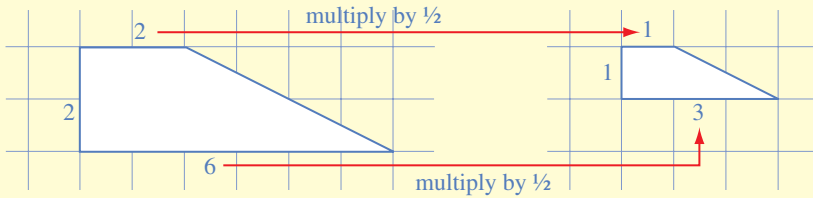


Enlargement

An **enlargement** makes the shape larger (or smaller). The original and the enlargement must be exactly the same shape. All angles in both shapes stay the same.

Note

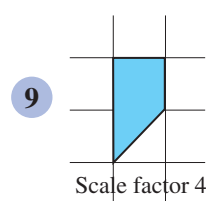
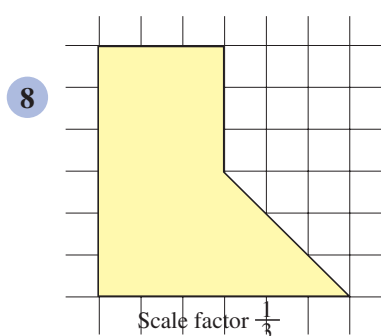
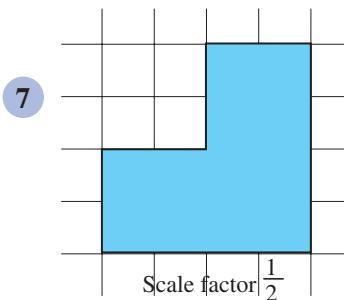
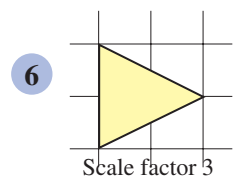
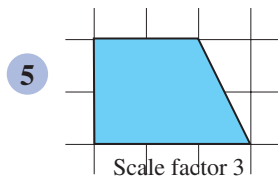
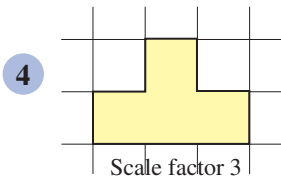
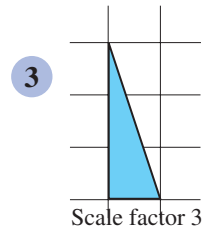
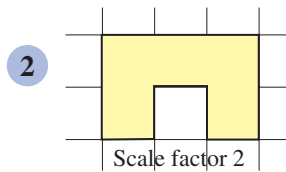
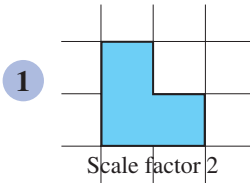
Enlarge this shape by a scale factor $\frac{1}{2}$



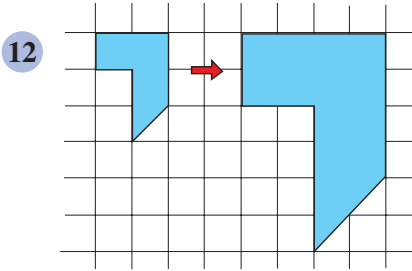
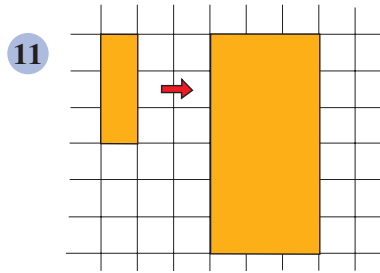
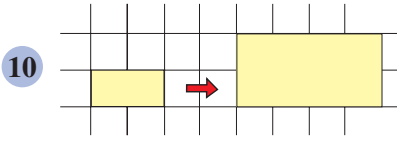
The shape gets smaller when the scale factor is a fraction between 0 and 1.

M8. 6

Enlarge these shapes by the scale factor given. Make sure you leave room on your page for the enlargement!



Look at each of the following pairs of diagrams and decide whether or not one diagram is an enlargement of the other. For each Question write the scale factor of the enlargement or write 'not an enlargement'.

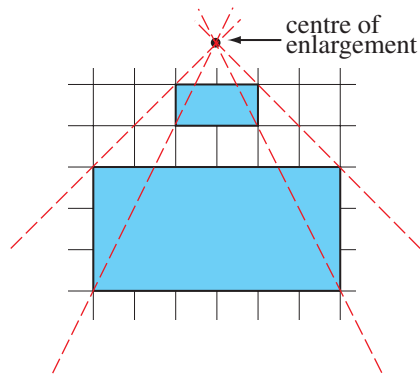


Centre of enlargement

A *mathematical enlargement* always has a centre of enlargement as well as a scale factor.

The centre of enlargement is formed by drawing a broken line through a corner of the new shape and the same corner of the old shape.

Do this for each pair of points as shown in the diagram.



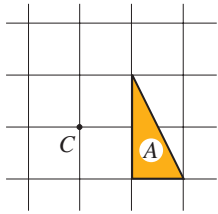
The centre of enlargement is the point where all the broken lines meet (intersect).

We need 2 things to describe fully an enlargement:

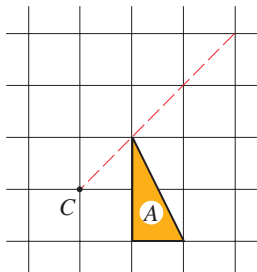
1. the **scale factor**
2. the **centre of enlargement**

Drawing an enlargement

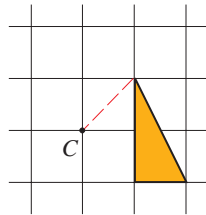
Draw an enlargement of triangle *A* with scale factor 3 about the centre of enlargement *C*.



