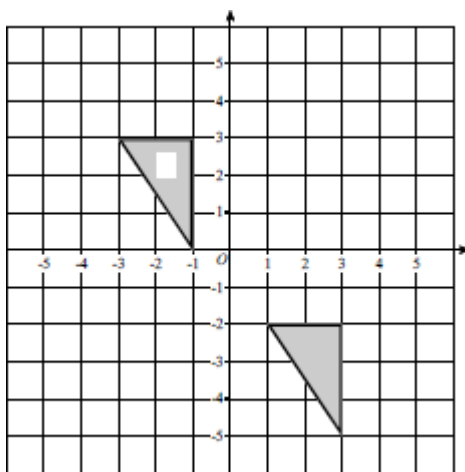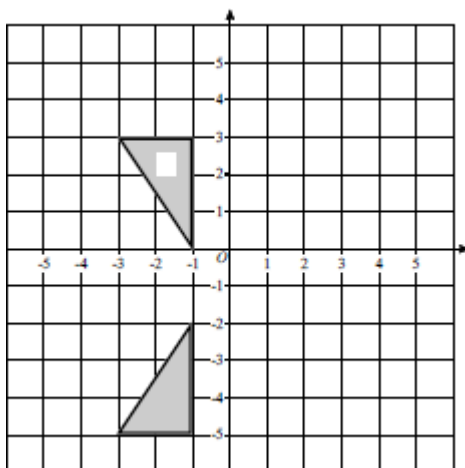**M1.**

D

B1

[1]

M2.

(a)   Correct translation

B1 for translation 4 right or 5 down
or for 3 correct points without the triangle
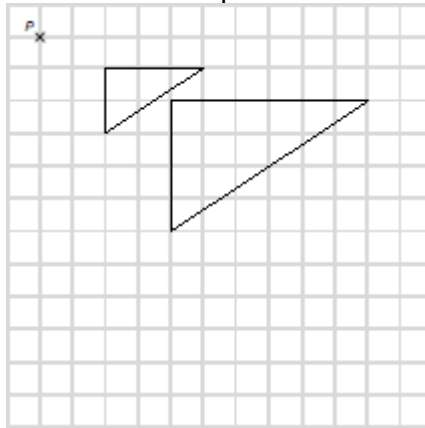
B2

(b)   Correct reflection

B1 for reflection in $y = c$ or in $x = {}^-1$

or for 3 correct points without the triangle

B2

[4]

M3.

(a)   Fully correct enlargement in correct position

B2 for enlargement SF2, wrong position
or for 3 correct vertices plotted but no triangle drawn
B1 for any other enlargement not SF1
or for 2 correct vertices plotted

B3

Additional Guidance
Mark intention

(b)   **Alternative method 1**
Rotation

B1

Origin or (0, 0) or *O*
             oe

B1

180 (clockwise)

or 180 (anticlockwise)

or −180
             oe

B1

Alternative method 2
Enlargement and SF −1

B2

Origin or (0, 0) or *O*
                    oe

B1

Additional Guidance
Rotation, (0, 0), 90 then 90

B1B1B0

Accept 180C for 180 (clockwise)

B1

Accept ½ turn for 180

B1

Accept $\begin{pmatrix} 0 \\ 0 \end{pmatrix}$ for origin

B1

Enlargement   (0, 0)

B0B1

Allow rotate, rotating, rotational (symmetry)

B1

Mixed transformations, e.g.

translation of 180

B0B0B1

reflection (0, 0)

B0B1B0

Do not accept turn for rotation

B0

Double transformations e.g. Rotate, translate

B0B0B0

[6]

M4.
(a)   Fully correct enlargement
                B2 for enlargement SF2, wrong position
                or for any enlargement centre P
                or for 3 correct vertices plotted but no triangle drawn

B1 for any other enlargement not SF1
or for 2 correct vertices plotted

B3

Additional Guidance
Mark intention

(b)   **Alternative method 1**
Rotation

B1

Origin or (0, 0) or *O*
          oe

B1

180 (clockwise)

or 180 (anticlockwise)

or −180
          oe

B1

Alternative method 2
Enlargement and SF −1

B2

Origin or (0, 0) or *O*
          oe

B1

Additional Guidance
Rotation, (0, 0), 90 then 90

B1B1B0

Accept 180C for 180 (clockwise)

B1

Accept ½ turn for 180

B1

Accept $\binom{0}{0}$ for origin

B1

Enlargement   (0, 0)

B0B1

Allow rotate, rotating, rotational (symmetry)

B1

Mixed transformations, e.g.

translation of 180

B0B0B1

reflection (0, 0)

B0B1B0

Do not accept turn for rotation

B0

Double transformations e.g. Rotate, translate

B0B0B0

[6]

M5.(a)   Correct reflection

B1 for a reflection in any line parallel to an axis
B1 for correct vertices plotted but no triangle

B2

(b)   Fully correct enlargement drawn

B2 for enlargement with SF4
or for any enlargement centre (1,1)
or for 5 correct vertices plotted but no pentagon
or for 4 correct vertices and 1 incorrect plotted and pentagon drawn
B1 for any enlargement
or one side of correct length

B3

[5]

M6.

