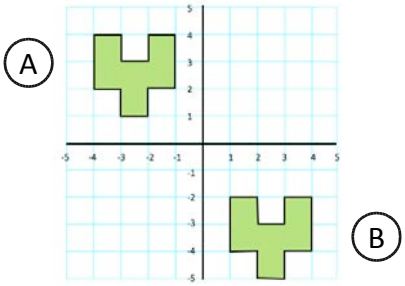
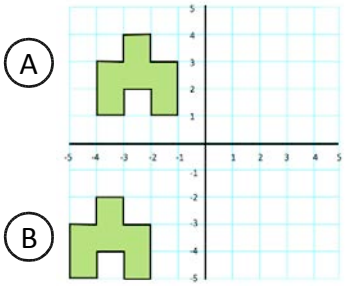


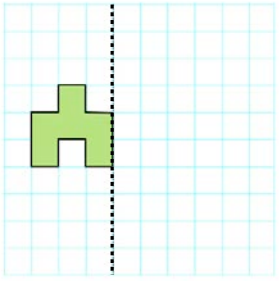

A software company are making a new series of games to help students study mathematics. The logo for the software, shown on the right, has to work in different orientations, as well as being scalable and reversible. It also has to be able to rotate with the phones screen.

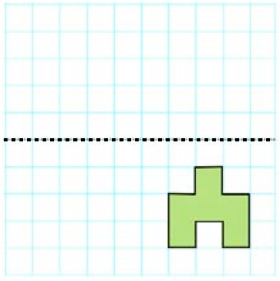
1. Explain the vector transformation from logo A to logo B

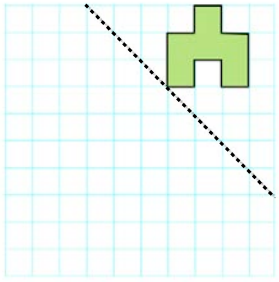


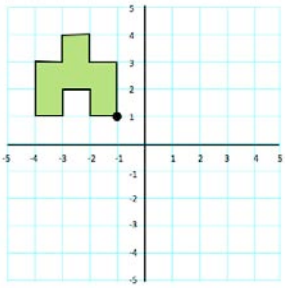

2. Reflect the logo along the mirror line



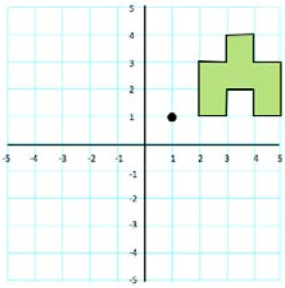




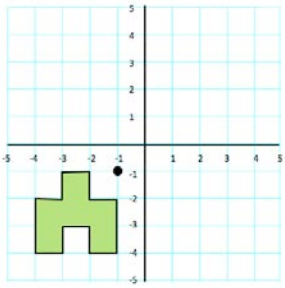
3. Rotate the logo about the point



Rotate by $90^0$ anti-clockwise

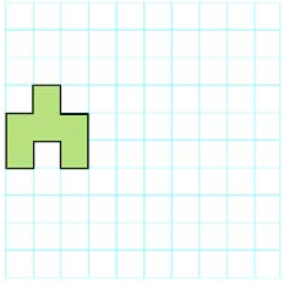


Rotate by $90^0$ clockwise

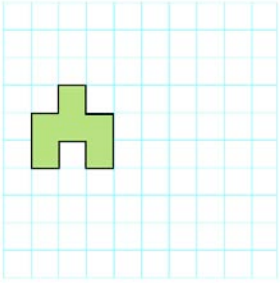


Rotate by $180^0$ clockwise

4. Enlarge the logo by the factor amount shown



Factor: 2



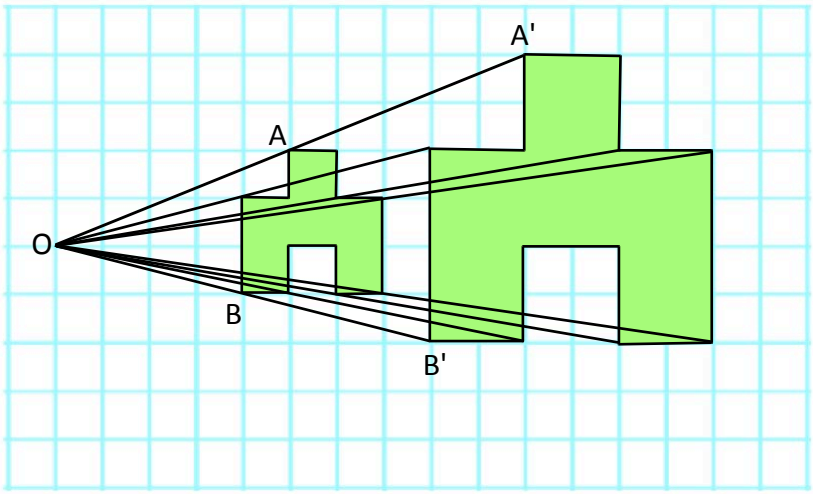
Factor: $\frac{1}{2}$

# Let's think about enlargement



Jon

I've noticed something very interesting about my shapes




1 What do you think Jon has noticed?



Amber

If you join corresponding points and extend the lines they all go through the same point.



Evie

And the length of OA' is twice the length of OA.



Alice

That works for each pair of points because the length of OB' is twice the length of OB.

**Centre of Enlargement**

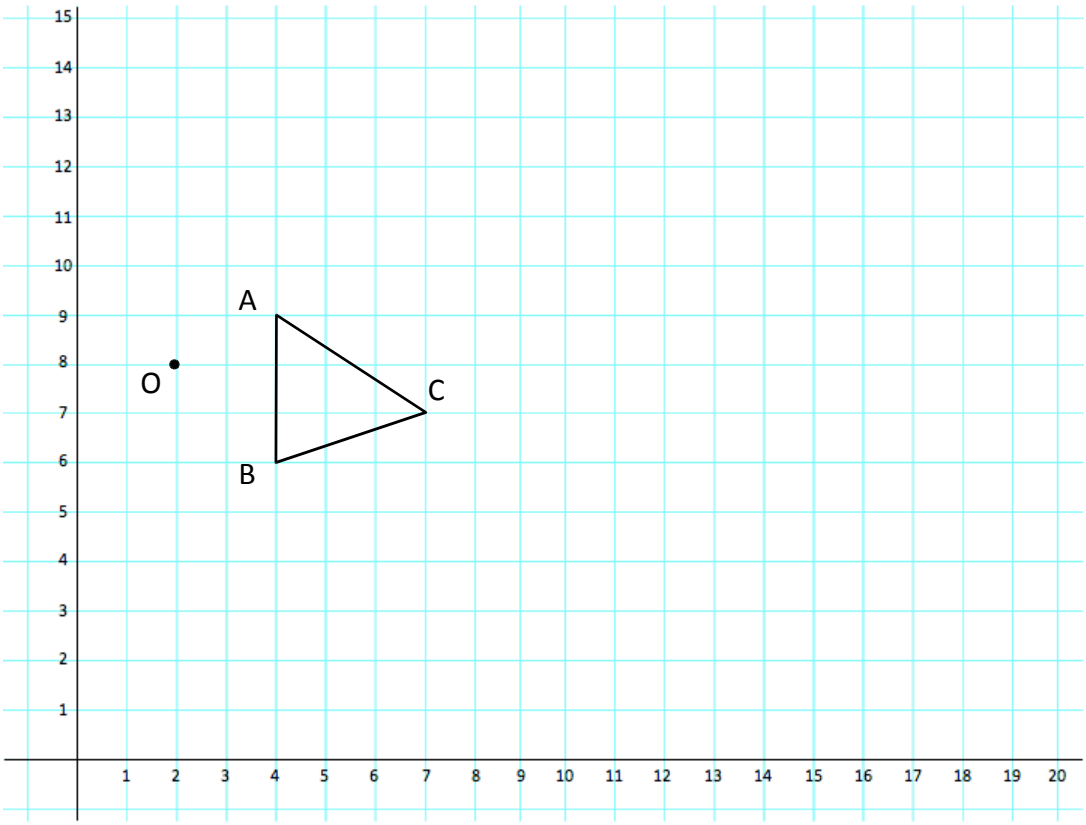
The point O in Jon's diagram is called the **centre of enlargement**. You can use this point and the scale factor to enlarge any shape.

2 Try it out for yourself by drawing a triangle, selecting a centre of enlargement and enlarging it by a scale factor of 2. Think about your choices because it has to fit into your book.