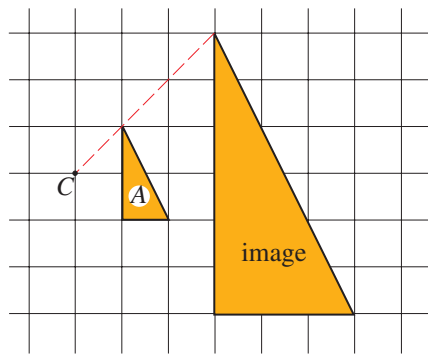
Join the centre *C* to one vertex (corner) with a dotted line



This shows where the top vertex will move to

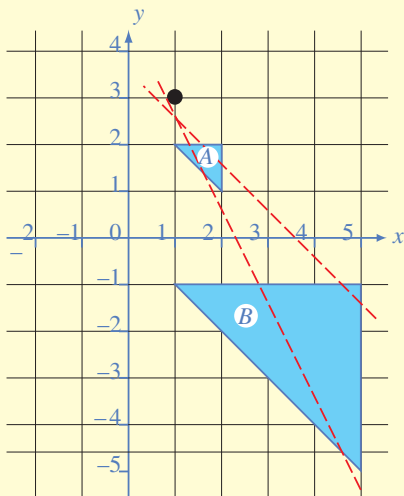


Multiply the length of the dotted line by the scale factor (do this by measuring or by counting squares) then draw the longer dotted line from *C*



The rest of the enlarged shape can be drawn from this new vertex.

Describe fully the enlargement which transforms shape *A* onto shape *B*.



Draw broken lines through each corner of the new shape and the same corner of the old shape.

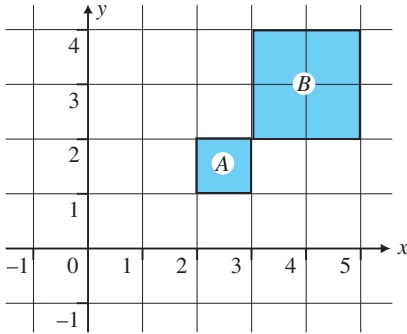
The centre of enlargement is where the broken lines meet (intersect).

Answer: enlargement by scale factor 4 about (1,3).

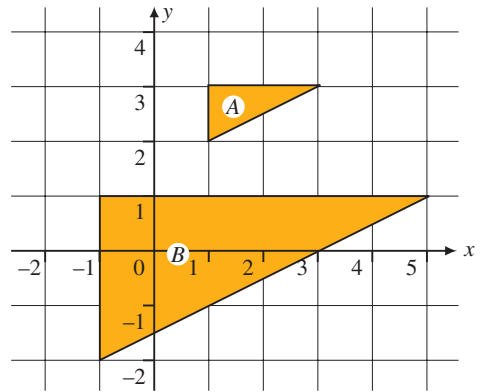
M8. 6

For Questions 1 to 5, draw the grid and the 2 shapes then draw broken lines through pairs of points in the new shape and the old shape. Describe *fully* the enlargement which transforms shape A onto shape B.

