

## UNIT 14 *Loci and Transformations*

## Overhead Slides

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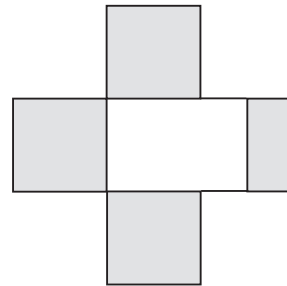
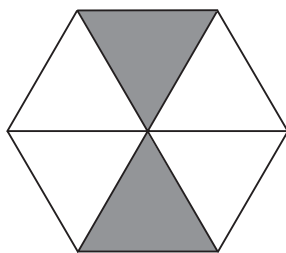
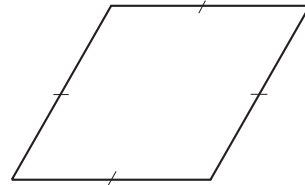
### Overhead Slides

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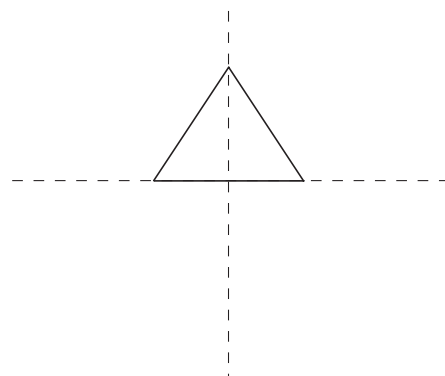
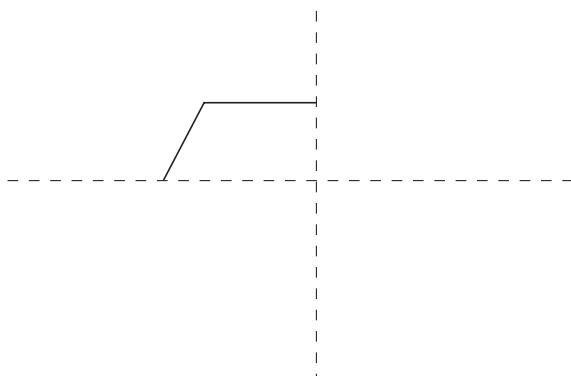
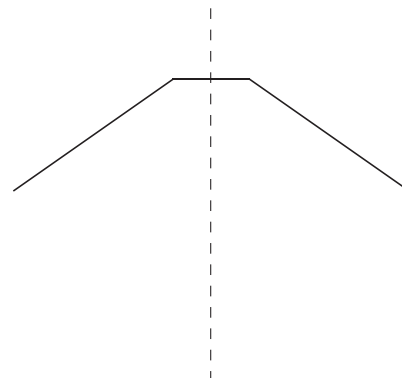
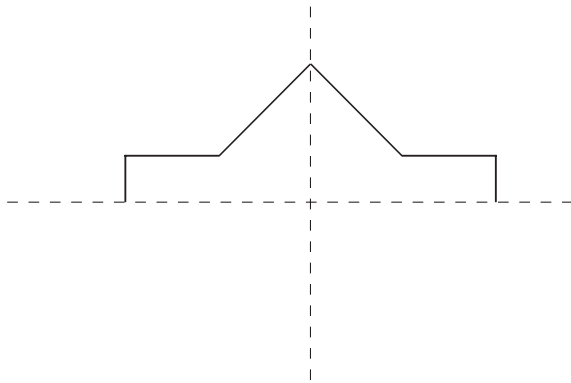
# OS 14.1

## *Lines of Symmetry*

1. Draw on each diagram all its lines of symmetry.



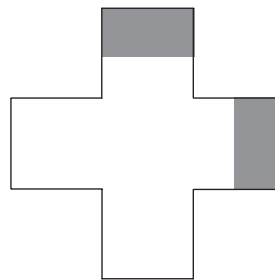
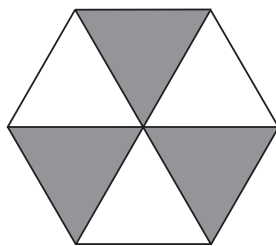
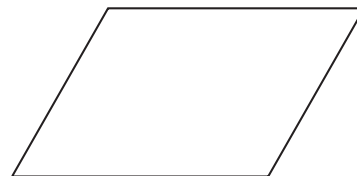
2. Complete the diagrams so that each shape has *only* the lines of symmetry shown by the dotted lines.



# OS 14.2

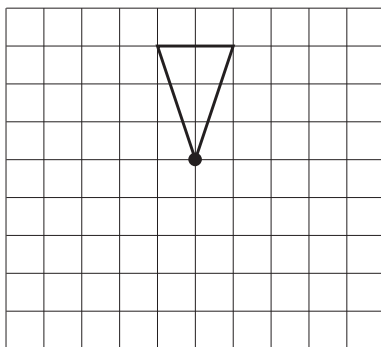
## Order of Rotational Symmetry

1. What is the order of rotational symmetry?

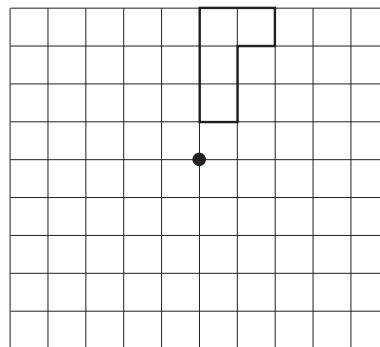


2. Complete the diagrams below so that they have the given rotational symmetry about the point.

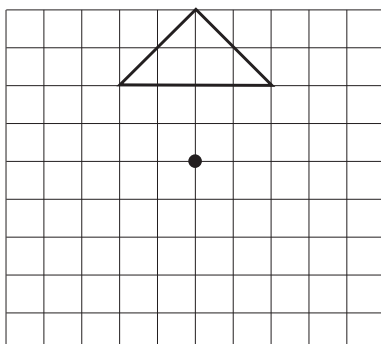
*Order 4*



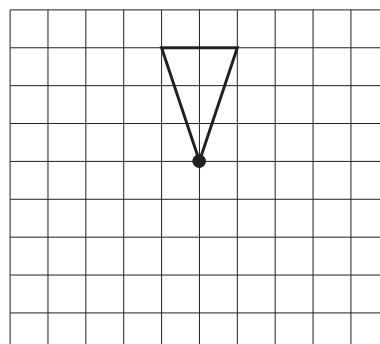
*Order 2*



*Order 4*



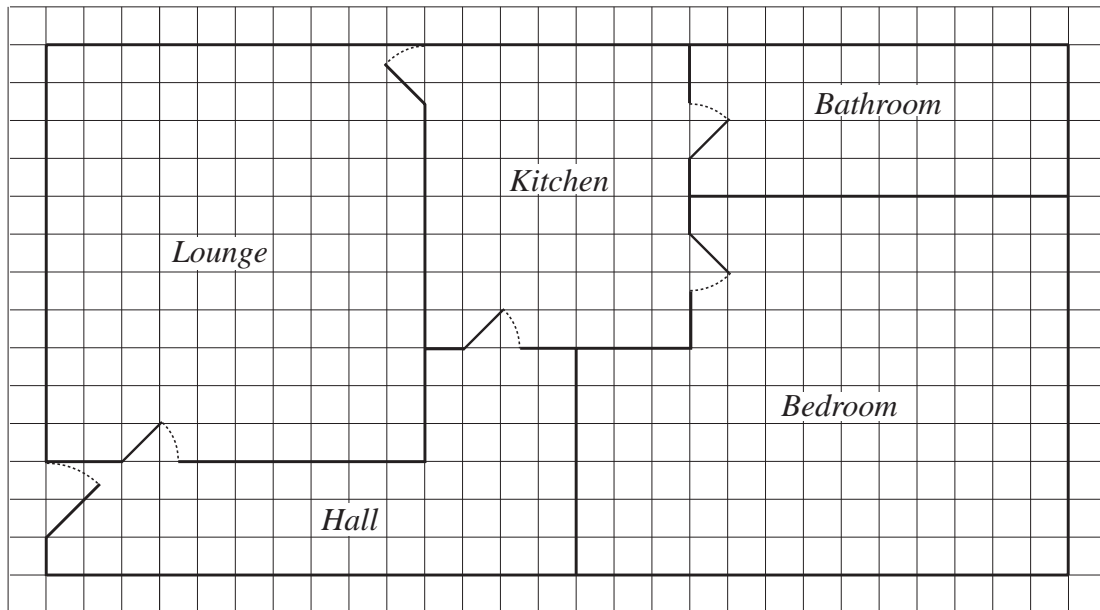
*Order 3*



## OS 14.3

*Scale Drawings*

This scale drawing of a flat is drawn to a scale of 1 in 100.