Now try worksheet 1

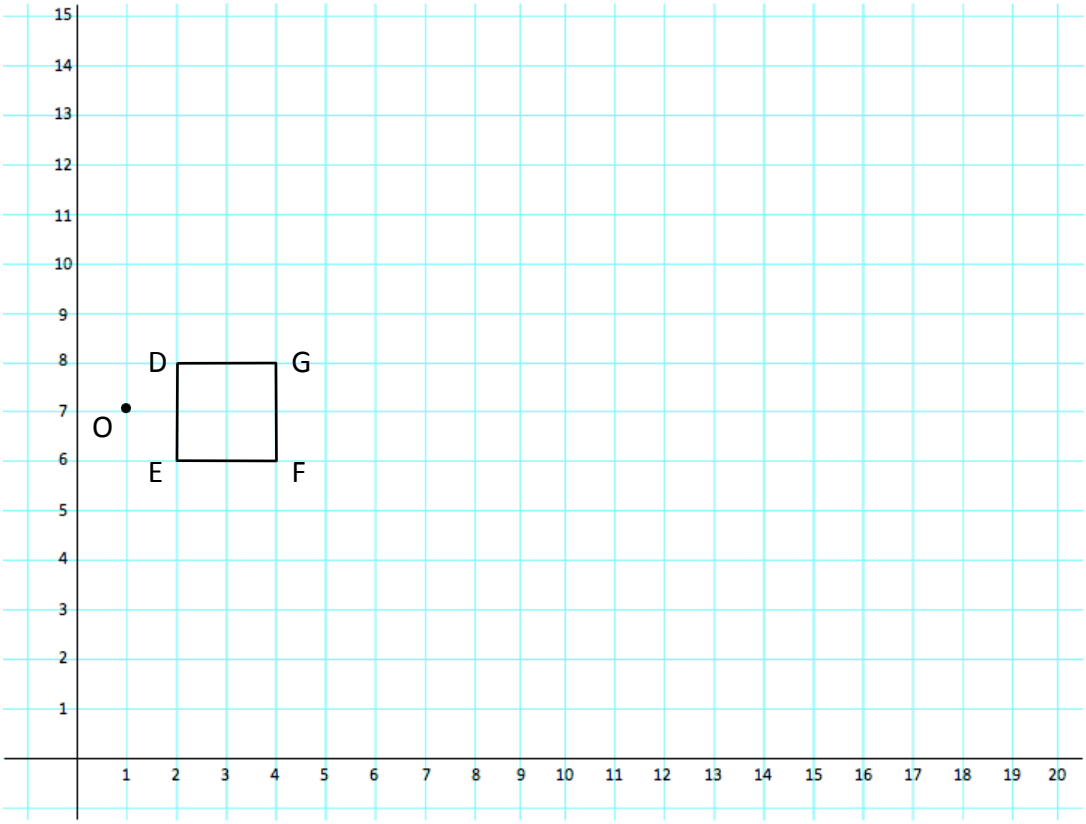
# Enlargement 4B: Worksheet 1

1




Enlarge triangle ABC by a scale factor 3, centre O.

2



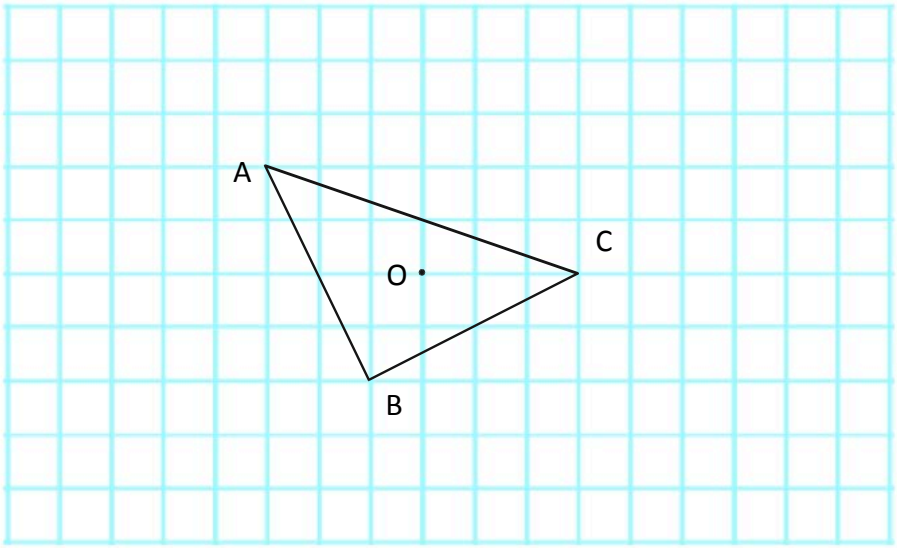

Enlarge the square DEFG by a scale factor 4, centre O.

# What if the centre of enlargement is inside the shape?



Matthew

Can you enlarge triangle ABC, scale factor 2 with centre of enlargement O.?

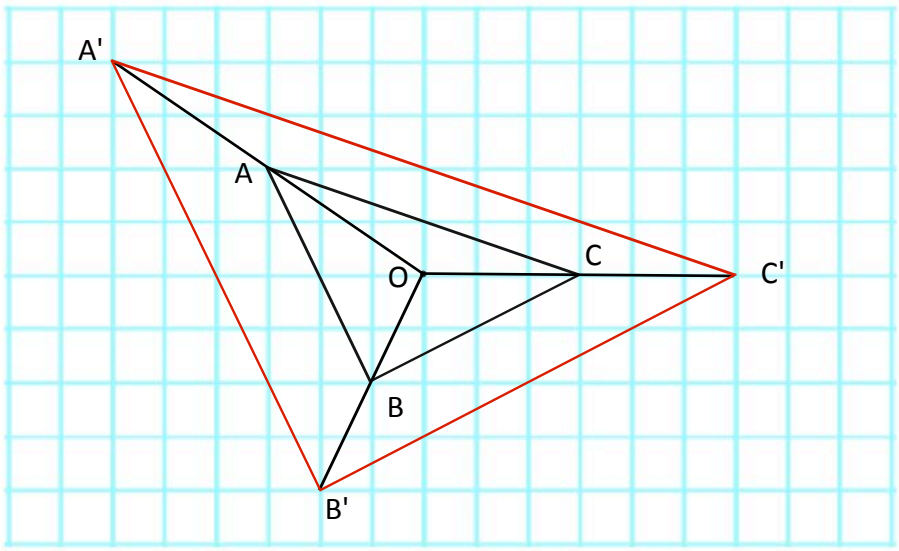



3 Try it out for yourself. Label your new triangle A'B'C'.

Evie's working



Evie




4 Is Evie correct? How did you decide?

What can two things can you say about the line segments A'B' and AB?

Is the same true for line segments BC and B'C'?

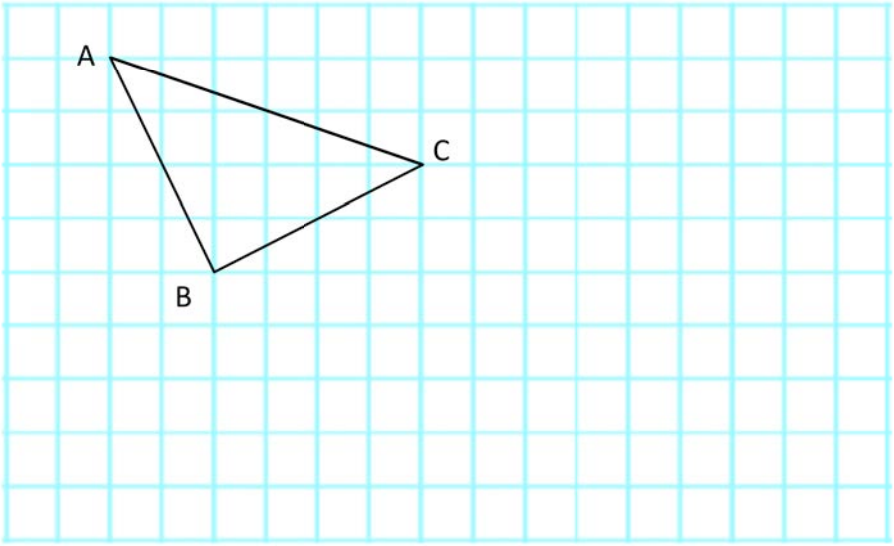
What about line segments AC and A'C'?

# What if the centre of enlargement is at a vertex?



Sarah

Can you enlarge triangle ABC, scale factor 2 with centre of enlargement A.?

