Answers

Extended answers for Non-verbal Reasoning Home Tutor Ages 10-11

Series (pages 12–13)

1	**E**	The square gradually increases and decreases in size. As it increases, it becomes darker; as it decreases, it becomes paler.
2	**C**	The pentagon rotates 45° clockwise each time. The circle stays in the same position, to the right of where it's pointing. It cannot be A because the circle is striped. It cannot be D because the shape is a hexagon. It cannot be E because the line is not across the centre. It cannot be B because it is pointing up and the rotation means it needs to be pointing to the right, so the answer is C.
3	**D**	The whole shape reflects, but the arrow goes down one place each time. When it reaches the bottom, it restarts from the top. Therefore, the correct answer needs the circles on the left-hand side and the arrow needs to point at the third circle down, so the answer must be D.
4	**A**	The shading moves around the square clockwise each time. So the next one in the sequence is back to black at the top and grey on the right, which is A.
5	**E**	The number of straight lines varies, but the number of intersections between them increases from one through to five. The missing box is box number 3, so we are looking for the box where three lines cross, which is E.
6	**D**	The striped sections move down one place each time. The black section never moves and the other sections jump over it. Therefore, the answer cannot be A or C because the black section is in the wrong place. It can't be E as that matches the second position, and B has the horizontal and vertical lines in the wrong order. So the answer is D.
7	**B**	The 'corner piece' drops to the bottom, half a square at a time, then reappears at the top. The heart moves around the corners of the box anticlockwise.
8	**D**	The black circles drop down one space each time. When they reach the bottom, they go to the next column. The answer cannot be E because there are only ever two black circles. It cannot be A as the black circle on the left is always one space higher than the right. B is the same as the second square and C has the black circles in the wrong columns.
9	**E**	The central combination alternates. The outer shading increases, so we need three sections with the correct direction of shading. The shading always starts on the next section around, moving anticlockwise, so it must start on the bottom and go around for the next three sections anticlockwise.
10	**B**	The three-quarter circle makes its way anticlockwise around the box, always facing out to the corner. The central shape has six sides, four sides, six sides, four sides…so we need a shape which has six sides.
11	**A**	The doughnut shape gets larger and moves around the box anticlockwise. It reverts to small after reaching its third size. The arrow alternates between up and down. The small rectangle drops down the box, alternating between black and white, going to the top once it's reached the bottom.
12	**B**	The whole shape rotates 90° clockwise across the series.

Analogies (pages 16–17)

1	**A**	The shape stays the same size and orientation but is shaded and has a smaller version of itself, unshaded, in the middle. The lines also stretch from the corners of the outside shape to the corners of the shape in the middle.
2	**C**	The main central line shape is reflected in the vertical axis. The top shape drops to the bottom, while the bottom shape goes to the top and rotates 90° clockwise. The bottom right shape does not appear in the new image, but it does give its shading to the new bottom shape.
3	**C**	The entire picture rotates 180°, while the shading swaps with the white shape.
4	**D**	The large shape reflects in the horizontal axis. The arrows in the first shape are reversed in the second shape, so the shapes under the third shape must also be reversed in the answer, making the shape that appears to have an oval inside it. There will be a small circle under the entire shape.
5	**E**	The outer shape rotates 45° clockwise, while the internal shape rotates 90° clockwise.
6	**B**	The whole shape is reflected in the horizontal axis. The black shape becomes white and overlaps the main shape, while the white shape becomes black.
7	**C**	The black pieces, when put together, would make the 3D shape pictured.
8	**E**	The central shape becomes the main shape. The outer shapes move 90° anticlockwise and go into the main shape, but they adopt the shading of the shape that was originally in that position.
9	**A**	The three lines rotate as a block 90° anticlockwise. The shapes on the top left/bottom right go to the top and bottom of the central line/shape, while the shapes on the top right/bottom left go to the top and bottom of the third line.
10	**D**	The triple rectangle shape is dismantled to form a shape based on the triangle, with a rectangle at each corner. They start with the largest one at the top. Based on the triangle in the new shape, we need the largest pentagon at the top and the other two at the other corners.

11	**A**	The shape on the bottom left becomes the central shape. It takes on the spotty shading. Meanwhile, the two black shapes disappear, but one appears, upside-down, on the lower left in the new image. The central main shape shrinks down to create two small versions that appear at the top of the new main shape. The one on the left is white, the one on the right takes on the shading of the initial lower left shape.
12	**E**	The initial shape is turned 90° clockwise and given diagonal shading. Another version – turned 90° anticlockwise – sits directly above it with the same shading. The outer shape is completely new and has the shading of the original main shape. The small circle has disappeared and there are now two small squares. This means our answer must have both the large scroll shape, in the same orientation as the first part of the question, and the squares.

