The sixth square will have side length  $12 + 5 = 17$  m, and the seventh square will have side length  $17 + 6 = 23$  m.

20 a) 270°

The 'Muesli' and 'Fruit' sectors add up to 90°, so the 'Toast' sector has angle  $360^\circ - 90^\circ = 270^\circ$ .

20 b) 48

The 'Fruit' and 'Muesli' sectors make up  $\frac{1}{4}$  of the circle. So 1 out of 4 people ate either fruit or muesli, which means you can multiply 12 by 4 to find the total number of people:  $12 \times 4 = 48$  people.

20 c) 36

The 'Toast' sector is 3 times the size of the combined 'Muesli' and 'Fruit' sectors ( $270^\circ = 3 \times 90^\circ$ ). 12 people had fruit or muesli, so  $3 \times 12 = 36$  people had toast.

20 d)  $\frac{1}{12}$

The 'Fruit' sector is 30° out of the total 360°. As a fraction, this is  $\frac{30}{360}$ . Dividing the numerator and denominator by 30 simplifies this to  $\frac{1}{12}$ .

21 a)  $10 + 7.5h$

The total cost is '£10 plus £7.50 times the number of hours'. So for  $h$  hours, this is:  $£10 + (£7.50 \times h)$ , which is  $10 + 7.5h$ .

21 b) £32.50

Substituting  $h = 3$  into the formula from part a) gives:  $10 + (7.5 \times 3)$ . Work out the  $7.5 \times 3$  bit first. Using the partitioning method, 7.5 breaks down into  $7 + 0.5$ .  $7 \times 3 = 21$  and  $0.5 \times 3 = 1.5$ , so  $7.5 \times 3 = 21 + 1.5 = 22.5$ . So  $10 + (7.5 \times 3) = 10 + 22.5 = 32.5$ . You're looking for the cost, so the final answer is £32.50.

22 a) 19

Subtract Glenn's total from Alf's total to find the difference:  $33 - 14 = 19$ .

22 b) 0

The mean number of races won was 12, so the total number of races was  $12 \times 5 = 60$ . Terry, Alf, Glenn and Roy won  $6 + 33 + 14 + 7 = 60$  races between them. So Steve won 0 races.

22 c)  $\frac{11}{20}$

You know from part a) that the total number of races was 60. Alf won 33 of these, which is  $\frac{33}{60}$  as a fraction. Dividing the numerator and denominator by 3 simplifies this to  $\frac{11}{20}$ .

23 a) 1

Work backwards to reverse the operations.  $23 + 12 = 35$ ,  $35 \div 7 = 5$ ,  $5 - 4 = 1$ .

23 b)  $(n + 4) \times 7 - 12$

Remember BODMAS. The first step is adding 4, and the second step is multiplying by 7. In BODMAS, multiplication comes before addition, so the 'plus 4' bit needs to go inside brackets, to make sure it is done first. After multiplying by 7, the final step is subtracting 12. Because this comes last it doesn't need to go in brackets.