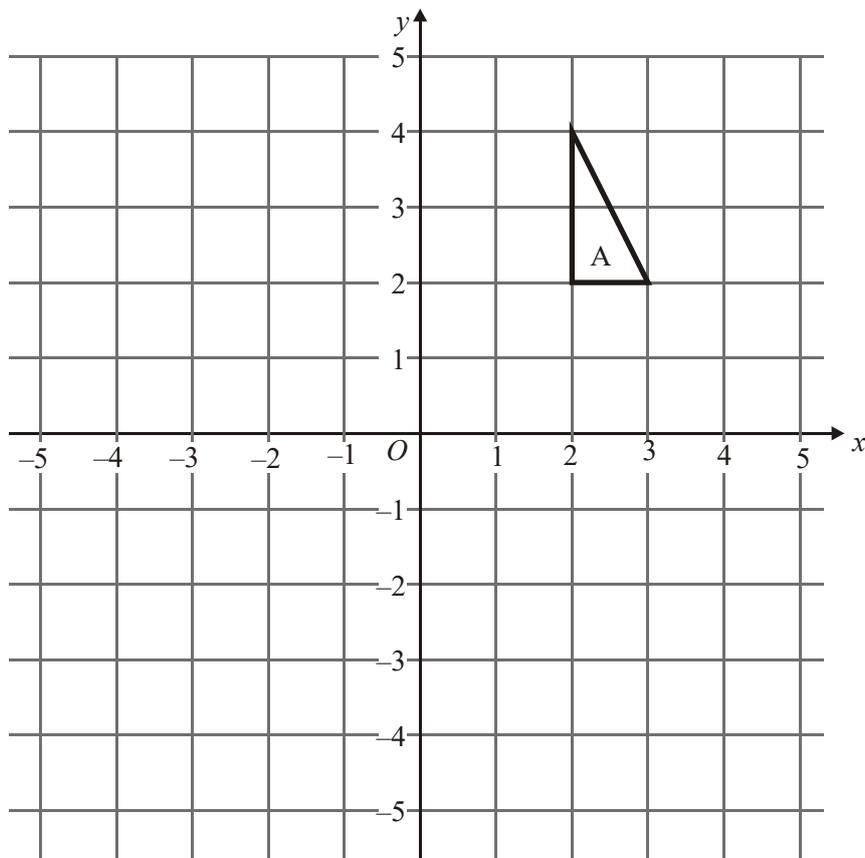**1.**

(a)   On the grid, rotate triangle **A** 180° about *O*.
        Label your new triangle **B**.
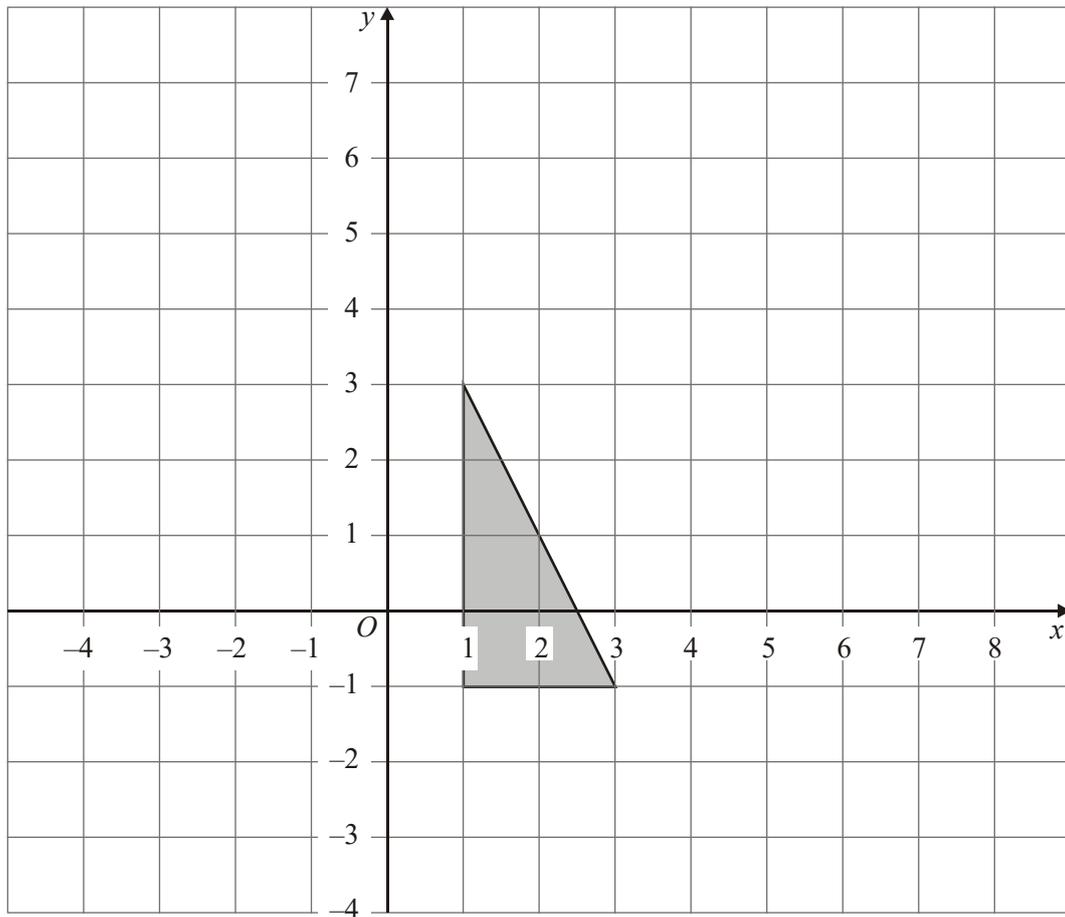
        (2)

(b)   On the grid, enlarge triangle **A** by scale factor $\frac{1}{2}$, centre *O*.

        Label your new triangle **C**.

        (3)
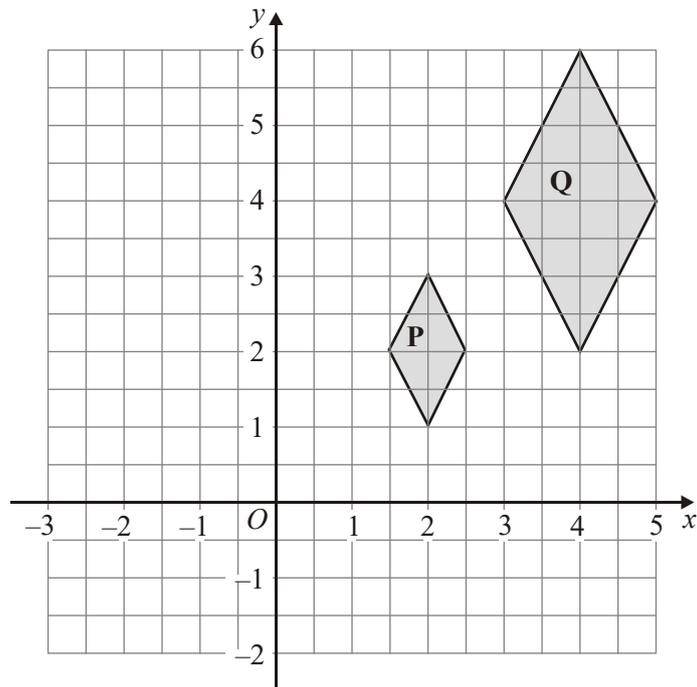   **(Total 5 marks)**

2.

