HIGHER

6.9 Enlarging with Negative Scale Factors: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A shape is enlarged by scale factor -0.4. State two facts about the size and position of the image compared with the object.

(Total for Question 1 is 2 marks)

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2 Triangle ABC has vertices A(2, 1), B(5, 1) and C(2, 4). It is enlarged by scale factor -2 with centre (3, 3) to give triangle A'B'C'. Find the coordinates of A', B' and C'.

(Total for Question 2 is 4 marks)

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3 The point P is (3, 1). P is enlarged by scale factor -3 with centre (2, -2). Find the coordinates of the image of P.

(Total for Question 3 is 3 marks)

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4 The point P(-1, 6) is mapped to P'(-1, -6) by an enlargement with scale factor -3. Find the coordinates of the centre of enlargement.

(Total for Question 4 is 3 marks)

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

(Total for Question 5 is 4 marks)

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6 Triangle T has a side from A(0, 4) to B(2, 3). Under a single enlargement, A maps to A'(0, -20) and B maps to B'(-6, -17). Describe fully the enlargement.

(Total for Question 6 is 3 marks)

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7 A shape has area 20 cm². It is enlarged by scale factor -2. Work out the area of the image.

(Total for Question 7 is 2 marks)

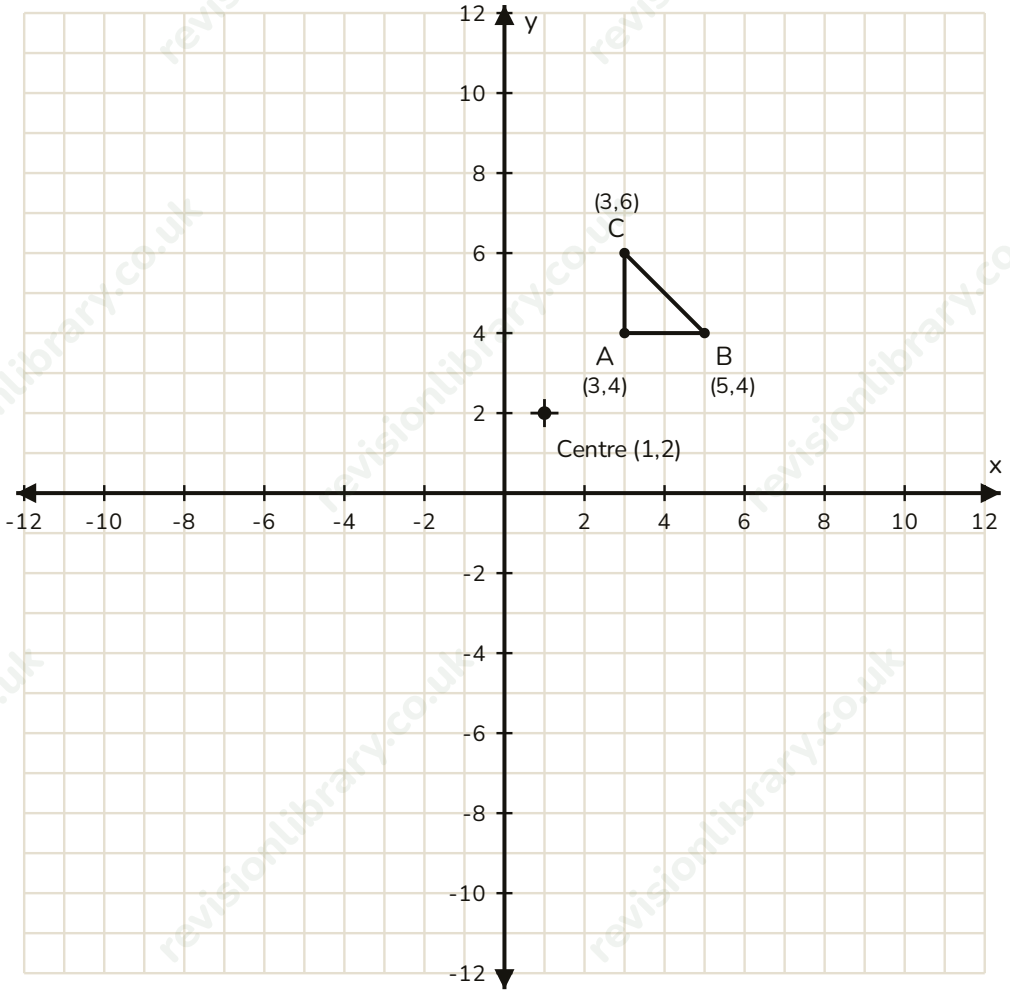
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8 The point P is (-6, 9). P is enlarged by scale factor -1/3 with centre (0, 0). Write down the coordinates of the image of P.

(Total for Question 8 is 2 marks)

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9 Triangle ABC has vertices A(3,4), B(5,4) and C(3,6). Triangle ABC is enlarged by scale factor -3, centre (1,2), to give triangle A'B'C'. Find the coordinates of A', B' and C'.



(Total for Question 9 is 4 marks)

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10 A shape has area 8 cm². The shape is enlarged by scale factor -2. Work out the area of the image.

(Total for Question 10 is 2 marks)

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11 Triangle ABC has vertices A(1,1), B(3,1) and C(1,2). It is enlarged to form triangle A'B'C' with vertices A'(5,-7), B'(-1,-7) and C'(5,-10). Find the scale factor of the enlargement and the coordinates of the centre of enlargement.

