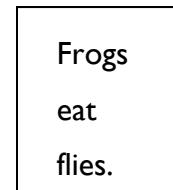
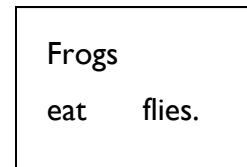
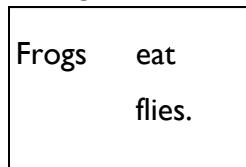
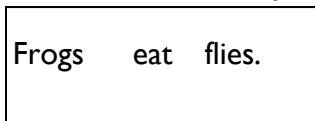


YOUR NAME:

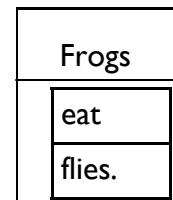
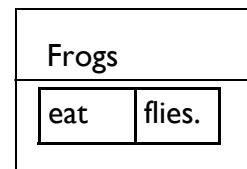
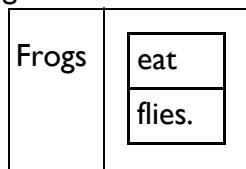
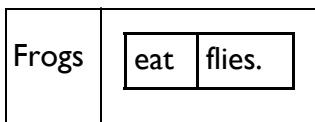
REGISTRATION #

**(H) Twodee (1/7) [20 points]**

Spoken language is one-dimensional — the words of a sentence are pronounced in some order. Standard writing systems merely record that order. But spoken language is often ambiguous. Written language might be clearer if we used Twodee, a two-dimensional writing system that places words on the cells of a rectangular grid. Here are all the ways to write “Frogs eat flies” in Twodee:



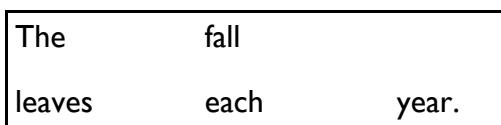
Why so many layout options? If a sentence or other phrase consists of two sub-phrases A and B, where A is spoken first, then Twodee lets you write A either to the *left* of B (as in ordinary writing) or *above* B. If A or B has multiple words, then it will have sub-phrases of its own. The diagrams below reveal how the four Twodee sentences above were put together.



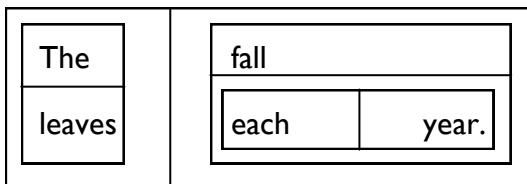
Clear writers of Twodee usually try to choose layout options that will help their readers identify the sub-phrases A and B. Make sure you align the top edges as shown when placing the A and B rectangles side-by-side, or align the left edges as shown when stacking the A and B rectangles top-to-bottom. No extra space (blank columns or rows) is allowed between the two rectangles.

To write Twodee, you do need to know how to divide the phrase you’re writing into sub-phrases. That is mostly a matter of common sense, based on the intended meaning of the phrase. There are also some conventions, such as the traditional division of a sentence into subject (“Frogs”) and predicate (“eat flies,” which describes what frogs do).

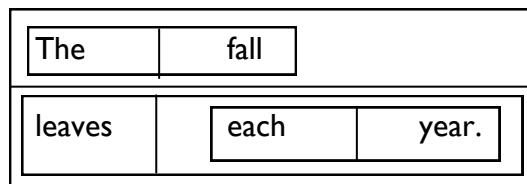
While Twodee is intended as a better writing system, it can still be ambiguous. For example, the meaning of



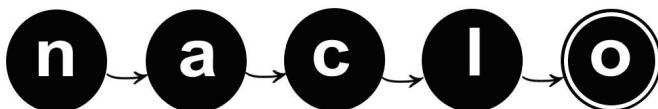
is not clear because the sentence could have been constructed in at least two plausible ways:



(Spoken order: “The leaves fall each year.”)



(Spoken order: “The fall leaves each year.”)