Enlarge the shaded triangle by a scale factor 2, centre 0.

(Total 3 marks)

3.

(i)　　Describe fully the single transformation that maps shape **P** onto shape **Q**.

....

....

(ii)　　Reflect shape **P** in the line $x = 1$

(Total 5 marks)

4.
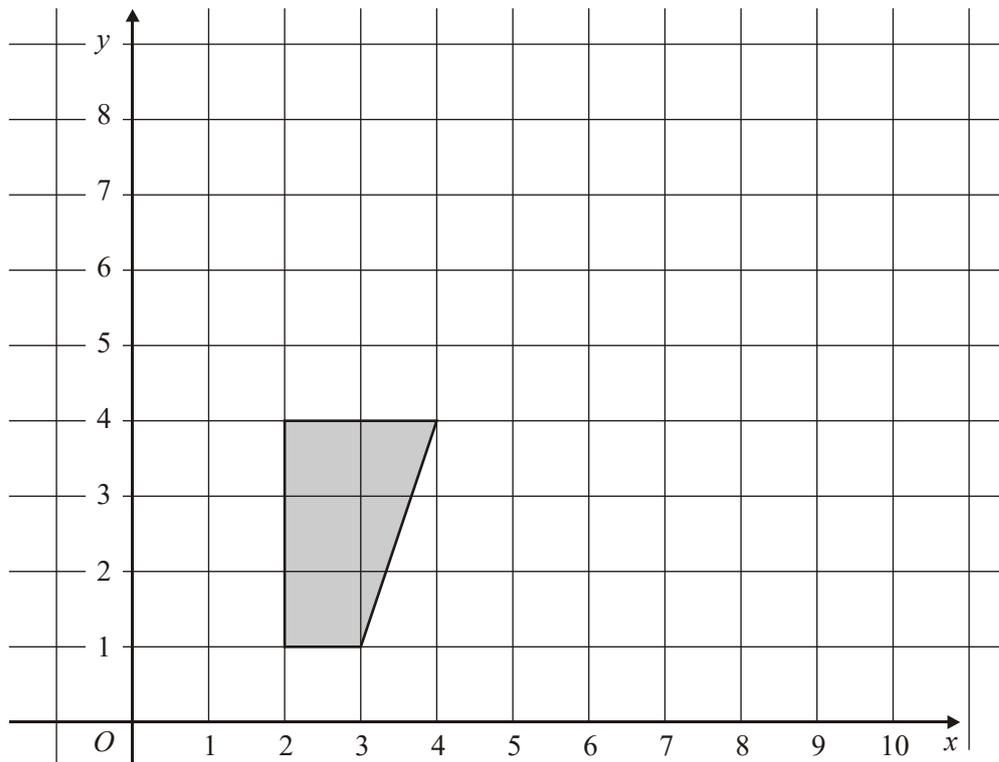
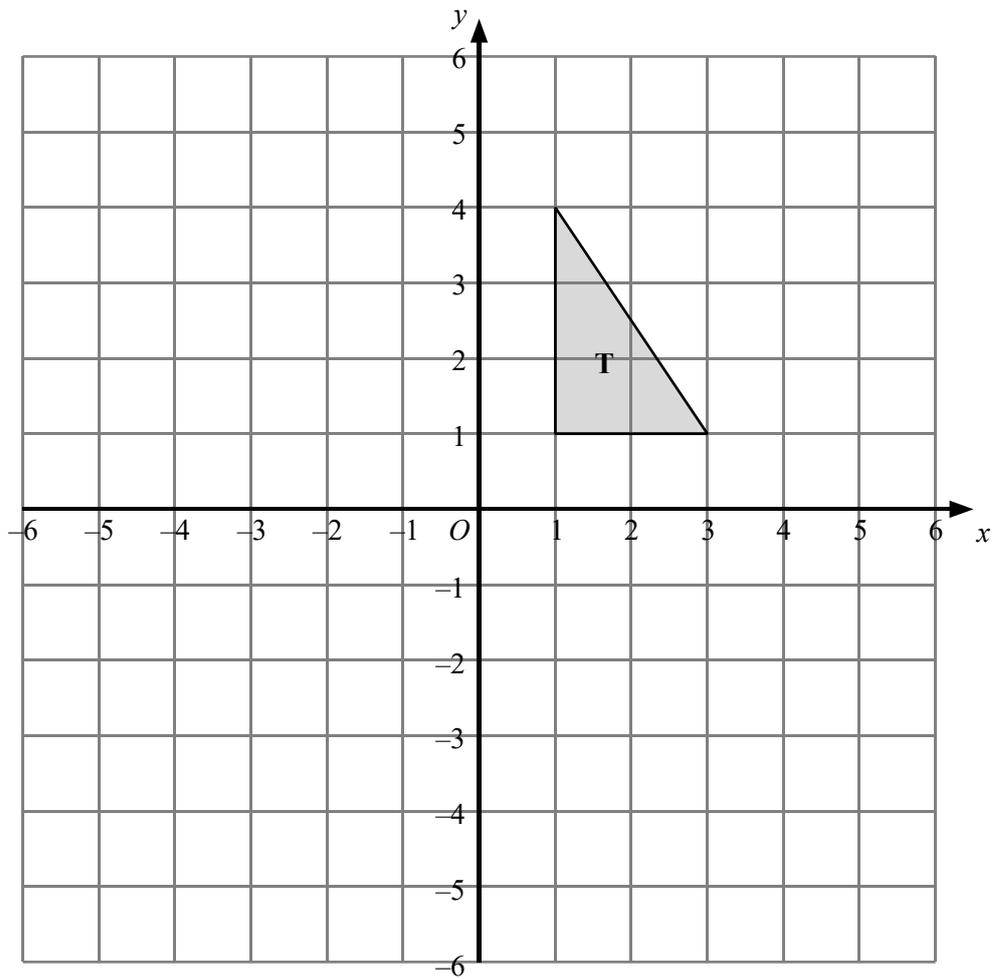On the grid, enlarge the shaded shape by scale factor of 2, centre (1,1).