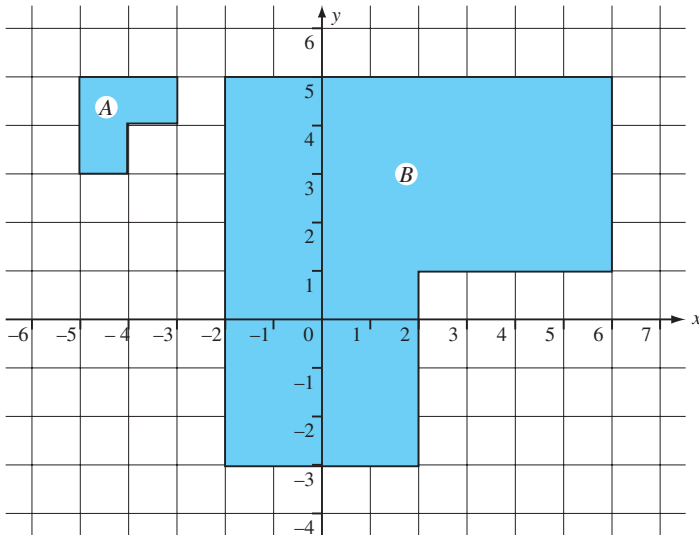
1



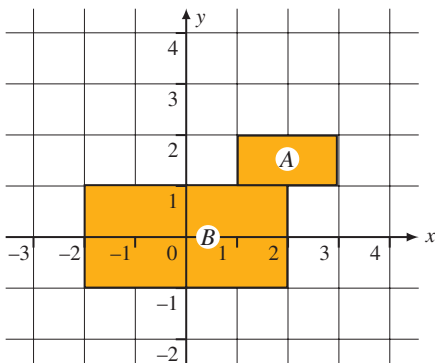
2



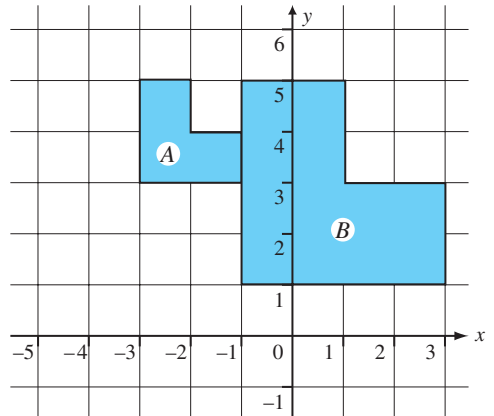
3



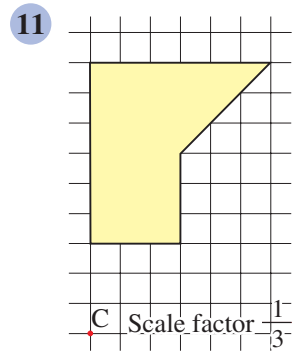
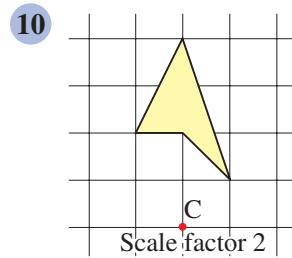
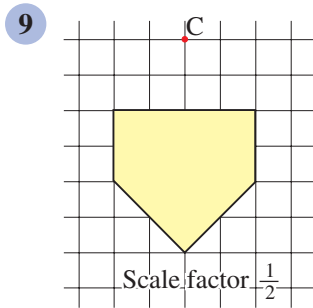
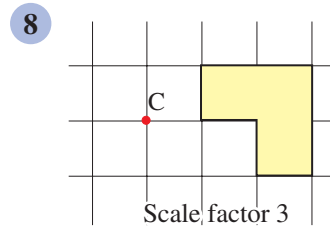
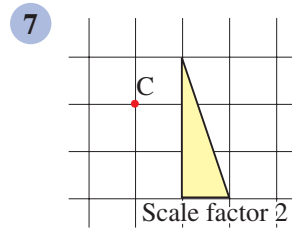
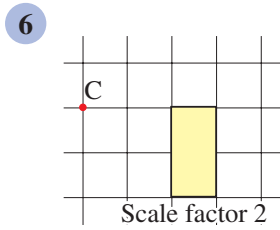
4



5

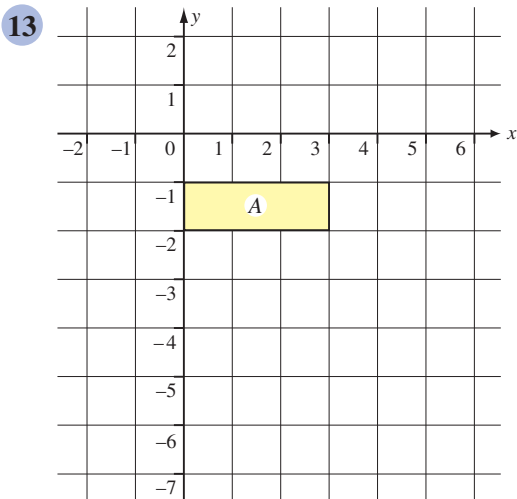


For Questions 6 to 11, copy the diagram and then draw an enlargement using the scale factor and centre of enlargement (C) given.
Leave room for the enlargement!



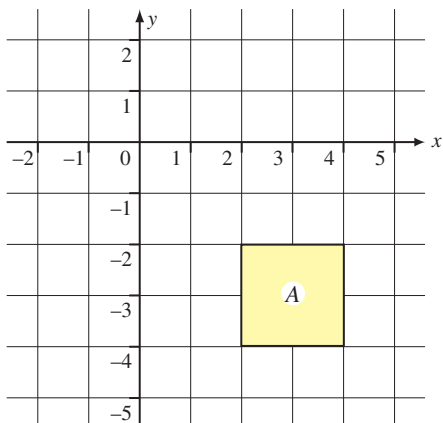
12 Look at your diagram for Question 8

- Write down the area of the original shape.
- Write down the area of the enlarged shape.
- How many times bigger is the area of the enlarged shape? Compare this to the scale factor.



- Copy the grid and rectangle A. Enlarge rectangle A by scale factor 2 about (0, 0). Label the image B.
- Write down the area of A.
- Write down the area of B.
- How many times bigger is the area of B? Compare this to the scale factor.

14



Copy the grid and square A

Enlarge square A by scale factor $\frac{1}{2}$ about $(0, 0)$

Label the image B

15

(a) Draw the x -axis from -4 to 8 . Draw the y -axis from -4 to 6 .

Draw the triangle A with vertices (corners) at $(1, 3)$, $(1, 4)$, $(3, 4)$.

(b) Enlarge triangle A by scale factor 2 about $(1, 5)$. Label the image B .

(c) Enlarge triangle B by scale factor $\frac{1}{2}$ about $(-3, 1)$. Label the image C .

(d) Enlarge triangle C by scale factor 3 about $(-2, 3)$. Label the image D .

16

(a) Draw the x -axis from -6 to 6 . Draw the y -axis from -7 to 7 .

Draw the triangle A with vertices at $(2, 2)$, $(2, 6)$, $(4, 6)$.

(b) Enlarge triangle A by scale factor $\frac{1}{2}$ about $(0, 0)$. Label the image B .

(c) Reflect triangle B in the y -axis. Label the image C .

(d) Enlarge triangle C by scale factor 3 about $(-1, 4)$. Label the image D .

(e) Rotate triangle D 90° clockwise about $(-1, -5)$. Label the image E .

(f) Enlarge triangle E by scale factor $\frac{1}{3}$ about $(5, 1)$. Label the image F .

Can you still?

8B Multiply and divide fractions (see Unit 5)

Can you still?

Work out (cancel the answers if possible):