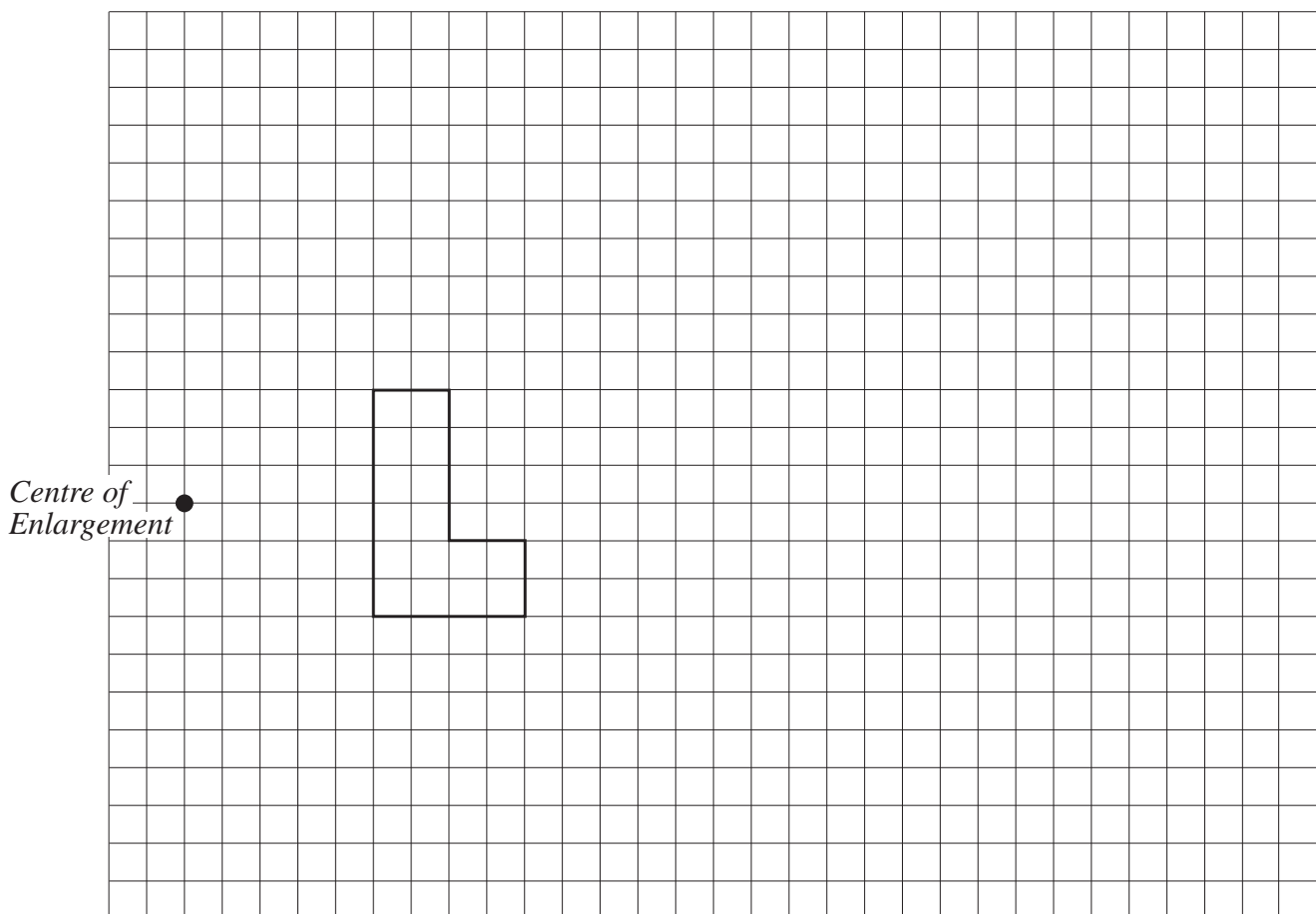


1. What is the actual size of the:
  - (a) lounge
  - (b) kitchen
  - (c) bathroom?
  
2. What is the floor area of the:
  - (a) hallway
  - (b) bedroom?
  
3. If the bath to be installed measures 1.5 m x 2 m, show a possible position for it on the scale drawing.

**OS 14.4***Enlargements*

1. Enlarge this shape using the given centre of enlargement and scale factors:

(a) 2      (b) 3.



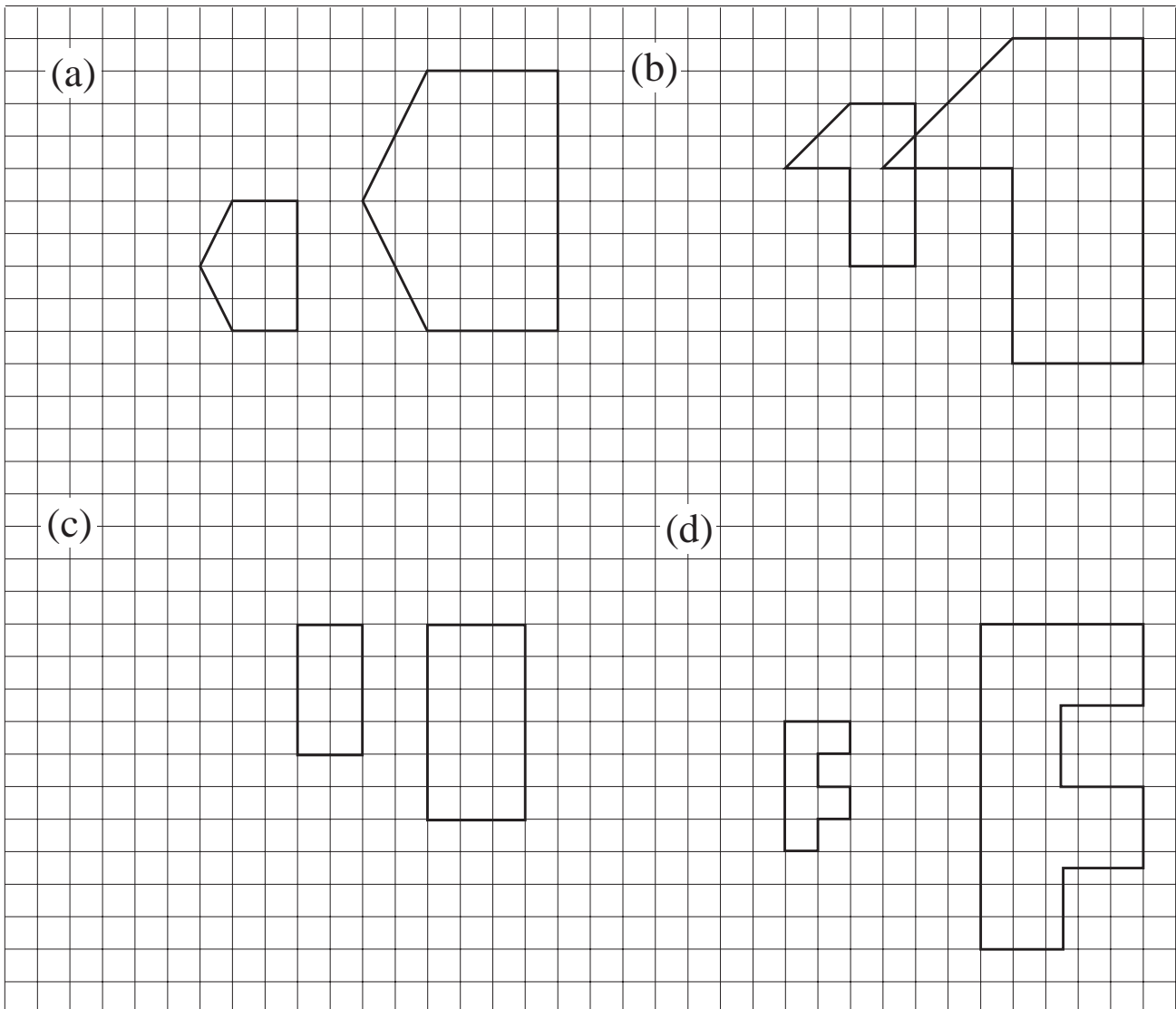
2. What is the ratio of the areas in each case?

