XT - MATHS Grade 10

Subject: Analytical Geometry **Date:** 2010/06/28

Total Marks: 49

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1. FALSE 1

Explanation: A line parallel to the x-axis has a gradient of 0 since there is no vertical rise in the line.
Since the line is parallel to the x-axis, it cuts the y-axis at 4.
Therefore, the equation is $y = 4$.

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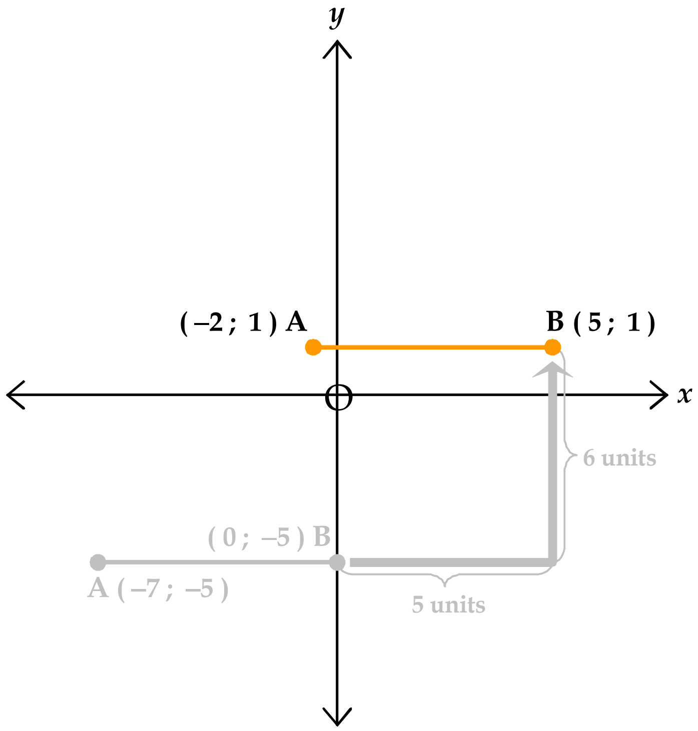
2. A 2

Explanation:



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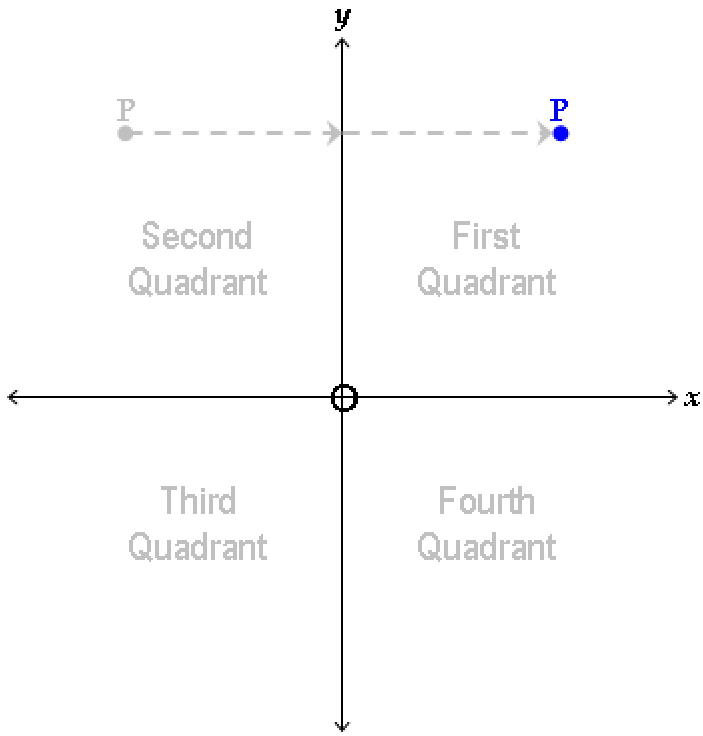
3. first
1st 1

Explanation: The distance between the new position of $\mathbf{P}$ and the y-axis must be the same as between the original point $\mathbf{P}$ and the y-axis.
Therefore:

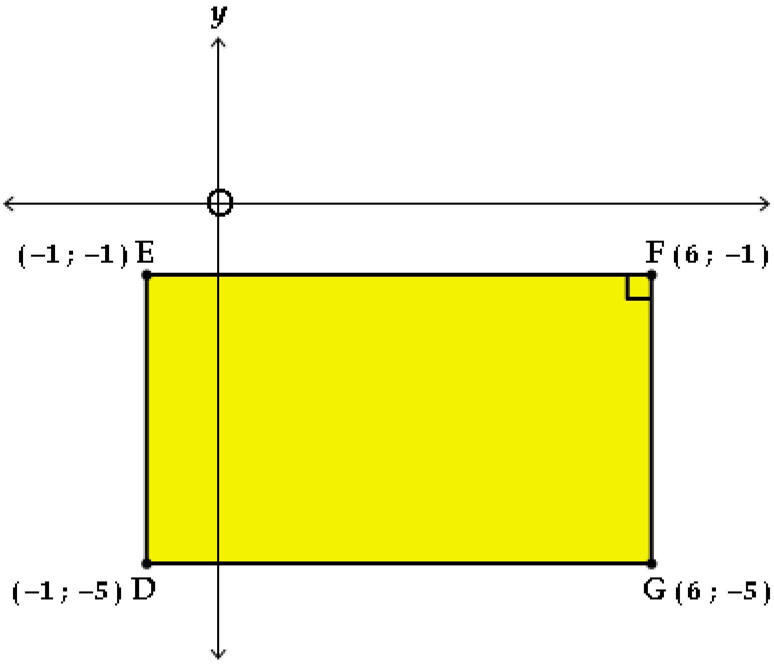


4. A 4

Explanation: For a reflection about the y-axis, replace the y-coordinates with $-y$.

Therefore:

D (–1; 3)	becomes	D' (–1; –3)
E (–1; –11)	becomes	E' (–1; 11)
F (6; –1)	becomes	F' (6; 1)
G (6; 3)	becomes	G' (6; –3)



5. TRUE 4

Explanation: The diagonals of a parallelogram bisect each other.

The point $(2\frac{1}{2}; -4)$ must therefore be the midpoint of both $\mathbf{AC}$ and $\mathbf{BD}$.

Midpoint of $\mathbf{AC} = \left(\frac{\text{sum of } x'\text{s}}{2} \ ; \ \frac{\text{sum of } y'\text{s}}{2} \right)$

$= \left(\frac{7 + (-2)}{2} \ ; \ \frac{(-5) + (-3)}{2} \right)$

$= \left(\frac{5}{2} \ ; \ \frac{-8}{2} \right)$

$= \left(2\frac{1}{2} \ ; \ -4 \right)$

Midpoint of $\mathbf{BD} = \left(\frac{\text{sum of } x'\text{s}}{2} \ ; \ \frac{\text{sum of } y'\text{s}}{2} \right)$

$= \left(\frac{2 + 3}{2} \ ; \ \frac{3 + (-11)}{2} \right)$

$= \left(\frac{5}{2} \ ; \ \frac{-8}{2} \right)$

$= \left(2\frac{1}{2} \ ; \ -4 \right)$

The point $(2\frac{1}{2}\,;\,-4)$ is therefore the point of intersection of the diagonals of **ABCD**.

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6. (1) $(3\,;\,2)$ 6

(2) $(-7\,;\,2)$

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

Explanation: (1) As the difference between the x-coordinates of **P** and **R** is **2**,
R is **2 units** to the right of **Q**.
Therefore, if **R** is reflected about **PQ**, **R** will be moved **2 units** to the left of **Q**.
The x-coordinate of **R** will thus be changed to $5 - 2 = 3$.

Point **R** stays in the same horizontal line when it is reflected, so the y-coordinate does not change.

The new coordinates of **R** will then be $(3\,;\,2)$.

(2) For a reflection about the y-axis, replace the x-coordinates with $-x$.
Therefore:

$P(5\,;\,8)$ becomes $P'(-5\,;\,8)$
$Q(5\,;\,2)$ becomes $Q'(-5\,;\,2)$
$R(7\,;\,2)$ becomes $R'(-7\,;\,2)$

(3) For a reflection about the x-axis, replace the y-coordinates with $-y$.
Therefore:

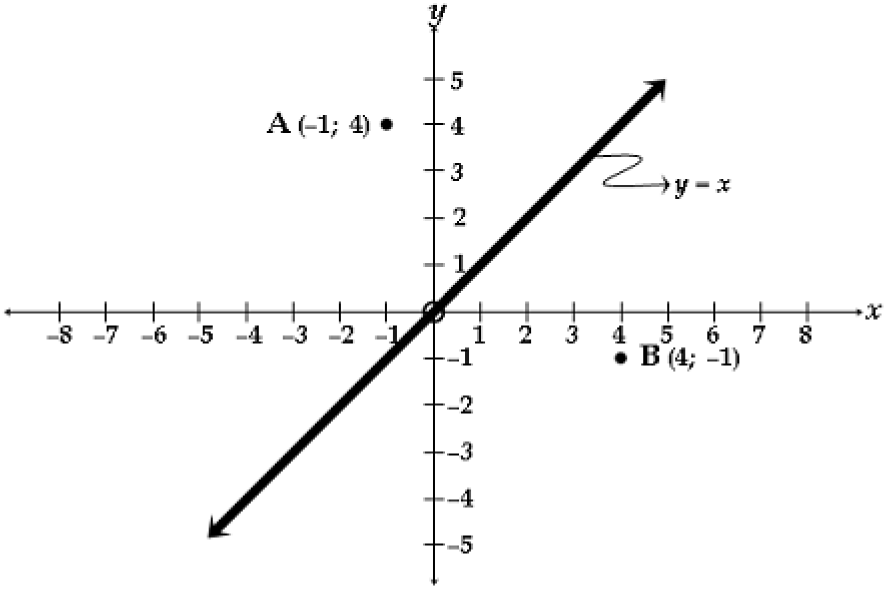
$P(5\,;\,8)$ becomes $P'(5\,;\,-8)$
$Q(5\,;\,2)$ becomes $Q'(5\,;\,-2)$
$R(7\,;\,2)$ becomes $R'(7\,;\,-2)$

7. (1) reflection about the line $y = x$ 3

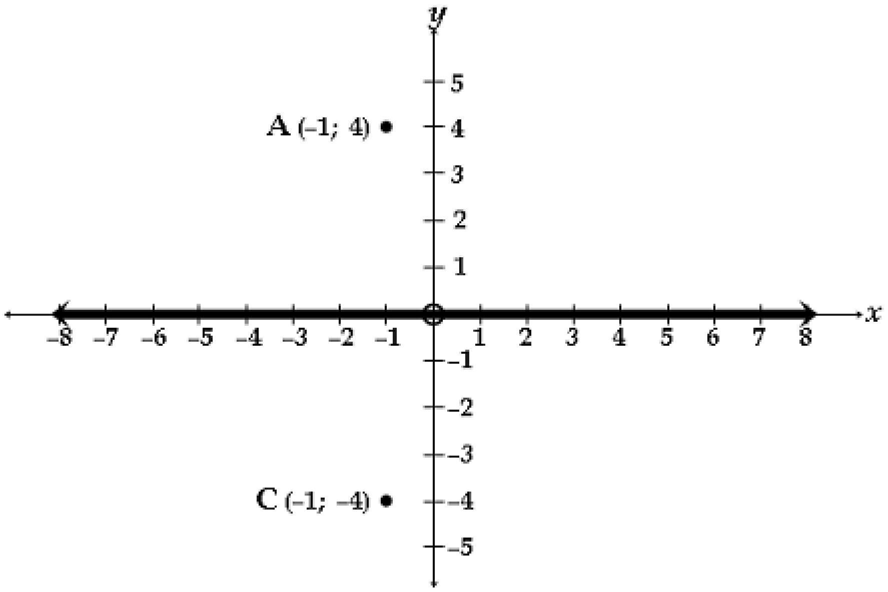
(2) reflection about the x-axis

(3) reflection about the y-axis

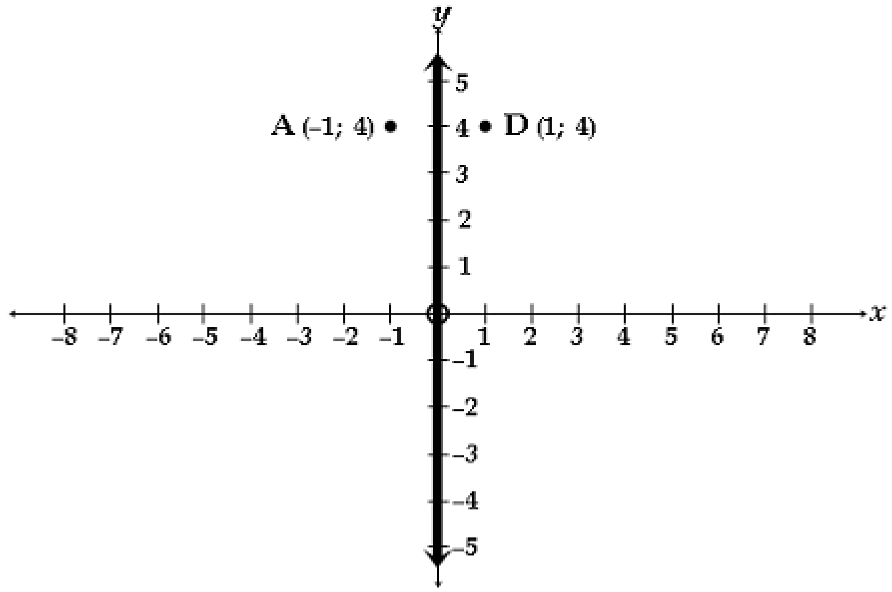
Explanation: (1) The x- and y-coordinates of the point **B (4; –1)** have been swopped with the point **A (–1; 4)**. Hence this is a reflection in the line $y = x$.