Like Figures (pages 20–21)

1	**C**	The two figures on the left are made up of three-line arrows pointing at six-sided shapes, so only C fulfils both of these.
2	**D**	The two figures on the left are made of two identical shapes, one inside the other, and both white. The central figure is identical to the outer figures but is half black.
3	**B**	The larger shapes on the left are both hexagons. They also have the arrow pointing to the bottom-left corner, having started at a corner on the top right. The smaller shape in each case is a quadrilateral (four-sided shape).
4	**E**	Each shape has a smaller reflection of itself in the top of it; it also has a black quadrilateral in the base.
5	**D**	The two images on the left are made of symmetrical three-line shapes containing a pair of identical small black shapes and an arrow pointing directly out of the main shape.
6	**A**	The large circle has four shapes on it. Going clockwise, these are circle, square, triangle and arrow, with the arrow being the only one that is on top of the big circle.
7	**C**	The images contain three parts. The first is replicated in the centre, with exactly the same orientation. The middle shape has one more side than the outer shape. A has three identical shapes, while E has a central shape with a different orientation, so it has to be C.
8	**B**	The outer shapes contain black shapes with a total of eight sides, while containing one other white shape.
9	**C**	Two lines meet at a point. The point has a black shape which points outwards (away from the line). The other ends of the line both have white shapes and point outwards (away from the line).
10	**A**	There are two shapes placed one inside the other. These shapes are repeated inside and are smaller (in this case, oval, square, oval, square). One of the shapes is shaded in black.
11	**E**	The line shape in the centre is the same each time, so therefore we can discount A. The black circle is always on a side of the line on its own, therefore we can discount B and D. The other side of the line always contains one or more white shapes, so we can discount C. So the answer must be E.
12	**D**	The shapes are symmetrical through the vertical axis.

Codes (pages 24–25)

1	**A**	The common letter is R and both of these boxes have a thick arrow. So therefore we can assume R = thick arrow and S = thin arrow. The shape at the bottom always stays the same, so we can ignore that. The top letter must relate to the shape under the arrow. A = circle, B = pentagon, C = diamond. So therefore the answer must be CR: diamond + thick arrow.
2	**D**	The common letter is K and both of these boxes have a circle inside the shape. So we can assume K = circle inside the shape, L = circle outside the shape. The top letters must relate to the shape that is in the box. G = hexagon, H = octagon, I = triangle. So the answer is GL: G = hexagon and L = circle outside the shape.
3	**B**	There are several common letters in this question: X, N and O. Look at the bottom first as N and O are both repeated here. The N boxes both have the arrow at the top and the O has them at the bottom. So N = top and O = bottom. Then go back to X at the top. There are two other differences: the direction or the pattern. There does not seem to be any correlation between the pattern and the letter, so you can ignore that. The letter must be which direction the single arrow is pointing. X = pointing up, Y = pointing down, Z = pointing left. Therefore, the answer must be YN: Y = pointing down, N = at the top of the box.
4	**E**	There are two Cs in the top box; these boxes do not have a square in the centre so C = no square, A = white square, B = black square. There are two Es at the bottom and these squares share the inner line dotted pattern. Therefore, E = dotted line, D = solid line, F = dashed line. The answer is BF: B = black square, F = dashed line.
5	**C**	The common letter at the top is P; both of these shapes have two horizontal lines to the right of the vertical line. Therefore, the top row gives you the number of lines to the right P = 2 lines, Q = 3 lines, R = 0 lines. The bottom row gives you the number of horizontal lines to the left of the vertical line. S = 3 lines, T = 1 line, U = 2 line. Therefore, the answer is PT: P = 2 lines on the right, T = 1 line on the left.
6	**A**	The common letter at the top is F. Both of these shapes have the second shape filled black. Therefore, the top row relates to the shading. F = middle shape, G = outside shape, H = inside shape. The bottom letter tells you the number of sides the outer shape has (and the inner shapes reduce by one side each time). We know K must be 6 sides for the outer shape as both shapes have that in common. So J = 5 sides and L = 7 sides. Therefore, the answer is GJ: G = outside shape filled, J = outside shape has 5 sides.