(Total 3 marks)
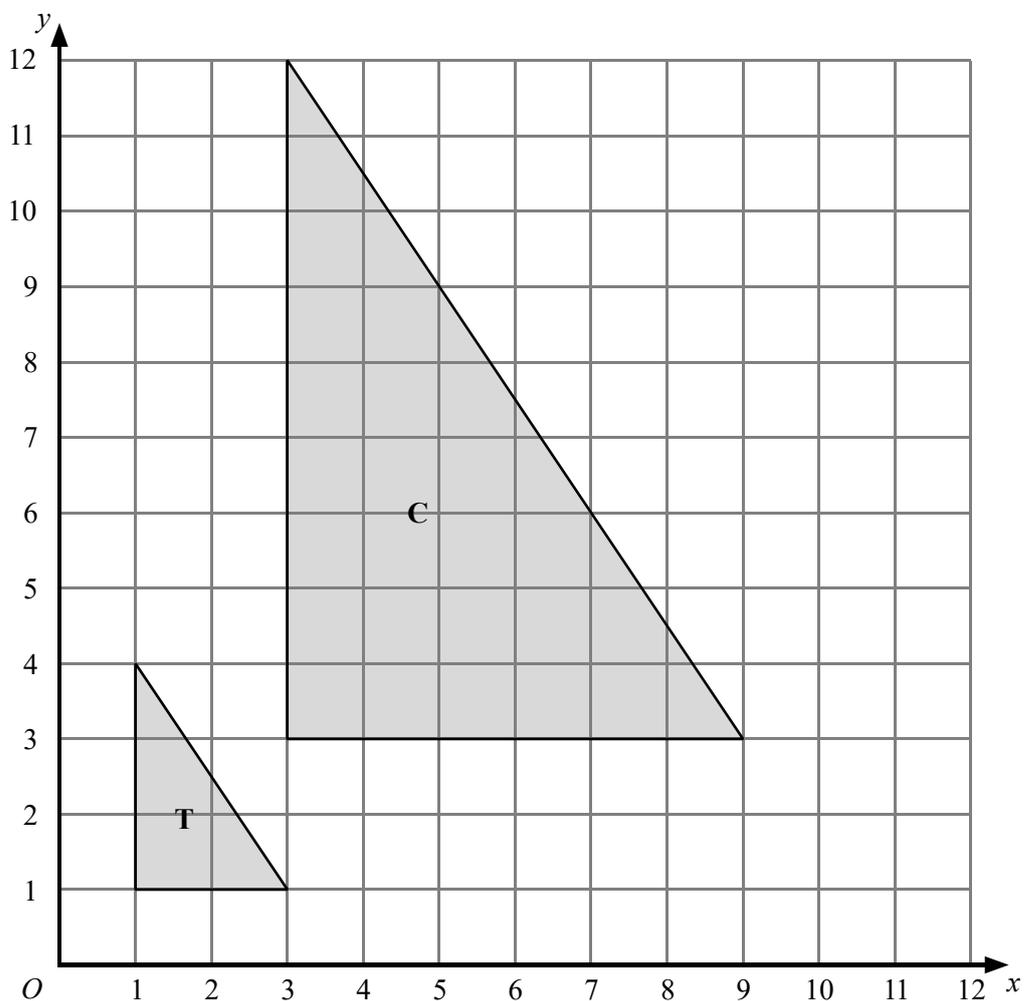
5.

Triangle **T** has been drawn on the grid.

(a)   Reflect triangle **T** in the *y*-axis.
       Label the new triangle **A**.

(1)

(b)   Rotate triangle **T** by a half turn, centre *O*.
Label the new triangle B.

(2)

(c)   Describe fully the single transformation which maps triangle **T** onto triangle **C**.

....

....

(3)
(Total 6 marks)

6.
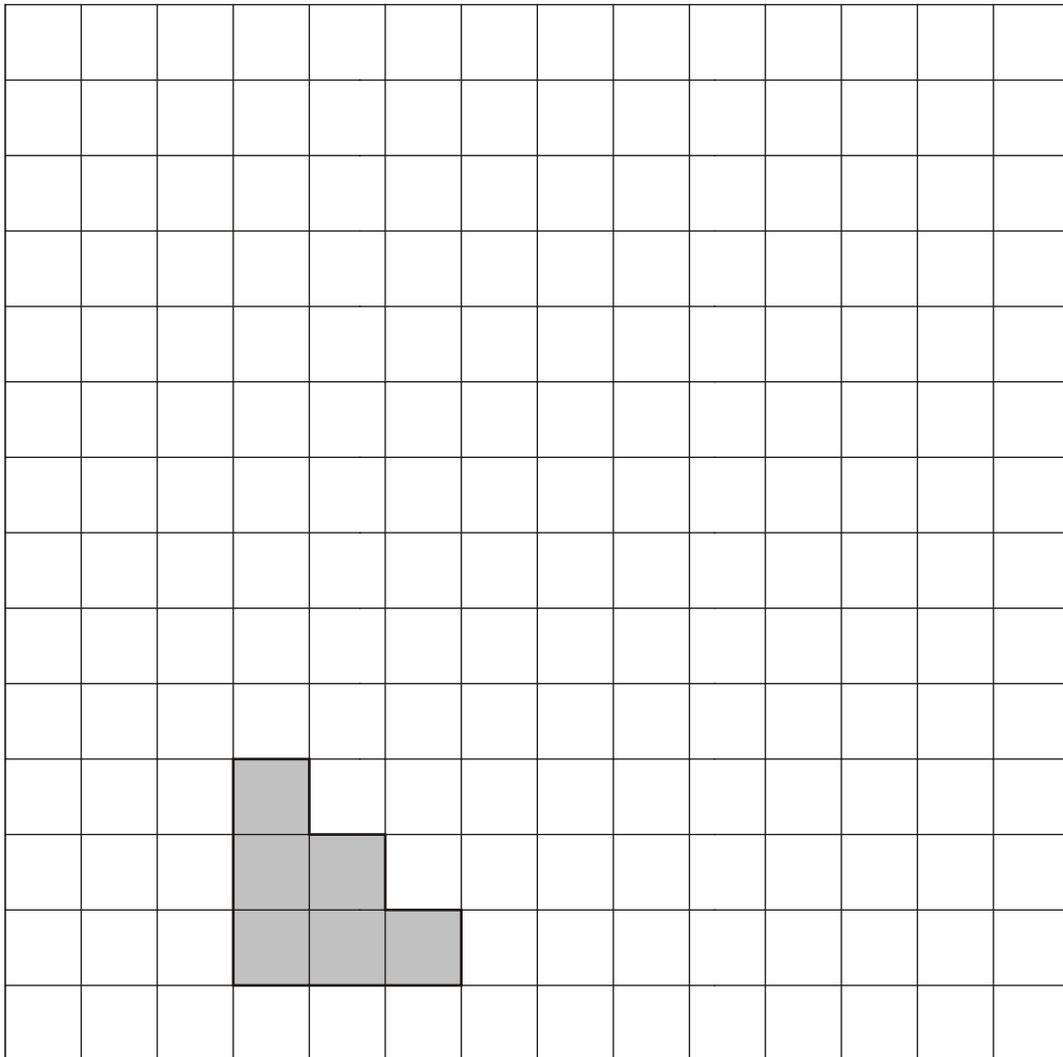
(a)   On the grid, draw an enlargement, scale factor 2, of the shaded shape.

