

Extended answers

Similarities p.5

Ex	D	D is most like the original shapes as it is a triangle with a horizontal base line.
1	C	The correct answer must have no overlaps that can be 'seen through'.
2	C	The correct answer must have a white circle on the middle section of the arrow covering the line on which it lies.
3	F	The correct answer needs two lines ending in dots and a single-headed arrow, all of which cross at the same point.
4	B	The correct answer needs a pair of mirror image shapes, the top one of which is shaded.
5	B	Each of the example shapes contains three of the same shape, one shaded, two unshaded.
6	E	Each of the examples is a pentagon containing a shaded quadrilateral.
7	A	In the examples, the shapes in opposite corners are the same but rotated through 45° .
8	F	F is the only cube or cuboid.
9	E	The first example has two circles, a quadrilateral and a triangle. The second example has two quadrilaterals, a triangle and a circle. The correct answer contains two triangles, a quadrilateral and a circle.
10	E	E is the only option which has the four correct elements: an arrow with a large head, one with an open head and one with a smaller filled head. There is a smaller, double-headed arrow across one of the others.
11	E	The correct answer needs four lines of which two are parallel, both are crossed by a third line and one is crossed by a shorter line.
12	C	C is the only quadrilateral.
13	E	E is the only cube or cuboid.
14	A	A is the only option with dots at each end of one of the long sides of the isosceles triangle.
15	E	A shaded, smaller version of the same shape is needed. E is the only option where the diagonal lines run top-left to bottom-right.
16	D	All of the other options are reflections of the original images, some of which are also rotated.

Differences p.10

Ex	B	All of the other answer options have a smaller, dotted version of the larger shape; the odd one out has two shapes both with solid lines.
1	C	All of the other images are rotations of the same basic triangle; C is a reflection of that shape. The dotted sides are not significant here because F also has them.
2	F	The single-headed arrow points out of the shaded shape.
3	D	The arrow head points downwards in D but upwards in all of the other options.
4	F	In all of the other shapes there is one more black dot than there are white dots.
5	C	In option C, both shapes have the same number of sides.
6	A	All of the other shapes have a line of symmetry from top to bottom.
7	F	There is no dot where the lines cross.
8	E	All of the other options have one more side on the outside shape than the inside shape.
9	F	All of the other images are rotations of the same irregular pentagon; F is a reflection of that shape.

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10	E	It is the only shape with seven sides.
11	F	The black triangle is partly hidden behind the square.
12	A	All of the other images are rotations of the same shape; A is a reflection of that shape.
13	B	All of the other options have a shape and one less dot inside than sides on the shape.
14	D	J is the only letter with no line of symmetry.
15	C	The outside unshaded layer is missing.
16	C	The other options all have one point of the star in the angle; in C the points of the star touch the sides.

Analogies p.13

Ex	A	The oval has been rotated through 90° so the shape will have a rectangle with its longest sides vertical. The central dot remains in the centre so the answer cannot be C.
1	C	The arrow needs to have rotated through 90° ; the triangle becomes shaded and rotates through 180° .
2	D	The dots are now arranged on the midpoint of each side and inside the triangle.
3	A	The inside shape becomes the largest and the others maintain their order but reduce in size. There is no rotation. So the answer must have a large oval (in the same orientation as the original), a hexagon in the middle and a small square.
4	F	The star must be rotated 180° ; it gains a dotted outline and diagonal shading (bottom-left to top-right).
5	D	The original shape is made smaller (ruling out A), inverted (ruling out C and F), the shading rotates through 90° (ruling out B and E) and a new white version in the original orientation overlaps it (further ruling out E and F).
6	E	The rectangle rotates through 90° , the pentagons will become shaded quadrilaterals.
7	D	The four outlying triangles are inverted, the central one remains in the same orientation. Top-left and bottom-right triangles gain shading.
8	B	The top two shapes are inverted and become slightly larger; this rules out A, C and E. The bottom shape is not rotated (so it cannot be option F) and it becomes smaller ruling out D.
9	C	The original shape is rotated through 180° and reduced in size.
10	D	The shape is rotated 180° and gains a dotted line inside its perimeter.
11	E	Of the four corner images in the original, top-left and bottom-right remain the same. Top-right and bottom-left swap positions.
12	F	The largest of the shapes becomes the smallest. The correct answer needs the cross shape in the centre with the double circle around it and the larger shape must be an oval.
13	C	This is a straight reflection – imagine a mirror line running down between the words ‘is’ and ‘to’.
14	A	In the original, the shaded triangle flips down into the hexagon; the shading swaps between the two shapes. The correct answer must have a small unshaded wedge shape touching the circumference, pointing upwards and within a shaded circle.
15	B	In each row of the original shape the shaded square is moved one space to the right.
16	B	The square must become two squares set diagonally with the black one above and to the right.

