

Precalculus · Solving Systems with Matrices · Test Answer Key

Common Core A-REI.C.8, A-REI.C.9, N-VM.C.11, N-VM.C.12 · mathovore.fr

This precalculus matrix systems test answer key gives the full solution and the scoring guide for each of the 8 test questions on solving systems with matrices.

Each solution comes with a scoring guide showing where the points are awarded. Give partial credit for a correct method with an arithmetic slip, and deduct the final-answer point only once for the same mistake carried forward.

Precalculus Common Core: A-REI.C.8 · A-REI.C.9 · N-VM.C.11 · N-VM.C.12

Precalculus Matrix Systems Test Answer Key: questions 1-5

Question 1: Matrix form of a system (2 points)

- a. A has rows 5, -2 and 1, 3; $X = (x, y)$; $B = (9, -5)$.
- b. $\det A = 5(3) - (-2)(1) = 17 \neq 0$, so A has an inverse.

Scoring: (a) 1 point for correct A , X , B . (b) 1 point for 17 together with the conclusion.

Question 2: Inverse of a matrix (3 points)

- a. $\det A = 16 - 15 = 1$.
- b. Swap the diagonal, negate the others: A^{-1} has rows 4, -5 and -3 , 4.
- c. Row 1 of A : $4(4) + 5(-3) = 1$ and $4(-5) + 5(4) = 0$. Row 2: $3(4) + 4(-3) = 0$ and $3(-5) + 4(4) = 1$. So $AA^{-1} = I$.

Scoring: (a) 1 point. (b) 1 point, with 0.5 for correct swapping and 0.5 for correct signs. (c) 1 point for all four entries.

Question 3: Solve a system with matrices (3 points)

- a. $\det = 15 - 14 = 1$, so the inverse has rows 5, -2 and -7 , 3.
- b. $x = 5(4) - 2(9) = 2$ and $y = -7(4) + 3(9) = -1$. Check: $6 - 2 = 4$ and $14 - 5 = 9$. (2, -1)

Scoring: (a) 1 point. (b) 1 point for $X = A^{-1}B$ set up with the right order, 1 point for the correct pair.

Question 4: Singular matrices (2 points)

- a. $\det C = 12 - 3k = 0$, so $k = 4$.
- b. The system is $2x + 4y = 6$, $3x + 6y = 9$. The second equation is 1.5 times the first, so the lines coincide: infinitely many solutions.

Scoring: (a) 1 point for $k = 4$. (b) 1 point for "infinitely many" with the multiple 1.5 or equivalent reason.

Question 5: Transforming points (2 points)

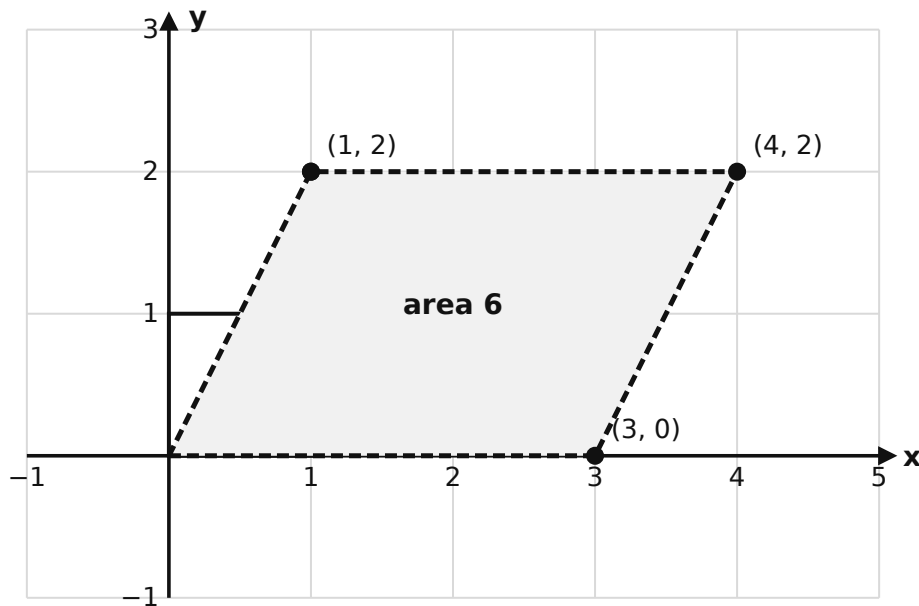
- a. $Q(3, 1) = (0 \cdot 3 + 1 \cdot 1, -3 + 0) = (1, -3)$. $Q(-2, 4) = (4, 2)$.
- b. Each point turns 90° clockwise about the origin (for example $(3, 1)$ goes to $(1, -3)$).