7	**C**	The most obvious difference is the shading, so you can start by looking to see which letter the top and the bottom share, which is F. So F = one black and one white and then G = both white. So now you can look at the other letters. The first two share the letter A; both of the first shapes are 6 sides. So A = first shape is 6 sides and B = first shape has 5 sides. Now look at the middle row and what is left, nothing has told us about the second shape yet. All the letters are different and one of those shapes is repeated in the question, so it relates to the shape of the second shape. C= octagon, D = parallelogram, E = triangle. So the answer is BDG: B = first shape has 5 sides, D = second shape is a parallelogram, G = both white.
8	**E**	The most obvious difference is the outside shape: the first and third are both rectangles with rounded corners and the middle is an oval. The top and bottom share letter T so the middle letter must tell us the outside shape. T = rounded rectangle, U = oval. The next shared letter is W for the first and second shape. The only similarity is that they both have one arrow. So W = one arrow, X = two arrows. The number of black circles vary each time, so this must be what the first letter tells us: N = two, O = none, P = one. Therefore, the answer is PUW: P = one black circle, U = oval outer shape, W = one arrow.
9	**C**	The first letter represents the type of shape. We need M, as ours has right-angled corners throughout. The second letter tells us the shading – we want Q, for black. Being all different, the last letters must tell which way round the shape is, so we need S to be the same as the second shape. The answer is MQS.
10	**A**	Look at the shading. The first and last options share black and share the letter D; therefore, the first letter must be the shading. D = black, E = dotted, F = stripes. In the second row, all the letters are different, and every one is a different shape. Therefore, that relates to the shape. J = circle, K = hexagon, L = diamond, M = triangle. The last letter must tell us how much of the shape is shaded. X is 3/4 shaded, Y is 1/2 shaded, Z is 1/3 shaded. Therefore, the answer is FKY: F = stripes, K = hexagon, Y = 1/2 shaded.
11	**D**	The first letter tells us how many waves there are. A = two, B = three, C = four. The second letter relates to the triangle and its shading. N = black triangle, O = white triangle, P = no triangle. The third letter relates to the circle. R = black circle, S = no circle, T = white circle. The answer is BOT: B = 3 waves, O = white triangle, T = white circle.

Odd One Out (pages 28–29)

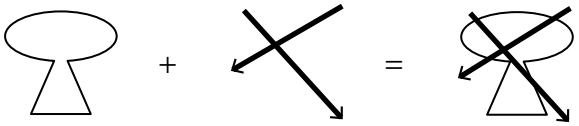
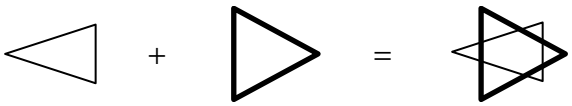
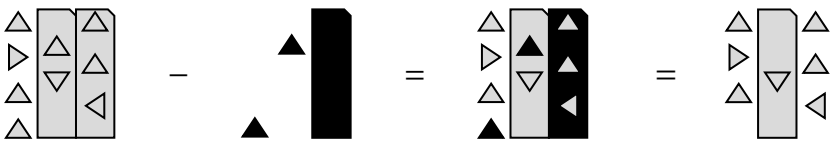
1	**D**	The other four have got two sections shaded that are adjacent (next to each other). The type of shading is unimportant for this question.
2	**D**	The two lines inside the shape create a triangle in all the shapes except D. All the shapes except D use one side of the shape as the bottom of the triangle. D uses two sides at the bottom, making it a quadrilateral.
3	**C**	The outside shape is the same each time but rotated. All the shapes have small black circles randomly placed. The only difference is that the arrows in the shapes all point clockwise except C, which is pointing anticlockwise so is the odd one out.
4	**C**	This question has lots of distractors which we can eliminate. The white circles at the top vary between one and two - but there is not one that is different. The arrow shading and the rectangle also vary, but do not make one stand out as different. Then we need to look at the shapes as a whole and we can see that in C the position of the rectangle in relation to the arrow is different from the others; therefore, it is the odd one out.
5	**A**	All the shapes are made of two parts which are the same. However, B, C, D and E are all reflections of the first shape while A is a rotation (not a reflection).
6	**D**	There are various differences between the shapes such as the dashed lines; however, this does not identify one as the odd one out, so we can ignore it. The shape and the cross rotate each time, but it's D where the cross aligns to the shape's corners, rather than its sides which makes it different.
7	**A**	Every main shape is five-sided; all but A have a circle touching it and two circles that are unfilled and overlapping it.
8	**B**	Every one of the pairs of shapes contains two parts that fit together exactly, making a single shape. However, there is no way of fitting the pieces in B together properly.
9	**E**	The arrowhead in E has got a triangle at the tip, instead of a pentagon.
10	**B**	The other four are rotations of the same complete shape.
11	**B**	The black circles for A, C, D and E are diagonally two spaces apart. The black circles in B are not diagonally two spaces apart.
12	**C**	The top and bottom of each shape share the same shading. The left and right section of each shape share the same shading. However, in C the top and bottom shading are opposite.