(Total for Question 11 is 4 marks)

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12 Describe fully the single transformation that maps triangle XYZ, with vertices X(2, 1), Y(4, 1) and Z(2, 4), onto triangle X'Y'Z', with vertices X'(-4, -2), Y'(-8, -2) and Z'(-4, -8).

(Total for Question 12 is 3 marks)

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13 An enlargement maps a line segment of length 6 cm to an image of length 15 cm. The image is inverted compared with the object. State (i) the scale factor of the enlargement, including its sign (ii) the area scale factor that this would give for a 2-dimensional shape.

(Total for Question 13 is 2 marks)

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14 A student called Aaliyah enlarges a triangle with vertices (2, 0), (4, 0) and (2, 3) by scale factor -2, centre the origin O. Aaliyah's image has vertices (4, 0), (8, 0) and (4, 6).

(a) Explain the error Aaliyah has made. **(1)**

(b) Write down the correct coordinates of the image vertices. **(2)**

(Total for Question 14 is 3 marks)

15 Triangle ABC has vertices A(a, 2), B(a + 4, 2) and C(a, 5), where a is a constant. The triangle is enlarged by scale factor -1, centre the point (3, 4), to give triangle A'B'C'.

(a) Show that A' has coordinates (6 - a, 6). **(3)**

(b) Given that A' has coordinates (2, 6), find the value of a. **(2)**

(Total for Question 15 is 5 marks)

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Mark scheme · 6.9 Enlarging with Negative Scale Factors: 1-hour Pack

Question 1

the image is smaller than the object, since the magnitude of the scale factor is less than 1 oe	**B1**
the image is on the opposite side of the centre and inverted, since the scale factor is negative oe	**B1**

Answer: The image is smaller than the object (since |scale factor| < 1), and it lies on the opposite side of the centre of enlargement, inverted compared with the object.

Question 2

method for one vertex, e.g. (vertex - centre) x scale factor, then + centre	**M1**
A'(5, 7)	**A1**
B'(-1, 7)	**A1**
C'(5, 1)	**A1**

Answer: A'(5, 7), B'(-1, 7), C'(5, 1)

Question 3

vector from centre to P = (1, 3)	**M1**
multiplies by -3 and adds the centre	**M1**
(-1, -11) cao	**A1**

Answer: (-1, -11)

Question 4

sets up an equation, e.g. centre + k x (P - centre) = P'	**M1**
solves for one coordinate of the centre	**M1**
(-1, 3) cao	**A1**

Answer: (-1, 3)

Question 5

method for one vertex, e.g. (vertex - centre) x scale factor, then + centre	**M1**
A'(-7, -3)	**A1**
B'(-8, -3)	**A1**
C'(-7, -4)	**A1**

Answer: A'(-7, -3), B'(-8, -3), C'(-7, -4)

Question 6

enlargement	**B1**
scale factor -3	**B1**
centre (0, -2)	**B1**

Answer: Enlargement, scale factor -3, centre (0, -2)

Question 7

area scale factor $(-2)^2 = 4$ (the negative sign does not matter for size)	**M1**
80 cm²	**A1**

Answer: 80 cm^2

Question 8

multiplies both coordinates by -1/3	**M1**
(2, -3) cao	**A1**

Answer: (2, -3)

Question 9

correct vector method used for at least one vertex, e.g. (A - centre) x -3, then + centre	**M1**
A'(-5,-4)	**A1**
B'(-11,-4)	**A1**
C'(-5,-10) cao	**A1**

Answer: A'(-5,-4), B'(-11,-4), C'(-5,-10)

Question 10

area scale factor = $(-2)^2 = 4$	**M1**
32 cm² cao	**A1**

Answer: 32 cm^2

Question 11

correct comparison of corresponding lengths, e.g. AB = 2, A'B' = 6, so ratio = 3	**M1**
scale factor = -3 (negative because image is inverted / opposite orientation)	**A1**
correct equation set up using one vertex and its image with k = -3 to find the centre (p,q)	**M1**
centre = (2,-1) cao	**A1**

Answer: Scale factor = -3; centre of enlargement = (2,-1)

Question 12

enlargement	**B1**
scale factor -2	**B1**
centre (0, 0) oe	**B1**

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

Question 13

k = -2.5 (or -5/2) cao	**B1**
area scale factor = 6.25 (or 25/4) cao	**B1**

Answer: k = -2.5; area scale factor = 6.25

Question 14

(a) states Aaliyah has used scale factor +2 (ignored the negative sign), placing the image on the same side as the object instead of the opposite side oe	**B1**

(a) Answer: Aaliyah used scale factor +2 instead of -2, so her image is on the same side of the centre as the object instead of the opposite side.

(b) multiplies each vertex by -2	**M1**
(b) (-4,0), (-8,0) and (-4,-6) all correct cao	**A1**

(b) Answer: (-4, 0), (-8, 0) and (-4, -6)

Question 15

(a) finds the vector from the centre (3,4) to A: (a-3,-2) oe	**M1**
(a) multiplies by -1: (3-a,2) oe	**M1**
(a) adds the centre to show A' = (6-a, 6) cso	**A1**

(a) Answer: A' = (6 - a, 6) [shown]

(b) sets 6 - a = 2 oe	**M1**
(b) a = 4 cao	**A1**

(b) Answer: a = 4

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