## OS 14.5

*Finding the Centre of Enlargement*

For each of the enlarged shapes below, find:

- (i) the scale factor
- (ii) the centre of enlargement.

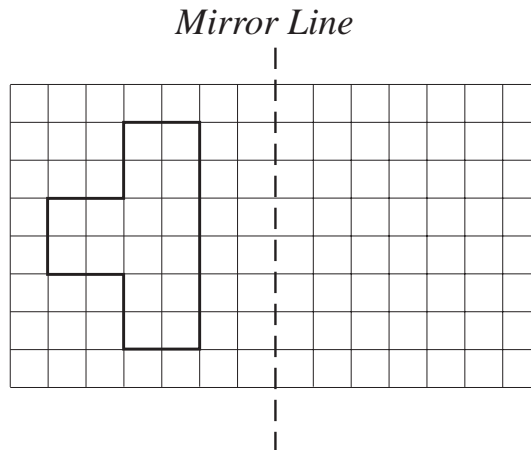


# OS 14.6

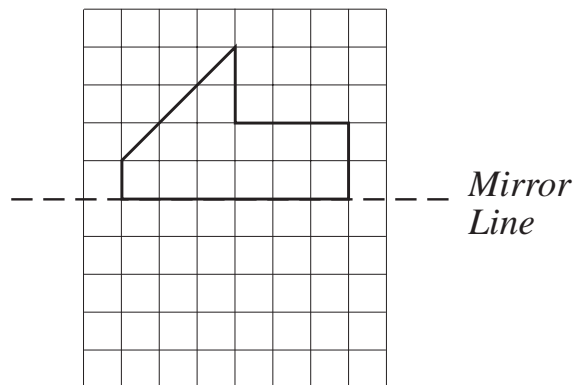
## Reflections

Reflect each of the shapes below in the given *mirror line*.

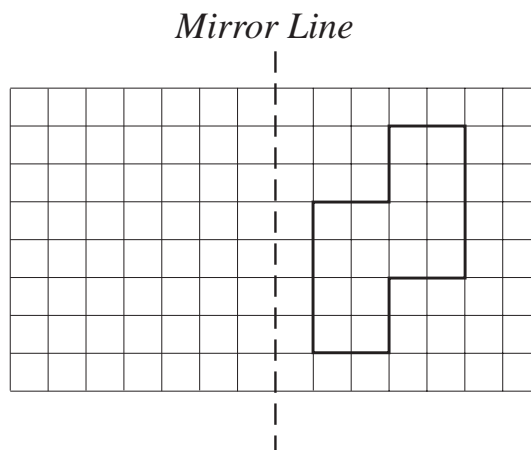
(a)



(b)



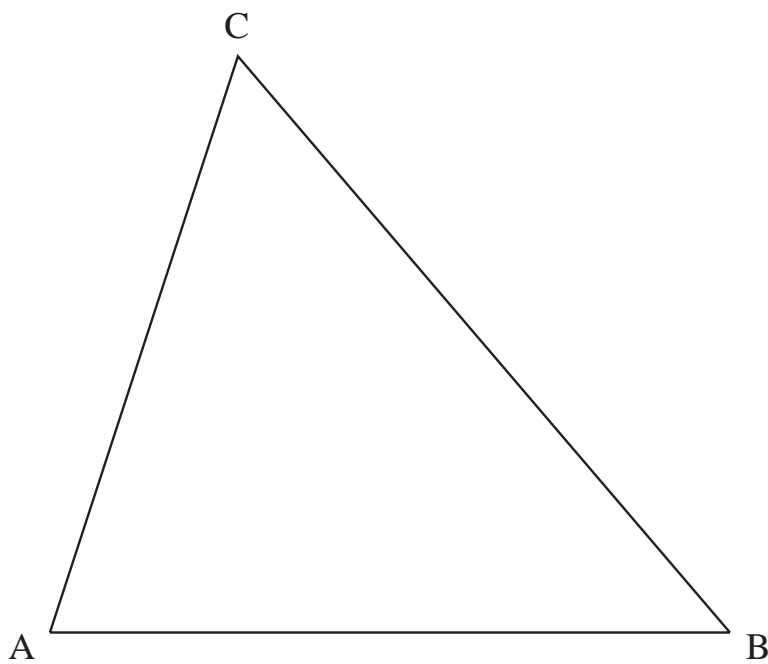
(c)



**OS 14.7***Loci 1*

On the diagram, construct and label the locus of points which are:

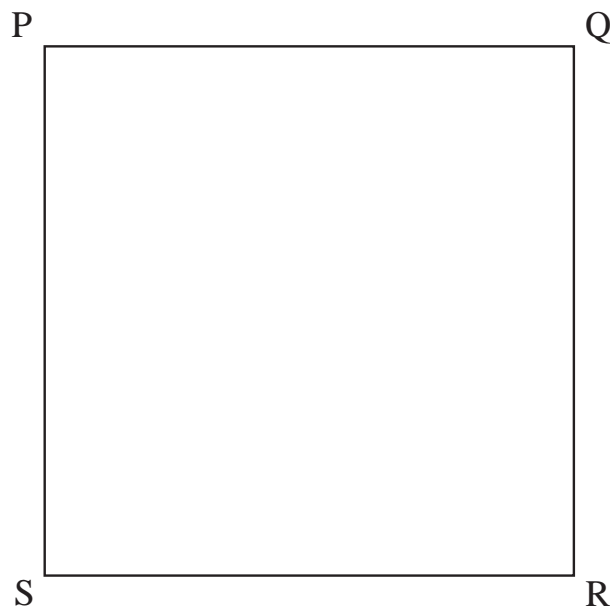
- (a) 4 cm from A
- (b) equidistant from B and C
- (c) equidistant from AB and AC.





**OS 14.8***Loci 2*

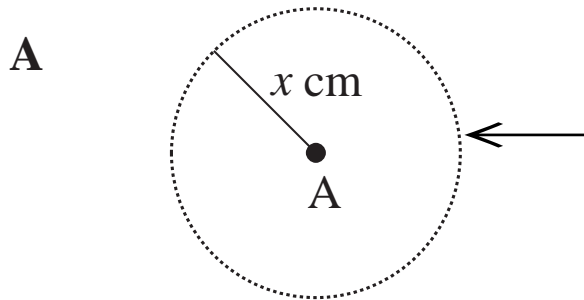
A square, PQRS, is shown below.



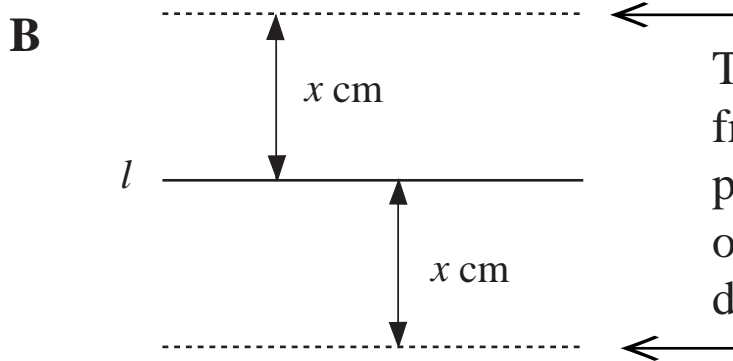
- (a) Construct the locus of points which are 4 cm from S.
- (b) Construct the locus of points inside the square which are 4 cm from PQ.
- (c) Mark, and label clearly, a point X inside the square such that  $XS = 4 \text{ cm}$  and X is 4 cm from PQ.  
Measure and write down the length of PX.