(2)
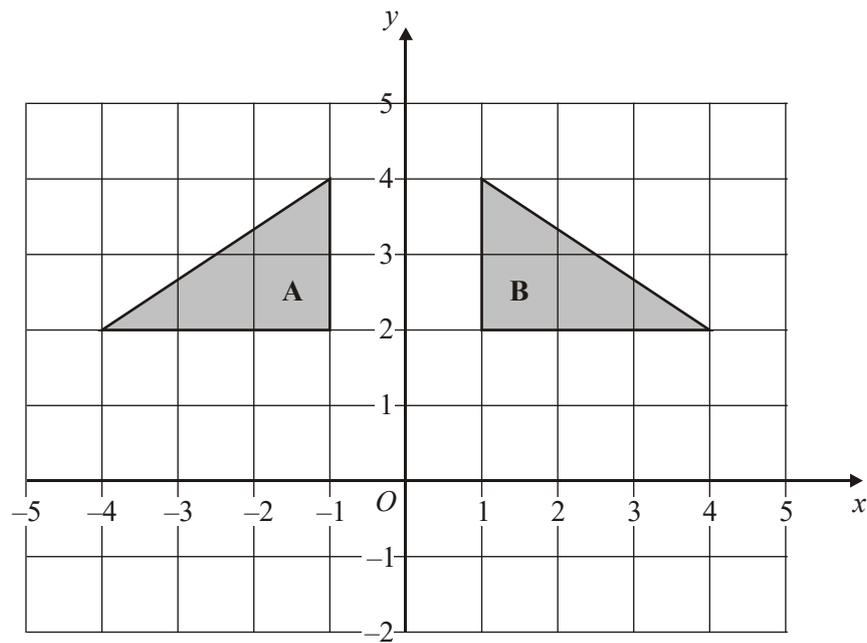
(b)   Describe fully the single transformation that maps triangle **A** onto triangle **B**.

    ....

                                                                                                                    (2)
                                                                                                 (Total 4 marks)

7.
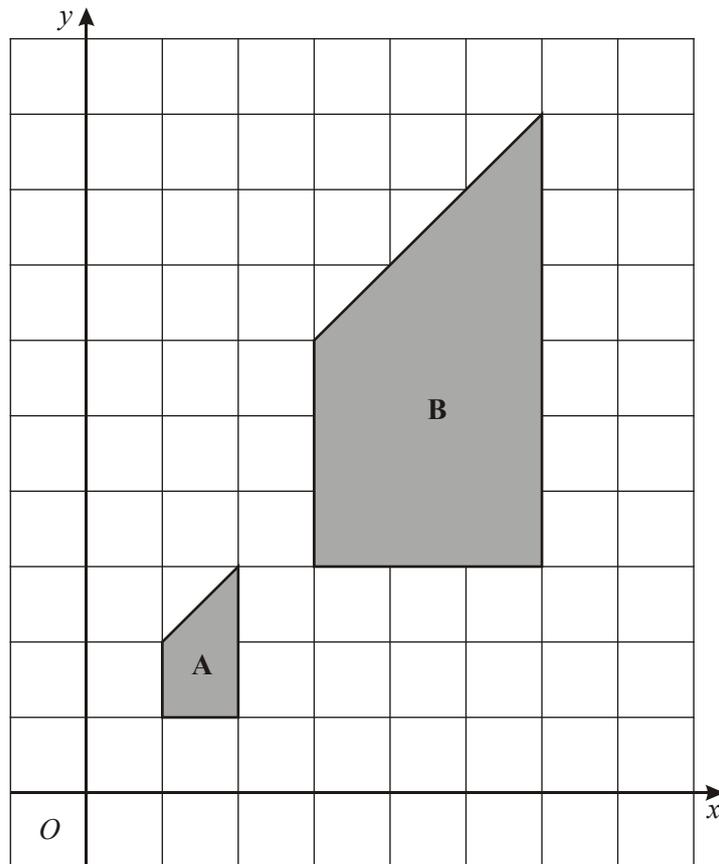
Describe fully the single transformation which takes shape **A** onto shape **B**.

………………………………………………………………………………………………

……………………………………………………………………………………………….

(Total 3 marks)

8.
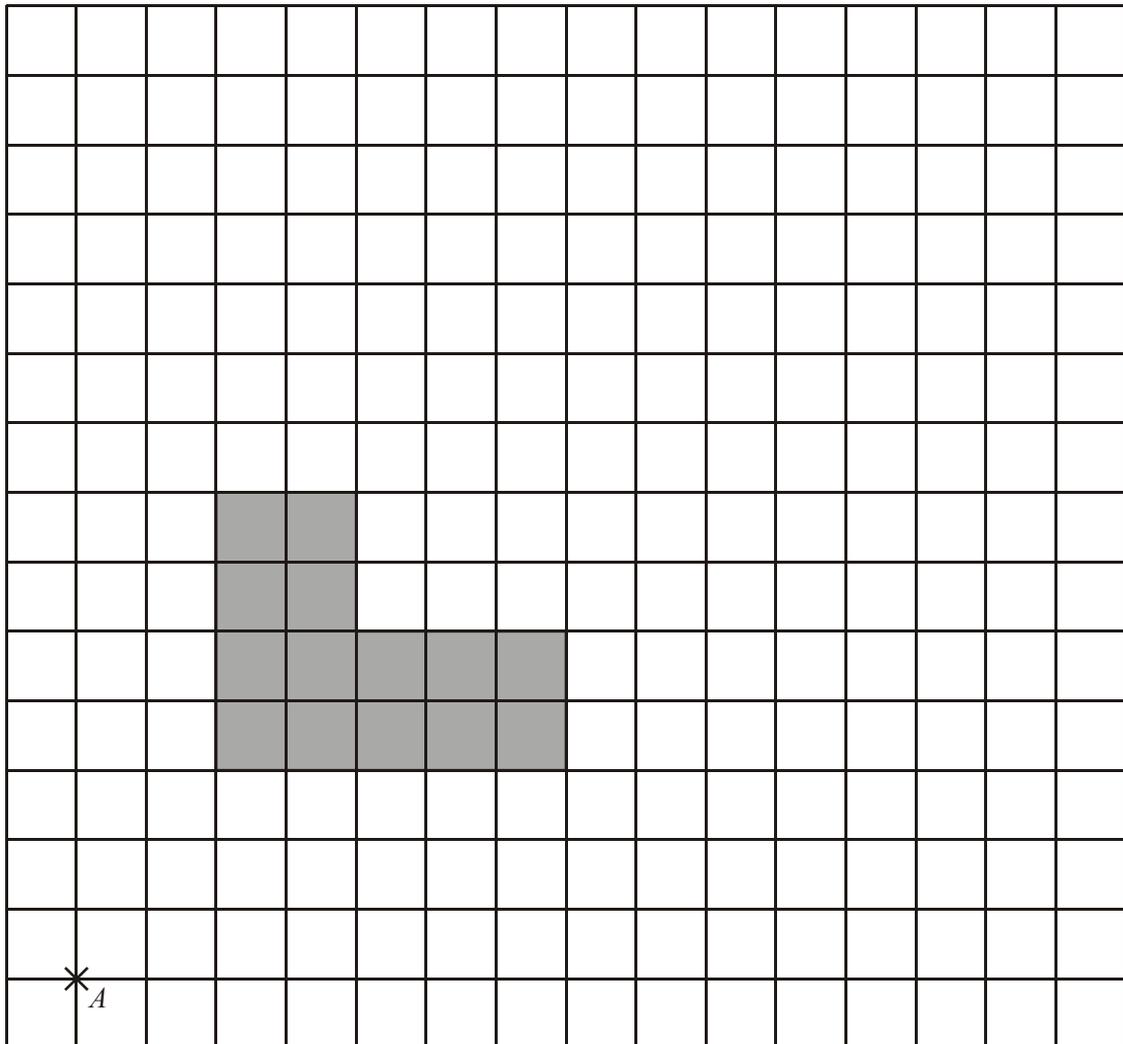
On the grid, enlarge the shaded shape by a scale factor of 2, centre *A*.