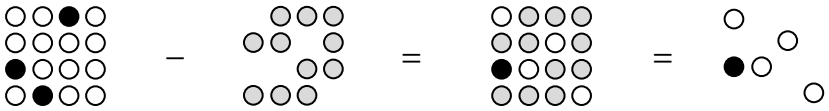
Matrices (pages 32–33)

1	**B**	All shapes stay in the same position. The top right shape gets smaller and rotates 90 degrees. The middle shape gets bigger and takes on the shading of the bottom shape. The bottom shape stays the same sizes and takes on the shading of the middle shape.
2	**B**	The small shape stays in the same place, but the other shapes rotate 90° clockwise.
3	**A**	In the top row, the square in the centre does not change. The shape inside the square moves to the top-right corner. The shape in the bottom-left corner moves to the middle of the square. The shading of the shapes does not change, so in the bottom row it can't be D or E. The middle shape stays the same way up, so it can't be C. In B, the hexagon goes to the bottom-left corner instead of top right, so the answer is A.

4	**C**	The line on the right turns 90 degrees anticlockwise. The arrow on the left crosses it at 45 degrees near the white shape at the end. The middle line remains vertical and crosses the horizontal line near the end. There are no changes to the lines so it can't be A or E. B and D don't have the thick line with white shape horizontal. So the answer is C.
5	**D**	The rows are shaded alternately white, black, white, so the missing shape must be white. Shapes in the first column are all positioned top left and shapes in the third column are all positioned bottom right. The first two cells in the middle column are in the centre so we're looking for a shape in the centre. Next, look at the shapes: there is a pentagon, circle with a quarter missing and a rounded shape in each row and column. There is no circle shape in the bottom row. Therefore, we're looking for a white circle shape positioned in the centre of the cell, which is D.
6	**E**	The two outside shapes show where non-shaded parts go. So we are looking for a shape which has no shading in a top triangle and a right-hand triangle, which is option E.
7	**A**	Each column and row has one shape with a diagonal line pattern, one shape with a checked pattern and one with dotted horizontal lines. The missing square needs to be a diagonal pattern. The first column is squares, the second column is circles and the third is triangles. Therefore, we are looking for a triangle. So the answer is A: a triangle with diagonal pattern.
8	**D**	All of the arrows from the corners point into the centre of the square; therefore, we want an arrow pointing to the bottom right of the square, this eliminates A and C. There are three different styles of rectangular shapes, each row and column contain one of each. The missing cell needs to contain a landscape rectangle with solid outer border and dashed central shape. This means the answer must be D.

Merge Shapes (pages 36–37**)**

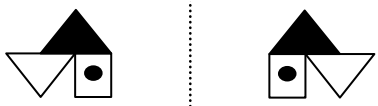
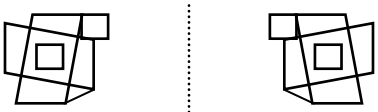
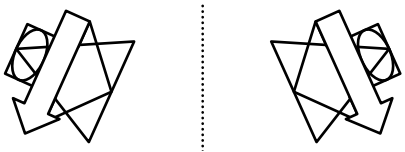
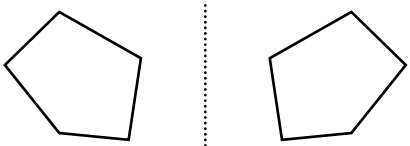
1	**B**	
2	**A**	
3	**C**	
4	**E**	
5	**D**	
6	**D**	
7	**B**	
8	**B**	The answer diagram uses a grey fill for the starting image and a black fill for what was subtracted. 
9	**C**	The answer diagram uses a grey fill for the starting image and a black fill for what was subtracted. 

10	**A**	The answer diagram uses black and white fill for the starting image and grey fill for what was subtracted. 

Cubes (pages 40–41)

1	**B**	Use the 'M' shape to guide you. It is next to the thin white rectangle and the thick black line is vertical when under it, so B will work perfectly.
2	**D**	The face at the top of the column of four in the net will appear on the face adjacent to the bottom box of the column of four, and the top shape will stay the same way up. This means the triangle will point upwards towards the arrow in D, as per the given cube. The vertical line will follow the direction of the arrow, also as per the test shape. The triangle also points the correct direction to the arrow in C but because the triangle, arrow and rectangle are in a straight line, it can be discounted as the rectangle will be opposite the triangle, not next to it.
3	**A**	If you spin the net A round 180°, you will see much more easily how it works. The diamond 'points' towards the longer side of the rectangle and both shapes link with the side containing the circle.
4	**E**	A cannot be right as the 'corner piece' and circle are on opposite faces as they are two places apart. If you turn E 90° clockwise, it may be easier to see that the 'corner piece' shape sits in the right place under the circle, while the cross completes the picture perfectly.
5	**B**	If the net were to move 90° anticlockwise, you would see that the stripes align with the pale grey square as in B, while the dark face would also drop down to make the trio of faces that we see. Note that C has a stripe that doesn't appear on the original, so has to be wrong. D has two faces that are two places apart on the net, so again – it wouldn't be possible to make this.
6	**C**	Be careful here – the bottom left and top centre squares on the net are effectively the same. E can be ruled out for having two faces next to each other that are two places apart on the net (black and arrow).
7	**C**	Even accounting for the slanting of a 3D version, A has a face that doesn't exist as a square on the net. The base of the white triangle abuts the face with a black square (as in C).
8	**A**	You can rule out B and C as they have elements two spaces apart on the net, which will never touch. E has an element which is not on the net. Although it's very hard to picture the answer, you should be able to work out the arrow points to the hexagon, not the triangle (as in D), so it must be A.