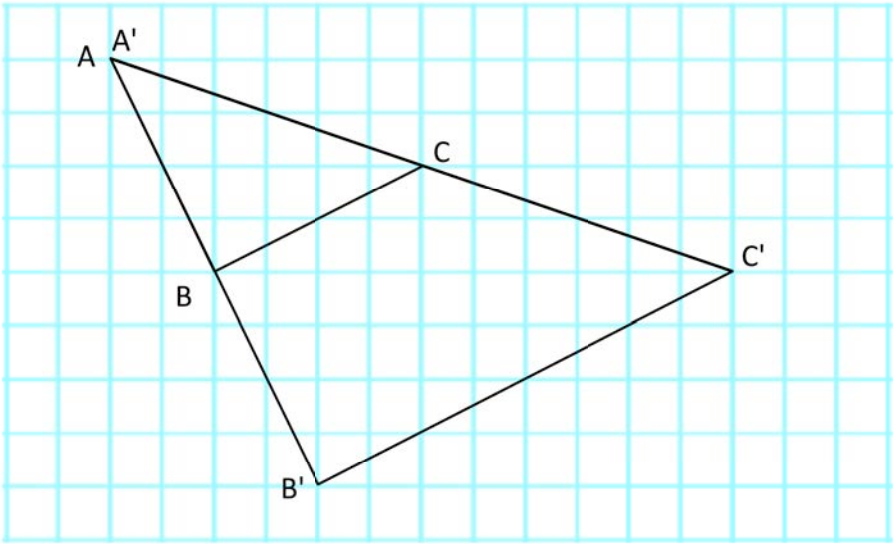



5 Try it out for yourself. Label your new triangle A'B'C'.



Alice

Alice's working



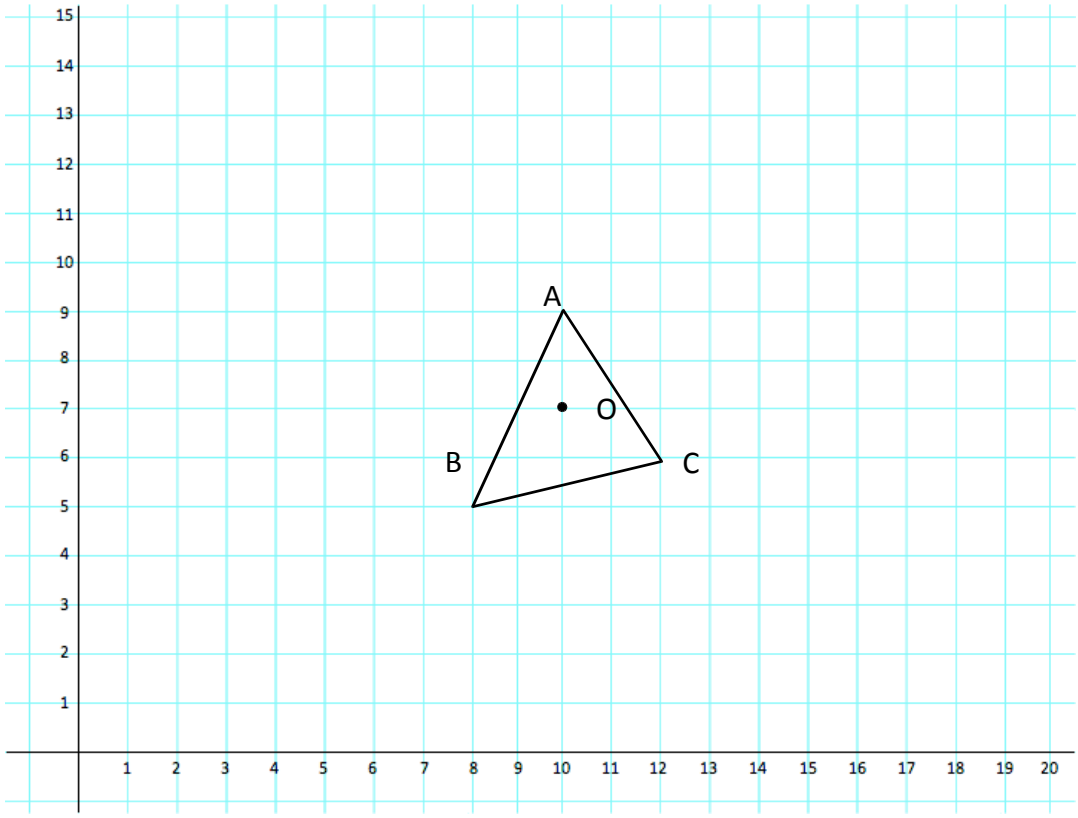

6 Can you explain Alice's idea in words?

What can you say about the line segments BC and B'C'?

Now try worksheets 2 and 3

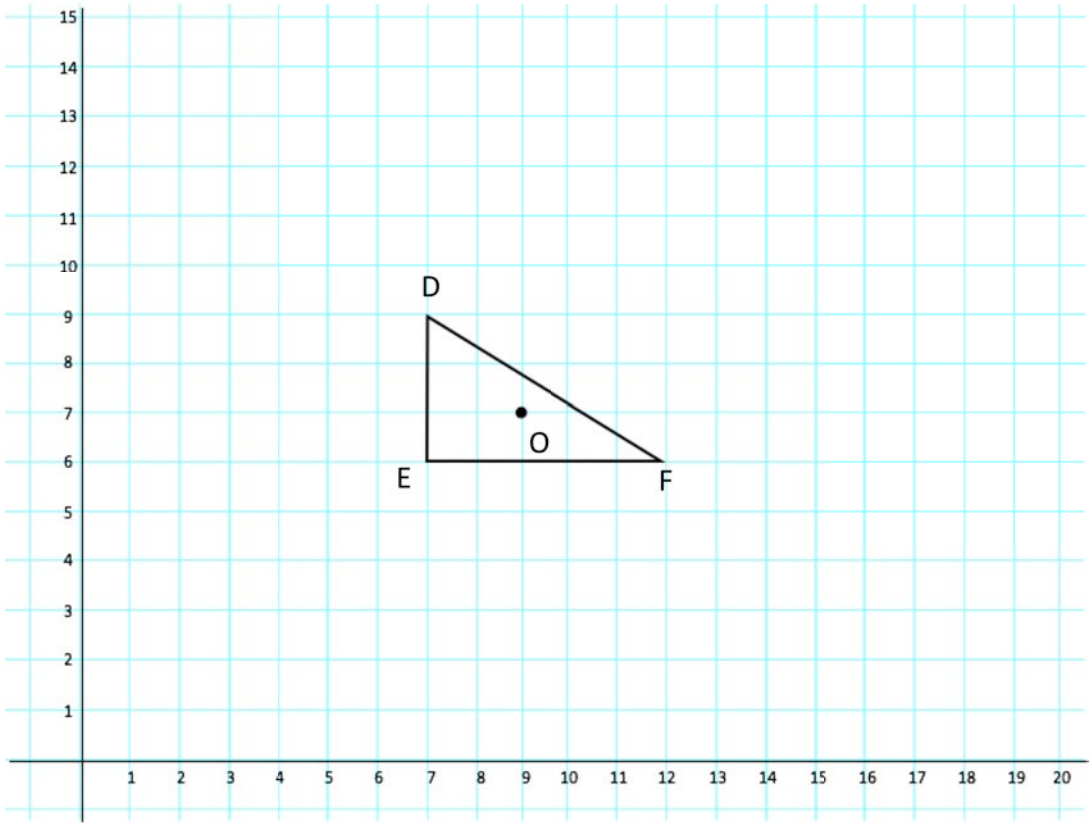
# Enlargement 4B: Worksheet 2

3




Enlarge triangle ABC by a scale factor 3, centre O

4

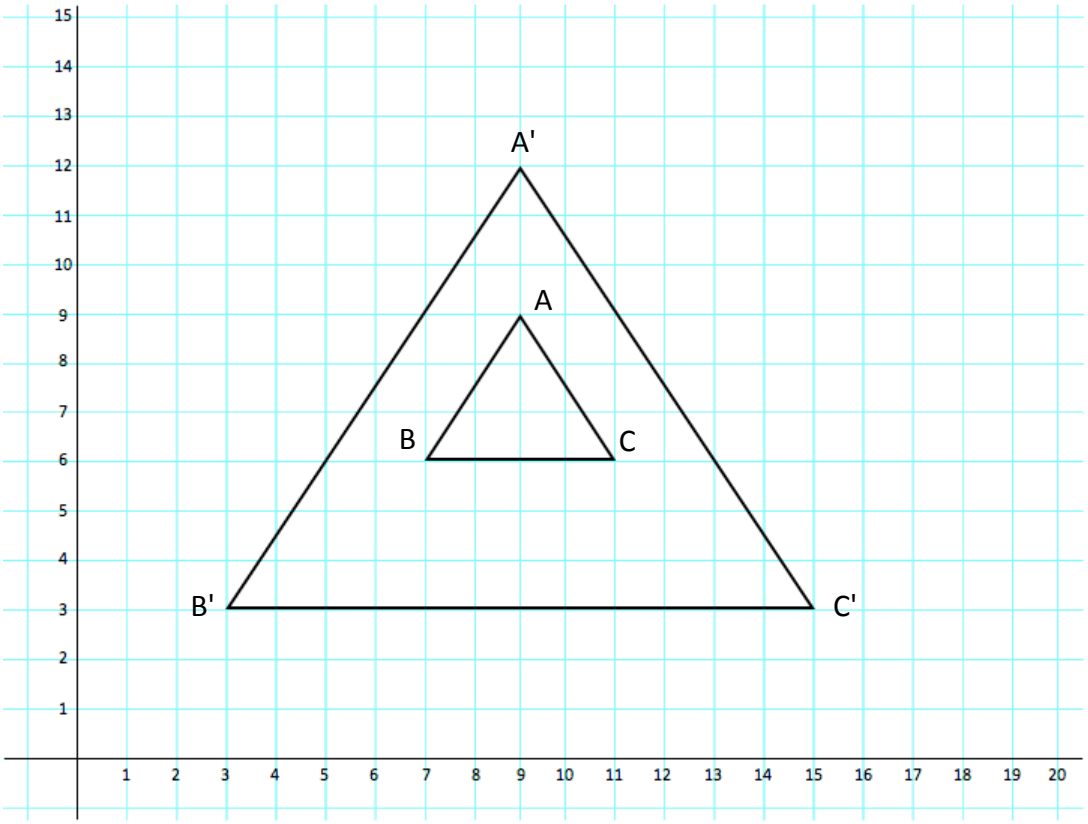



Enlarge triangle DEF by a scale factor 4, centre O.