(Total 3 marks)

9.   Enlarge shape **Q** by a scale factor of 2.
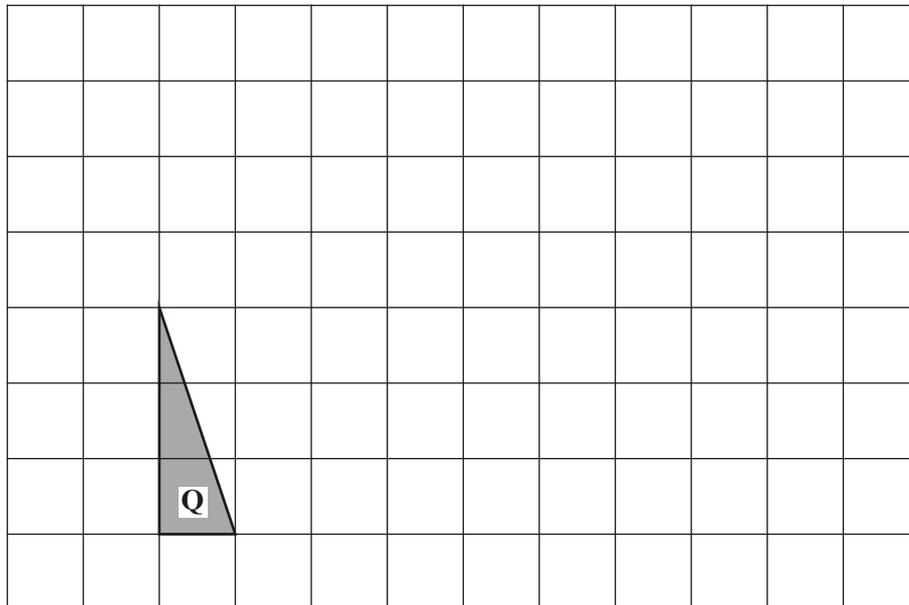
(Total 2 marks)

10.
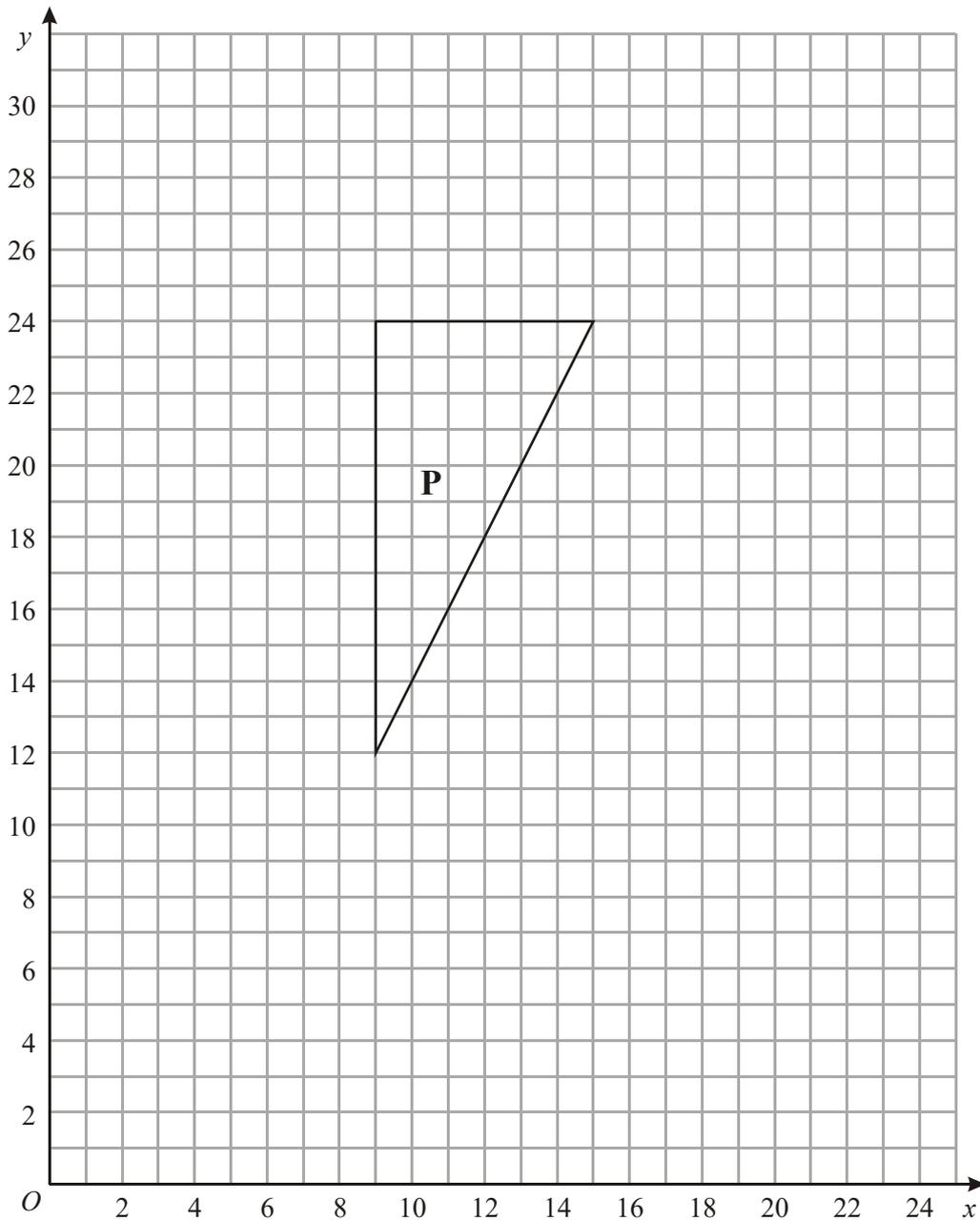
(a) On the grid, translate triangle **P** by the vector $\begin{pmatrix} 8 \\ -3 \end{pmatrix}$

Label the new triangle **Q.**

(1)

(b)   On the grid, enlarge triangle **P** by a scale factor of $\frac{1}{3}$, centre (15, 6).

Label the new triangle **R**.

(2)
(Total 3 marks)

11.   On the grid, enlarge the shaded shape by a scale factor of 3, centre *A*.
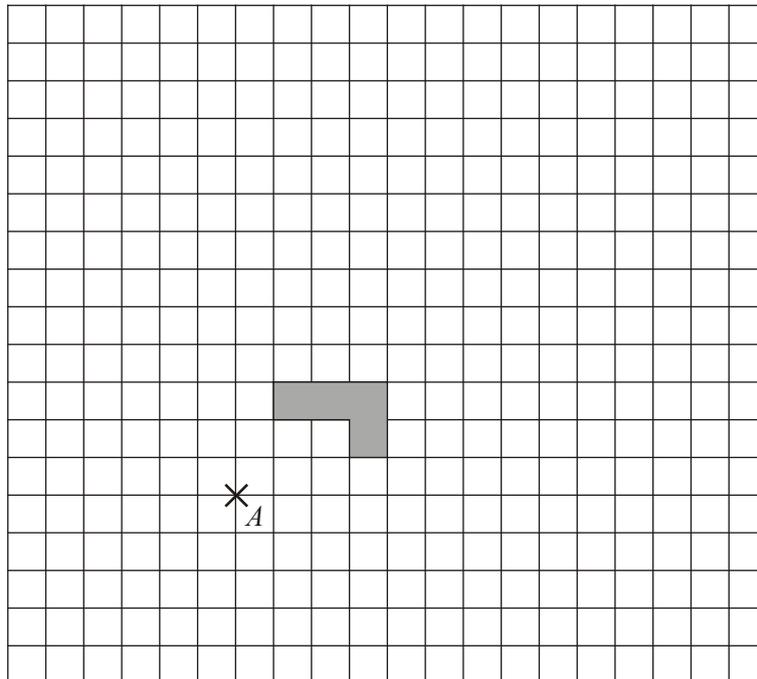
(Total 3 marks)