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Sequences p.18

Ex	E	The 'pencil' rotates through 180° each time.
1	C	The correct answer must be a shaded circle containing one square.
2	C	The correct answer needs a black dotted triangle, pointing downwards and positioned in the top-left of the space.
3	E	The shape rotates 45° clockwise each time; the shading moves between shapes and switches between straight and diagonal. The correct answer needs the small circle bottom-left in the arrangement (option B or E). It needs a white large oval, striped middle oval and grey circle so it must be E.
4	D	The three hexagons rotate clockwise into the next position at each step. The correct answer needs a grey hexagon on top, white to the right and dotted to the left.
5	B	The sequence is an increasing number of loops in the line. The correct shape needs three loops so it must be B.
6	C	The lines alternate between horizontal and vertical and increase by one each time. The correct shape needs five lines aligned vertically so the answer is C.
7	A	The arrow rotates 45° each time so it needs to point to the right. The star and large arrow switch left and right so the correct answer will have star top-right and arrow on the left. The short arrow moves down each time so needs to be just above the bottom position and also pointing downwards.
8	F	The shape comprises five lines and the black shading switches between the centre and the first ring around that centre shape. The correct answer must be F.
9	A	The lines alternate between six and five so the correct answer needs six. In addition, the shape alternates between five and four sided and the pattern between dots and lines. This correct answer needs six lines and a dotted pentagon.
10	D	The number of bends in the line increases each time so the correct answer needs six bends and no loops.
11	D	The cross within the square alternates between touching at the sides and corners. The correct answer needs the cross to touch at the sides, ruling out A and E. The dots increase in number each time and alternate between white and black; the correct answer will need four white dots. It must be D.
12	C	There are six dots in every shape. White dots increase and black dots decrease in number each time. The correct answer needs five white and one black dot.
13	B	The rectangle reduces in size through three sizes; the missing shape needs to be largest size. The stripes switch between vertical and horizontal so the missing shape needs horizontal. B is the correct answer.
14	D	The rectangle–arrow shape rotates through 45° clockwise each time so the arrow will point downwards in the correct answer. The shading pattern alternates so white with black dots will be correct. The cross in the small circle also alternates between + and x in relation to the arrow head so the correct answer needs + orientation. This leads to option D.
15	B	There are six squares in every image in the sequence. White dots increase and black dots decrease in number each time. The correct answer needs four white and two black dots.
16	A	The number of loops in the line is increasing each time so the correct answer will have three loops. Also, the shape is open-ended, not close. Only option A has three loops and open ends.