1. $\frac{1}{5}$ of $\frac{1}{4}$

2. $\frac{2}{3}$ of $\frac{6}{7}$

3. $\frac{2}{5} \times \frac{1}{8}$

4. $\frac{3}{4} \times \frac{5}{9}$

5. $\frac{1}{4} \times \frac{8}{9}$

6. $\frac{4}{5} \times \frac{10}{11}$

7. $\frac{3}{4} \times 28$

8. $\frac{2}{7} \times 21$

9. $\frac{1}{9} \div \frac{1}{5}$

10. $\frac{1}{3} \div \frac{4}{5}$

11. $\frac{3}{8} \div \frac{3}{10}$

12. $\frac{7}{9} \div \frac{5}{6}$

13. $\frac{3}{4} \div \frac{7}{8}$

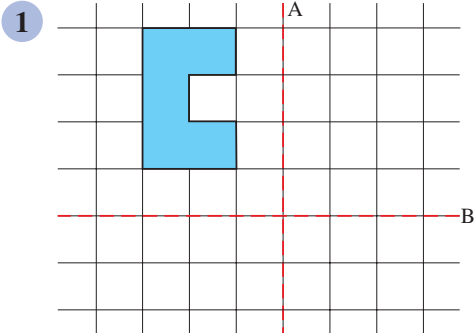
14. $\frac{5}{9} \div 3$

15. $\frac{3}{5} \div 2$

16. $\frac{2}{11} \div \frac{4}{5}$

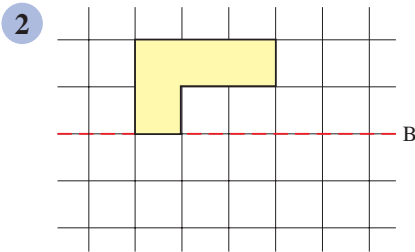
M8. 7

You may use tracing paper.



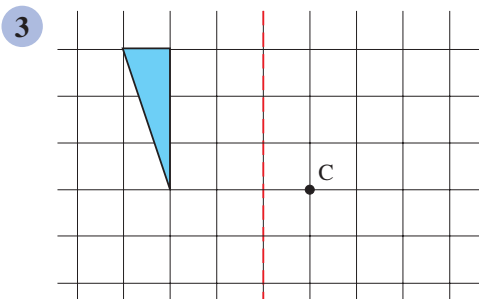
Copy the shape and the mirror lines.

- Reflect the shape in mirror line A .
- Reflect the image (new shape) in mirror line B .



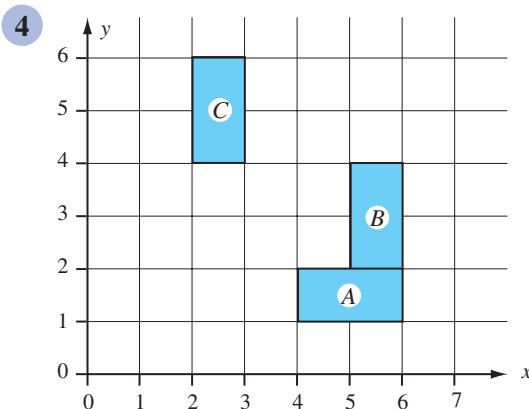
Copy the shape and the mirror line.

- Reflect the shape in the mirror line.
- Translate the image (new shape) 3 units to the right and 1 unit up.



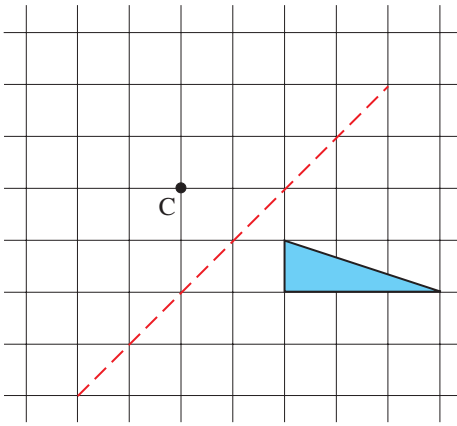
Copy the shape and the mirror line.

- Reflect the shape in the mirror line.
- Rotate the image 90° clockwise about the point C .



- Describe *fully* the rotation which moves shape A onto shape B .
- Describe *fully* the translation which moves shape B onto shape C .

5



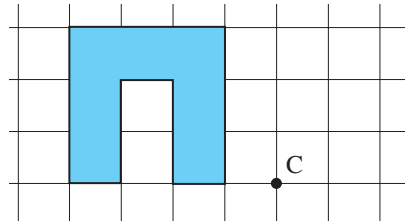
Copy the shape and the mirror line.

- Reflect the shape in the mirror line.
- Rotate the image 90° anticlockwise about the point C .

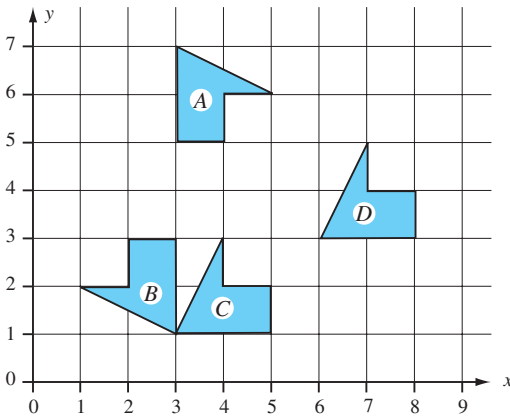
6

Copy the shape.

- Rotate the shape 180° about the point C .
- Translate the image 4 units to the left and 2 units down.



7



- Describe *fully* the rotation which moves shape A onto shape B .
- Describe *fully* the rotation which moves shape B onto shape C .
- Describe *fully* the translation which moves shape C onto shape D .

Can you still?

8C

Multiply out brackets and collect like terms (see Unit 4)