# OS 14.9

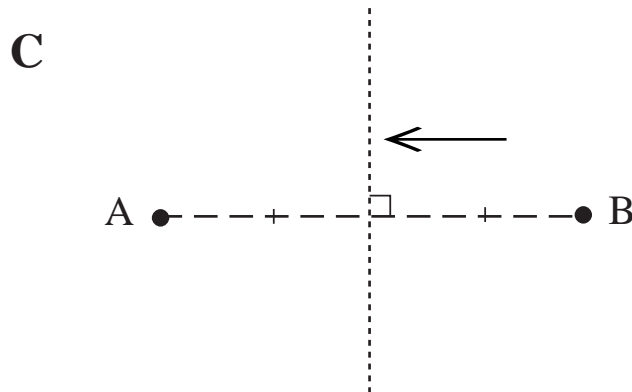
## Important Loci



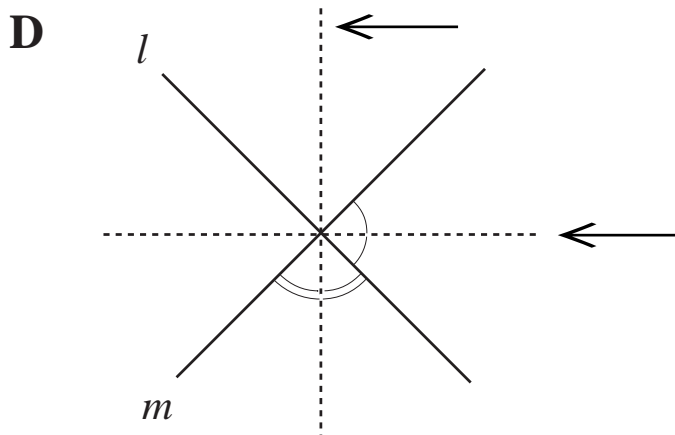
The locus of a point  $x$  cm from a given point  $A$  is a circle with centre  $A$  and radius  $x$  cm.



The locus of a point  $x$  cm from a given line  $l$  is a pair of parallel lines, one on each side of  $l$ , and at a distance  $x$  cm from  $l$ .



The locus of a point equidistant from two given points  $A$  and  $B$  is the perpendicular bisector of the line segment  $AB$ .

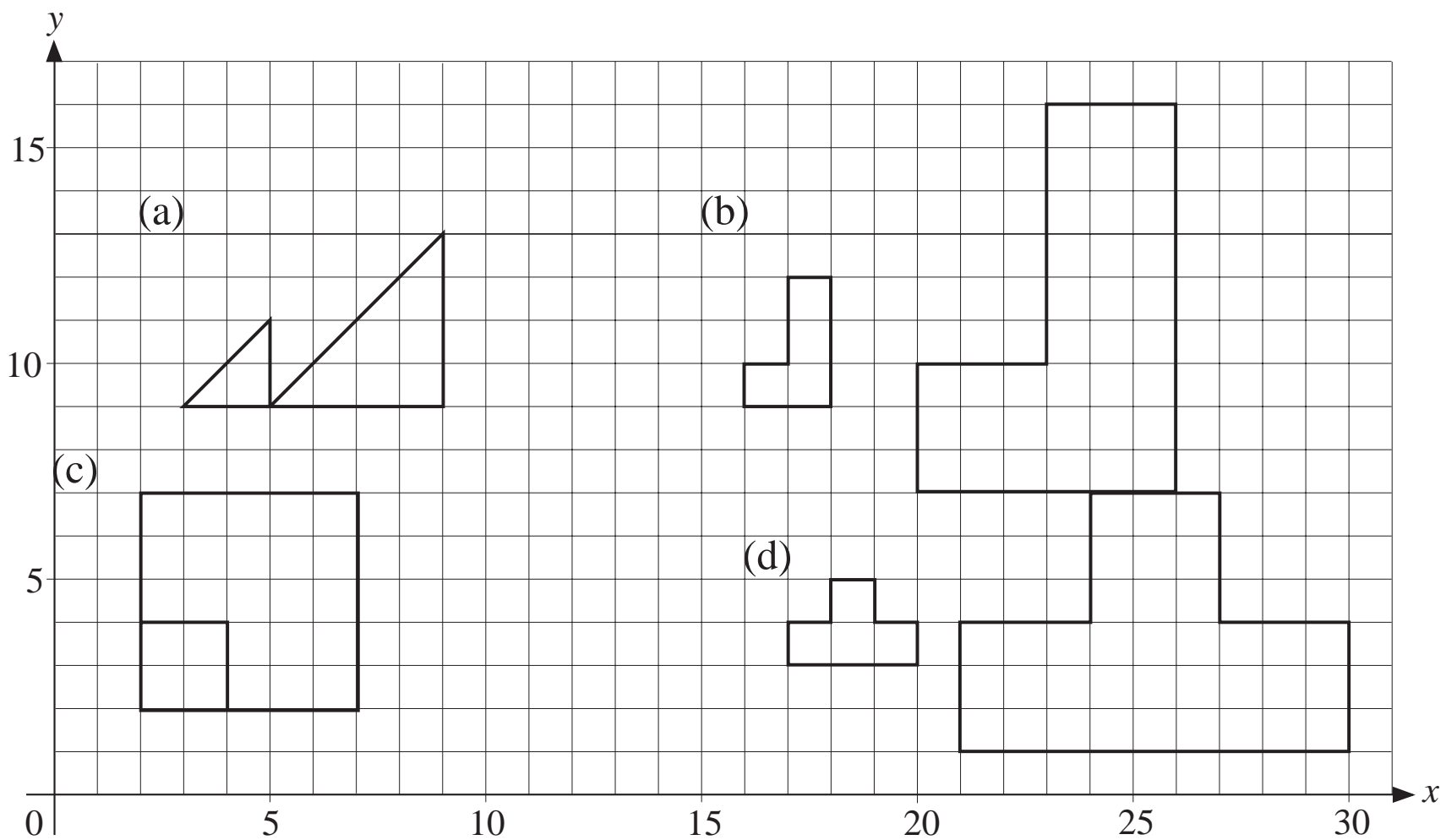


The locus of a point equidistant from two given intersecting lines,  $l$  and  $m$ , is a pair of perpendicular lines bisecting the angles between  $l$  and  $m$ .