(a)   3, × 3, 'times 3', '1:3'

Ignore units

B1

(b)   **Alternative method 1**

2 and 18 seen

> *Can be seen in a subtraction or on diagram*

M1

9

A1

Alternative method 2

3^2

> *ft their sf 3 × 3*
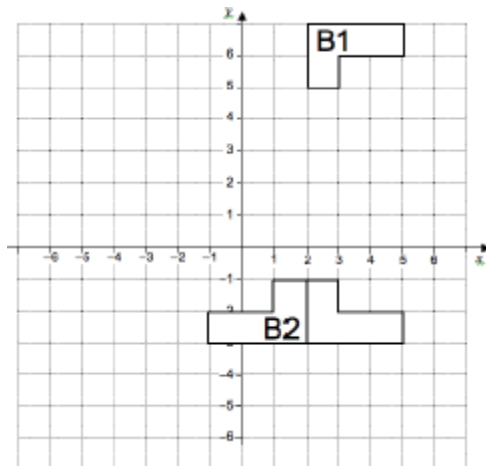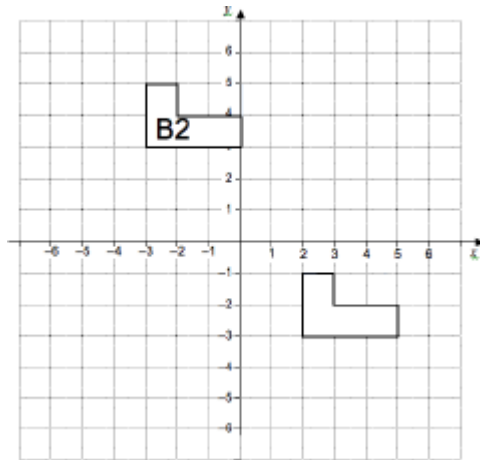
M1

9

A1ft

[3]

M7.

(a)

> *B1 for line $x = 2$ shown*
>
> *B1 for reflection in $y = 2$*
>
> *B1 for any reflection in a line of form $x = a$ where a is less than 2.*

B2

(b)

B1 for any translation of form $\begin{pmatrix} p \\ 6 \end{pmatrix}$ *or* $\begin{pmatrix} -5 \\ q \end{pmatrix}$

B1 for correct shape with top left corner at (−5, 6)

B2

[4]

M8.(a)   Line $x = -2$ drawn

B1

Additional Guidance

Line does not need to be full length of grid.

Line can be solid or dashed.

(b)   Line $y = x$ drawn

B1

Additional Guidance

Line does not need to be full length of grid.

Line can be solid or dashed.

(c)   Translation

Accept Translate

B1

9 right and 8 down

or $\begin{pmatrix} 9 \\ -8 \end{pmatrix}$

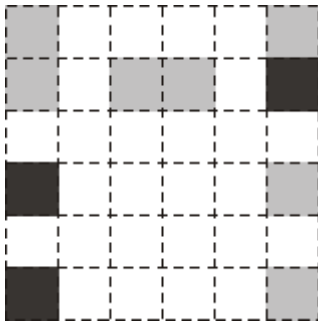*Accept (9, −8)*

B1

Additional Guidance

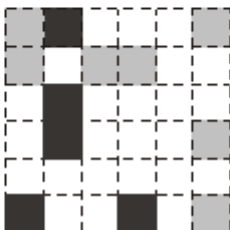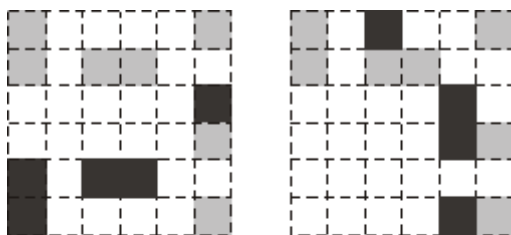$(y = -8, x = 9)$ is   B0 B0

[4]

M9.