Simplify

1. $3(x + 4)$

2. $5(2x - 3)$

3. $4(3x + 6) + 2$

4. $4(2x + 1) + 7$

5. $3(x + 2) + 2(x + 3)$

6. $4(3x + 4) + 3(2x + 3)$

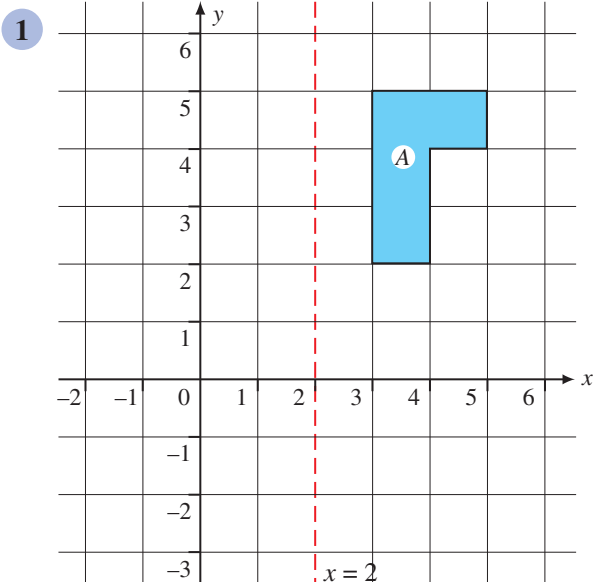
7. $8x + 5 + 4(3x - 1)$

8. $2(5x + 2) - 3(2x - 4)$

9. $5(x + 4) + 2(3x - 5)$

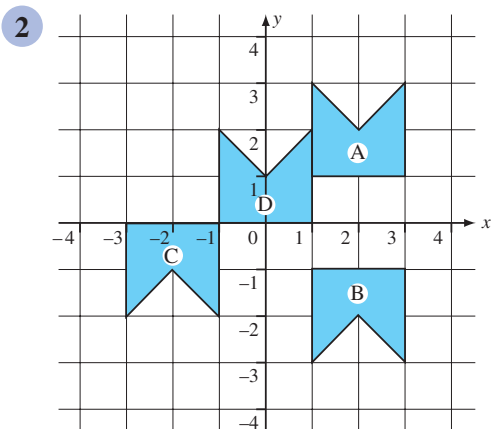
Can you still?

You may use tracing paper.



Copy the grid and shape opposite.

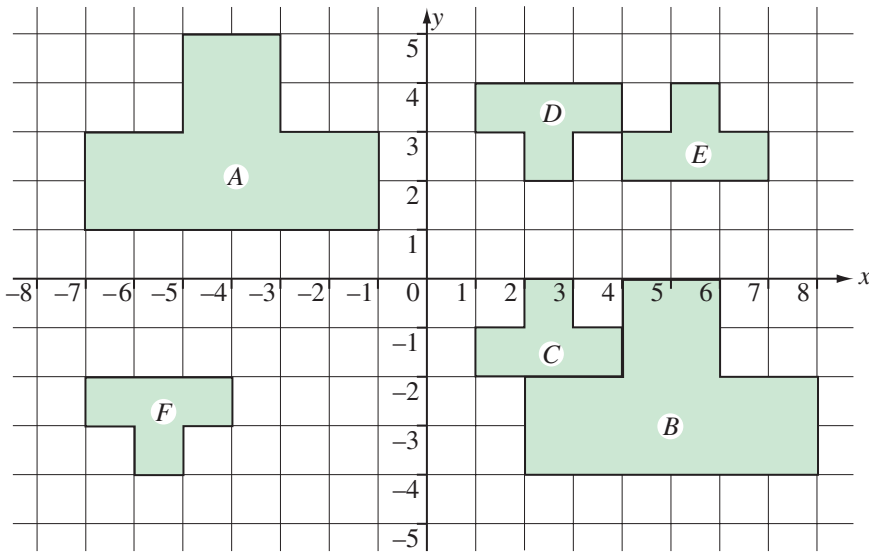
- Reflect shape A in the line $x = 2$. Label the image B .
- Reflect shape B in the line $y = 1$. Label the image C .
- Rotate shape C 90° clockwise about $(1, -3)$. Label the image D .



- Describe *fully* the transformation which transforms shape A onto shape B .
- Describe *fully* the transformation which transforms shape B onto shape C .
- Describe *fully* the transformation which transforms shape C onto shape D .
- Describe *fully* the transformation which transforms shape D onto shape A .

- 3
- Draw the x -axis from -4 to 8 .
Draw the y -axis from -5 to 5 .
Draw triangle A with vertices of $(1, 1)$, $(1, 2)$, $(3, 2)$.
 - Enlarge triangle A by scale factor 2 about $(0, 0)$. Label the image B .
 - Rotate triangle B 90° anticlockwise about $(6, 4)$. Label the image C .
 - Translate triangle C through $\begin{pmatrix} -1 \\ -4 \end{pmatrix}$. Label the image D .
 - Reflect triangle D in the line $x = 3$. Label the image E .
 - Rotate triangle E 90° clockwise about $(1, 0)$. Label the image F .

4



Describe *fully* the transformation which moves:

- (a) shape *A* onto shape *B* (b) shape *B* onto shape *C*
 (c) shape *C* onto shape *D* (d) shape *D* onto shape *E*
 (e) shape *E* onto shape *F*

5

- (a) Draw the *x*-axis from -5 to 10 .

Draw the *y*-axis from -8 to 5 .

Draw shape *A* with vertices at $(2, 2)$, $(2, 4)$, $(3, 3)$, $(5, 3)$, $(5, 2)$.

- (b) Rotate shape *A* 180° about $(3, 1)$. Label the image *B*.
 (c) Enlarge shape *B* by scale factor 3 about $(1, 1)$. Label the image *C*.
 (d) Reflect shape *B* in the *y*-axis. Label the image *D*.
 (e) Reflect shape *D* in the line $y = 1$. Label the image *E*.
 (f) Describe *fully* the translation which moves shape *E* onto shape *A*.

6

- (a) Draw the *x*-axis from -8 to 4 .

Draw the *y*-axis from -5 to 5 .

Draw shape *A* with vertices $(-1, 2)$, $(-1, 5)$, $(-2, 5)$, $(-2, 3)$, $(-3, 3)$, $(-3, 5)$, $(-4, 5)$, $(-4, 2)$.

- (b) Rotate shape *A* 90° anticlockwise about $(-4, 1)$. Label the image *B*.
 (c) Reflect shape *B* in the line $x = -2$. Label the image *C*.
 (d) Reflect shape *C* in the *x*-axis. Label the image *D*.
 (e) Rotate shape *D* 90° clockwise about $(0, 0)$. Label the image *E*.
 (f) Describe *fully* the transformation that would move shape *E* onto shape *A*.