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Grids p.23

Ex	B	The missing grid square needs a crescent shape that will match by touching the others above and to the left of it. This must be B.
1	C	The shapes in the top and bottom rows remain the same size and orientation but switch between white and black. So the correct answer needs a white circle, black triangle and black star, all arranged in the same way as the top row of the grid. Option C is correct.
2	C	The shape in the second column of the grid contains a mirror image of that in the first column. Only option C offers this.
3	E	The arrows in opposite corners are rotated through 180° and the direction of shading rotated through 90° . The correct answer needs a horizontal arrow pointing to the left with diagonal shading top-left to bottom-right. That is option E.
4	A	The pairs of arrows switch between above and below the ovals; the missing section of the grid needs arrows above. The shading of the ovals switches between the central oval and the outer loop. The correct answer needs shading in the central oval.
5	F	Within the grid, every element needs to be in each position once. For example, the crescent is shown in the bottom-right, bottom-left and top-right positions so it must be top-left in the correct answer. The triangle is shown top-right, bottom-right and top-left so it needs to be in the bottom-left position. The only possible answer is F.
6	B	In the top row of the grid, the circles are combined, shading rotated through 90° and the arrow is in front of them. The correct answer needs triangles with dotted black shading on the outside and vertical stripes. The curved line will be in front of them in its original position. This leads to option B.
7	B	The second column of the grid contains a mirror image of the first column but with the star shaded. The star and dot at the end of the line are incorrect in A, C, D, E and F. D is also rotated. This means option B is correct.
8	C	The second row of the grid appears identical to the top but with one extra arrow crossing at the central point. Only option C offers this combination.
9	F	This grid can be viewed as a simple flower; the correct missing section needs the petal shape to be positioned between the top-left and centre of the grid square – option F.
10	B	Each row contains one of each of the three shapes; the missing shape must be a crescent. Each shape appears once in the grid as a small, medium and large version. The two crescents already in the grid are large and medium so the correct option will be a small version. This leaves only B.
11	D	In each row of the grid, the sum of the dots in the first and second column gives the number of dots in the third space: $2 + 3 = 5$; $3 + 1 = 4$. The missing grid piece needs $2 + 1 = 3$ dots so the answer is D.
12	A	Across each row of the grid, the shapes remain the same but rotate a quarter turn clockwise each time. The missing grid section needs a black dot to the bottom-left of the arrow which means answer A.
13	E	With the exception of the central image, the grid has symmetry both left–right and up–down. The missing shape must be a straight arrow pointing horizontally to the left.
14	D	Each row contains a square with light grey, dashed and chequered pattern. The missing grid square needs a grey shaded square, so option A and B can be ruled out. Each row contains a shape in three different sizes: small, medium and large. The missing grid square needs a medium-sized rhombus so E is ruled out. Each row contains a dotted, striped and black version of the shape – the missing grid square needs dots. D is the correct answer.
15	A	This can be viewed as the central image in each row is a combination of the shapes to its left and right. The correct answer will therefore have the quadrilateral shapes with grey shading in the middle section. Option F has the correct pattern but is wrongly rotated so the answer is A.

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Rotations p.29

Ex	C	Options B and D can be ruled out because the dot is in the wrong position within the arrow. The original arrow points clockwise; only option C does this, the others all point anticlockwise.
1	D	The white oval is in the end of the longer direction of the cross; the black oval is at the opposite end but not at the extreme. The only possible option is D.
2	A	A is the only rotation; the others are all reflections of the original image.
3	D	The others are all reflections of the original image; D is the only rotation.
4	C	C is the only rotation; the others are all reflections of the original image.
5	B	The others are all reflections of the original image; B is the only rotation.
6	C	C is the only rotation; the others are all reflections of the original image.
7	F	The arrows in this image all point clockwise; only option F does this, the others all point anticlockwise.
8	B	The key to this is that the 'bar' to which the arrows are attached extends longer at one end than the other. If the smaller part is at the top and the top arrow points right, the only possible option is B.
9	E	E is the only rotation; the others are all reflections of the original image.
10	E	The others are all reflections of the original image; E is the only rotation.
11	F	When the correct image is rotated, the cloud should be above the tree on the right.
12	E	Look at the arrangement of the door here – its window and handle are the key to finding the rotation.
13	B	In the correctly rotated shape, the black jigsaw piece will be in the top right with the white piece below it.
14	D	Look out for specific features in the original to help rule out answer options. All of the options could rotate so that the shaded irregular pentagon would lie in the top-right corner. Looking next at the loops, E and F have too many loops; the line almost touches the acute angle of the pentagon which rules out A, B and C. The correct answer must be D.
15	D	Look at the loops in the original to help rule out answer options. A and E have too few loops, F has too many. The loops in C are all of a similar size, unlike the original. Looking at B and D, B is a mirror image so the correct answer must be D.
16	E	Below the original image, it is clear that A is a direct reflection. Looking along the answer options, B, C, and D are rotations of A and F is identical to A. The correct option is E.

Reflections p.34

Ex	D	The arrow must point to the left ruling out A, C and E. The diagonal pattern must be in the opposite direction to the original so the correct is option D.
1	F	The reflection must point anticlockwise; only option F does this.
2	E	Look out for specific features in the original to help rule out answer options. The small loop at the bottom rules out A and B and the loop in D is too big. C is a duplicate of the original and the proportions of F are wrong so the answer must be E.
3	C	The top element of the reflection must be a grey rectangle which overlaps the top of the vertical bar so A, B and E can be ruled out. The dashed rectangle overlaps the bar but is mostly to the left on the original – it must be mostly to the right in the reflection ruling out D; it is near the top of the bar so F is wrong. This leaves C.