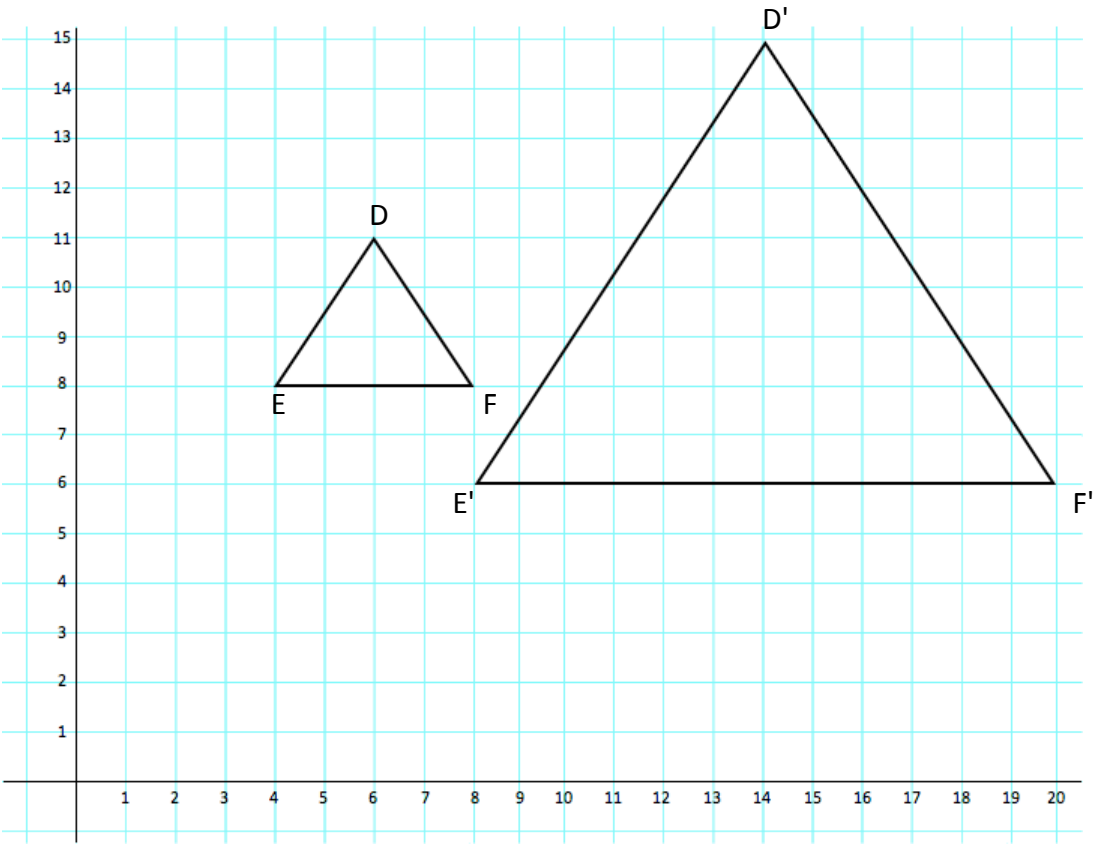
# Enlargement 4B: Worksheet 3

In each of these cases, find the centre of enlargement and the scale factor.

5




6



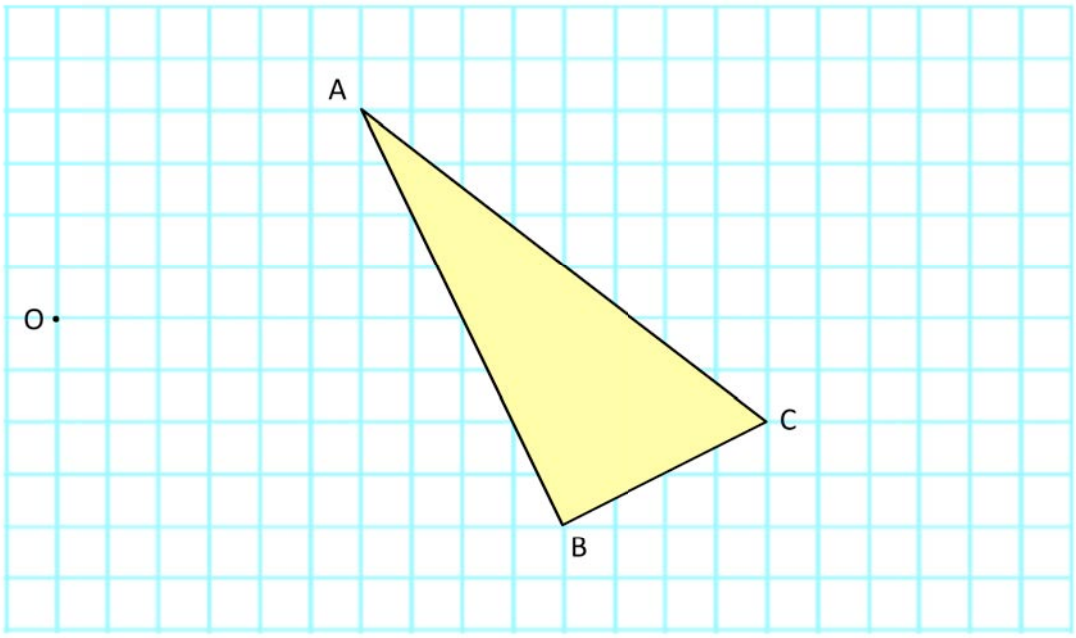
# What happens if the scale factor is less than 1?



Alice

What happens if the scale factor is $\frac{1}{2}$ and the centre is outside of the shape?

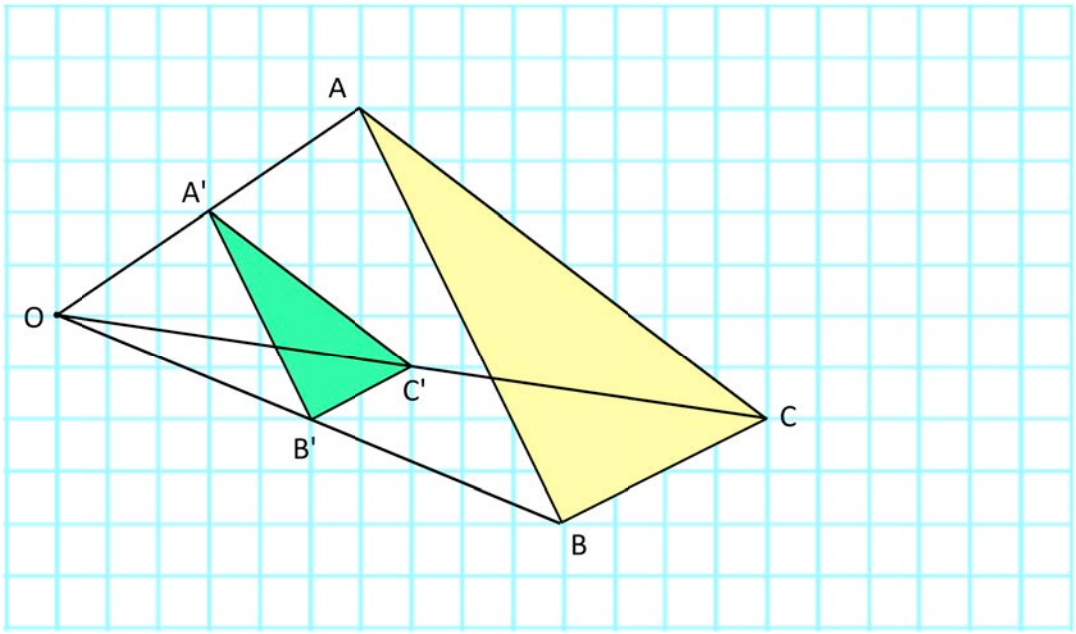
7 Try it out for yourself. Label your new triangle A'B'C'.