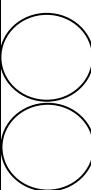


# (H) Twodee (2/7)

**H1.** For each Twodee sentence (on the left), use the circles to enter the numbers of all its possible meanings (paraphrased on the right). Some circles may be left blank. **Hint:** You may find it helpful to identify the sub-phrases of a Twodee sentence by drawing boxes as above.

A.

Jack and Jill  
TM  
went up the hill.



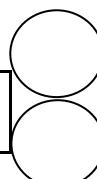
1. The trademarked group known as “Jack and Jill” ascended the hill.

Jack and Jill  
TM  
went up the hill.



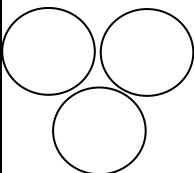
2. Jack ascended the hill with his trademarked companion, “Jill.”

Jack and Jill TM went up the hill.



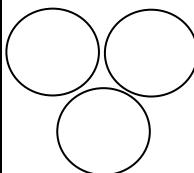
B.

The citizens  
hugged the  
and soldiers.  
cheered



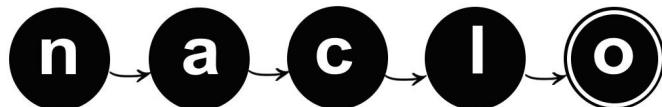
3. The citizens hugged the soldiers and cheered the soldiers.

The citizens  
hugged  
and  
cheered the  
soldiers.



4. The citizens hugged each other and cheered the soldiers.

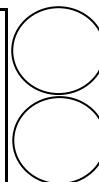
5. The citizens hugged the soldiers and cheered.



**(H) Twodee (3/7)**

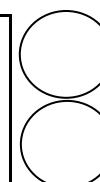
C.

John didn't marry his sweetheart  
because she was rich.



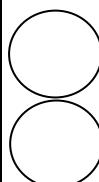
6. It's not because his sweetheart was rich that John married her.

John didn't marry his sweetheart  
because she was rich.



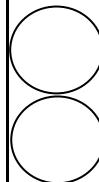
7. Because his sweetheart was rich,  
John didn't marry her.

Alice  
attacked the  
scientists  
with the  
faulty data.



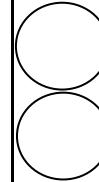
8. Alice used the faulty data  
to attack the scientists.

Alice  
attacked the with the  
scientists faulty data.



9. Alice attacked the scientists  
who had faulty data.

Alice attacked the  
scientists  
with the  
faulty data.



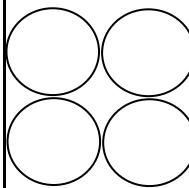
YOUR NAME:

REGISTRATION #

## (H) Twodee (4/7)

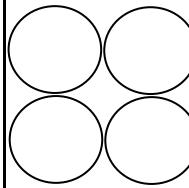
E.

Heavy farmers are forbidden  
and on this  
cattle ramp.



10. Heavy farmers and heavy cattle  
are forbidden on this ramp.

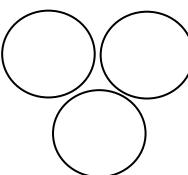
Heavy farmers are forbidden  
and on this  
cattle ramp.



11. Heavy farmers and cattle farmers  
are forbidden on this ramp.

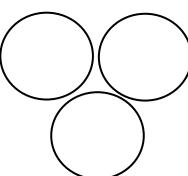
F.

Please shake in  
the  
raisins.



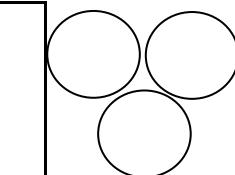
14. Please add the raisins by shaking them.

Please shake in  
the raisins.



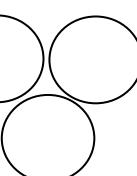
15. Please get into the raisins and shake  
yourself.

Please shake in  
the raisins.