12.
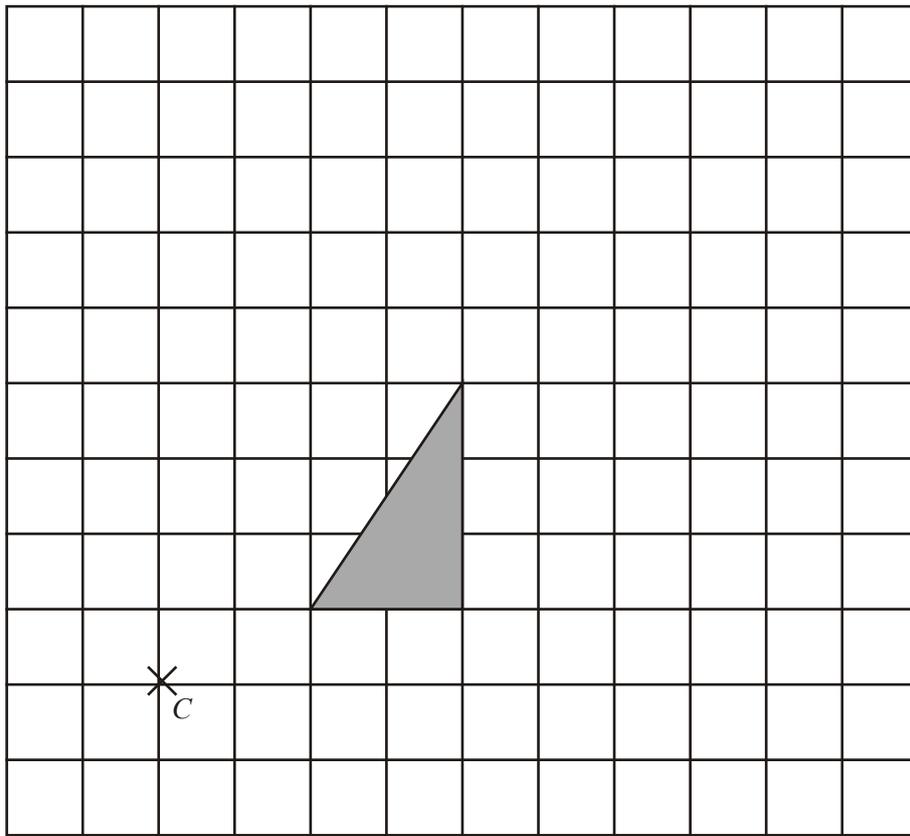
On the grid, enlarge the shaded triangle by a scale factor of 2, centre *C*.

(Total 3 marks)

13.
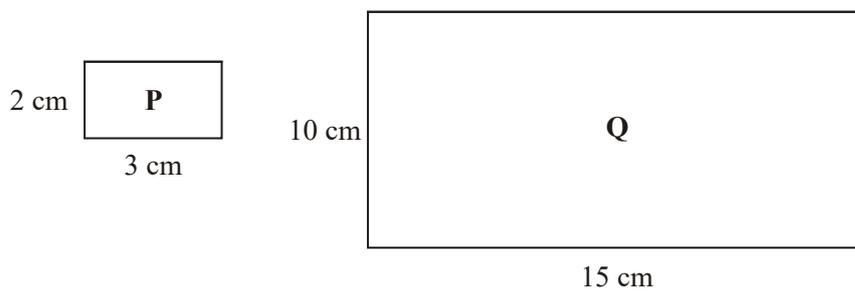
2 cm [**P**]
3 cm

10 cm [**Q**]
15 cm

Diagram **NOT** accurately drawn

Rectangle **Q** is an enlargement of rectangle **P**.

(a)   Work out the scale factor of the enlargement.

....

(1)
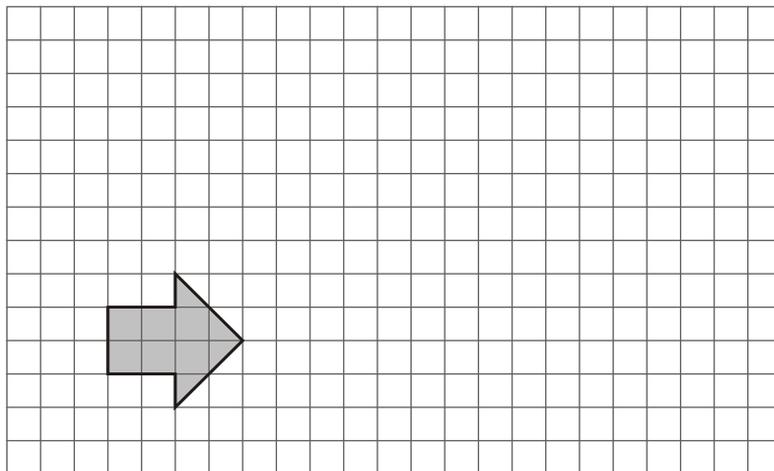
(b)   On the grid, enlarge the shaded shape with a scale factor of 2

(2)
(Total 3 marks)

14.

2 cm

P

3 cm

10 cm

Q

15 cm
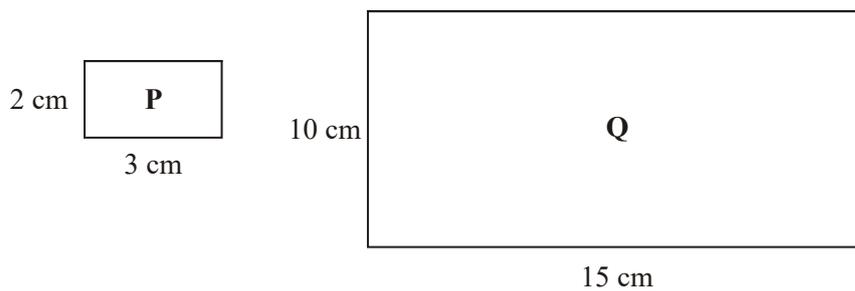
Diagrams **NOT** accurately drawn

Rectangle **Q** is an enlargement of rectangle **P**.

(a)   Work out the scale factor of the enlargement.

....

(1)

(b)   On the grid, enlarge the shaded shape with a scale factor of 2

(2)
(Total 3 marks)

15.