USE YOUR MATHS! – WHO’S WORKING NOW?

A manager has six people willing to work one weekend at the ‘Dog and Elephant’ pub.

At any one time he needs two people behind the bar, one person serving food and one person in the kitchen. This is not the case towards the end of the evening when food is no longer served.

This table shows what the six people can do which depends on their age and experience.

Name	Bar	Serving food	Kitchen
Joe			
Kate			
Ben			
Penny			
Nazrul			
Milly			

On Saturday the six people can work the hours shown below.

Name	Joe	Kate	Ben	Penny	Nazrul	Milly
Hours	8	9	5	$3\frac{1}{2}$	9	8



Task A

No person can work more than 3 hours with out taking a break of at least $\frac{1}{2}$ hour.

Make a copy of the Saturday schedule below then fill in who works where and when. It may be better to use a pencil and have a rubber handy.

Saturday schedule

12pm 1pm 2pm 3pm 4pm 5pm 6pm 7pm 8pm 9pm 10pm 11pm 12pm

Bar												
Bar												
Serving food												
Kitchen												

On Sunday five people can work the hours shown below.

Name	Joe	Kate	Ben	Penny	Milly
Hours	6	5	2	6	6

Task B

On Sunday the pub is shut between 3 pm and 7 pm. Make a copy of the Sunday schedule below then fill in who works where and when. *Remember n pers n can w rk m re than 3 h urs with ut taking a break f at least $\frac{1}{2}$ h ur.*

Sunday schedule

12pm 1pm 2pm 3pm 4pm 5pm 6pm 7pm 8pm 9pm 10pm 11pm 12am

Bar												
Bar												
Serving food												
Kitchen												

Rate of pay per hour	
Bar	£6.70
Serving food	£5.90
Kitchen	£5.90

Task C

Using your schedules, work out how much each of the six people earn during this weekend.

Their total pay should add up to £428.65

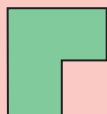
Task D

Get a partner to check through your two schedules to make sure you have not broken any rules.

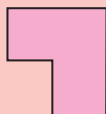
TEST YOURSELF ON UNIT 8

1. Recognising congruent shapes

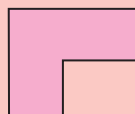
Which shapes are congruent to shape A?



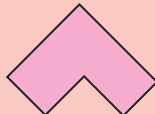
A



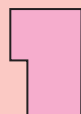
B



C

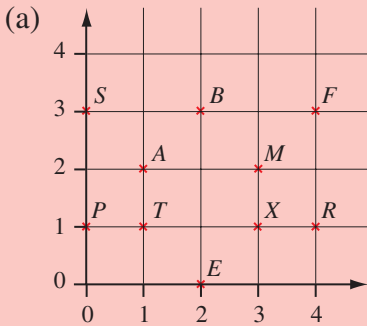


D



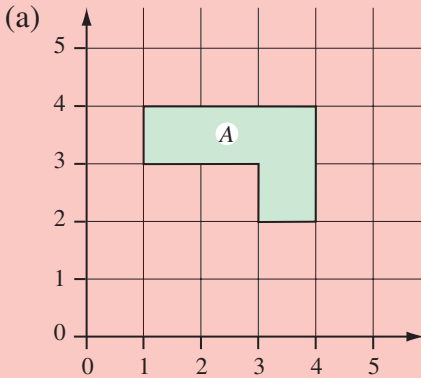
E

2. Using co-ordinates



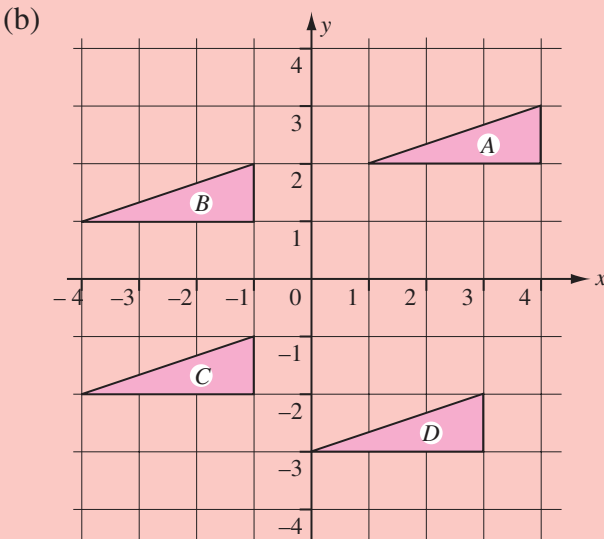
Write down the co-ordinates of each letter that spells the word A X E S

3. Translating shapes



Copy the grid opposite and draw the shape shown.

- Translate shape *A* 1 unit to the left and 2 units down. Label the new shape *B*.
- Translate shape *B* 2 units to the right and 3 units up. Label the new shape *C*.

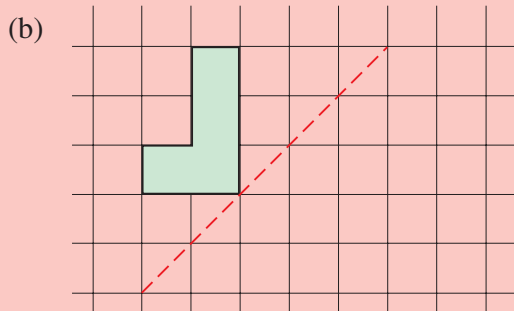
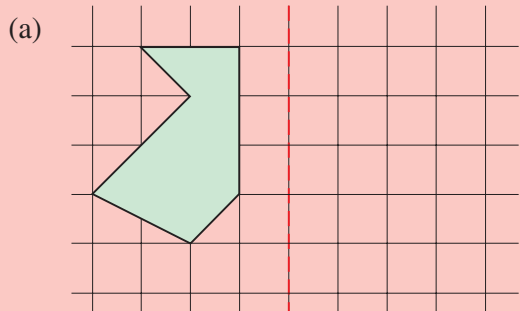


Describe the following translations.