## OS 14.10

*Enlargements which Reduce 1*

1. What is the scale factor of each of the enlargements?
2. What are the coordinates of the centres of enlargement?



## OS 14.11

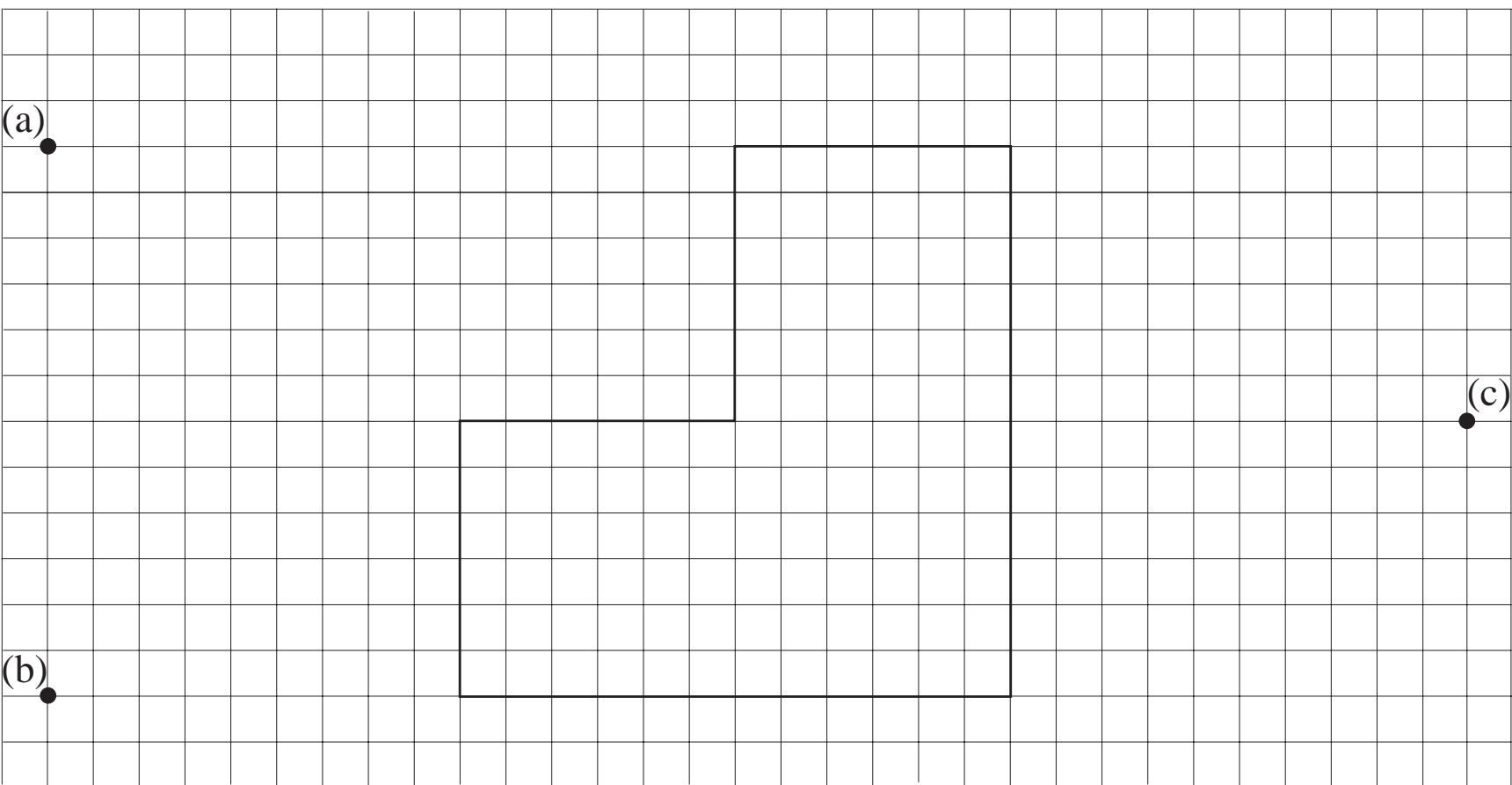
*Enlargements which Reduce 2*

For the shape below, use each of the centres of enlargement shown and the specified scale factors to find new shapes.

(a) Scale factor  $\frac{2}{3}$

(b) Scale factor  $\frac{1}{3}$

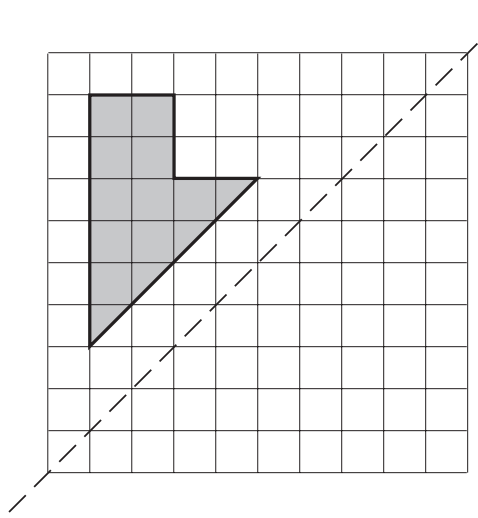
(c) Scale factor  $\frac{1}{2}$



# OS 14.12

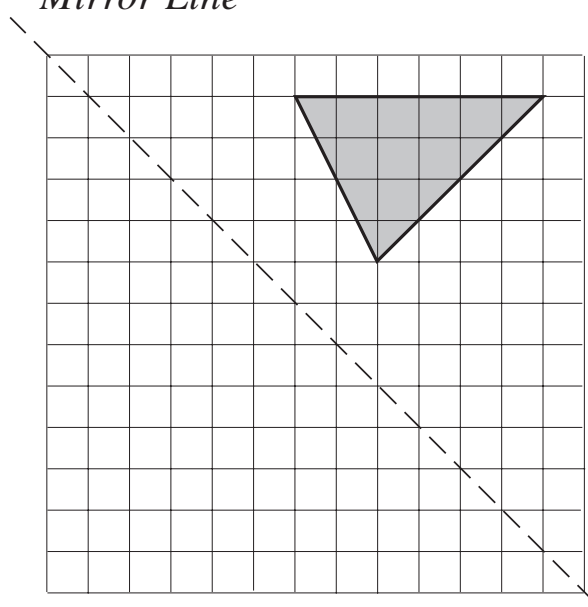
## Reflections in Oblique Lines

**A**



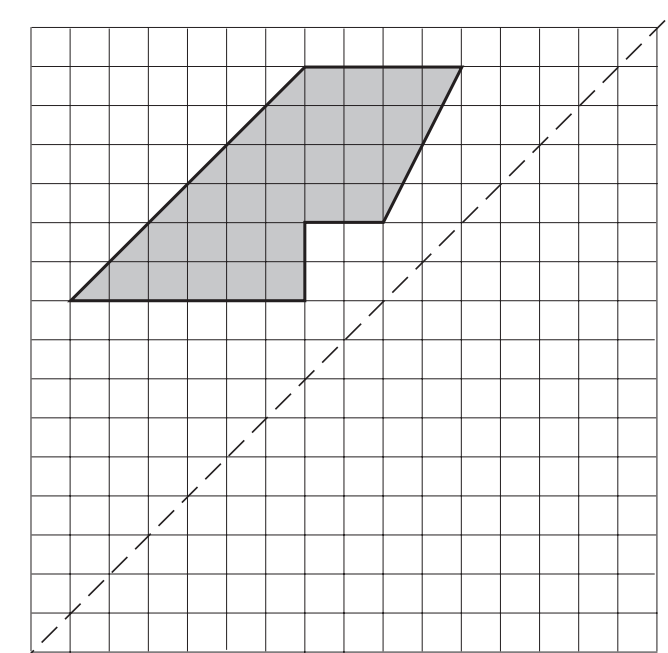
*Mirror Line*

**B**



*Mirror Line*

**C**



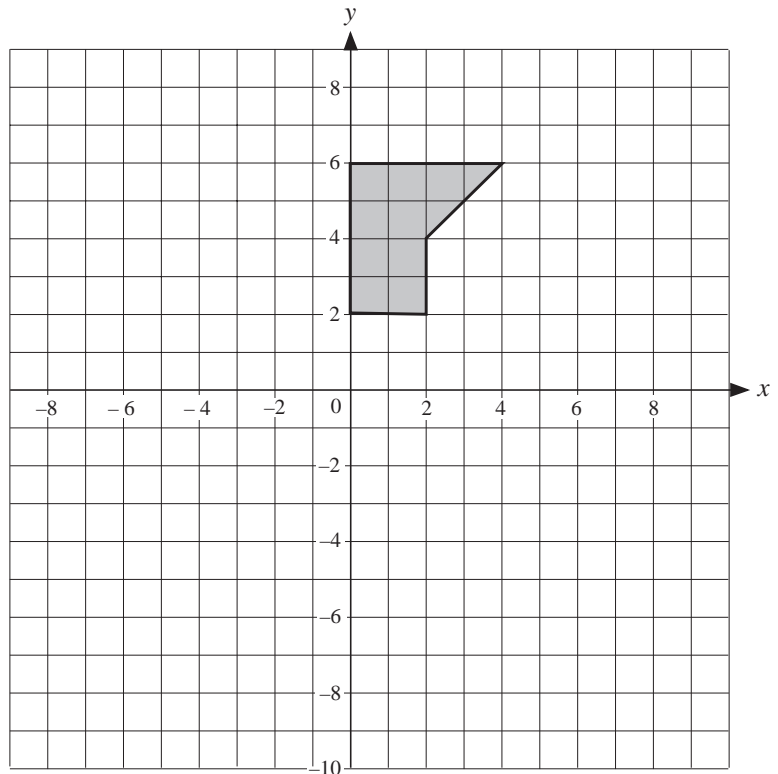
*Mirror Line*

Detailed description of diagrams A, B, and C: Each diagram shows a shaded polygon on a 10x10 grid. A dashed line, labeled 'Mirror Line', is drawn at a 45-degree angle. In diagram A, the mirror line passes through the bottom-left corner of the grid. The shaded polygon is an L-shape with vertices at (1,1), (1,4), (2,4), (2,5), (3,5), and (3,1). In diagram B, the mirror line passes through the top-left corner. The shaded polygon is an inverted triangle with vertices at (6,6), (7,6), (7,9), and (8,6). In diagram C, the mirror line passes through the bottom-left corner. The shaded polygon has vertices at (1,4), (1,6), (2,6), (2,7), (3,7), (3,8), (4,8), (4,9), (5,9), (5,6), and (5,4).