(2) The y-coordinate of the point **C (–1; –4)** has changed sign from the point **A (–1; 4)**. Hence this is a reflection in the x-axis.



(3) The x-coordinate of the point **D (1; 4)** has changed sign from the point **A (–1; 4)**. Hence this is a reflection in the y-axis.



8. (1) m 2

(2) c

Explanation: (1) By definition, m = gradient.

(2) Since the y-intercept is found by substituting $x = 0$, it follows that the y-intercept will be c.

9. 4; - 4 6
- 4; 4

Explanation: Distance between $(x\,;\,-3)$ and $(0\,;\,0)$

$= \sqrt{(\text{difference in } x\text{' s})^2 + (\text{difference in } y\text{' s})^2}$

$= \sqrt{[x - 0]^2 + [(-3) - 0]^2}$

$= \sqrt{[x]^2 + [-3]^2}$

$= \sqrt{x^2 + 9}$

But the distance is given as 5.
Therefore:

$\sqrt{x^2 + 9} = 5$

$\therefore\ x^2 + 9 = 25$ [squaring both sides]

$\therefore\ x^2 = 16$

$\therefore\ x = \pm 4$ [taking the square root on both sides]

10. y = 4x - 11 3

Explanation: The equation of a straight line: $y = mx + c$
If the slope is 4, then $m = 4$.
Therefore:

$y = 4x + c$

Substitute the point $(2\,;\,-3)$ into this equation:

$$-3 = 4(2) + c$$

$$\therefore -3 = 8 + c$$

$$\therefore c = -11$$

The equation of this straight line will then be $y = 4x - 11$.

11. B 2

Explanation: To determine where this straight line cuts the x-axis:

let $y = 0$: $x = 7(0) - 24$

$$\therefore x = -24$$

To determine where this straight line cuts the y-axis:

let $x = 0$: $0 = 7y - 24$

$$\therefore 7y = 24$$

$$\therefore y = \frac{24}{7}$$

$$\therefore y = 3\frac{3}{7}$$

12. D 3

Explanation: Distance between $\mathbf{P}$ and $\mathbf{Q}$

$= \sqrt{(\text{difference in } x\text{' s})^2 + (\text{difference in } y\text{' s})^2}$

$= \sqrt{[(-2) - 5]^2 + [3 - 1]^2}$

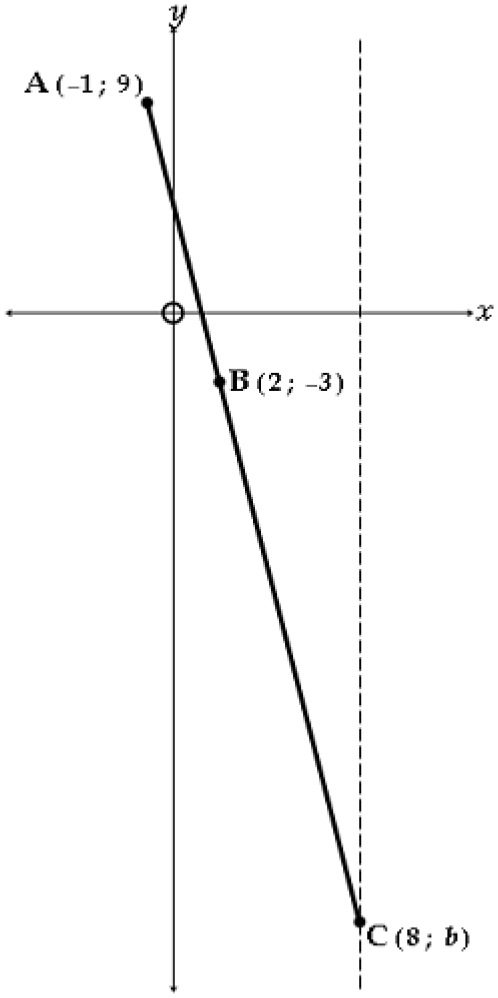
$= \sqrt{(-7)^2 + (2)^2}$

$= \sqrt{49 + 4}$

$= \sqrt{53}$

13. -27 5

Explanation:



$$m_{AB} = \frac{9 - (-3)}{-1 - 2} = \frac{12}{-3} = -4$$

and

$$m_{BC} = \frac{b - (-3)}{8 - 2} = \frac{b + 3}{6}$$

If the points are collinear, they will lie on the same straight line.
Therefore, the gradients between the points must be equal.
Then:

$$\frac{b + 3}{6} = -4$$

$$\therefore \; b + 3 = -24$$

$$\therefore \; b = -27$$

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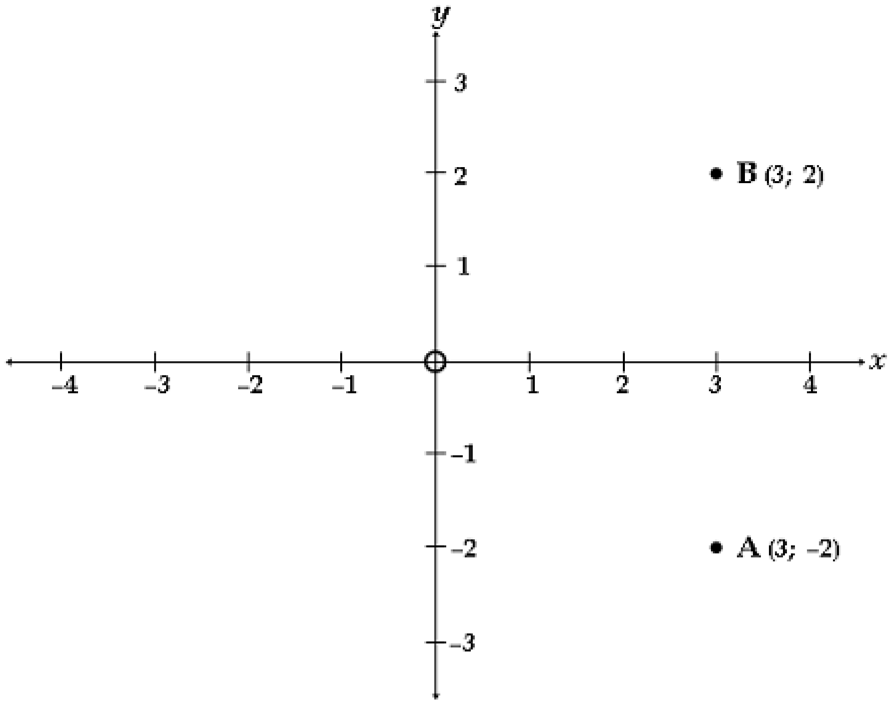
14. (1) reflection about the x-axis 3