Reflections (pages 44–45)

1	**E**	
2	**A**	
3	**C**	
4	**A**	
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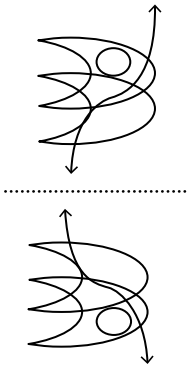
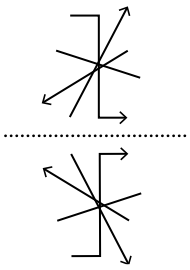
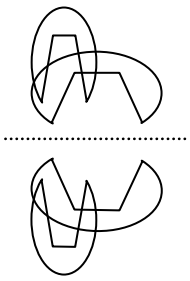
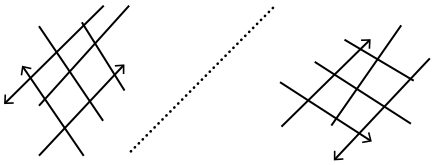
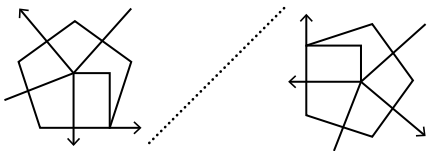
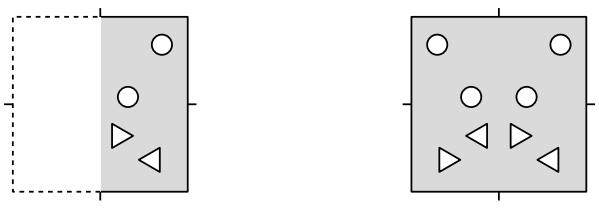
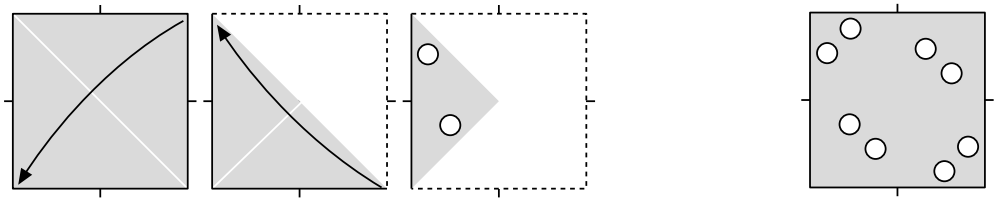
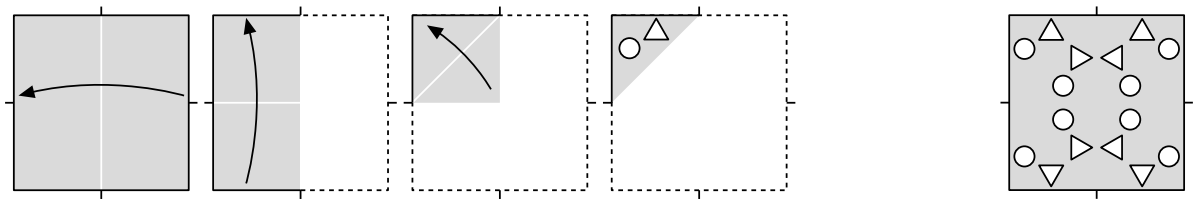
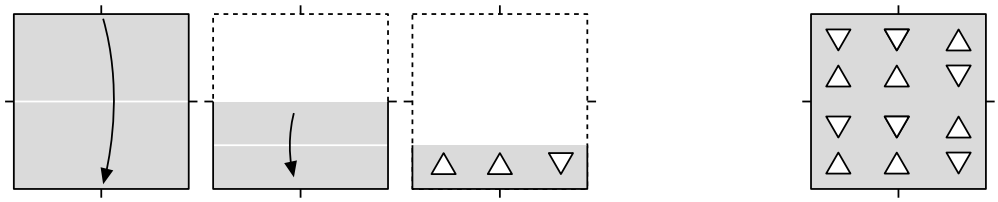
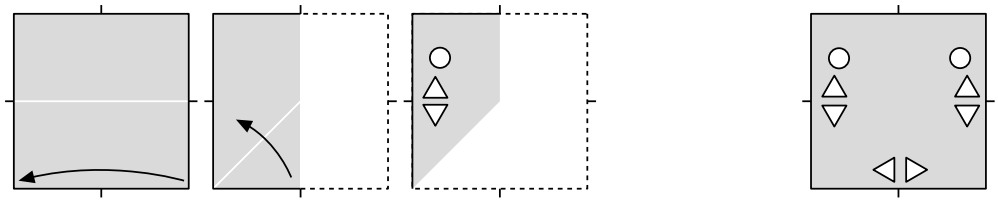
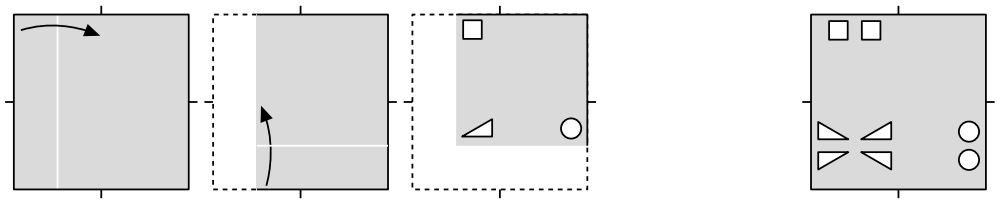
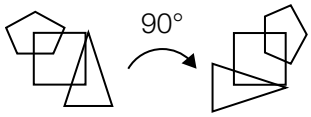
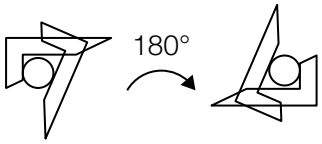
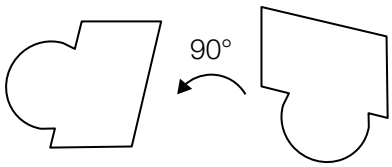
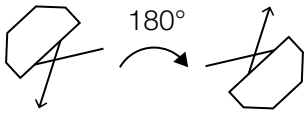
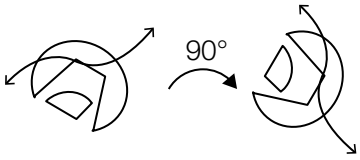
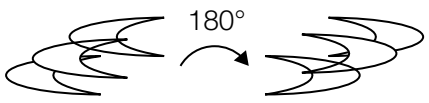
6	E	
7	D	
8	D	
9	E	
10	B	