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4	D	This shape can be viewed rather like a '3' and its reflection will look something like an 'E'. It sticks out more at the top than the bottom. These factors rule out A, C, E and F. B and D both have the correct reflected outline so next consider the pattern. The diagonal pattern is the same direction as the original in B so the answer is D.
5	E	C is identical to the original so it can be ruled out. B has an extra triangular point at the base. The main upright element of the shape is too thin in F. The middle triangle is wrong in A. The bottom triangle comes down almost to the base of the main shape which excludes D. The only remaining option is C.
6	C	A and B only have one star and F has two white stars so they can be ruled out straight away. In the reflection, the diagonal pattern will be in the opposite direction to the original which rules out D and E. C is now the only possible option.
7	D	Look out for specific features in the original to help rule out answer options. The loop at the bottom is almost diamond shaped which rules out options A, B, C and E. Answer D is correct because the loop in F has a sharp corner.
8	B	In the reflected image, the top arrow will point left and the bottom arrow point right. This rules out D and E. The flag must wave in the opposite direction so A and C cannot be correct. The arrows must be on the left of the new image and the flag on the right; this leaves B as the correct answer because in F, even though each element is correctly reflected, they are in the same positions as the original.
9	F	One way to solve this is to count down the triangular points: from the top they are long, short, long, short, downwards. Using this on the answer options excludes A and C. The bottom two points point downwards on options B, D and E so the correct answer is F.
10	C	B cannot be a reflection as it is a closed loop; F could not be possible unless we were looking for a rotation; E does not have the turn back at the bottom. Counting the bends in the line excludes A – there are too few. This leaves C and D and closer inspection shows D is not the correct reflection.
11	F	The reflection of this image will have the 'stem' leaning to the right, the larger part of the arrow head on the left and the more acute-angled part of the head on the right. The proportions are clearly wrong in A, B and D; the 'stem' is too thick and too upright in C and the acute-angled part comes up too high in E.
12	A	The correct reflection will have a shaded circle to the top-right at the end of the top line. Options B and E can therefore be ruled out. The smaller, dotted square must lie at the end of the bottom line to its left in the reflection; that now rules out F. Consider the diagonal pattern in the middle square: it must run in the opposite direction to the original so C and D are also ruled out. This leaves A.
13	B	Look out for specific features in the original to help rule out answer options. The small loop at the top rules out A (two loops) as well as C, D and E in which the loop is too big. At first glance, the bottom section of F could be a reflection but the top section is wrong so the answer must be B.
14	E	The elements of the correct reflection are: opposite diagonal pattern and right angle in the bottom-right corner. Options A and B are the same as the original, D and F are ruled because of their pattern. C has the same diagonal as the original so the correct answer must be E.
15	C	In the correct reflection, the white circle will be in the top right corner and the shaded circle will be at the end of the bottom line. Only option C has these two elements correct.
16	F	This could be viewed as two irregular arrows pointing to the top-right of the space. The reflection must point top-left so A is ruled out. From the top down, the uppermost arrowhead is clearly the wrong shape in B, C and E. Comparing D and F, thick rectangle is too thin in D and more horizontal than the original so the correct answer is F.

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3D and Spatial Reasoning p.39