Jon

Jon's working




8 Do you agree with Jon's idea? Can you explain it in words?

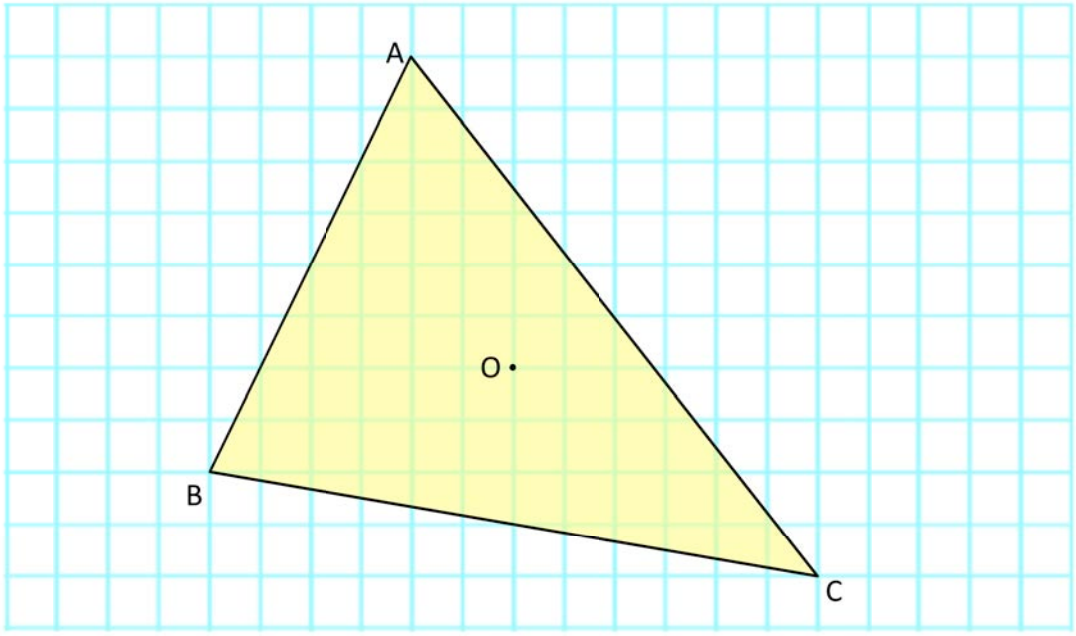
# What happens if the scale factor is less than 1?



Matthew

What happens if the scale factor is $\frac{1}{2}$ and the centre is inside of the shape?

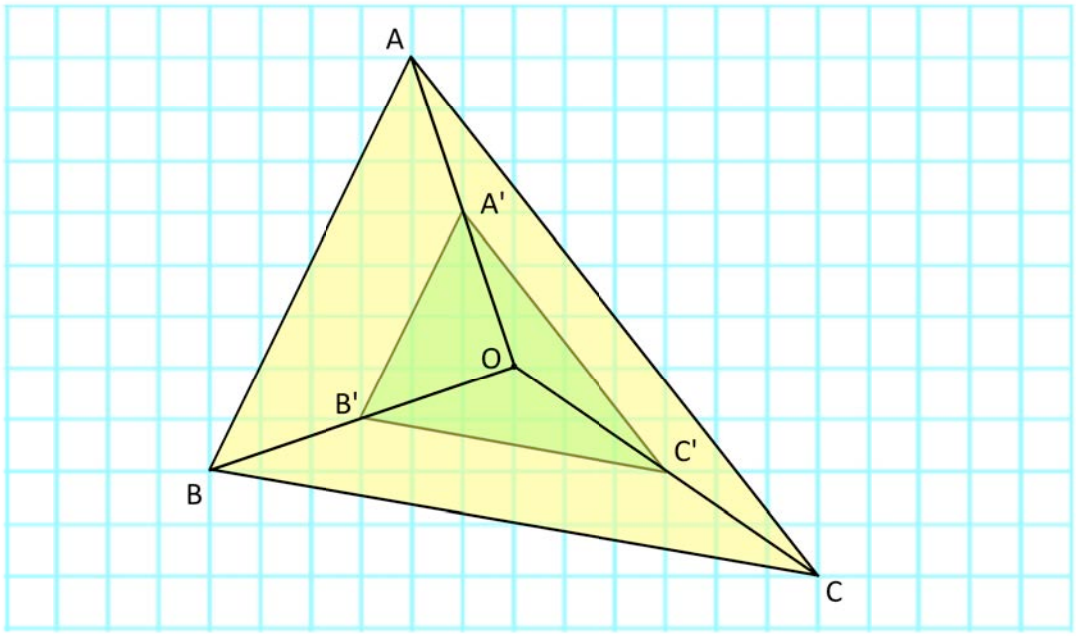
9 Try it out for yourself. Label your new triangle A'B'C'.




Sarah's working



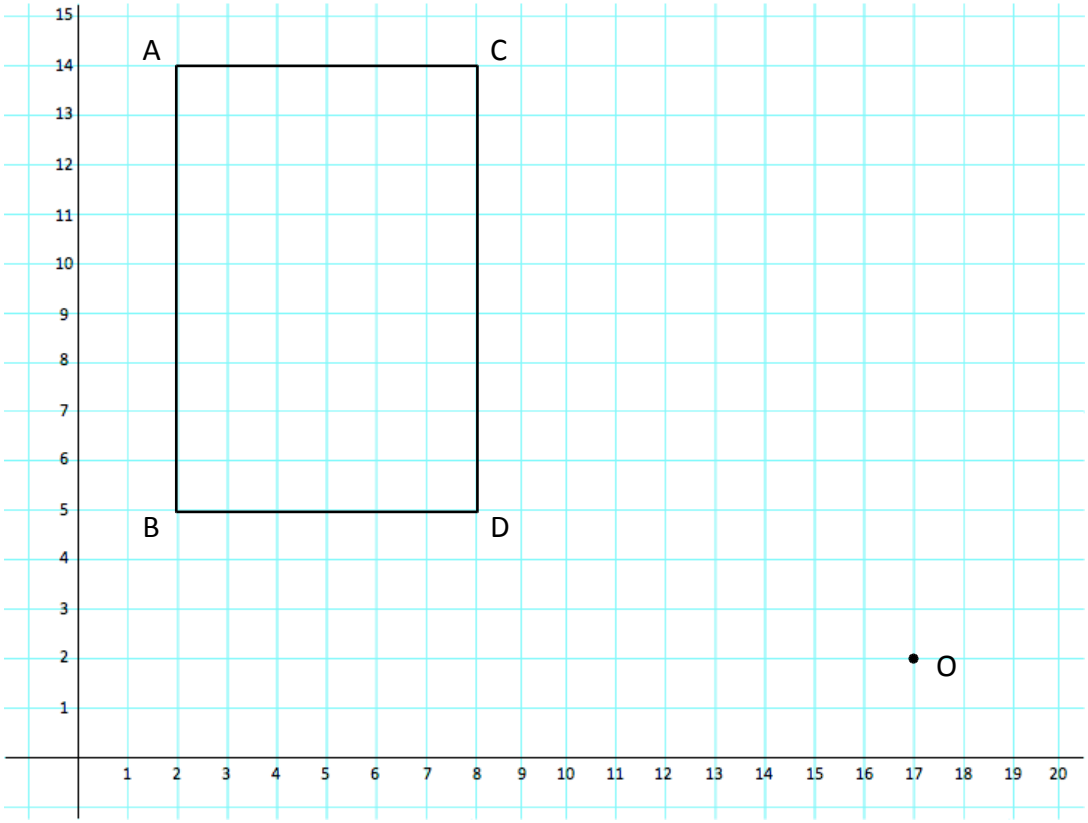
Sarah




10 Do you agree with Sarah's idea? Can you explain it in words?

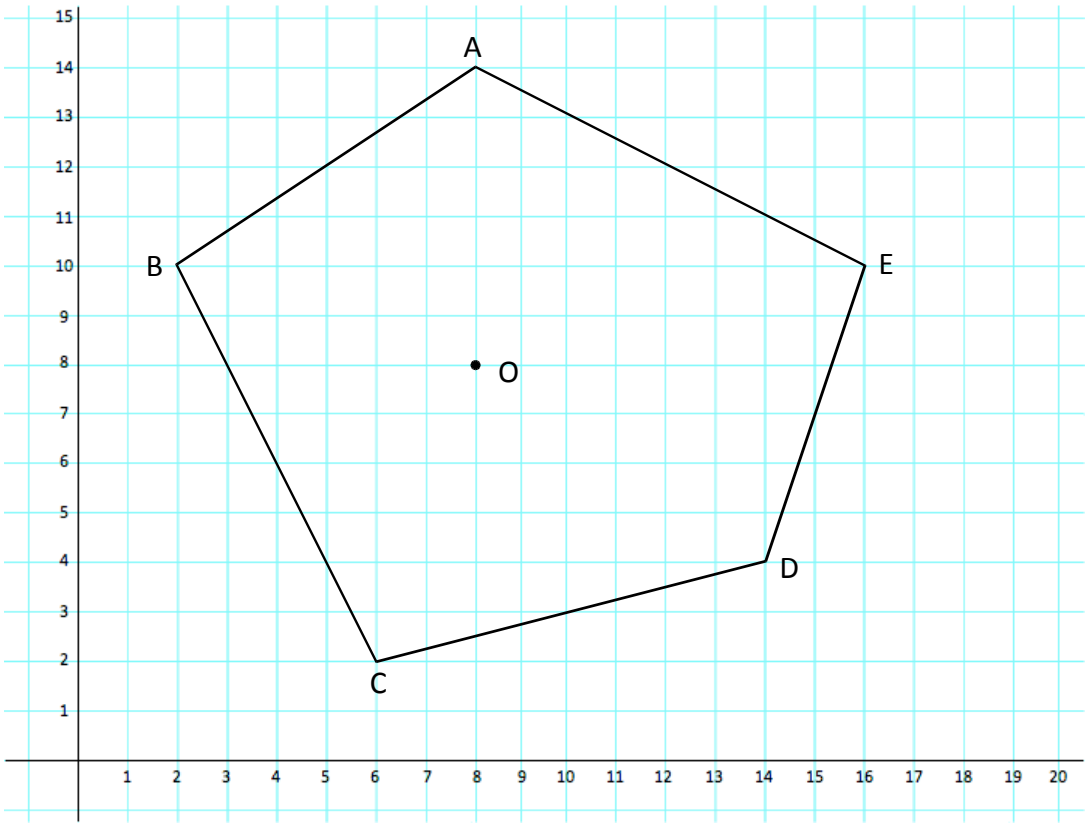
# Enlargement 4B: Worksheet 4

7




Enlarge rectangle ABCD by a scale factor $\frac{1}{3}$, centre O.

