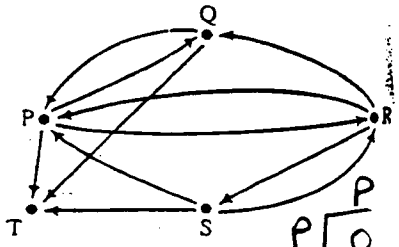
12. **Write the communication matrix**

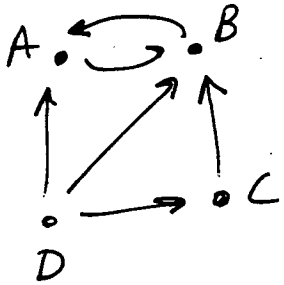
FOR THIS NETWORK



	P	Q	R	S	T
P	0	1	1	0	1
Q	1	0	0	0	1
R	1	1	0	1	0
S	1	0	1	0	1
T	0	0	0	0	0

13. **Draw a communication network that is described by the given matrix.**

	A	B	C	D
A	0	1	0	0
B	1	0	0	0
C	0	1	0	0
D	1	1	1	0

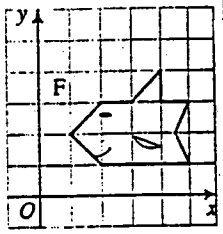


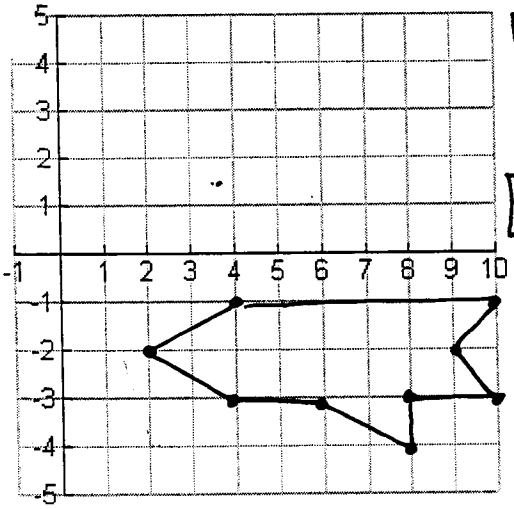
14. Consider the transformation

T: $(x, y) \rightarrow (2x, -y)$,

and the "fish" figure F shown at the right.

a. Find the transformation matrix T.
b. Using matrices, find the images of the nine points determining F.
c. Plot the image points and draw F′. Compare the orientations of F and F′.



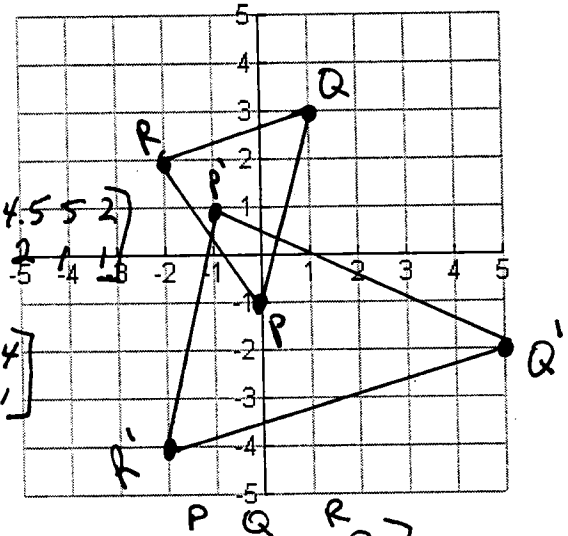


$\begin{bmatrix} 2 & 0 \\ 0 & -1 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 & 4 & 4 & 5 & 4.5 & 5 & 2 \\ 2 & 3 & 3 & 4 & 3 & 3 & 2 & 1 & 1 \end{bmatrix}$

$\begin{bmatrix} 2 & 4 & 6 & 8 & 8 & 10 & 9 & 10 & 4 \\ -2 & -3 & -3 & -4 & -3 & -3 & -2 & -1 & -1 \end{bmatrix}$

15. Consider the transformation T: $(x, y) \rightarrow (2x + y, x - y)$.

a. Draw $\triangle PQR$ with vertices $P(0, -1)$, $Q(1, 3)$, and $R(-2, 2)$.
b. Draw $\triangle P'Q'R'$, the image of $\triangle PQR$ under the transformation T.
c. Find the transformation matrix T



	P	Q	R
x	2	1	
y	1	-1	

$\begin{bmatrix} 0 & 1 & -2 \\ -1 & 3 & 2 \end{bmatrix}$

	P′	Q′	R′
x	-1	5	-2
y	1	-2	-4

Animal Science A dog breeder finds that certain brands of dog food contain different amounts of three main nutrients, measured in milligrams per serving, as shown in the matrix N. The dog breeder decides to mix the brands in order to give the healthiest feeding mixture possible. Matrix P gives the portion of the mixture for each brand.

N · P

	brands W	X	Y	Z
nutrient 1	250	480	360	200
nutrient 2	320	510	475	315
nutrient 3	180	200	230	155

$= N$

	part of mixture
W	40%
X	10%
Y	15%
Z	35%

$= P$

	mixture
nutrient 1	272
nutrient 2	360.5
nutrient 3	180.75

a. Which matrix is defined, NP or PN? Find this matrix.
b. How many milligrams of nutrient 2 are in a serving of the mixture?

360.5 mg