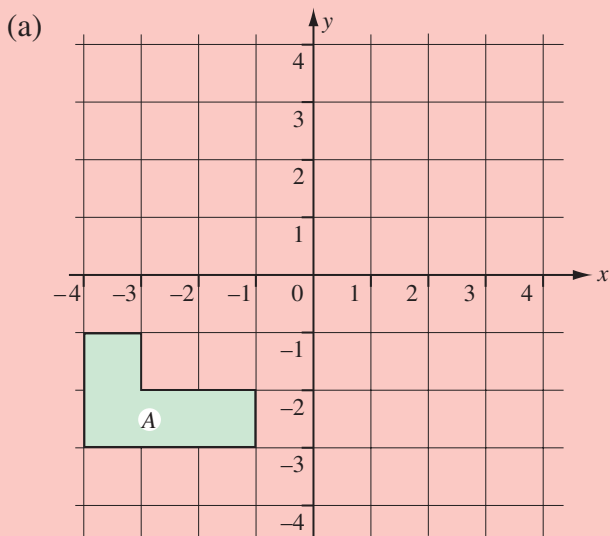
- A* to *C*
- A* to *D*
- D* to *B*
- B* to *A*

4. Reflecting shapes in mirror lines

Draw each shape below and reflect in the broken mirror line.

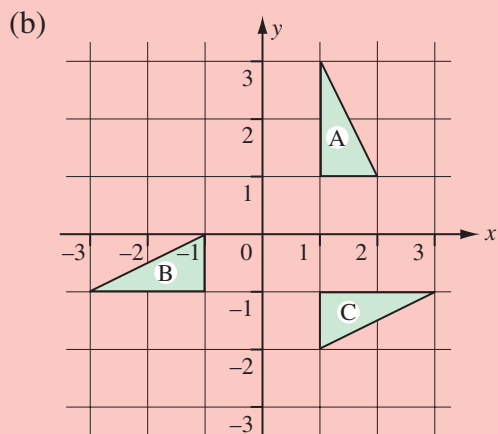


5. Rotating shapes



Copy the grid and shape *A* opposite.

- (i) Rotate shape *A* 90° anticlockwise about $(0, 0)$. Label the image *B*.
- (ii) Rotate shape *A* 180° about $(-1, -2)$. Label the image *C*.

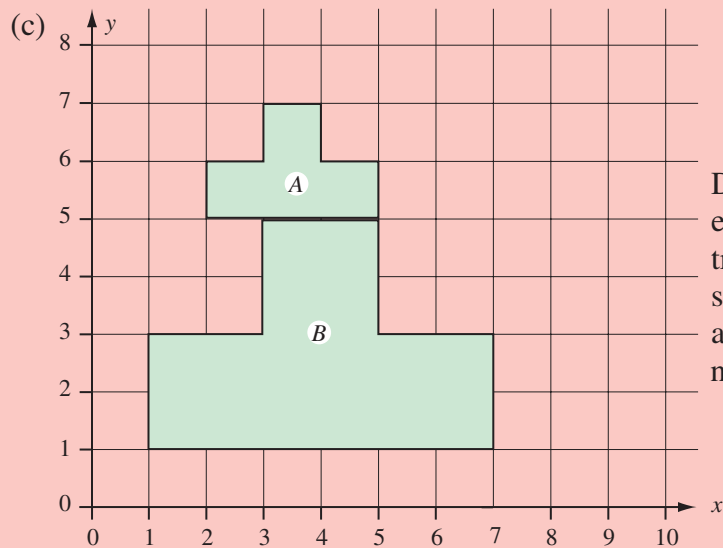
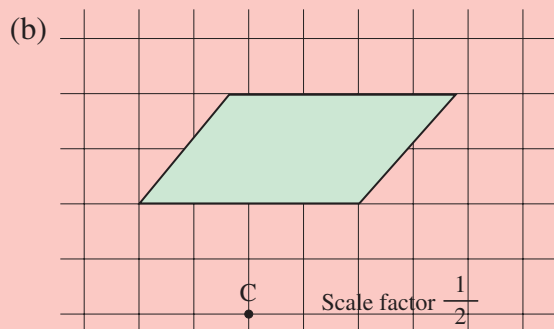
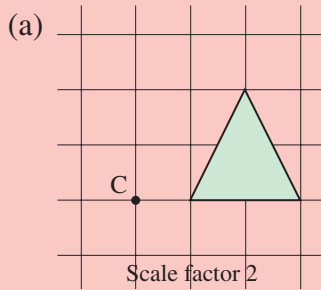


Describe *fully* the rotation which transforms:

- (i) shape *A* onto *B*
- (ii) shape *A* onto *C*

6. Enlarging shapes

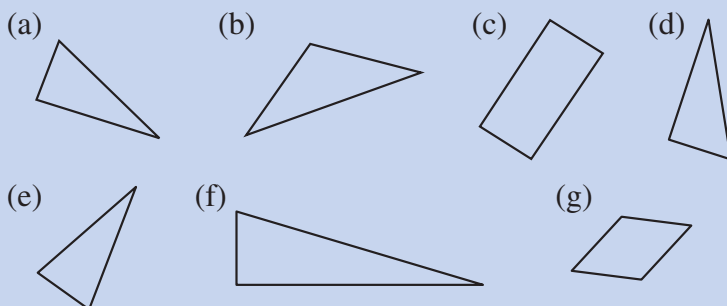
Copy the diagrams below and then draw an enlargement using the scale factor and centre of enlargement (C) given.