8




Enlarge pentagon ABCDE by a scale factor $\frac{1}{2}$, centre O.

# What happens if the scale factor is negative?



I wonder what a scale factor of -2 might mean?

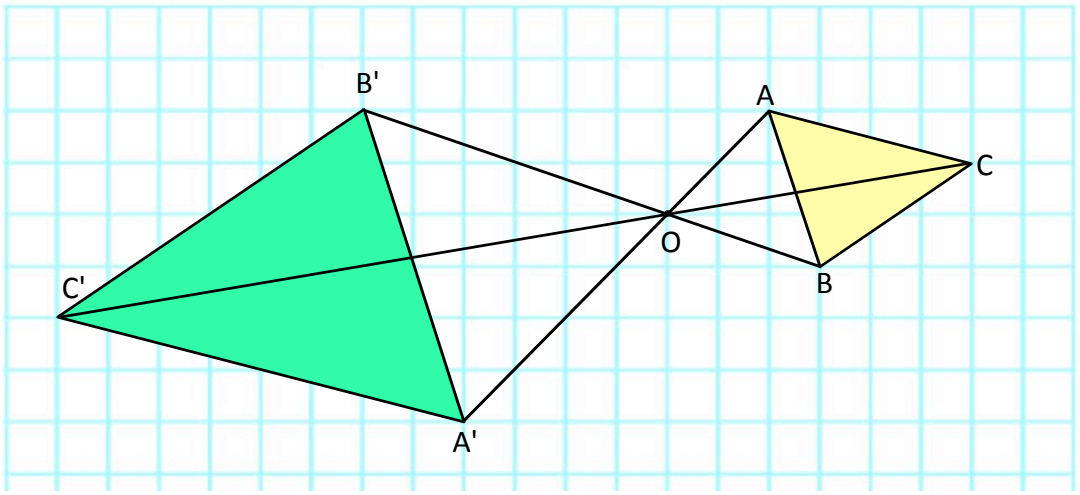
Matthew

11 How would you answer Matthew's question.



Evie

Well negative is the opposite of positive.
So I think you would draw the lines in the opposite direction.
Look I will show you.

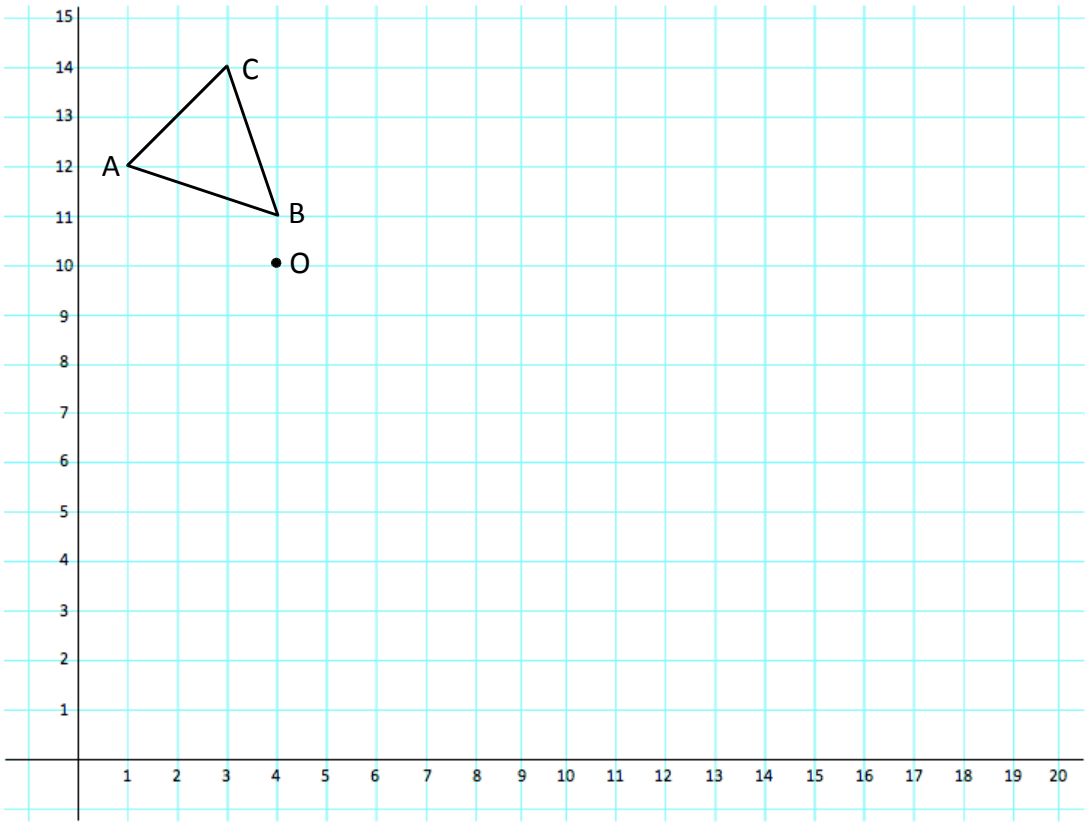



12 Can you explain Evie's idea in words?

Now try worksheets 5 and 6

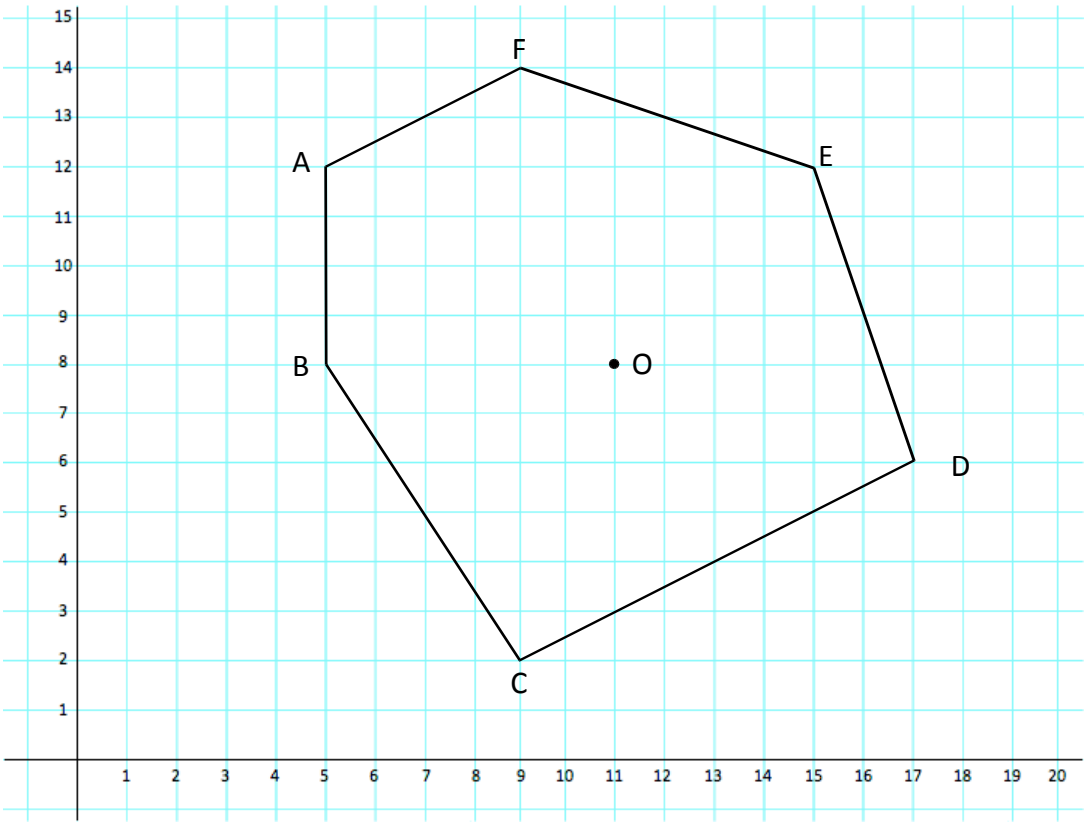
# Enlargement 4B: Worksheet 5

9




Enlarge triangle ABC by a scale factor -3, centre O.

