Your matrix is for a 90° counter-clockwise rotation of the plane:

$$A = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$$

I. Commutativity

1. Find the group with matrix B. Compute AB and BA. Do you commute with B?

2. Find the group with matrix C. Compute AC and CA. Do you commute with B?

3. Find the group with matrix D. Compute AD and DA. Do you commute with D?

II. Powers

1. Compute A^2 $(= AA)$, A^3, A^4, A^5.

2. Look for a pattern. What might A^n be, for arbitrary n? Take a guess.

Your matrix is for a reflection of the plane across the y-axis:

$$B = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$$

I. Commutativity

1. Find the group with matrix A. Compute AB and BA. Do you commute with A?

2. Find the group with matrix D. Compute BD and DB. Do you commute with D?

3. Find the group with matrix C. Compute BC and CB. Do you commute with C?

II. Powers

1. Compute B^2 $(= BB)$, B^3, B^4, B^5.

2. Look for a pattern. What might B^n be, for arbitrary n? Take a guess.

Your matrix is for a dialation of the plane by a factor of 3:

$$C = \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$$

I. Commutativity

1. Find the group with matrix D. Compute CD and DC. Do you commute with D?

2. Find the group with matrix A. Compute AC and CA. Do you commute with A?

3. Find the group with matrix B. Compute BC and CB. Do you commute with B?

II. Powers

1. Compute C^2 $(= CC)$, C^3, C^4, C^5.

2. Look for a pattern. What might C^n be, for arbitrary n? Take a guess.

Your matrix is for a dialation of the plane by a factor of 3:

$$C = \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$$

I. Commutativity

1. Find the group with matrix D. Compute CD and DC. Do you commute with D?

2. Find the group with matrix A. Compute AC and CA. Do you commute with A?

3. Find the group with matrix B. Compute BC and CB. Do you commute with B?

II. Powers

1. Compute C^2 $(= CC)$, C^3, C^4, C^5.

2. Look for a pattern. What might C^n be, for arbitrary n? Take a guess.

Your matrix is for a projection of the plane to the x-axis:

$$D = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$$

I. Commutativity

1. Find the group with matrix C. Compute CD and DC. Do you commute with C?

2. Find the group with matrix B. Compute BD and DB. Do you commute with B?

3. Find the group with matrix A. Compute AD and DA. Do you commute with A?

II. Powers

1. Compute D^2 $(= DD)$, D^3, D^4, D^5.

2. Look for a pattern. What might D^n be, for arbitrary n? Take a guess.