Describe *fully* the enlargement which transforms shape *A* onto shape *B* (draw the grid and 2 shapes if you need to)

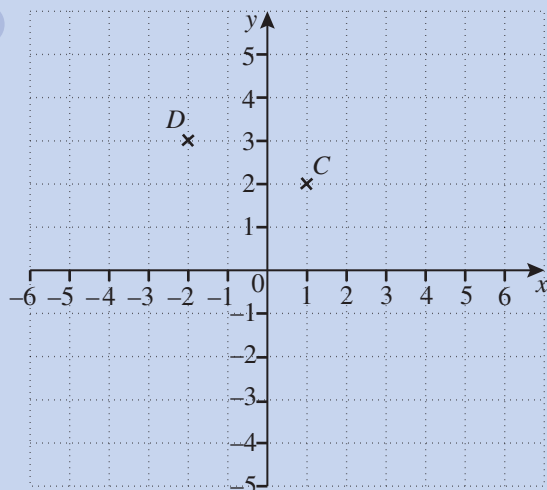
Mixed examination questions

- 1 Which **two** of the following shapes are congruent to each other?



(WJEC)

2



- (a) Write down the co-ordinates of the points C and D .
- (b) Copy the grid and plot the points $E(-5, -1)$ and $F(2, -4)$.
Label each point clearly.

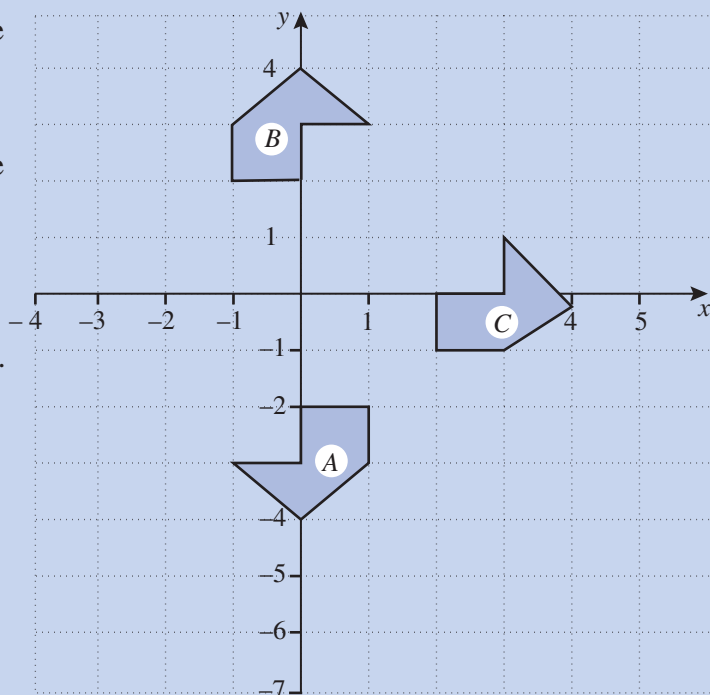
(OCR)

- 3 (a) Describe fully the single transformation which takes A onto B .

- (b) Describe fully the single transformation which takes B onto A .

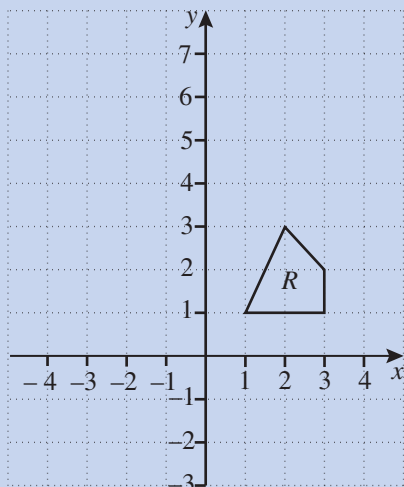
- (c) A is mapped onto D by transformation $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$.

Copy the grid and draw the position of D on the diagram.



(AQA)

4

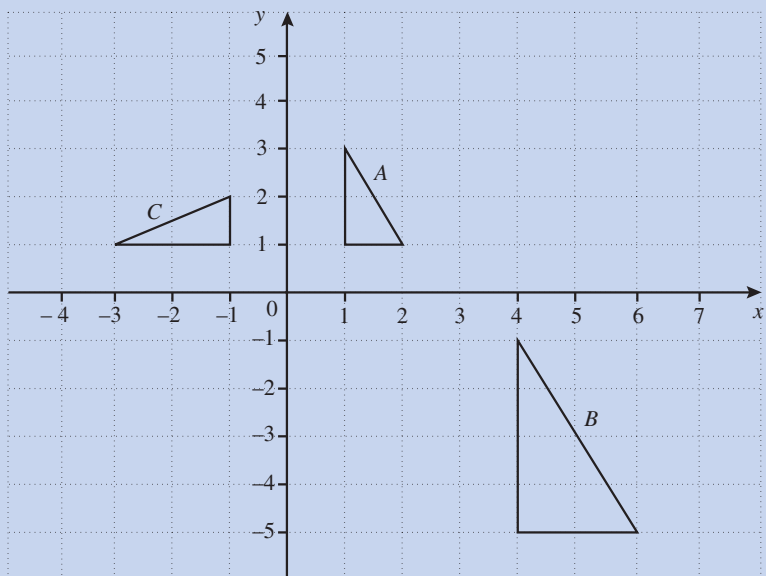


- (a) Copy the grid opposite. R is mapped onto S by a reflection in the y -axis. Draw and label S .
- (b) S is mapped onto T by reflection in the line $y = 4$. Draw and Label T .
- (c) Describe fully the single transformation which maps T onto R .

(AQA)

5

- (a) Copy the grid opposite. Reflect the triangle A in the line $x = 4$. Label the image P .
- (b) Translate triangle A by 4 squares to the left and 3 squares down. Label the image Q .
- (c) Triangle B is an enlargement of triangle A . Write down the scale factor of the enlargement.



- (d) Describe fully the single transformation that maps triangle A onto triangle C .

(OCR)