10

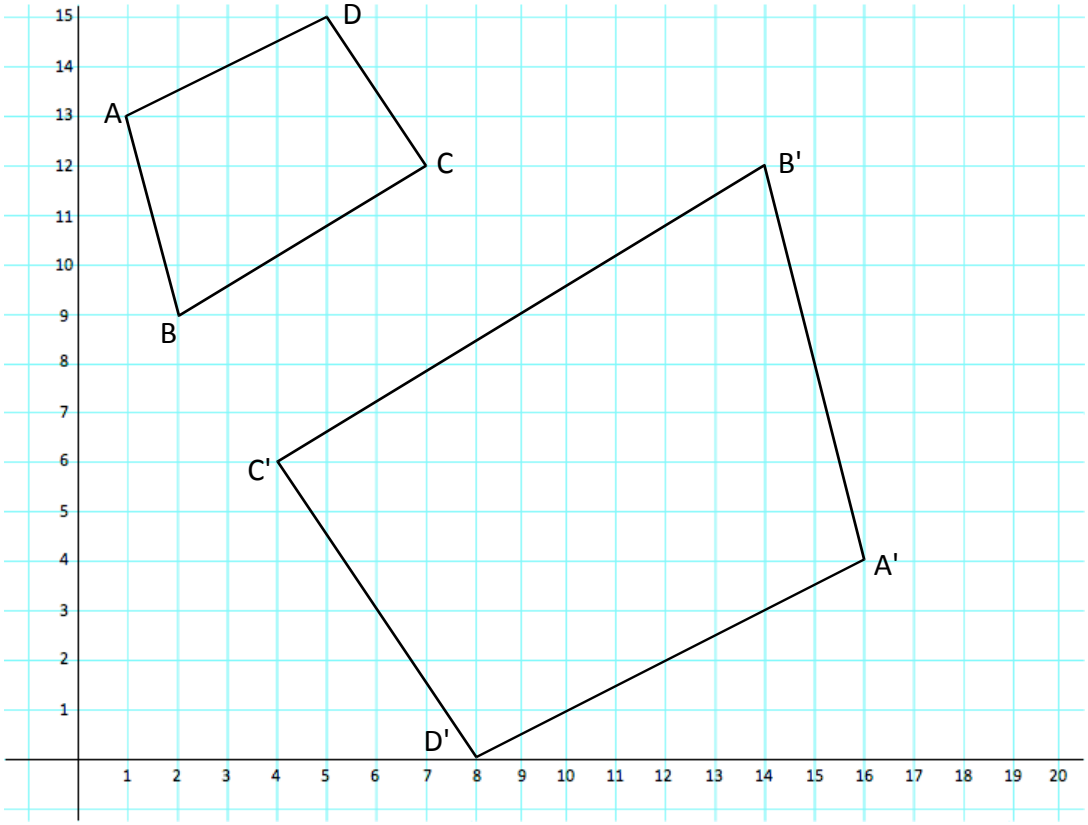



Enlarge the hexagon ABCDEF by a scale factor $-\frac{1}{2}$, centre O.

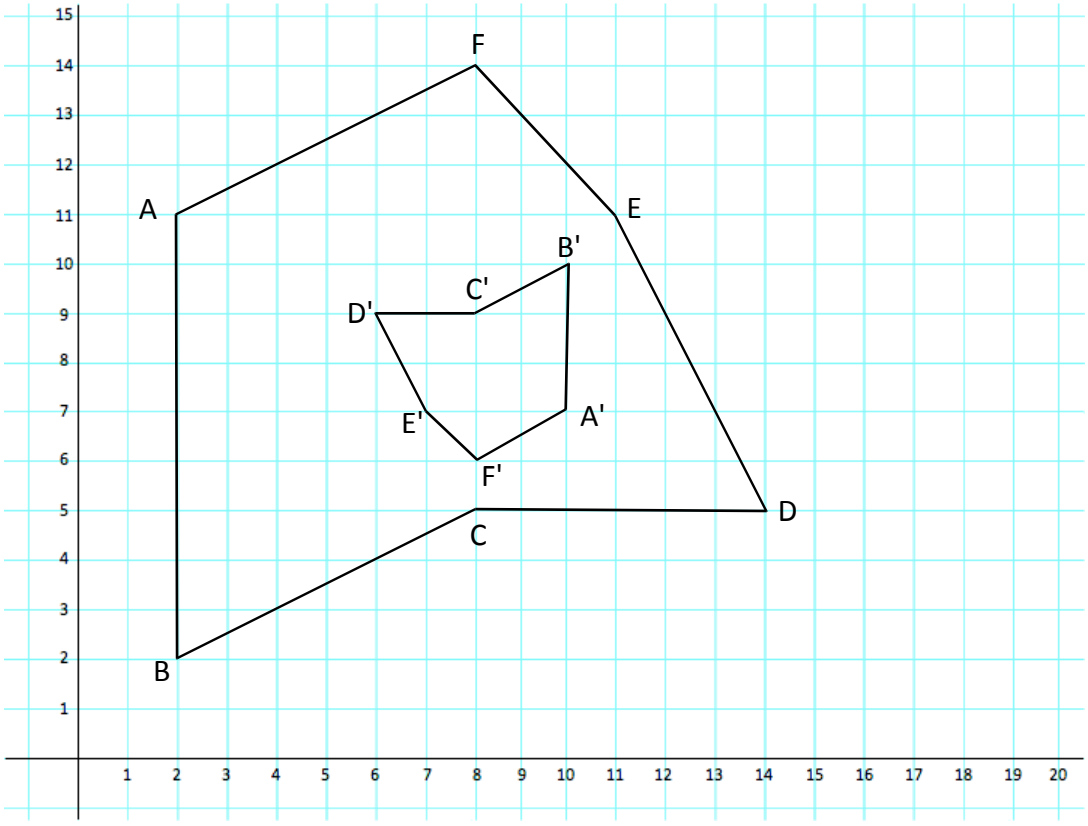
# Enlargement 4B: Worksheet 6

In each of these cases, find the centre of enlargement and the scale factor.

11




12



# Transformations 4b Mastery

1. In Fig. 1, triangle PQR is enlarged by a scale factor 3, centre (-4,2). Which point is the correct image of P?

2. In Fig. 1, triangle PQR is enlarged by a scale factor of -2, centre (0,2). Which point is the correct image of P?

3. In Fig. 1, triangle PQR is enlarged by a scale factor of 0.5, centre (2,3). Which point is the correct image of P?

4. In Fig. 1, triangle PQR is enlarged by a scale factor of -0.5, centre (2,3). Which point is the correct image of P?

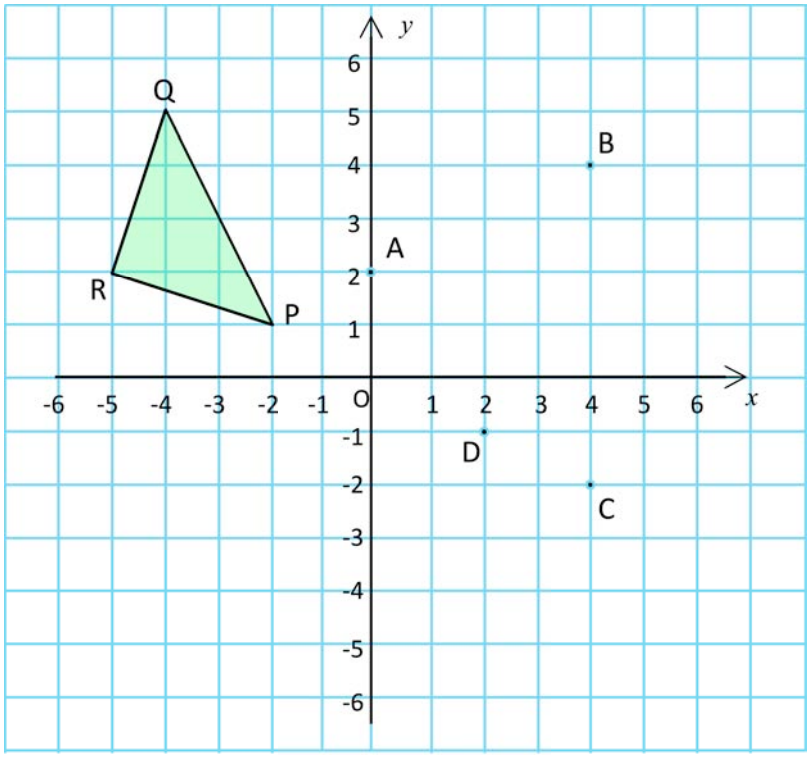



Fig. 1

5. In Fig. 2, which of these could be used to describe the enlargement from shape E to shape F?

| | |
|---|---|
| A | An enlargement scale factor 2, centre (1,3) |
| B | An enlargement scale factor 2, centre (4,6) |
| C | An enlargement scale factor 0.5, centre (-2,0) |
| D | An enlargement scale factor 0.5, centre (4,6) |

