HIGHER

6.9 Enlarging with Negative Scale Factors: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A shape is enlarged using a negative scale factor. Which of these correctly describes the image compared with the object?

- ☐ A) Same side of the centre of enlargement, same orientation
- ☐ B) Same side of the centre of enlargement, but rotated 180 degrees (upside down)
- ☐ C) Opposite side of the centre of enlargement, and rotated 180 degrees (upside down)
- ☐ D) Opposite side of the centre of enlargement, but the same orientation as the object

(Total for Question 1 is 1 mark)

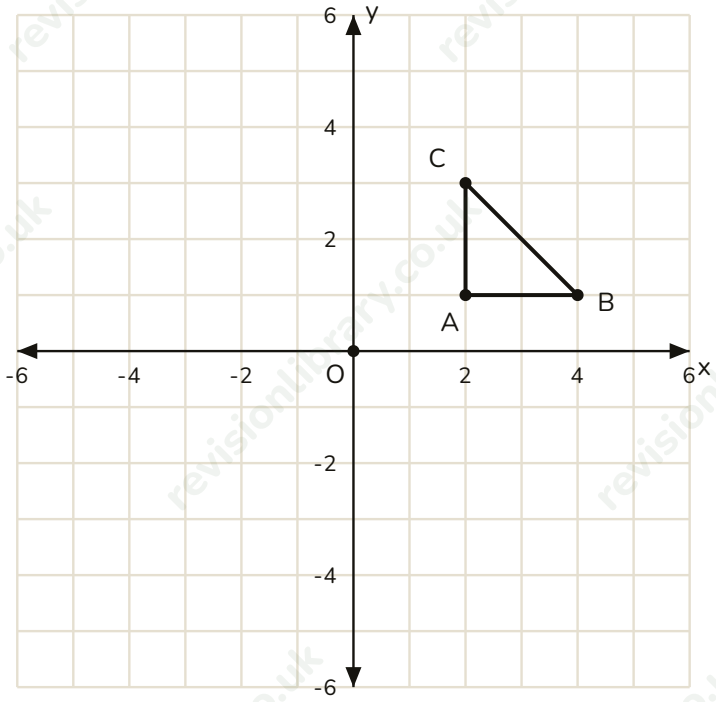
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2 A student is asked to enlarge a triangle by scale factor -2 from a given centre. The student draws the image on the same side of the centre as the original triangle, but twice the size. Explain the error in the student's diagram.

(Total for Question 2 is 1 mark)

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3 Triangle ABC has vertices A(2,1), B(4,1) and C(2,3). Triangle ABC is enlarged by scale factor -1, centre (0,0), to give triangle A'B'C'. Find the coordinates of A', B' and C'.



(Total for Question 3 is 3 marks)

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4 A shape is enlarged by scale factor -5. State the area scale factor of the enlargement.

(Total for Question 4 is 1 mark)

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5 A drawing tool enlarges shapes by a scale factor of -2.5 about a fixed point. A line segment on the original drawing has length 6 cm. Work out the length of the corresponding line segment on the enlarged copy.

(Total for Question 5 is 2 marks)

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6 A shape is enlarged by scale factor -1. Sunita says, 'The image will have the same area as the original shape.' Is Sunita correct? Justify your answer.

(Total for Question 6 is 2 marks)

7 A shape has perimeter 13 cm. It is enlarged by scale factor -2. Work out the perimeter of the image.

(Total for Question 7 is 2 marks)

8 The point P is (-15, 3). P is enlarged by scale factor -1/3 with centre (0, 0). Write down the coordinates of the image of P.