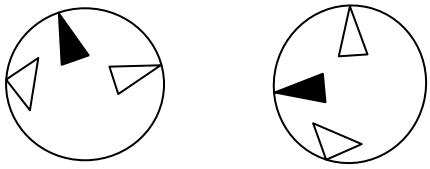
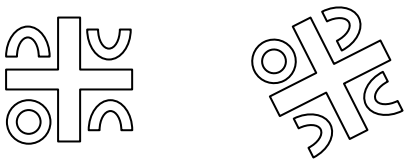
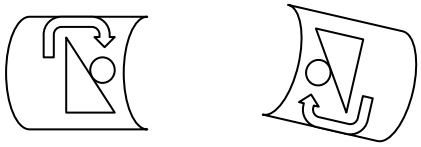
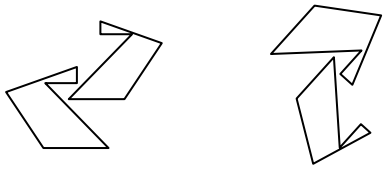
Fold and Punch (pages 48–49)

1	A	
2	D	

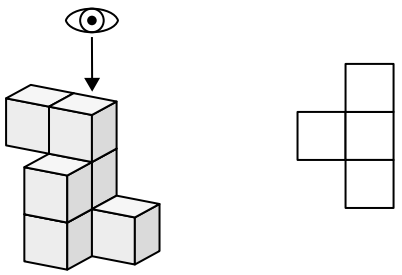
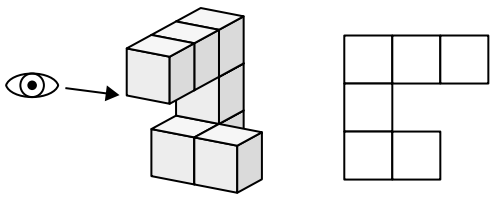
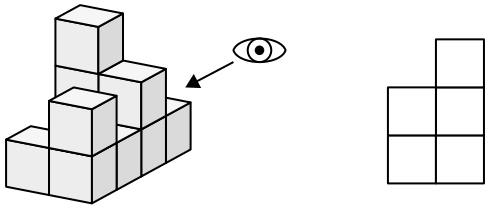
3	E	
4	A	
5	E	
6	E	