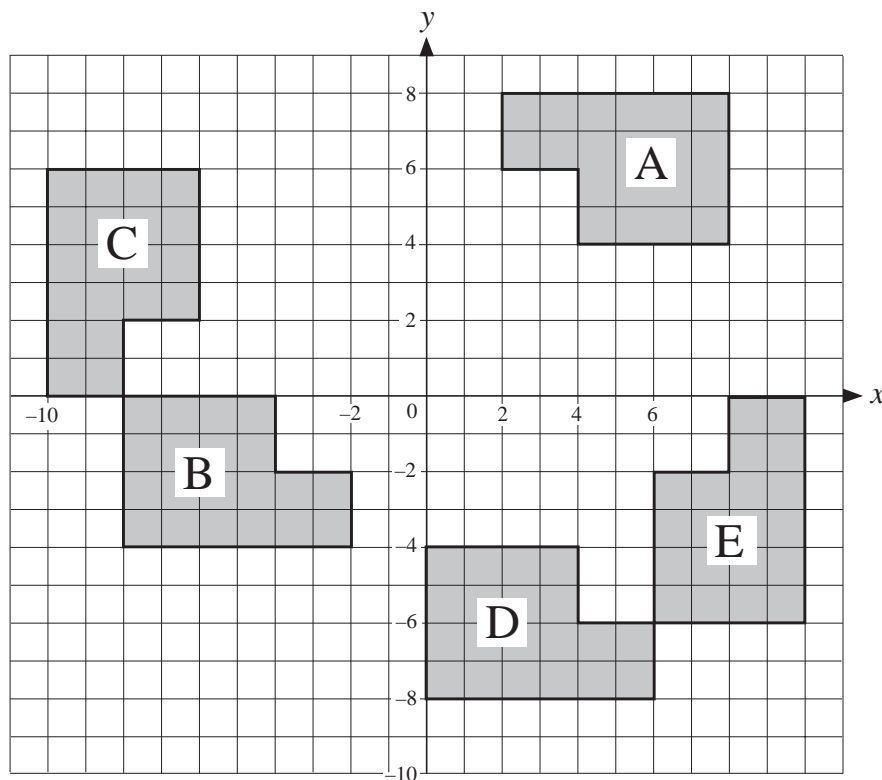
# OS 14.13

## Rotations

1. Rotate this shape clockwise through  $90^\circ$ ,  $180^\circ$  and  $270^\circ$  about the centre of rotation  $(0, 0)$ .



2. Shapes B, C, D and E can be transformed from A by a rotation. For each, find the centre and angle of rotation.



## OS 14.14

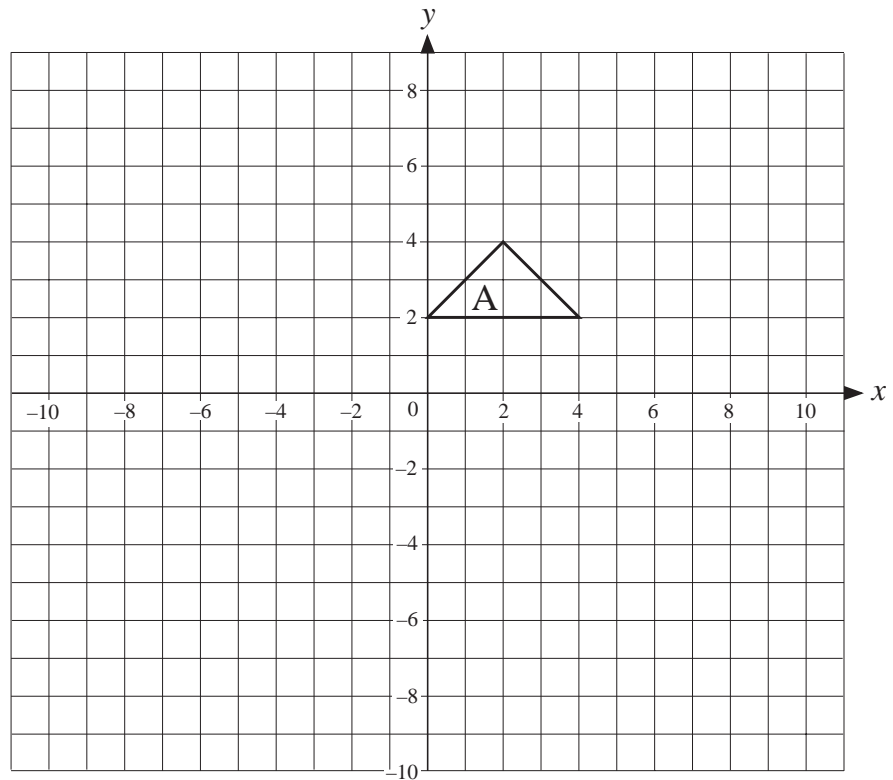
## Translations

1. Translate  
shape *A*  
using these  
translations:

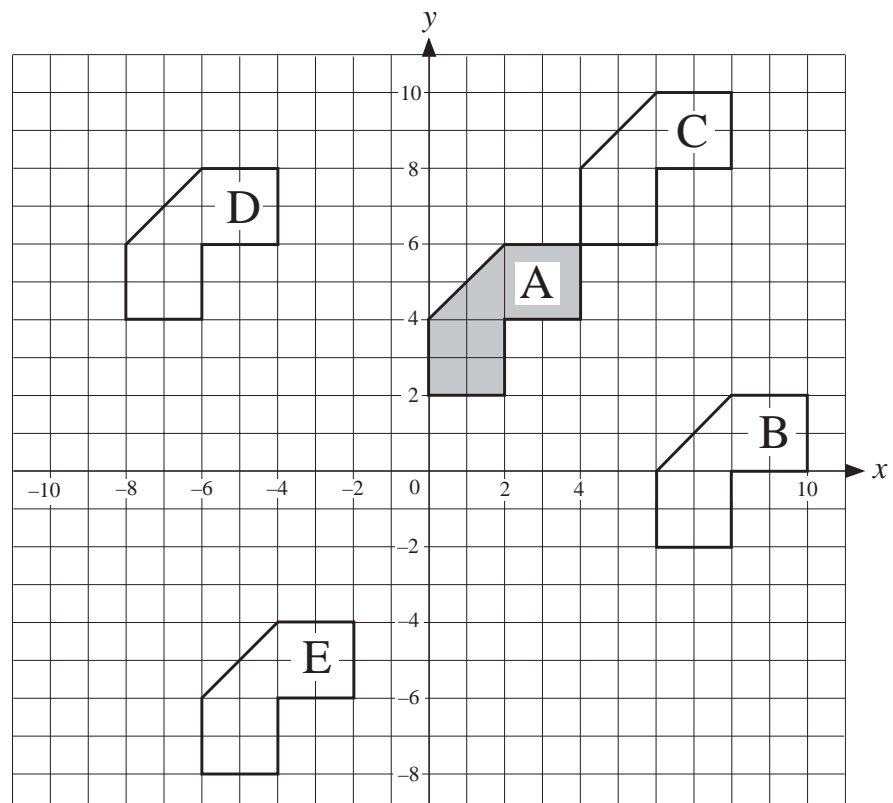
(a)  $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$