16. If you are going to shake yourself,  
please do it in the raisins.

Please shake in  
the  
raisins.

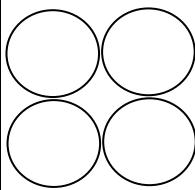


n → a → c → l → o

**(H) Twodee (5/7)**

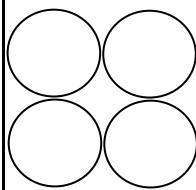
G.

I was  
spooked out  
by the dark magician's  
hut.



17. The hut of the dark magician  
spooked me out.

I was  
spooked  
out by the dark hut.  
magician's



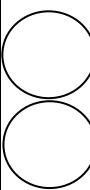
18. The dark hut of the magician  
spooked me out.

19. Out by the hut of the dark  
magician, something spooked me.

20. Out by the dark hut of the  
magician, something spooked me.

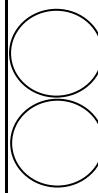
H.

The sold  
business to  
the bank  
bought from  
the  
government.



21. The business sold things to the bank  
that was bought from the government.

The bought from  
business sold the  
to government.  
the bank



22. The business that was sold to the bank  
bought things from the government.



YOUR NAME:

REGISTRATION #

# (H) Twodee (6/7)

**H2.** In April 2012, an entertainment reporter wrote:

“Zooey Deschanel left her husband Death Cab for Cutie frontman Ben Gibbard.”

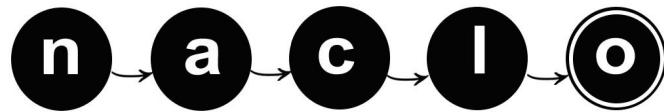
The former husband, Ben Gibbard, was the frontman for a band called “Death Cab for Cutie.” However, an editor for ABC News incorrectly clarified the sentence and published the following:

“Deschanel filed for divorce from husband Death Cab, throwing him over for Cutie frontman Ben Gibbard.”

(The editor went on to add that “Deschanel and Cab were married for a little more than three years.”)

By using Twodee, how could the reporter have written the original sentence to avoid this confusion? Place the words of the original sentence in 12 different cells of this two-dimensional grid (starting with “Zooey” at the top left).

Zooey											

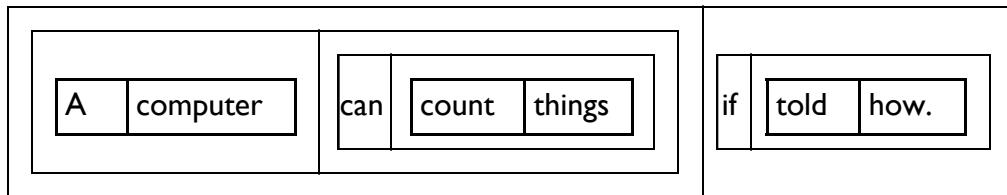


# (H) Twodee (7/7)

**H3.** Recall that multiple Twodee layouts were possible for “Frogs eat flies.” Here is a completely horizontal Twodee sentence:

A	computer	can	count	things	if	told	how.
---	----------	-----	-------	--------	----	------	------

An editor is considering alternative arrangements of the words that might make the intended meaning more apparent. *How many ways can this sentence be written in Twodee?* Consider only ways that preserve the intended division into phrases and sub-phrases, for instance:



Answer: \_\_\_\_\_

**H4.** Here are some Twodee sentences whose spoken order is not obvious, as in the “leaves fall”/“fall leaves” example. In each case, how many different spoken orders are possible? (We have just used letters to stand for the words, since the particular words don’t affect the answer.)

a	b	c
e		g
i	j	k

a	b	c
e	f	g
i	j	k

A. \_\_\_\_\_

B. \_\_\_\_\_

a	b	c	d
e	f	g	h
i	j	k	l

a	b	c	d
e	f	g	h
i	j	k	l
m	n	o	p

C. \_\_\_\_\_

D. \_\_\_\_\_