Ex	C	A has a face that does not appear on the cube net; in B, the cross and small square positioned like this should have the star on the top; D has two faces adjacent which are opposite in the net; in E, with the star and square outline like this, the cross should be on the side face; F has its front and side faces swapped.
1	B	A has its front and top faces swapped; C has an incorrect front face; D has two faces adjacent which are opposite in the net; E has a face that does not appear on the net; F has its front and side faces swapped.
2	E	A has two faces adjacent which are opposite in the net; B has a face that does not appear on the net; in C, the arrow could not point to the square/cross pattern; D has a face that does not appear on the net; if the star and square/cross were arranged like this, the front face would be the arrow.
3	B	In option A, if the 'T' is on the top face, the equilateral triangle should be the side face; in option C, with T on the side, the equilateral cannot be on the front face (it would be at the back); D has a face that does not appear on the net; E has two faces adjacent which are opposite in the net; F has an incorrect top face.
4	A	B has an incorrect side face; C has two faces adjacent which are opposite in the net; in D, with the cross on the side and black outline on the top, the front face would be grey; E has its front face rotated incorrectly; F is a rotation of D, also the hatched part of the top face would be adjacent to the black outline in the cube.
Ex	E	When a piece of paper is folded in half and holes punched in it, the hole will be mirrored in the other half of the paper when the paper is opened. Option E is the only option which mirrors these three holes.
5	A	Imagine the fold line as a mirror line – the correct image will have three holes along the top and left edges and one more hole on the right and bottom edges.
6	E	Viewing the fold line as a mirror line, the correct answer will have a reflection of the punched pattern. In B and D, the dots are at the opposite ends to the original; in A, the hearts are copied, not reflected; in C and F, the up–down pattern of the hearts is in the wrong order.
7	C	Firstly looking at the top-left arrow pointing up – this will translate into an arrow in the bottom-right pointing right. This rules out A and D. Next take the arrow 1/3 up the left side pointing left – this will become an arrow 1/3 along the bottom face and pointing downwards. Now B is ruled out. The arrow in the top-right pointing right will create an arrow near the top of the right side and pointing up; E is now ruled out. The middle of the three arrows near the fold line in F points in the wrong direction so the answer must be C.
8	E	First, imagine the paper being unfolded once into a triangle. The pattern would be two chevrons pointing down on the left face and two pointing right on the top face. In this case, this rules out all of the options except E. A further check is that the unfolded square will be a reflection along the diagonal fold line.
Ex	D	The back row has three cubes across, the middle row has two cubes and the front row has one cube. The only answer matching this is D.
9	C	The shape has three blocks coming forwards on the right side and four on the left. This reduces the correct choices to C and E. The single cube in the middle of the back row has no block in front of it so the answer is C.

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10	E	The main part of the block is two cubes across and three cubes forwards with two extra cubes, one on the front and one on the right. A, B, D and F do not provide this pattern. Looking at C and E, C has two blocks on the right so the answer must be E.
11	F	The top view of this shape will resemble a letter 'c'. The answer must be F, although B is the right shape but rotated.
12	D	The back row of this shape is one cube deep with two additional cubes coming forward on the left and only one additional on the right. A and E have too many cubes on the right; B and C have no cubes coming forward on the right. There is a gap in F which is not present in the original so the answer must be D.

Codes p.45

1	D	E describes the square balanced on its corner and F describes the square in the conventional orientation. In the bottom boxes, an arrow pointing upwards is G, downwards is H and to the left is J. Therefore the shape in the fourth box would be coded F and G.
2	E	In the top boxes, T relates to four dots and V relates to five dots. In the bottom boxes, white dots are coded as Y, black dots coded as X and a mixture coded as W. The missing code must be V and X.
3	D	P represents the line lying to the right of the triangle and Q codes for the line to the left. In the bottom boxes, L represents one dot inside and one dot outside the triangle, M is both dots inside and N is both dots outside. The missing code is therefore Q and L.
4	B	The first clear thing in common is that K codes for the line below the circle so L must code for a line above the circle. In the top boxes, F, G and H code for the different line styles of the circle and cross: dashed, dotted and solid. The missing code must be F and L.
5	C	P means the arrows point to the right and Q points to the left so the missing code will contain a P in the bottom box. That means that I, J and K code for one, two or three arrows. Therefore the missing code will be a different letter as there are four arrows. The missing code is L and P.
6	D	L codes for two of the same shape and M codes for different shapes. P codes for a white shape inside and Q for a black shape inside. The missing code is M and P.
7	D	L codes for a pentagon and M for a hexagon. P codes for a five-pointed star and O for a four-pointed star. The missing code is MO.
8	D	S codes for the trapezium with the longest side uppermost and T codes for the shortest side at the top. U codes for a black crescent and V for a white crescent. The missing code must be TV.
9	B	B codes for an odd number of dots and C for an even number of dots. The missing code contains 'C'. A codes for all white dots so the missing code contains 'D', a mixture of black and white.
10	F	L codes for two arrows and M codes for one arrow. The code will contain M. Where two lines cross the arrows, the code is O and if one line crosses the arrow, the code is N. The missing code is MN.
11	C	The five-pointed star in a circle corresponds to B so the code for a four-pointed star is A. The triangle with matching diagonal shading corresponds to E. The correct answer is AE.
12	F	P corresponds to an arrow pointing right so the missing code needs Q (arrow pointing left). Three lines crossing the arrow corresponds to R, four lines T and two lines code for S. The answer is QS.
13	A	D codes for an arrow pointing upwards so the missing code needs E. W codes for an unshaded dot, Y for a shaded dot so the missing code needs Y.