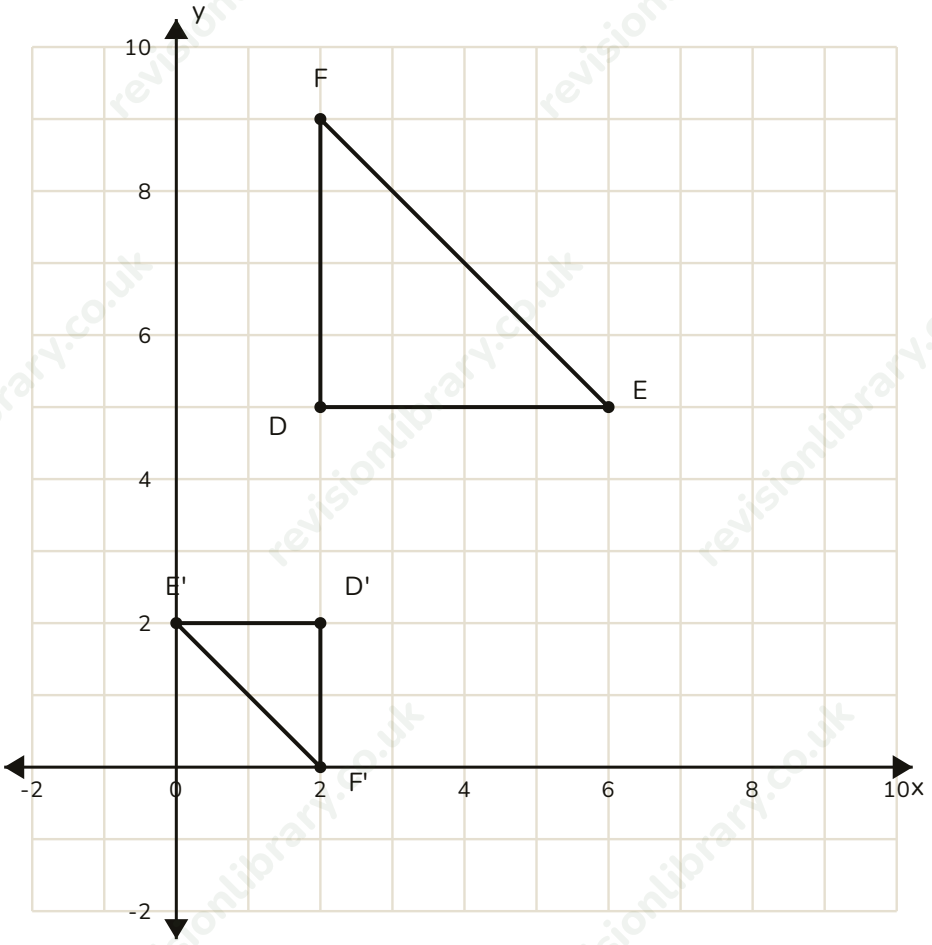
(Total for Question 8 is 2 marks)

9 Triangle T has a side from A(4, 1) to B(6, 2). Under a single enlargement, A maps to A'(-17, 7) and B maps to B'(-21, 5). Describe fully the enlargement.

(Total for Question 9 is 3 marks)

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10 Triangle DEF has vertices D(2,5), E(6,5) and F(2,9). Triangle D'E'F' has vertices D'(2,2), E'(0,2) and F'(2,0). Describe fully the single transformation that maps triangle DEF onto triangle D'E'F'.



(Total for Question 10 is 3 marks)

11 A single transformation maps a triangle with vertices (2, 2), (4, 2) and (2, 5) onto a triangle with vertices (-1, -1), (-2, -1) and (-1, -2.5). State (i) the type of transformation (ii) the scale factor.

(Total for Question 11 is 2 marks)

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12 Shape A is enlarged by scale factor -3, centre (0,0), to form shape B. Shape B is then enlarged by scale factor -1/3, centre (0,0), to form shape C. Describe fully the single transformation that maps shape A directly onto shape C.

(Total for Question 12 is 3 marks)

13 Triangle A has an area of 18 cm². It is enlarged by a negative scale factor to form triangle B, which has an area of 72 cm². Find the scale factor of the enlargement.

(Total for Question 13 is 3 marks)

14 The point R has coordinates (3, 1). R is enlarged by scale factor -3, centre (1, 1), to give the image R'. Find the coordinates of R'.

(Total for Question 14 is 3 marks)

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15 Rectangle WXYZ has vertices W(-1, -1), X(3, -1), Y(3, 1) and Z(-1, 1), and has area 8 square units. The rectangle is enlarged by scale factor -3, centre the point (1, 1), to give rectangle W'X'Y'Z'.

(a) Show that W' has coordinates (7, 7), and find the coordinates of X'. **(3)**

(b) Find the area of rectangle W'X'Y'Z'. **(2)**

.....