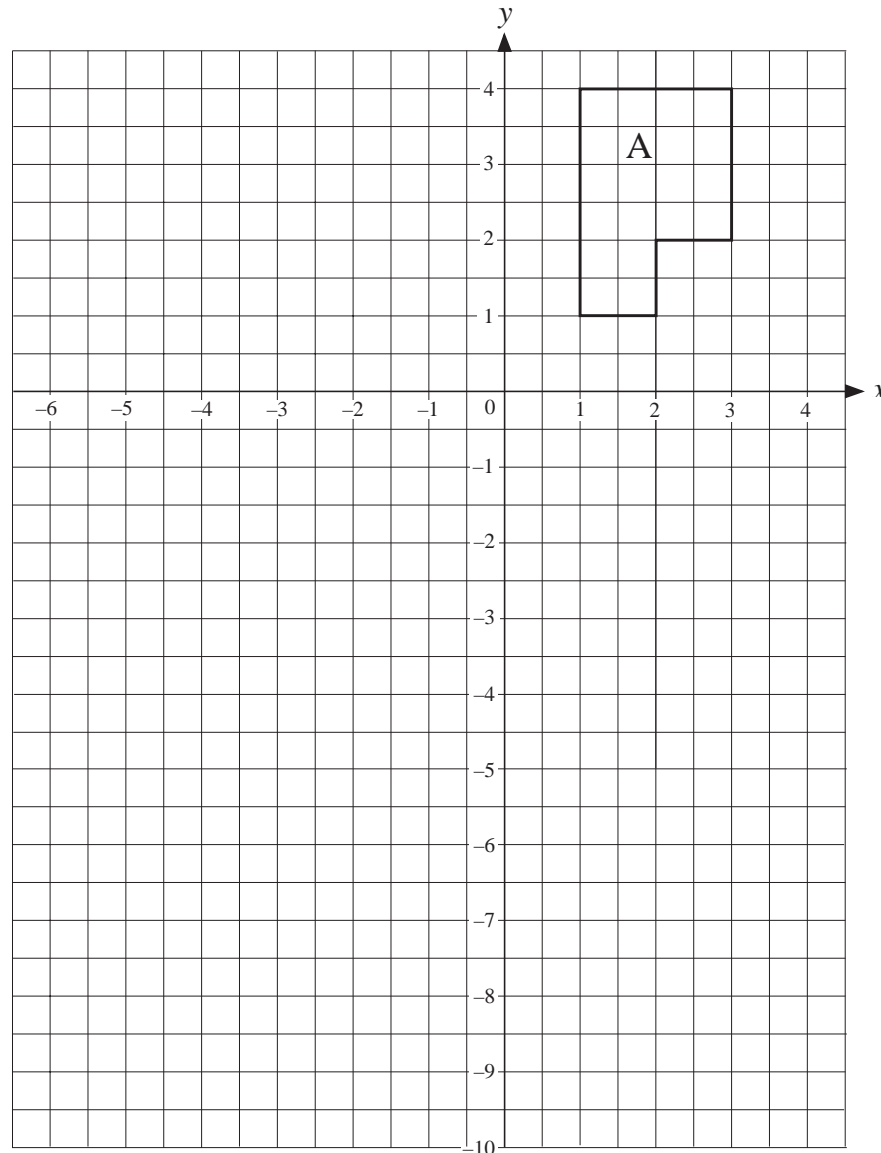
(b)  $\begin{pmatrix} -4 \\ 1 \end{pmatrix}$

(c)  $\begin{pmatrix} -2 \\ -3 \end{pmatrix}$



2. Find the translation which transforms *A* to each of *B*, *C*, *D* and *E*.



**OS 14.15***Combined Transformations*

1. (a) Reflect the given shape A in the line  $x = -1$  to obtain shape B.  
(b) Reflect the new shape B in the line  $y = -2$  to obtain shape C.  
(c) Find a single transformation to transform A to C.
2. Is it always possible to replace a rotation of  $180^\circ$  by two reflections? What about a rotation of  $90^\circ$ ?

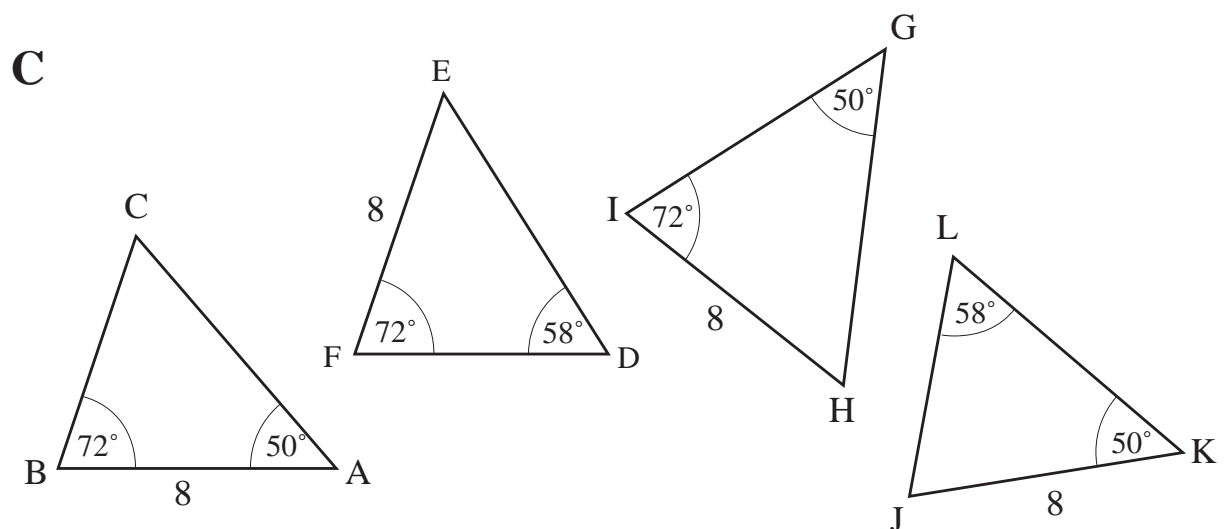
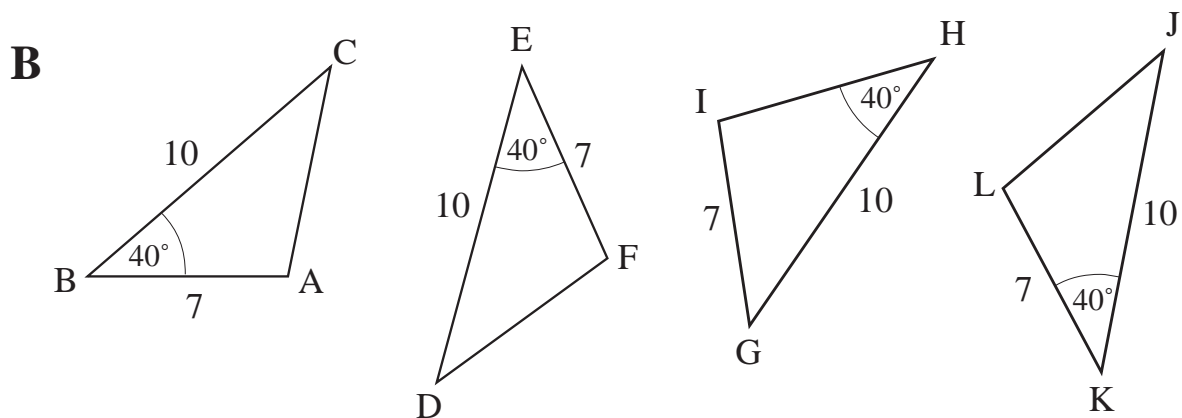
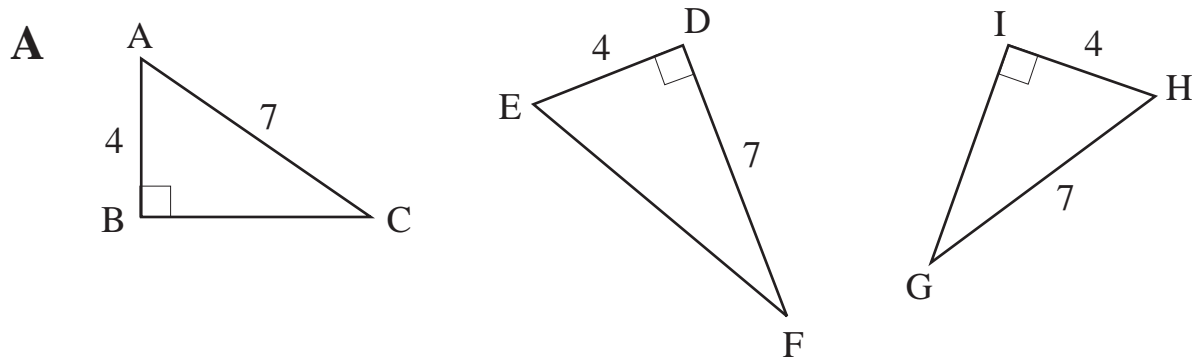


# OS 14.16

## Congruence

In each of the following, which triangles are congruent?