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14	A	B represents a four-pointed star and A is a five-pointed star. D means two dots, F is four dots and E is three dots. The missing code is BF.
15	E	M codes for triangles and L for squares. X is diagonal stripes, Y is black and Z is white. The missing code is MZ.
16	B	Three shapes are coded as D and four shapes as E. M codes for black shapes, N for white and P for striped. The code needed is DN.

Mixed Test 1 p.51

1	B	The outside shape has double the number of sides as the inside shape. Only the shapes in option B have this relationship.
2	C	The originals are made from three of the same shape; the small one is inside the large one and the middle sized one overlaps and obscures the large shape behind it. Only C has these features.
3	E	The number of points on the star is equal to the number of sides on the shape outside. Only E matches this.
4	F	The two arrows become black and are rotated through 90° . C, D and E can be ruled out because they have some white areas. A is a reflection and B is rotated through 45° so the answer must be F.
5	A	The three shapes retain their original shading and become nested inside each other in a regular pattern. The answer will have a small grey circle inside two white circles. The answer must be A because, although the shapes are correct in F, they are incorrectly positioned.
6	C	The original 'ice cream cone' shape becomes a round pattern of six of them overlapping at the smaller 'ice cream' end. The shapes overlap at the pointed 'cone' end ruling out A, C, D and F. To distinguish between B and E, look at the shape at the top and imagine a vertical line running through the middle of the pattern. In option E, that 'ice cream' is to the left so the answer must be B.
7	E	In each of the original images, there are four stars on the left and five on the right. From left to right, the number of shaded stars increases by one each time on the left and decreases by one each time on the right. The correct answer needs three shaded stars out of four on the left and two out of five on the right; only E matches that requirement.
8	A	The outer circle remains the same size but the inner circle gets larger with each step of the sequence. The diagonal pattern alternates between within or outside the smaller circle. The correct answer will need shading outside the central circle and that circle will need to be larger than the previous one. It cannot be B as the centre circle is shaded. The stripes are in the wrong direction in C and D. F is ruled out because the inner circle is too small and E has the wrong shading.
9	F	The diagonal dividing line in the square switches between corners. The heart moves around the corners of the square in a clockwise direction each time so the correct answer will have a heart in the bottom-left corner. These factors rule out options C and D. The shading switches between unshaded and diagonal stripes and the missing step in the sequence will have an unshaded heart; now E is excluded. The dividing line gets thicker each time and the line in A is too thick; the heart in B is upside-down. The answer must be F.
10	E	The correct piece to complete the grid will need an arrow with a dot bottom-right and head matching those in the grid at the top-left. B, C and F are ruled out. The stars will need to match the positions of those in the top-left square of the grid but switch colour so: white on the left and black above and right. This excludes A and D with the same coloured stars and leaves option E.

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11	C	Each row contains the irregular pentagon containing a white heart, dotted pentagon and grey hexagon. The orientation of each item is not the same as in the row above. The middle row is missing the dotted pentagon item so options A, D, E and F can be ruled out. The pentagon is too small in B so C is the correct answer.
12	A	Each row includes a shape with a solid, dotted and dashed outline and a smaller shape associated with it in the same way each time. The small grey circle is in the wrong part of the shape in options B and C and the shading is wrong in option F. The shape appears to rotate by 45° clockwise each time so the orientation of A and B are correct. But B has already been ruled out so the correct answer must be A.
13	D	Only D is not a reflection of the original image.
14	D	All of the images except D are reflections of the original.
15	B	Only B is not a reflection of the original image.
16	C	U codes for a dot at the bottom of the line and V for an arrow. R codes for a circle, S for a triangle and T for a square. The correct code will contain U and R.
17	C	P codes for a double circle so the missing code will also contain P. E, F and G code for a four, five and eight pointed star, respectively. The missing code will need F.
18	A	P codes for grey shading and Q for stripes. K codes for a quarter circle, L for a semi-circle and M for three-quarters. The missing code will need L and P.