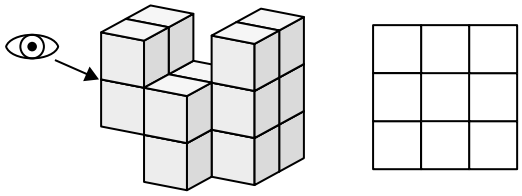
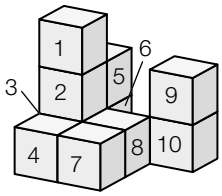
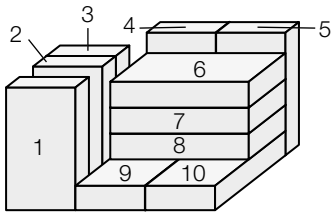
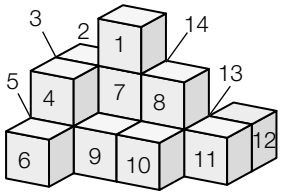
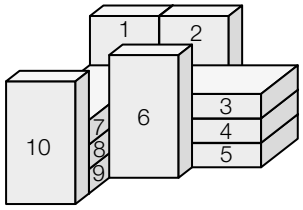
Rotations (pages 52–53)

1	C	
2	A	
3	E	
4	B	
5	C	
6	D	

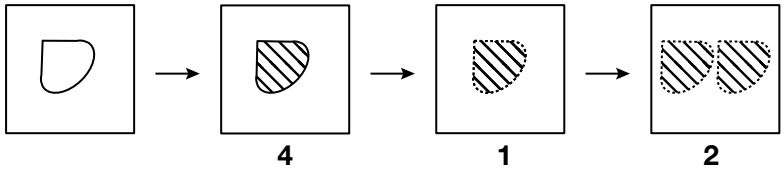
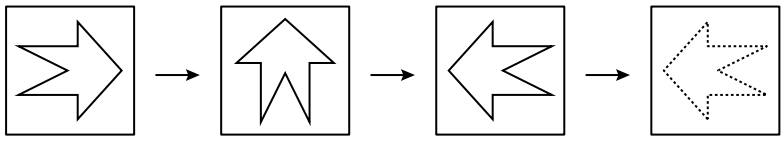
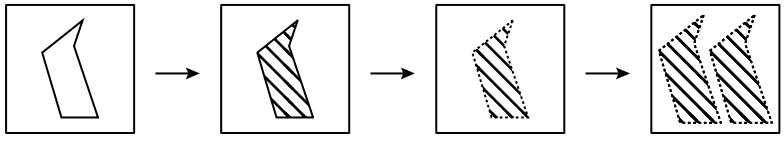
7	A	
8	D	
9	C	
10	E	
11	A	
12	B	

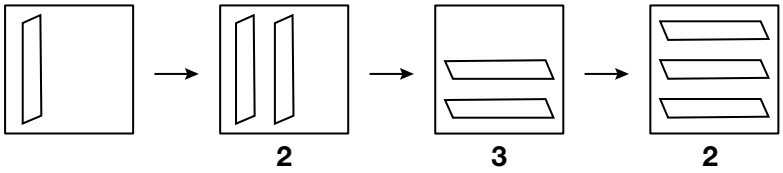
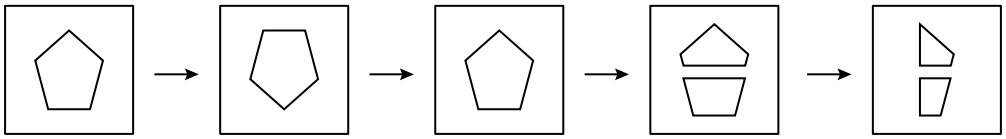
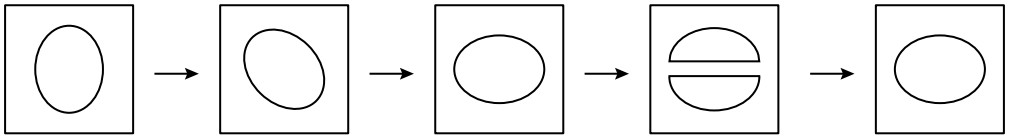
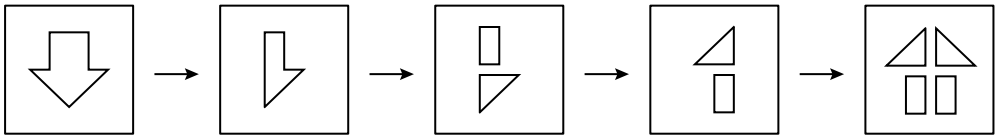
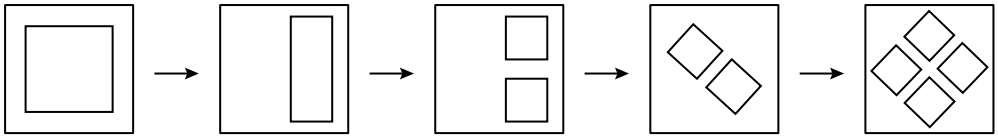
3D Shapes (pages 56–57)