6. In Fig. 2, which of these could be used to describe the enlargement from shape F to shape E?

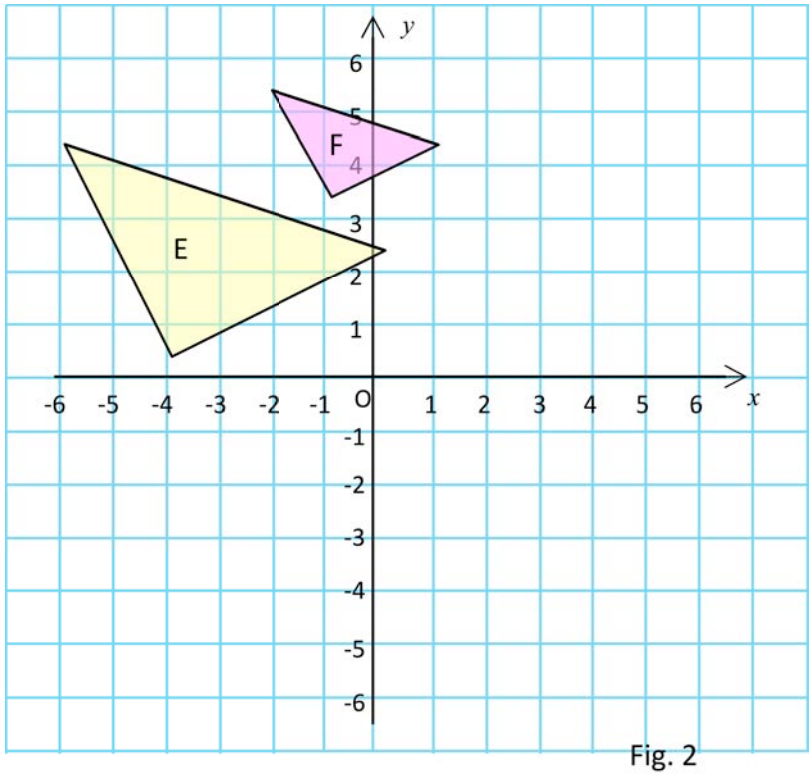



Fig. 2

| | | | |
|---|---|---|---|
| A | An enlargement scale factor 2, centre (1,3) | B | An enlargement scale factor 2, centre (4,6) |
| C | An enlargement scale factor 0.5, centre (-2,0) | D | An enlargement scale factor 0.5, centre (4,6) |

7. In Fig. 3, triangle PQR is enlarged by a scale factor -2, centre (4,7). Which point is the correct image of P?

8. In Fig. 3, triangle PQR is enlarged by a scale factor of -1, centre (4.7). Which point is the correct image of Q?

9. In Fig. 4, which of these could be used to describe the enlargement from shape E to shape F?

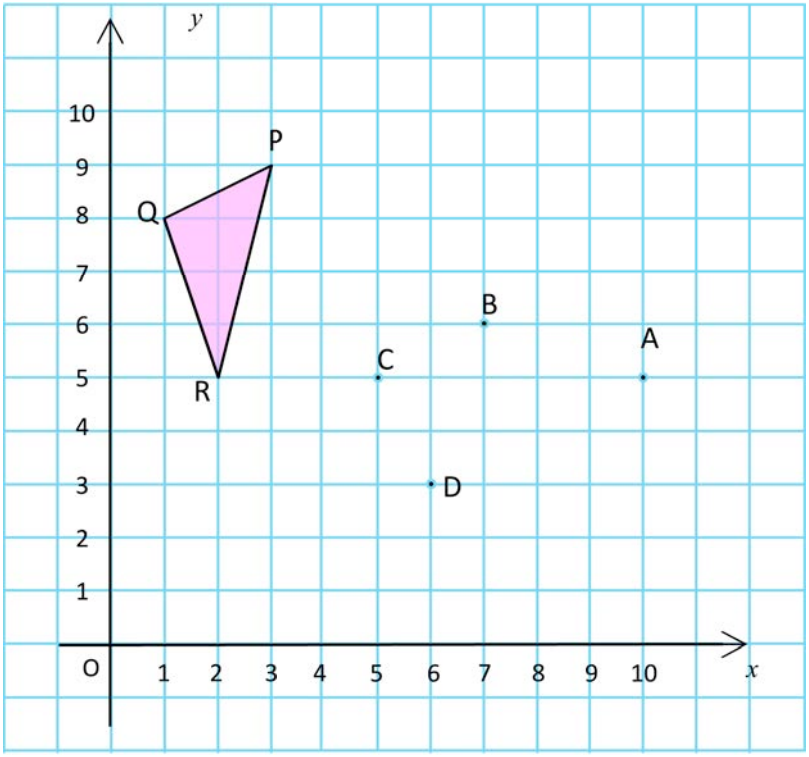



Fig. 3

| | |
|---|---|
| A | An enlargement scale factor 3, centre (3,2) |
| B | An enlargement scale factor $\frac{1}{3}$, centre (3,2) |
| C | An enlargement scale factor -3, centre (3,2) |
| D | An enlargement scale factor $-\frac{1}{3}$, centre (3,2) |

10. In Fig. 4, which of these could be used to describe the enlargement from shape F to shape E?

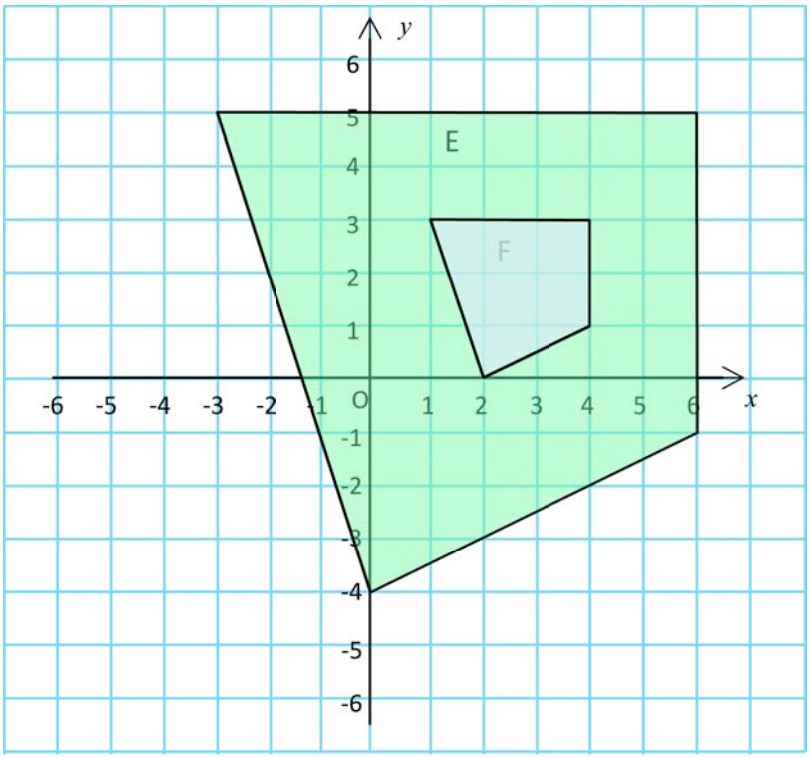



Fig. 4

| | | | |
|---|---|---|---|
| A | An enlargement scale factor 3, centre (3,2) | B | An enlargement scale factor $\frac{1}{3}$, centre (3,2) |
| C | An enlargement scale factor -3, centre (3,2) | D | An enlargement scale factor $-\frac{1}{3}$, centre (3,2) |

11. In Fig. 3, triangle PQR is enlarged by a scale factor 3, centre (-4,2). Which point is the correct image of P?

12. In Fig. 1, triangle PQR is enlarged by a scale factor of -2, centre (0,2). Which point is the correct image of P?

13. In Fig. 1, triangle PQR is enlarged by a scale factor of 0.5, centre (2,3). Which point is the correct image of P?

14. In Fig. 1, triangle PQR is enlarged by a scale factor of -0.5, centre (2,3). Which point is the correct image of P?

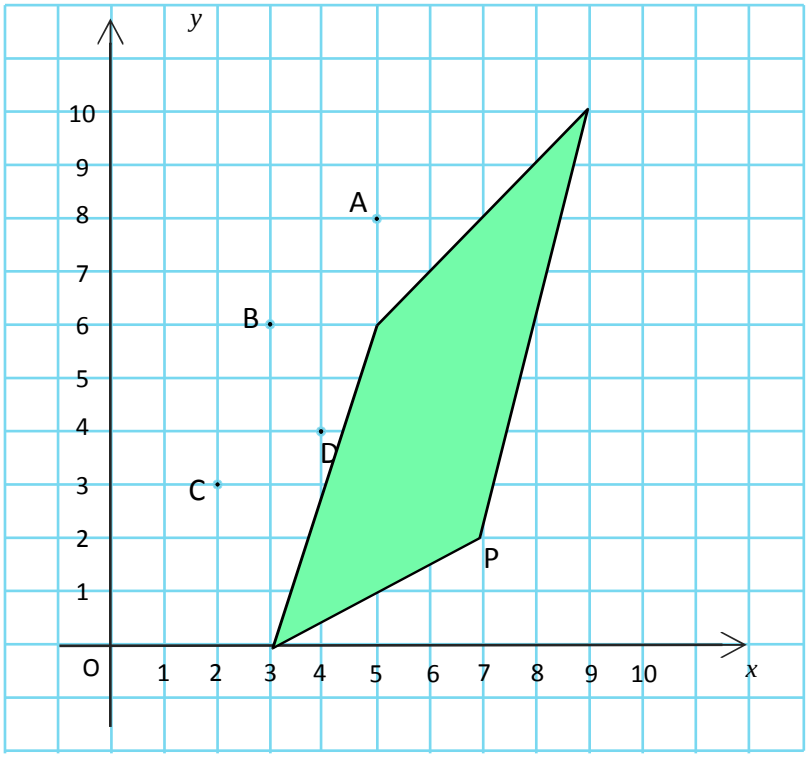



Fig. 3