Scoring: (a) 1 point for both images. (b) 1 point for rotation, direction and angle.

Precalculus Matrix Systems Test Answer Key: questions 6-8

Question 6: Image of the unit square (3 points)

- a. $N(0, 0) = (0, 0)$; $N(1, 0) = (3, 0)$; $N(1, 1) = (4, 2)$; $N(0, 1) = (1, 2)$.
- b. $\det N = 3(2) - 1(0) = 6$, so the area is $6 \times 1 = 6$. (Check: base 3, height 2, area 6.)



Dashed: the image parallelogram.

Scoring: (a) 0.5 point per vertex image (2 total). (b) 1 point for 6 with a valid method.

Question 7: Area under a matrix (2 points)

- a. $\det T = 2(4) - (-1)(3) = 11$.

b. The area is multiplied by $|11|=11$: $11 \times 7 = 77$.

Check with vertices: the image has vertices $(0, 0)$, $(14, 21)$, $(-2, 8)$ and shoelace area $\frac{1}{2}|14 \cdot 8 - 21 \cdot (-2)| = 77$.

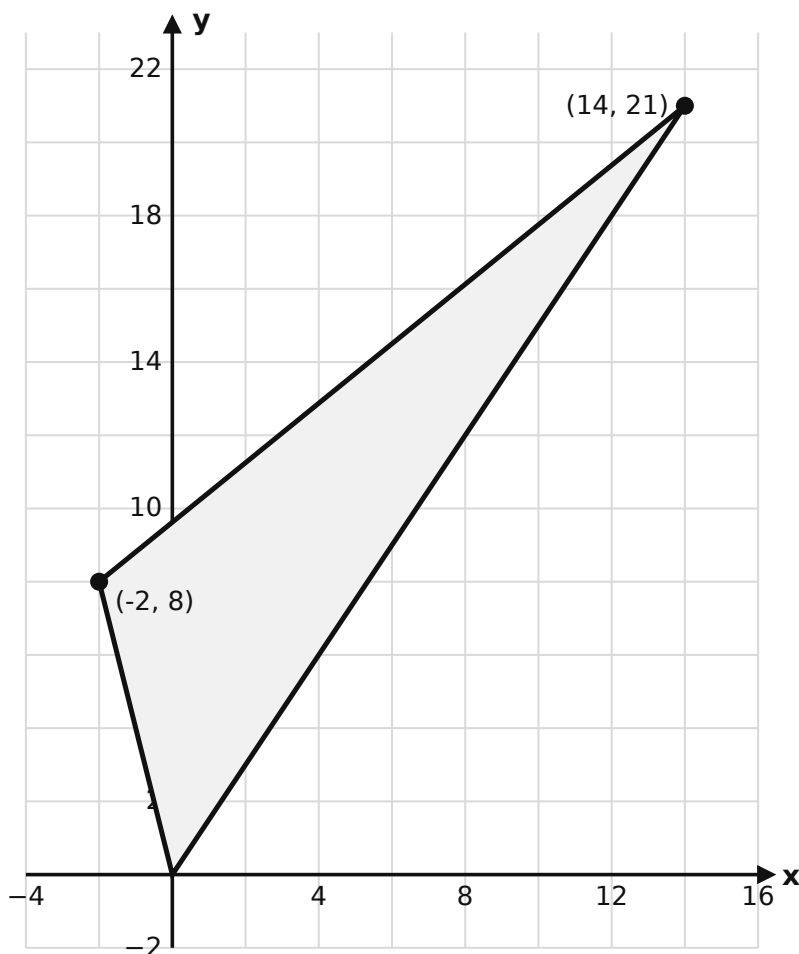


Image of the triangle.

Scoring: (a) 1 point. (b) 1 point for 77 using the factor $|\det T|$.

Question 8: Ticket prices (3 points)

a. Let a be the adult price and s the student price. A has rows 2, 3 and 3, 2; $X = (a, s)$; $B = (36, 39)$.

b. $\det A = 4 - 9 = -5$. $A^{-1} = -\frac{1}{5}$ times rows 2, -3 and -3, 2. Then $a = -\frac{1}{5}(72 - 117) = 9$ and $s = -\frac{1}{5}(-108 + 78) = 6$. Check: $18 + 18 = 36$ and $27 + 12 = 39$. **Adult \$9, student \$6**

Scoring: (a) 1 point. (b) 1 point for the inverse (determinant -5), 1 point for both prices.

Scoring summary

Total

20 points: add the points of every question of this precalculus matrix systems test answer key.

How to use this precalculus matrix systems test answer key

Use this precalculus matrix systems test answer key to score the test fairly and to see which skills need more practice.