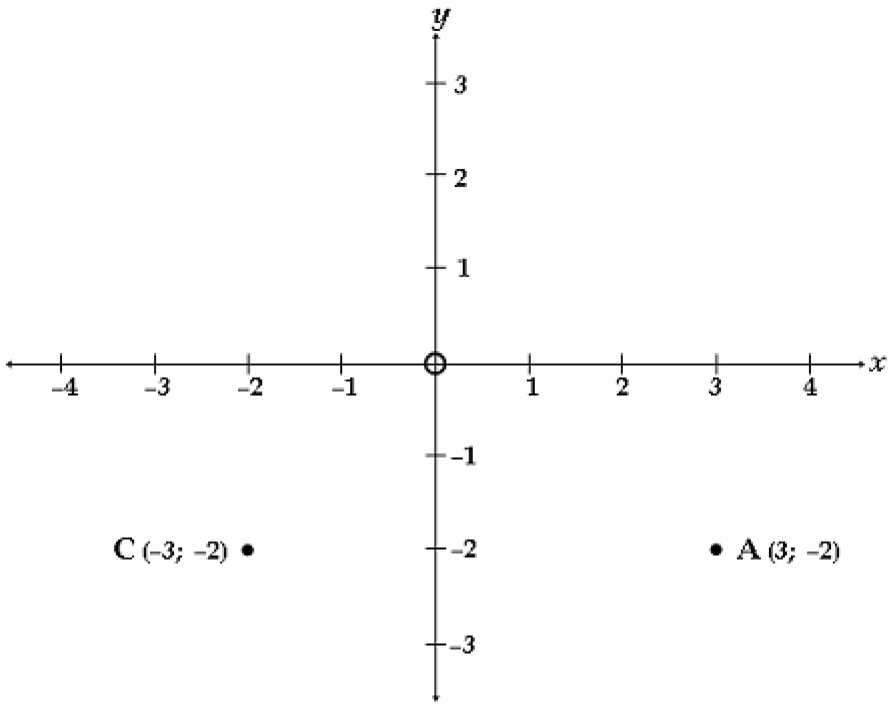
(2) reflection about the y-axis

(3) reflection about the line $y = x$

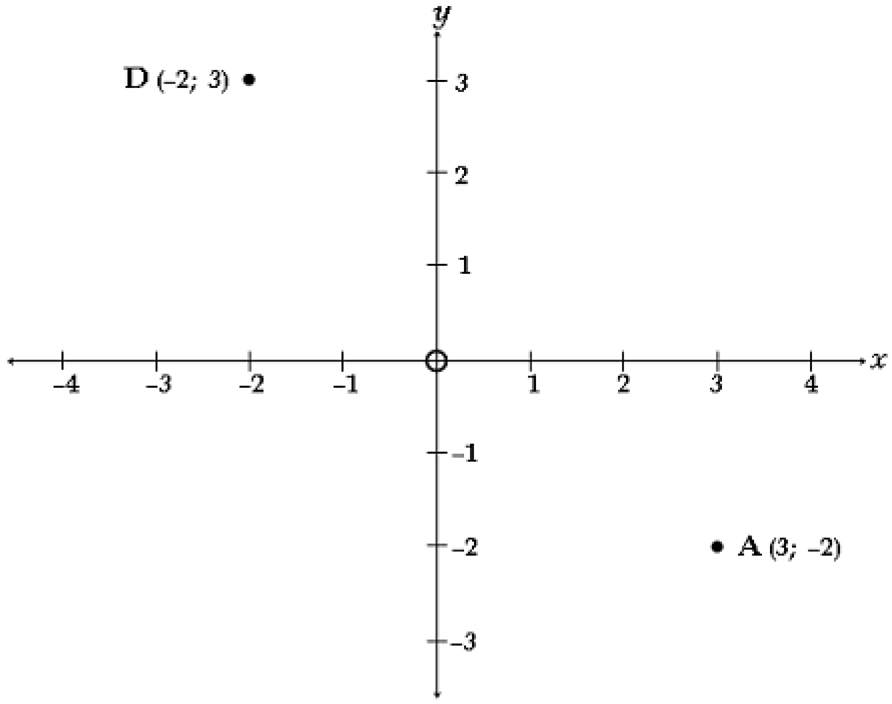
Explanation: (1) The y-coordinate of the point **B (3; 2)** has changed sign from the point **A (3; –2)**.
Hence this is a reflection in the x-axis.
Sketch the coordinates of both points to visualise the reflection.



(2) The x-coordinate of the point **C (–3; –2)** has changed sign from the point **A (3; –2)**.
Hence this is a reflection in the y-axis.
Sketch the coordinates of both points to visualise the reflection.



(3) The y- and x-coordinates of the point **D (–2; 3)** have been swopped with the point **A (3; –2)**.
Hence this is a reflection in the line $y = x$.
Sketch the coordinates of both points to visualise the reflection.



15. (1 ; 3) 4

Explanation: $\mathbf{T}$ lies on $\mathbf{AB}$ and divides $\mathbf{AB}$ into the ratio $\mathbf{1:1}$.
Therefore, $\mathbf{T}$ is the midpoint of $\mathbf{AB}$.
The coordinates of $\mathbf{T}$:

$$\text{Midpoint of } \mathbf{AB} = \left(\frac{x_{\mathbf{A}} + x_{\mathbf{B}}}{2} ; \ \frac{y_{\mathbf{A}} + y_{\mathbf{B}}}{2} \right)$$

$$= \left(\frac{-4 + 6}{2} ; \ \frac{2 + 4}{2} \right)$$

$$= (1 ; 3)$$

15 Questions, 9 Pages