



ACHIEVE ACADEMY

GCSE Maths — Foundation Tier

Transformations & Vectors · Practice Booklet

NAME: _____

CLASS: _____

DATE: _____

☐ Developing

☒ Secure

☐ Greater Depth

Answer every question in the working space provided. Method marks are available for correct working even if the final answer is wrong. Check the time allowed with your tutor before you start.

Transformations & Vectors

Total marks available: 74

● Transformations & Vectors

✓ $(-3, -5), (-5, -5), (-5, -2)$

Q1 · ● Developing · 2 marks

METHOD

Reflection in the y-axis: $(x, y) \rightarrow (-x, y)$

$$(3, -5) \rightarrow (-3, -5)$$

$$(5, -5) \rightarrow (-5, -5)$$

$$(5, -2) \rightarrow (-5, -2)$$

✓ $(-3, -2), (-5, -2), (-5, 0), (-3, 0)$

Q2 · ● Developing · 2 marks

METHOD

Reflection in the y-axis: $(x, y) \rightarrow (-x, y)$

$$(3, -2) \rightarrow (-3, -2)$$

$$(5, -2) \rightarrow (-5, -2)$$

$$(5, 0) \rightarrow (-5, 0)$$

$$(3, 0) \rightarrow (-3, 0)$$

✓ $(2, 4), (5, 4), (2, 2)$

Q3 · ● Developing · 2 marks

METHOD

Reflection in the x-axis: $(x, y) \rightarrow (x, -y)$

$$(2, -4) \rightarrow (2, 4)$$

$$(5, -4) \rightarrow (5, 4)$$

$$(2, -2) \rightarrow (2, 2)$$

✓ $(5, -6), (2, -6), (4, -3)$

Q4 · ● Developing · 2 marks

METHOD

Reflection in the y-axis: $(x, y) \rightarrow (-x, y)$

$$(-5, -6) \rightarrow (5, -6)$$

$$(-2, -6) \rightarrow (2, -6)$$

$$(-4, -3) \rightarrow (4, -3)$$

✓ $(1, -2), (3, -2), (3, 0), (1, 0)$

Q5 · ● Developing · 2 marks

METHOD

Add $(2, -4)$ to each vertex of P:

$$(-1, 2) \rightarrow (1, -2)$$

$$(1, 2) \rightarrow (3, -2)$$

$$(1, 4) \rightarrow (3, 0)$$

$$(-1, 4) \rightarrow (1, 0)$$

✓ $(-6, -1), (-3, -1), (-5, -4)$

Q6 · ● Developing · 2 marks

METHOD

Reflection in the x-axis: $(x, y) \rightarrow (x, -y)$

$$(-6, 1) \rightarrow (-6, -1)$$

$$(-3, 1) \rightarrow (-3, -1)$$

$$(-5, 4) \rightarrow (-5, -4)$$

✓ $(-3, 0), (-6, 0), (-4, 3)$

Q7 · ● Developing · 2 marks

METHOD

Reflection in the y-axis: $(x, y) \rightarrow (-x, y)$

$$(3, 0) \rightarrow (-3, 0)$$

$$(6, 0) \rightarrow (-6, 0)$$

$$(4, 3) \rightarrow (-4, 3)$$

✓ $(-1, 5), (2, 5), (2, 3), (-1, 3)$

Q8 · ● Developing · 2 marks

METHOD

Reflection in the x-axis: $(x, y) \rightarrow (x, -y)$

$$(-1, -5) \rightarrow (-1, 5)$$

$$(2, -5) \rightarrow (2, 5)$$

$$(2, -3) \rightarrow (2, 3)$$

$$(-1, -3) \rightarrow (-1, 3)$$

✓ $(-5, -7), (-3, -7), (-3, -5), (-5, -5)$

Q9 · ● Developing · 2 marks

METHOD

Add $(-5, 0)$ to each vertex of P:

$$(0, -7) \rightarrow (-5, -7)$$

$$(2, -7) \rightarrow (-3, -7)$$

$$(2, -5) \rightarrow (-3, -5)$$

$$(0, -5) \rightarrow (-5, -5)$$

✓ $(3, -2), (1, -2), (1, 1)$

Q10 · ● Developing · 2 marks

METHOD

Reflection in the y-axis: $(x, y) \rightarrow (-x, y)$

$$(-3, -2) \rightarrow (3, -2)$$

$$(-1, -2) \rightarrow (1, -2)$$

$$(-1, 1) \rightarrow (1, 1)$$

✓ $(-2, 1), (-2, 4), (-5, 2)$

Q11 · ● Secure · 3 marks

METHOD

Rotation of 90° anticlockwise about the origin sends (x, y) to $(-y, x)$:

$$(1, 2) \rightarrow (-2, 1)$$

$$(4, 2) \rightarrow (-2, 4)$$

$$(2, 5) \rightarrow (-5, 2)$$

✓ $(5, 2), (2, 2), (5, 0)$

Q12 · ● Secure · 3 marks

METHOD

Rotation of 180° about the origin sends (x, y) to $(-x, -y)$:

$$(-5, -2) \rightarrow (5, 2)$$

$$(-2, -2) \rightarrow (2, 2)$$

$$(-5, 0) \rightarrow (5, 0)$$

✓ (0, 1), (-3, 1), (-1, -2)

Q13 · ● Secure · 3 marks

METHOD

Rotation of 180° about the origin sends (x, y) to $(-x, -y)$:

$$(0, 1) \rightarrow (0, 1)$$

$$(3, -1) \rightarrow (-3, 1)$$

$$(1, 2) \rightarrow (-1, -2)$$

✓ (-2, -2), (1, -2), (-1, -5)

Q14 · ● Secure · 3 marks

METHOD

Reflection in $y = -3$: $(x, y) \rightarrow (x, 2 \times -3 - y)$

$$(-2, -4) \rightarrow (-2, -2)$$

$$(1, -4) \rightarrow (1, -2)$$

$$(-1, -1) \rightarrow (-1, -5)$$

✓ (4, 3), (4, 5), (1, 5)

Q15 · ● Secure · 3 marks

METHOD

Rotation of 90° anticlockwise about the origin sends (x, y) to $(-y, x)$:

$$(3, -4) \rightarrow (4, 3)$$

$$(5, -4) \rightarrow (4, 5)$$

$$(5, -1) \rightarrow (1, 5)$$

✓ (-1, 3), (2, 3), (2, 1), (-1, 1)

Q16 · ● Secure · 3 marks

METHOD

Reflection in $y = -2$: $(x, y) \rightarrow (x, 2 \times -2 - y)$

$$(-1, -7) \rightarrow (-1, 3)$$

$$(2, -7) \rightarrow (2, 3)$$

$$(2, -5) \rightarrow (2, 1)$$

$$(-1, -5) \rightarrow (-1, 1)$$

✓ (2, 1), (5, 1), (2, -1)

Q17 · ● Secure · 3 marks

METHOD

Reflection in $y = -2$: $(x, y) \rightarrow (x, 2 \times -2 - y)$

$$(2, -5) \rightarrow (2, 1)$$

$$(5, -5) \rightarrow (5, 1)$$

$$(2, -3) \rightarrow (2, -1)$$

✓ (-2, 2), (1, 2), (-1, -1)

Q18 · ● Secure · 3 marks

METHOD

Reflection in $y = 2$: $(x, y) \rightarrow (x, 2 \times 2 - y)$

$$(-2, 2) \rightarrow (-2, 2)$$

$$(1, 2) \rightarrow (1, 2)$$

$$(-1, 5) \rightarrow (-1, -1)$$

✓ (-6, 0), (-6, -3), (-4, 0)

Q19 · ● Secure · 3 marks

METHOD

Rotation of 90° clockwise about the origin sends (x, y) to $(y, -x)$:

$$(0, -6) \rightarrow (-6, 0)$$

$$(3, -6) \rightarrow (-6, -3)$$

$$(0, -4) \rightarrow (-4, 0)$$

✓ (-5, -6), (-7, -6), (-7, -4), (-5, -4)