1	D	
2	A	
3	E	

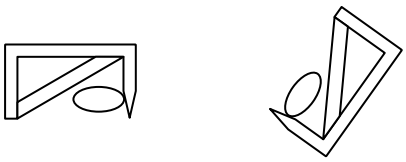
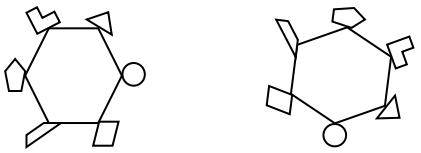
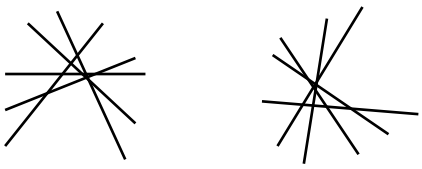
4	E	
5	C	
6	B	
7	E	
8	D	

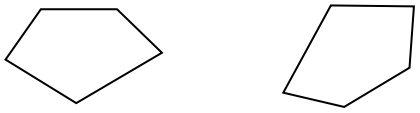
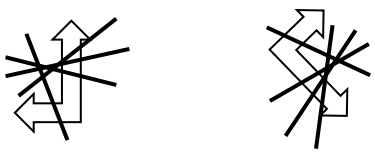
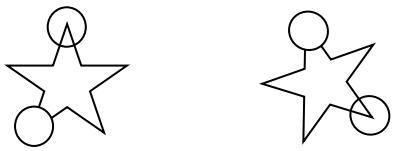
Action Sequences (pages 60–61)

1	B	 4 1 2
2	A	 3 3 1
3	E	 4 1 2

4	E	 2 3 2
5	D	 3 3 1 4
6	B	 2 2 1 1
7	D	 4 1 3 4
8	E	 4 1 2 4

Practice Test Paper (pages 63–68)

1	D	
2	B	
3	E	
4	E	
5	A	

6	A	
7	C	
8	E	
9	D	
10	B	
11	B	
12	A	
13	D	
14	B	
15	C	
16	E	
17	D	
18	A	The main shape reflects in the vertical axis, becomes narrower and doubles up. The smaller shape goes to the outside of the main shape and stretches vertically.
19	D	The second shape is identical to the first shape when rotated 180°.
20	C	Put together the three shapes on the left and you make a triangle, so do the same with the parts on the second analogy and you make a rectangle. A smaller rectangle appears above the shape and takes the shading of the original shape.

21	**E**	The shape on the bottom disappears. The shape in the middle loses its line and goes to the top. The two small shapes at the top show the shape of the new bottom shape – the top half of this being shaded like the right-hand original one; the bottom half being shaded like the left-hand one.
22	**C**	The double-headed arrow and line that crosses it stay as they are but all the shapes move around the grid one space clockwise.
23	**D**	The inner shape becomes the outer shape. The second-largest shape becomes small and doubles up into the top left and bottom right corners. The outer shape appears in the centre of the new shape.
24	**B**	The shaded shape drops to the bottom, with two of the circles in, but each is the inverse colour (black/white). The bottom shape goes up and turns 90° clockwise.
25	**C**	Rotate the lower shape 90° anticlockwise and slot it into the upper shape to make the composite shape.
26	**B**	The top shape is turned upside-down and placed on top of the bottom shape, which itself is turned 90° anticlockwise.
27	**E**	The inner shape moves to the top, behind everything else. The two larger shapes rotate 90° clockwise. The largest drops to the bottom, while the medium-sized one is slightly above it and behind it.
28	**D**	The whole shape rotates 90° anticlockwise. The arrow line becomes dashed, while a small triangle appears in the section without anything in it. Note that the pentagon in option C is rotated incorrectly.
29	**D**	The outer shape becomes the inner shape, taking on the shading of the original inner shape. The original inner shape becomes the new outer shape. The lines that make the new outer shape are the ones that were in the original shape and at the same angle.
30	**A**	The whole shape is rotated 180°. The original two elements of the large shape are combined, while the shading is combined as well, forming a fine-lined version of the two originals.
31	**D**	The top shape reflects vertically. The line types of the two shapes switch. The circle goes into the smaller shape.
32	**B**	The whole shape rotates 135° anticlockwise. The shape that was at the back comes to the front, whereas the shape that was at the front goes to the back.
33	**C**	A new main shape is created; it has the number of sides of the zigzag and the shading of the right-hand shape. The right-hand shape disappears. The left-hand shape stays but is bigger.
34	**B**	The overall shape stays the same, but the shadings move. The top and bottom shadings swap, while the right-hand shading becomes the same as the left-hand shading. The centre shape stays exactly the same.