Sets & Steps
Math Practice & Worked Solutions

AP Precalculus

Transition Matrices and Long-Term Behavior

Transition Matrices and Long-Term Behavior | APPC-U04-P20

96 problems · Four activity formats

Topic focus

Across 96 tasks this topic asks for matrix family and parameter interval, terminal states and decision, switch counts, terminal states, and decision, complete set, fixed states for t=0 and t>0 and all possible priors.

8 PDFs and a README; 85 buyer pages.

The following pages use the same questions, given data, and notation as the final files. Question/card serial numbers and internal IDs are omitted in this preview only. Table values and matching responses are retained. Full answer keys are not included.

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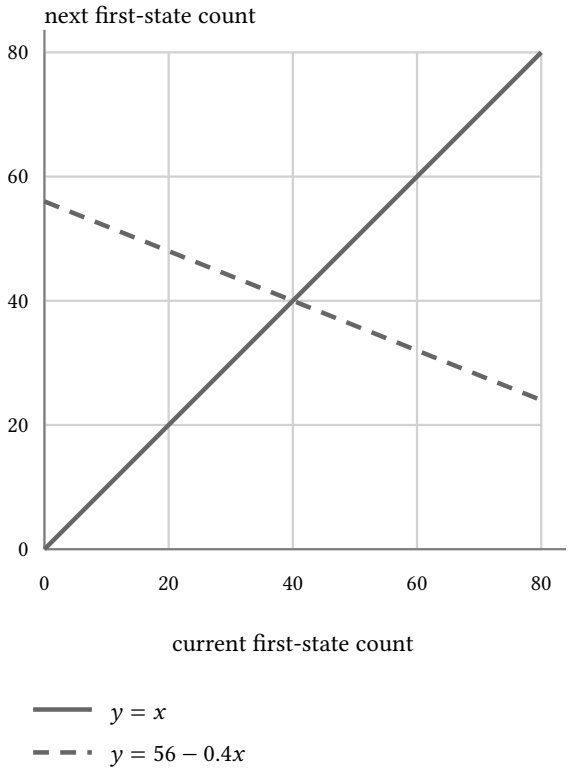
Name: _____ **Date:** _____ **Class:** _____

Answer each question and record the matching bank letter. Give exact values. Give the whole requested response, including any reasoning the question asks for.

Use the graph equations to find the fixed distribution.



0.3	0.7
0.7	0.3

Bank label: _____

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Answer each question and show your reasoning in the workspace. Give exact values rather than decimals unless the question supplies a decimal. Give the whole requested response, including any reasoning the question asks for.

Compare subscribed counts after two months and recommend the policy for that horizon. The components are ordered subscribed, then paused. The horizon in cycles is 2.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

Initial state

100
0

Policy A

0.8	0.3
0.2	0.7

Policy B

0.6	0.5
0.4	0.5

Compute tomorrow's proportions and identify both contributions to the online state. The components are ordered online, then offline.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

Initial state

0.7
0.3

Transition matrix

0.85	0.4
0.15	0.6

Classify all fixed distributions as t ranges from 0 through 0.5. The conserved total is 90. The allowed parameter interval is $0 \le t \le 0.5$.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

Transition matrix

1-t	$2t$
t	$1 - 2t$

Determine the two unknown first-row probabilities from the observations.

Show a complete response in the numbered workspace, preserving requested exactness, units, interval endpoints, and justification.

Matrix pattern

p	q
1-p	1-q

Observation 1: initial state

50
50

Observation 1: later state

55
45

Observation 2: initial state

80
20

Observation 2: later state

70
30

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Begin at START. Answer the card, then find the matching final answer at the top of another card. Use the recording sheet for your reasoning. Visit each card once and continue to FINISH.

Incoming: $[80, 20]$

Convert the shares to counts and calculate the next state. The conserved total is 80.

Solve the card, use the complete requested response as the outgoing match, and move to the unique card whose incoming header matches it; continue until FINISH.

Initial proportions

0.25
0.75

Transition matrix

0.5	0.1
0.5	0.9

Your response: _____

Incoming: $[28, 72]$

Find the equilibrium counts. The conserved total is 80.

Solve the card, use the complete requested response as the outgoing match, and move to the unique card whose incoming header matches it; continue until FINISH.

Transition matrix

0.9	0.3
0.1	0.7

Your response: _____

Incoming: $[[0, 0], [1, 1]]$

Translate the conditional branches into a transition matrix. The components are ordered A, then *B*. The conditional A-to-*B* probability is 0.4; the *B*-to-A probability is 0.15.

Your response: _____

Incoming: $[16, 64]$

Find the fixed distribution with total 120.

Solve the card, use the complete requested response as the outgoing match, and move to the unique card whose incoming header matches it; continue until FINISH.

0.7	0.3
0.3	0.7

Your response: _____

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Evaluate the supplied statement or method. Say whether it is correct, repair it if it is not, and verify the result exactly. Not every prompt contains an error.

A student claims: "Because every displayed row rounds to $(50.0, 50.0)$, the state sequence converges to $(50, 50)$." Diagnose the first invalid step or assumption, give the corrected conclusion, and justify the correction. Then complete the stated task: A rounded table displays $(50.0, 50.0)$ repeatedly. Decide whether that proves convergence.

Identify the error or first invalid step, give the corrected result, and state a brief mathematical reason.

49.96
50.04

0	1
1	0

Find the state after three periods using the supplied power, and explain why multiplying the one-period matrix by 3 would be invalid.

Identify the error or first invalid step, give the corrected result, and state a brief mathematical reason.

40
60

0.8	0.3
0.2	0.7

0.65	0.525
0.35	0.475

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Full Worked Solutions - excerpt

Worked example

Problem. Translate the conditional branches into a transition matrix. The components are ordered A, then B. The conditional A-to-B probability is 0.4; the B-to-A probability is 0.15.

Answer. $[[0.6, 0.15], [0.4, 0.85]]$

Explanation and check.

Each tree root is a current-state source, so its two destination branches become one matrix column.

Worked example

Problem. Encode the deterministic switching rule. The components are ordered left, then right. The transition rule is: every member switches states each cycle.

Answer. $[[0, 1], [1, 0]]$

Explanation and check.

Each source sends probability one to the opposite destination and zero to itself.