Rectangle **C**: 3 cm (height), 5 cm (width)

Rectangle **D**: 12 cm (height), 20 cm (width)
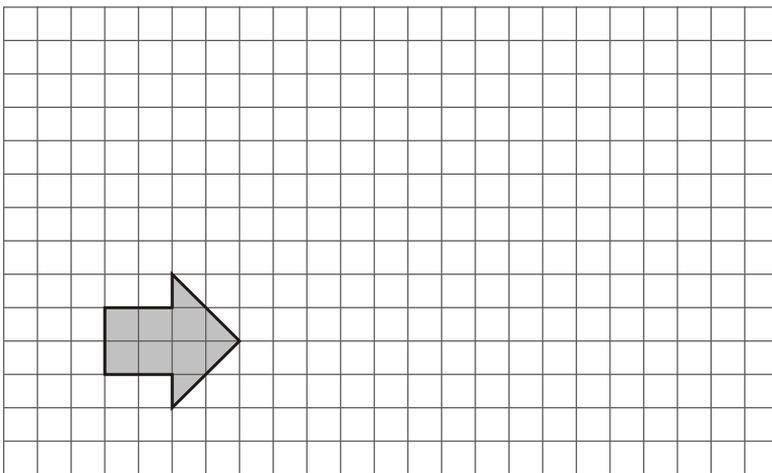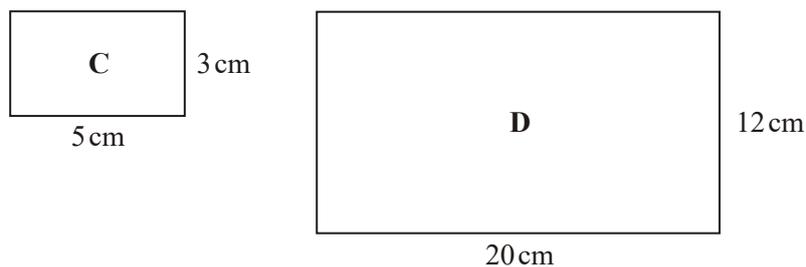
Diagram **NOT** accurately drawn

Rectangle **D** is an enlargement of rectangle **C**.

Find the scale factor of the enlargement.

....

(Total 2 marks)

1.   (a)   2

B1 for 180° rotation (wrong centre)
B1 cao

(b)   3

B1 for any enlargement sf other than 1
B1 for all sides halved
B1 for position

[5]

2.   Correct triangle drawn   3

Vertices of new triangle at (2, –2) (2, 6) and (6, –2)
B3 cao
*(B2 for either correct triangle in wrong translated position or
for 2 vertices correct)*
*(B1 a right angled triangle with horizontal length 4 or vertical
length 8 in the same orientation as the shaded triangle)*
SC B2 for s + 3 totally correct

[3]

3. (i)   Enlargement scale factor 2 centre (0, 0)   3
                    B1 for enlargement
                    B1 for scale factor 2
                    B1 for centre (0, 0)

    (ii)   2
                    B2 for all points correct
                    *B1 for any other correct reflection of **P***

                                                                     [5]

4.   Shape vertices at (3, 1);
          (3, 7);
          (7, 7); (5, 1)   3
                    B3 cao
                    (B2 for correct enlargement in wrong position)
                    (B1 for any 2 correctly enlarged line segments)

                                                                     [3]

5.   (a)

          Reflection in *y*-axis   1
                    B1 cao

    (b)

          Rotation by half turn about (0, 0)   2
                    B2 cao
                    (B1 for half turn not about (0, 0).)

(c)   Enlargement
        Scale factor 3
        Centre (0,0)   3
                B1 for 'enlargement'
                B1 for "scale factor 3" or 3 seen
                B1 for 'centre (0, 0)

                                                                   [6]

6.   (a)   Correct shape   2
                B2 for correct shape; any orientation.
                (B1 for any two sides correct or all correct for scale factor
                other than 1 or 2), tolerance to within half square

        (b)   Reflection in line
                $x = 0$ 2
                B1 for reflection, reflect, reflected.
                B1 for line x = 0 or y-axis
                NB: more than one transformation should be awarded 0 marks.

                                                                   [4]

7.   Enlargement
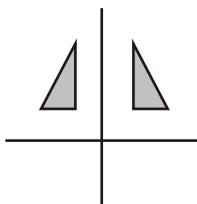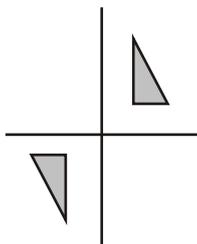   scale factor 3
         centre O   3
                B1 for enlargement
                B1 cao for scale factor 3
                B1 for centre O
                [−1 if an additional transformation is given]

                                                                   [3]

8.   Enlargement   3
                B3 for a fully correct enlargement in the correct position
                [B2 for a fully correct enlargement in a wrong position]
                [B1 for any 3 correct lines]

                                                                   [3]

9.   Enlargement   2

         Enlarge scale factor 2
                B2 (B1 for 1 side correct)

                                                                   [1]

10.   (a)   (17, 9) (17, 21) (23, 21)
          Translation   3
                    B1 cao

        (b)   (13, 8) (13, 12) (15, 12)
          Enlargement

                    B2 correct triangle $\pm \dfrac{1}{2}$ square

                    (B1 correct size but in wrong position <u>or</u> 2 out of 3 vertices in

                    correct position $\pm \dfrac{1}{2}$ sq)

                                                                                    [3]

11.   Correct size & position   3
                    B3 fully correct
                    (B2 correct size, wrong position or correct enlargement of sf
                    n($\neq$ 3) about A)
                    (B1 At least 2 sides correct or correct size, wrong position with
                    sf n($\neq$ 3))

                                                                                    [3]

12.   enlargement   3
                    B3 for fully correct answer
                    (B2 for 2 points in correct position or correct enlargement in
                    incorrect position)
                    (B1 for 1 point in correct position or one side correctly
                    enlarged or correct enlargement s.f.3, any centre)

                                                                                    [3]

13.   (a)   5   1
                    B1

        (b)   enlargement   2
                    B2 for correct enlargement
                    (B1 for any 3 sides correctly enlarged or for any correct
                    enlargement by a different scale factor $\neq$1) allow tolerance of $\pm$
                    ½ square

                                                                                    [3]

14. (a)   5   1

                 B1

    (b)   enlargement   2

                 B2 for correct enlargement
                 (B1 for any 3 sides correctly enlarged)

                                                                                                     [3]

15.   4   2

        M1 for $\dfrac{20}{5}$ *or* $\dfrac{5}{20}$ *or* $\dfrac{12}{3}$ *or* $\dfrac{3}{12}$ *OR 3 × 4 and 5 × 4 seen*
        A1 cao
        SC: B1 for 4:1 or 1:4 oe

                                                                                                       [2]

1.   Most candidates undertook a rotation in part (a), though there were some errors in the final positioning of the triangle. Those candidates who used tracing paper had much greater success in the correct positioning of the triangle. There were very few correct solutions to part (b). Most candidates chose to draw a triangle of a scale factor 2 rather than ½; there were, however, many errors in these attempts, since not all three sides were doubled in length, with a significant number *adding* ½ cm to each side. It is clear that of all the transformations, enlargement is the one in which candidates are the weakest.

2.   **Paper 1**

About 25% of candidates obtained one mark for drawing one enlarged side correctly and a further 20% of the candidates gained two marks for drawing the length a triangle of the correct size. Only 0.7% of candidates were able to draw a fully correct triangle in the correct position relative to the centre of enlargement.