(Total for Question 15 is 5 marks)

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16 Triangle ABC has vertices A(2, 1), B(4, 1) and C(2, 6), and has area 5 square units. Triangle ABC is enlarged to give triangle A'B'C', where A' has coordinates (2, 11), the area of triangle A'B'C' is 80 square units, and the image is inverted compared with the object.

(a) Show that the linear scale factor of the enlargement is -4. **(2)**

(b) Find the coordinates of the centre of enlargement. **(3)**

.....

(c) Find the coordinates of C', the image of C. **(2)**

.....

(Total for Question 16 is 7 marks)

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Mark scheme · 6.9 Enlarging with Negative Scale Factors: Test Pack

Question 1

C oe **B1**

Answer: C

Question 2

the image should be drawn on the opposite side of the centre of enlargement (and inverted), because the scale factor is negative oe **B1**

Answer: The image should be on the opposite side of the centre of enlargement (and inverted), because the scale factor is negative.

Question 3

A'(-2,-1) **B1**

B'(-4,-1) **B1**

C'(-2,-3) cao **B1**

Answer: A'(-2,-1), B'(-4,-1), C'(-2,-3)

Question 4

25 cao **B1**

Answer: 25

Question 5

6 x 2.5 with 2.5 identified as the magnitude of the scale factor **M1**

15 cm cao **A1**

Answer: 15 cm

Question 6

yes, Sunita is correct **B1**

reason: area scale factor = $(-1)^2 = 1$, so the area is unchanged oe **B1**

Answer: Yes, Sunita is correct.

Question 7

lengths are multiplied by 2 (size of scale factor) **M1**

26 cm **A1**

Answer: 26 cm

Question 8

multiplies both coordinates by -1/3 **M1**

(5, -1) cao **A1**

Answer: (5, -1)

Question 9

enlargement **B1**

scale factor -2 **B1**

centre (-3, 3) **B1**

Answer: Enlargement, scale factor -2, centre (-3, 3)

Question 10

enlargement **B1**

scale factor -1/2 oe -0.5 **B1**

centre (2,3) oe **B1**

Answer: Enlargement, scale factor -1/2, centre (2,3)

Question 11

enlargement (centre the origin) oe **B1**

scale factor = -1/2 (or -0.5) cao **B1**

Answer: Enlargement, centre (0, 0), scale factor -1/2

Question 12

overall scale factor = (-3) x (-1/3) = 1 **B1**

a scale factor of 1 leaves every point unchanged **B1**

identity transformation stated, i.e. shape C is identical to shape A in the same position oe **B1**

Answer: The combined effect is an enlargement of scale factor 1, so shape C coincides exactly with shape A (identity transformation, no change).

Question 13

area ratio = 72 / 18 = 4 **M1**

$k^2 = 4$, so k = 2 or k = -2 **M1**

k = -2, since the scale factor is given as negative cao **A1**

Answer: Scale factor = -2

Question 14

finds the vector from the centre to R: (2, 0) oe **M1**

multiplies the vector by -3: (-6, 0) oe **M1**

R' = (-5, 1) cao **A1**

Answer: (-5, 1)

Question 15

(a) finds the vector from the centre (1,1) to W: (-2,-2) oe **M1**

(a) multiplies by -3 and adds the centre to show (7,7) **M1**

(a) X' = (-5, 7) cao **A1**

(a) Answer: W' = (7, 7) (shown); X' = (-5, 7)

(b) area scale factor = $(-3)^2 = 9$ **M1**

(b) 72 square units cao **A1**

(b) Answer: 72 square units

Question 16

(a) area scale factor = 80/5 = 16 **M1**

(a) k = -4 cso (since the image is inverted, +4 is rejected) **A1**

(a) Answer: k = -4 [shown]

(b) sets up centre = (A' - kA)/(1-k) or an equivalent vector method **M1**

(b) substitutes k = -4, A = (2,1) and A' = (2,11) correctly **M1**

(b) centre = (2, 3) cao **A1**

(b) Answer: (2, 3)

(c) finds the vector from the centre (2,3) to C: (0,3), and multiplies by -4: (0,-12) oe **M1**

(c) C' = (2, -9) cao **A1**

(c) Answer: (2, -9)

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