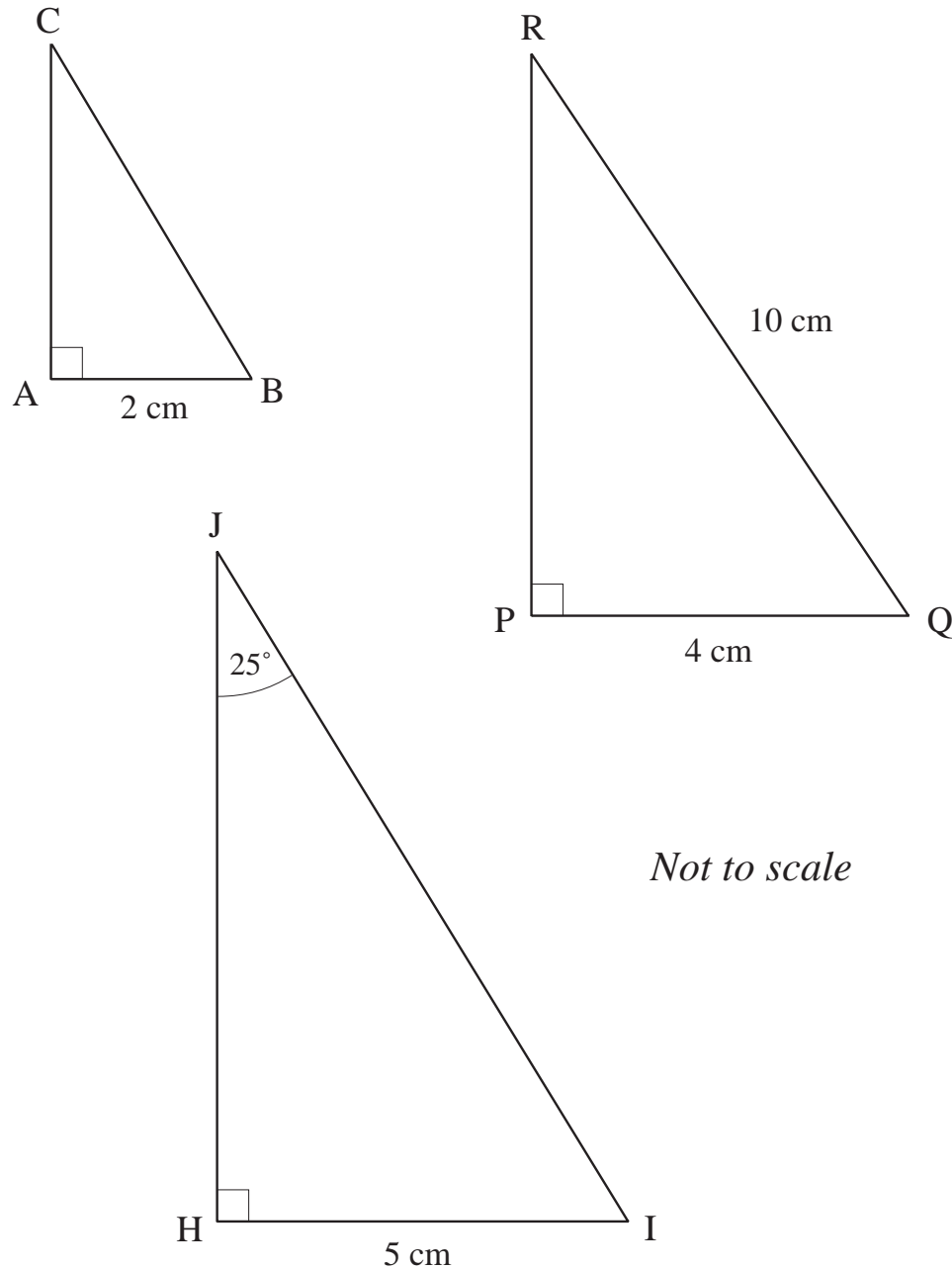
*Given lengths are in cm. Drawings are not to scale.*



## OS 14.17

## Similarity

Triangles ABC, PQR and HIJ are all *similar*.



What is:

- (a) the length of CB
- (b) the length of IJ
- (c) the size of angle PQR
- (d) the size of angle ABC?

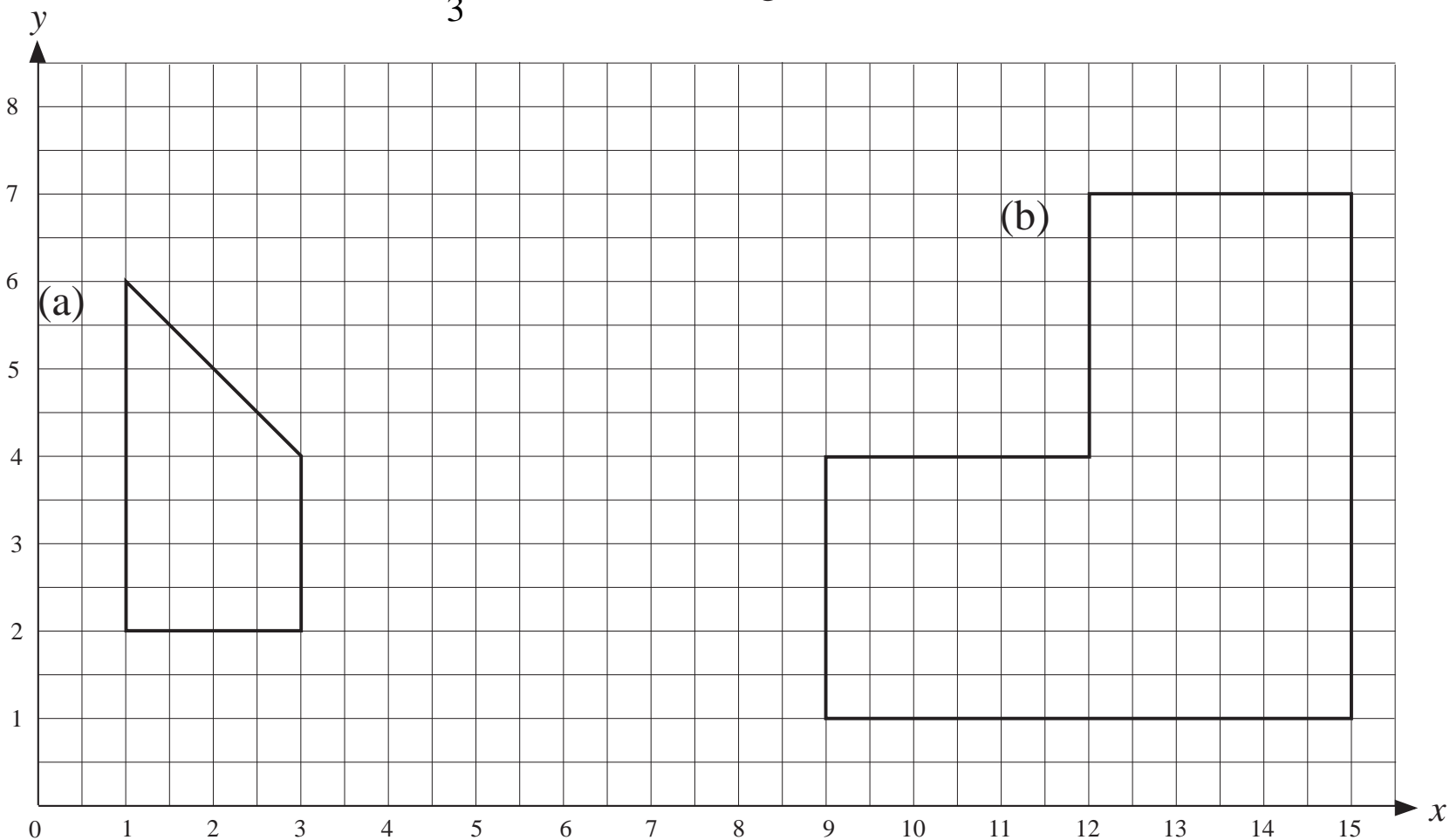
## OS 14.18

## Negative Enlargements 1

Enlarge each shape using the given scale factor and centre of enlargement:

(a) Scale factor:  $-\frac{1}{2}$ , centre of enlargement (7, 6)

(b) Scale factor:  $-\frac{2}{3}$ , centre of enlargement (13.5, 2.5)



## OS 14.19

## Negative Enlargements 2

Shapes B and C have been obtained from shape A by enlargements. In each case, find:

- (a) the scale factor      (b) the coordinates of the centre of enlargement.