Paper 3

Most candidates were familiar with the concept of enlargement by a scale factor of 2 and drew an enlarged triangle of the correct size in the correct orientation. However, using (0,0) as the centre of enlargement proved more difficult and the triangle was often drawn in an incorrect position on the grid. Some weaker candidates enlarged the triangle by adding two centimetres to the base and height.

3.   In part (a), many candidates were able to recognise the transformation as an enlargement with a scale factor of 2 but descriptions frequently contained no reference to the centre of enlargement. Some candidates omitted to mention either the scale factor or the centre of enlargement. In part (b), more than 80% of candidates reflected shape **P** but less than 20% reflected it in the line $x = 1$. Some candidates translated the shape.

4.   More than 70% of candidates enlarged the shape by scale factor 2 but only one quarter of these enlargements were in the correct position as many candidates did not know how to use the centre of enlargement. Many began the enlargement at (1, 1), rather than use it as the centre.

5.   **Foundation Tier**

Part (a) was well attempted the majority of students successfully reflecting the triangle. A common mistake was to reflect in the wrong axis or show the triangle moved one unit to the left. Candidates had less success with part (b) the rotations were often in the wrong quadrant, or had used an incorrect centre of rotation or were in the correct quadrant with the shape incorrectly aligned. Most students gained 1 mark for this response. A small minority of candidates drew a triangle in each quadrant, with no labelling and so scored no marks. Part (c) was least well answered it was rare indeed to see any candidate refer to the centre of enlargement, marks were gained for ×3 or tripled rather than using the term "scale factor 3".

Enlarged or inlarged was seen fairly often and the incorrect spelling was allowed on this occasion. Larger or made bigger were often seen but were deemed not worthy of credit.

Intermediate Tier

Part (a) was answered very well although a small number of candidates reflected the shape in the wrong line, most commonly the x-axis. The rotation in part (b) was less successful. The most common error was for the shape to be rotated by a quarter turn clockwise instead of by a half turn. Some of those candidates who did rotate by a half turn did so about a centre other than (0, 0). Most candidates gained at least one mark in part (c) but many failed to mention the centre of enlargement. Some candidates failed to refer to 'enlargement' with other, incorrect, words often used instead. There was less evidence of candidates using a combination of transformations than in the past.

6.   **Specification A**

Foundation

In part (a) there were many correct diagrams drawn and the vast majority of candidates scored at least one mark for drawing a diagram which shows at least two of the sides enlarged correctly. Some gave an enlargement that was scale factor 3. In part (b) performance was much worse. Some recognised this as a reflection, but few stated the line of symmetry. Many appeared to think this was a rotation. Others use common language such as "flipped" or "mirrored" rather than the correct description of "reflection".

Higher

Part (a) was extremely well answered by candidates, with most scoring full marks. The few mistakes included using a scale factor of 3 instead of 2, or doubling the number of steps rather than increasing their length. Most candidates clearly knew what the transformation was in part (b) and gained the first mark for reflection, but many lacked the skill to describe adequately, using words such as flipped and mirrored. However the second mark was not so readily achieved.

Although the correct answer was probably the most common, some confused the y-axis with the line $y = 0$ or merely called it the y line and a few quoted $y = x$ as their mirror line.

Specification B

Foundation

Drawing an enlargement using a scale factor of 2 in part (a) produced many all correct diagrams (75%) with a good degree of accuracy, often drawn using a ruler. Some used a scale factor of 3 and this was partially rewarded as was a diagram with two lengths correct using the intended scale factor of 2. The unsure just continued with a step diagram failing to appreciate what was being asked of them.

Part (b) requiring a description of the transformation produced some weird and wonderful ideas. The word 'flip' seemed to dominate despite the fact that it is not a mathematical name used to describe a transformation. The phrase 'mirror image' was ever present along with variations on the same theme. In reality it was a simple 'reflection in the y-axis', both parts being required to obtain full marks. It was extremely disappointing to note how many candidates were not familiar with the term 'reflection' or even related terms such as 'reflect', 'reflected' etc. Over 75% of the candidates failed to score on this question.

Higher

(a)   This was a straightforward question for this tier and consequently very well done.

(b)   It was surprising and disappointing to see so many wrong responses from candidates for this transformations question. Not all candidates could use the vocabulary for the type of transformation correctly, so that 'flip' appeared far too often. Of those that knew the transformation was a reflection the detailed description was often incorrect. This mainly involved an incorrect description of the y-axis as $y = 0$ or referring to the origin so that 'a reflection in *O'* or 'reflection by 90° in *O'* were often seen so the transformation was being described as a rotation -which of course it could be when referring to 3D.

7.   A single transformation was required, though many gave an additional translation to their enlargement. The scale factor was often correct, although any reference to a centre was rarely seen. The use of language in describing the transformation was varied.

8.   A correct enlargement was often seen but rarely in the correct place. Most candidates therefore gaining 2 out of the 3 marks. The most usual position of the enlargement was drawn using the point A as the bottom left-hand vertex.

9.   The enlargement without a given centre of enlargement and therefore much easier to handle enabled more than 75% of the candidates to access the first mark with just over half the candidates scoring both marks. Doubling the horizontal and vertical sides of the given triangle and then drawing in the third to complete the shape might have been the best approach. Many merely added on 2 squares to the horizontal and vertical sides ending with a triangle stretching 3 across and 4 up whilst others enlarged by a scale factor of 3.

10. Just over 60% of candidates were able to answer (a) correctly but only 29% of candidates were able to give a fully correct solution to part (b). In part (b) many candidates could reduce the shape to $\frac{1}{3}$ of its size but using the centre of enlargement was more problematic. Some candidates used a scale factor of $-\frac{1}{3}$. Those who were most successful marked the centre of enlargement and drew in the construction lines.

11. 70% of candidates gained at least two marks for a correct enlargement; unfortunately only just over 20% successfully gave their enlargement about the required centre. A few candidates, misread the question, and enlarged the given shape by a scale factor of 2, and in a few cases 4. Two marks only were available after this error.

12. There were few who could cope with the idea of a centre of enlargement and a scale factor. Over 40% of the candidates attempted to apply the scale factor but then its position on the grid was more often than not incorrect with less than 5% successfully using the correct centre of enlargement. A sound approach might have been to draw in the construction lines and then build the scale factor on to these. As it was, point C on the grid was simply used to position the left hand vertex of the triangle of the enlarged shape.

13. This question was well understood with 68% giving the correct answer of 5 for the scale factor in part (a) whilst in part (b) 68% obtained both marks for a fully complete enlargement and a further 19% obtaining one mark for getting at least 3 enlarged lengths correct.

14. Unsurprisingly, part (a), this was very well answered with over 96% of candidates providing the correct scale factor. A correct enlargement in part (b) was drawn by the vast majority of candidates. Errors, when these were seen, usually occurred with the diagonal lines although a very small minority of candidates drew an enlargement of scale factor 3 rather than 2 as required.

15. This question was done well. More than two thirds of the candidates were able to score 2 marks for this question. Common errors in this question include: adding or subtracting the two areas; finding the perimeter of shape D; writing the final answer as 4×4, 4^2, $\frac{4}{4}$ or 4 : 4.