Q20 · ● Secure · 3 marks

METHOD

Reflection in $x = -3$: $(x, y) \rightarrow (2 \times -3 - x, y)$

$$(-1, -6) \rightarrow (-5, -6)$$

$$(1, -6) \rightarrow (-7, -6)$$

$$(1, -4) \rightarrow (-7, -4)$$

$$(-1, -4) \rightarrow (-5, -4)$$

✓(3, 15)

Q21 · ● Greater Depth · 2 marks

METHOD

$$\begin{aligned}3a - 2b &= 3 \times (-1, 1) - 2 \times (-3, -6) \\&= (-3, 3) - (-6, -12) \\&= (3, 15)\end{aligned}$$

✓(0, 3), (9, 3), (0, 9)

Q22 · ● Greater Depth · 3 marks

METHOD

Enlargement, centre O, scale factor 3: $(x, y) \rightarrow (3x, 3y)$
 $(0, 1) \rightarrow (0, 3)$
 $(3, 1) \rightarrow (9, 3)$
 $(0, 3) \rightarrow (0, 9)$

✓(-6, 0), (-2, 0), (-2, 6)

Q23 · ● Greater Depth · 3 marks

METHOD

Enlargement, centre O, scale factor 2: $(x, y) \rightarrow (2x, 2y)$
 $(-3, 0) \rightarrow (-6, 0)$
 $(-1, 0) \rightarrow (-2, 0)$
 $(-1, 3) \rightarrow (-2, 6)$

✓(8, 6)

Q24 · ● Greater Depth · 2 marks

METHOD

$$\begin{aligned}2a + 2b &= 2 \times (5, -3) + 2 \times (-1, 6) \\&= (10, -6) + (-2, 12) \\&= (8, 6)\end{aligned}$$

✓(1, 24)

Q25 · ● Greater Depth · 2 marks

METHOD

$$\begin{aligned}3a - 2b &= 3 \times (3, 6) - 2 \times (4, -3) \\&= (9, 18) - (8, -6) \\&= (1, 24)\end{aligned}$$

✓(-2, -1)

Q26 · ● Greater Depth · 2 marks

METHOD

$$\begin{aligned}a + b &= 1 \times (-4, -5) + 1 \times (2, 4) \\&= (-4, -5) + (2, 4) \\&= (-2, -1)\end{aligned}$$

✓(-11, -12)

Q27 · ● Greater Depth · 2 marks

METHOD

$$\begin{aligned}2a - b &= 2 \times (-4, -6) - 1 \times (3, 0) \\&= (-8, -12) - (3, 0) \\&= (-11, -12)\end{aligned}$$

✓(8, -8)

Q28 · ● Greater Depth · 2 marks

METHOD

$$\begin{aligned}a - 2b &= 1 \times (6, -6) - 2 \times (-1, 1) \\&= (6, -6) - (-2, 2) \\&= (8, -8)\end{aligned}$$

✓(-6, 2), (0, 2), (-6, 6)

Q29 · ● Greater Depth · 3 marks

METHOD

Enlargement, centre O, scale factor 2: $(x, y) \rightarrow (2x, 2y)$

$$\begin{aligned}(-3, 1) &\rightarrow (-6, 2) \\(0, 1) &\rightarrow (0, 2) \\(-3, 3) &\rightarrow (-6, 6)\end{aligned}$$

✓ $(-2, 0), (2, 0), (2, 4), (-2, 4)$

Q30 · ● Greater Depth · 3 marks

METHOD

Enlargement, centre O, scale factor 2: $(x, y) \rightarrow (2x, 2y)$

$$(-1, 0) \rightarrow (-2, 0)$$

$$(1, 0) \rightarrow (2, 0)$$

$$(1, 2) \rightarrow (2, 4)$$

$$(-1, 2) \rightarrow (-2, 4)$$