Mixed Test 2 p.57

1	C	The second image in a pair is the result of shading in the overlapping areas of the first image. The second original is two hexagons overlapped by (or overlapping) a rectangle so the correct answer will be the two trapezium shapes created within the rectangle. This gives answer C.
2	B	The second part of each pair has the black square moved across one space to the right in each row. The solution will be a grid where the black square is top-left in the top row ruling out E. the second row will have a black square on the right ruling out A, C and F. D has two black squares so the correct answer is B.
3	B	The original square becomes two with a black version above right which is rotated through 180° . The only option with these features is B.
4	C	At each step there is one more line and one less circle. The correct answer will have 4 lines and two circles ruling out A, B, D and F. The arrow touches the square in E so the correct answer must be C.
5	D	The shapes alternate between white and shaded so the correct answer will be shaded. A, B and F are thus ruled out. The rectangle (irregular quadrilateral) becomes a square (regular quadrilateral) so the answer needs an equilateral triangle. C and E are ruled out so the answer is D.
6	E	The diamond shape moves one quarter turn clockwise at each step; it retains its orientation and also alternates between black and white. The correct answer needs a white diamond on the right side of the circle. This rules out B and F. The line dissecting the circle rotates 90° at each step so a horizontal line is needed; that rules out A, C and D. This means E is the correct answer.
7	B	The third item in each row of the grid is a combination of the first two shapes and the shading is switched. The correct answer will need a grey cross inside a white triangle. This limits the choice to B and F. In the grid, the arrow is not rotated (it's impossible to know about the circle) so it can be assumed the cross will not rotate. Now the answer must be B.

Extended answers

8	D	Across each row of the grid, the shape is positioned middle, bottom then top of the square. Each row contains one large, one small and one medium-sized shape. The missing grid square needs a small divided circle at the bottom so B and D are the only possible choices. Because the shapes are always in the middle of a side, not in a corner, then B is ruled out.
9	E	The missing part of the grid needs a star towards the top-left corner and two curved lines come from it. This means only B, E and F are possible answers. The orientation of the star is now the distinguishing feature. By reference to the other shapes, a star with the opposite orientation to that in the top-left square of the grid is needed. This means option B and F are ruled out.
10	D	Look for an answer which has a diagonally striped square towards the left. This means options A, D, E and F remain possible answers. Now consider the diagonal pattern of the original will be reversed in the reflection: only option D matches.
11	F	The baseline of the original shape is horizontal so options A, B, D and E can be ruled out. Comparing C and F, the largest triangle at the top is too small in C.
12	C	The reflection needs a dot at the top so F is ruled out. There are three regularly spaced lines so A, B, D and E are ruled out. This leaves only C.
13	C	C codes for a square and D for an oval so the correct answer will contain D. F, G and H code for solid, dotted and dashed lines, respectively, so the correct answer will need F.
14	F	M codes for diagonal lines so N codes for dots. D, E and F code for the way the arrow is pointing. The correct answer will need D and N.
15	D	P represents the curved line so Q codes for a circle. H, K and M code for the sides on the outer shape: 6-, 7- and 4-sided, respectively. The correct code will be H and Q.
16	F	The paper has been folded once in half, into quarters and then in half again before it is punched once. This will result in eight holes in the correct answer. Options B and E are ruled out. The hole is close to a corner so C and D cannot be correct. The final pattern will need to be symmetrical in all four planes so it cannot be A.
17	B	Viewing this from the side means the height is crucial in determining the answer. From the given viewpoint, the height of the blocks moving from left to right will be two, two, one, three. Only B fits this.
18	A	The 'button' cannot be alongside the 'T' so B is ruled out. The arrow cannot be below the 'T' so C is not possible. If the top and side were as shown in D, the front face would be the 'button'. E shows two faces adjacent which are opposite in the net. If the top and side were as shown in D, the front face would be the 'T'.