# Guide to: Invariant points

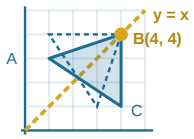
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**Explanation:**

An **invariant point** is a point on a shape that does not move (maps onto itself) after a single transformation or a combination of transformations.

- Under a **reflection**, every point lying directly on the mirror line is invariant.
- Under a **rotation** (not 360°) or **enlargement** (scale factor $k \neq 1$), only the **centre** of rotation or enlargement is invariant.
- Under a non-zero **translation**, there are **no invariant points**. For combined transformations, test vertices systematically or track (x, y) algebraically.

**Example 1:** Triangle ABC has vertices A(1, 3), B(4, 4), and C(4, 1). Which vertex is invariant under a reflection in the line y = x?




**Solution:**

Points on **y = x** stay fixed: A(1,3) → (3,1); C(4,1) → (1,4)

B(4, 4) lies on y = x ⇒ **Answer: (4, 4)**

**Example 2:** A point (x, y) is reflected in the x-axis and then translated by vector $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$. Find the equation of the line of invariant points.

**Solution:**

Reflection in x-axis maps (x, y) → **(x, −y)**

Translation by $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$ maps (x, −y) → **(x, −y + 6)**

For invariance, equate y-coordinates: −y + 6 = y

2y = 6 ⇒ y = 3 (for any x)

**Answer: y = 3**

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