Mark bottom grid unless blank
B1 for up to 5 squares shaded with at least 2 correct
or
B1 for any of these three patterns

B2
[2]

M10.(a)   Valid reason

Strand (ii)
eg 14 ÷ 4 is not a whole number
14 is not a multiple of 4
Because you need half centimetres
Half the perimeter has to be even
14 ÷ 4 = 3.5
4 × 3 = 12 and 4 × 4 = 16

Q1

Additional Guidance

Because it wouldn't have the sides as a whole number

Q1

14 doesn't divide into a whole number

Q0

Not possible because all the sides must be equal

Q0

Nothing divides into 14 4 times (not true)

Q0

Not possible to make 14 using the same number 4 times

Q0

14 ÷ 4 without an answer or correct comment

Q0

The grid is not big enough

Q0

The square would not have equal sides

Q0

)

(b)   Valid reason

> *Strand (ii)*
> *eg 12 is not a square number*
> $\sqrt{12}$ *is not a whole number*
> *3 × 3 = 9 and 4 × 4 = 16*
> $\sqrt{12}$ *= 3.4... or 3.5*

Q1

Additional Guidance

No number multiplied by itself equals 12

Q1

No whole number multiplied by itself equals 12

Q1

If it was a square it would have to be an area of 16 (not true)

Q0

The length and width would not match each other

Q0

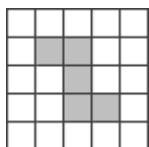It wouldn't have equal sides

Q0

The base can't be timesed by the height to give 12 because the sides need to be equal

Q0

Because 12 as an area would mean sides would be different lengths which would make the shape a rectangle not a square

Q0

(c)   Correct shape drawn

Shape shown may be reflected or rotated

> *B1 for a Pentomino with no lines of symmetry and no rotational symmetry*
> *B1 for any polyomino with no lines of symmetry and rotational symmetry of order 2*

B2

Additional Guidance

CANDIDATES MUST USE A DIFFERENT SHAPE TO THOSE GIVEN TO SCORE ANY MARKS

Accept any rotation or reflection of shape shown in mark scheme

If candidates do more than one, mark all and award the lowest mark

[4]

M11. Fully correct enlargement

B1 for 2 or 3 correct sides
B1 for fully correct enlargement using SF 2 or 4

B2

[2]

M12. (a) Fully correct diagram with vertices within 1mm

B1 for 2 or 3 sides correct from a full hexagon.
B1 for symmetrical diagram (about vertical line) with bottom vertex correct.
Ignore any internal lines.

B2

(b) (✗) 3 (✗) or 1 : 3

Accept − 3 or both

B1

[3]

M13. (a) 2 squares to the right **and** 3 up

*B1 for 2 squares to the right **or** 3 up*

B2

(b) Rotation

B1

90 clockwise or −90   *oe*

Accept $\dfrac{1}{4}$ *of a turn clockwise*

B1

(4, 3)

B1

[5]

M14.
(a)   [1.4, 1.6]

accept as ratio in form 1: [1.4, 1.6] or as × [1.4, 1.6]
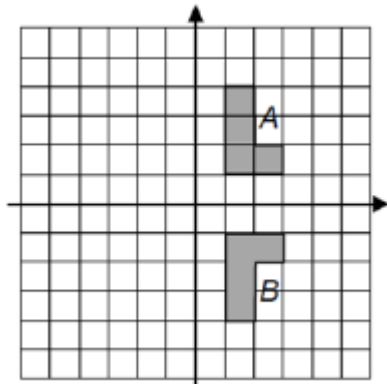*'increase by half' etc. B0*

B1

(b)   18

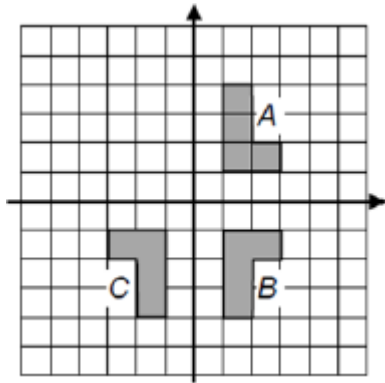*ft 12 × their 14a*

B1ft

[2]

M15.
(a)

B1

(b)

ft their (b) reflected in y-axis

Image in all 4 quadrants correctly reflected and shapes not labelled B1 B0.

If no labels and images in 4ᵗʰ and 3ʳᵈ quadrants only accept as B and C B2

A reflected in y axis and then x axis i.e. images in 2ⁿᵈ and 3ʳᵈ quadrants with C in correct position B0 B1

B1ft

(c)   origin or (0, 0) or *O*

            Multiple transformations, even if correct answer also seen is B0B0

B1ft

       180° or half-turn (direction need not be stated or can be ignored)

            Correct answer or ft their C. eg if C is 1 unit to the left then the rotation will be 180° about (−0.5, 0). Must be a rotation as this is stated in the question.

            If a correct combined rotation is given eg 90° clockwise followed by 90° clockwise must have appropriate directions is B1 but 90° followed by 90° would be B0.

B1ft

[4]

M16. Correct reflection

            B1   for any reflection in a vertical line
            or for three correct vertices

B2

[2]