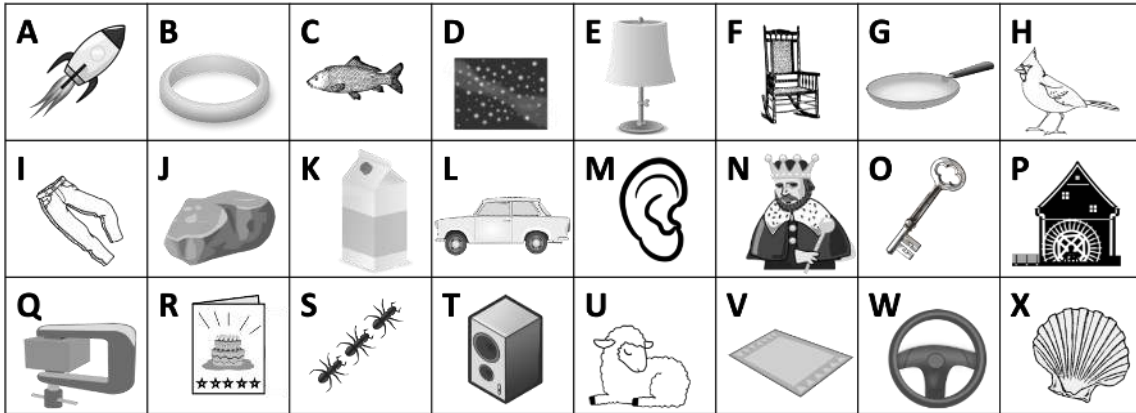


## (D) Made You Look! (1/4) [10 Points]

How do humans process language? One way to study this question is with **eye tracking**, a technique that allows scientists to monitor where an experimental participant is looking while they listen to a sentence. Suppose that a person has been familiarized with this grid of images:



The person is then read the sentences in the table below, and we track where their eyes fall as they listen to the bolded words.<sup>1</sup> The table shows what the person's predicted eye trajectory is for each of five different hypotheses about how humans might process language (note that the question mark means "not looking at any particular image"). For example, for the first sentence, Hypothesis 4 predicts the listener starts out looking at no specific image, then looks at Image U, then T, then Image E.

	<i>Hypothesis 1</i>	<i>Hypothesis 2</i>	<i>Hypothesis 3</i>	<i>Hypothesis 4</i>	<i>Hypothesis 5</i>
Mary had a little <b>*lamp*</b>	?,E	U	?,U,E	?,U,T,E	<b>(a)</b>
The guitar needs an <b>*amp*</b> <sup>2</sup>	?,T	T	?,T	?,T	T
The flour is from a <b>*mill*</b>	?,P	P	?,P	?,P	P
I drive a <b>*rocking chair*</b>	?,F	L	?,J,F	?,J,N,F	L,A,F
This bird is a <b>*cardinal*</b> <sup>2</sup>	?,H	H	?,L,R,H	?,L,R,H	H
This fish is a <b>*carp*</b> <sup>2</sup>	?,C	C	?,L,C	?,L,C	C
I held the block tightly with the metal <b>*pants*</b>	?,I	Q	?,G,I	?,G,S,I	Q,G,I
I locked the door with a <b>*steering wheel*</b>	?,W	<b>(b)</b>	?,W	?,M,B,W	O,W
In the desert sky I could see the <b>*Milky Way*</b> <sup>2</sup>	?,D	D	?,P,K,D	<b>(c)</b>	D
This fish is a <b>*clamp*</b> <sup>2</sup>	<b>(d)</b>	<b>(e)</b>	<b>(f)</b>	<b>(g)</b>	C,X,Q
The floor needs a <b>*carpet*</b>	<b>(h)</b>	<b>(i)</b>	<b>(j)</b>	<b>(k)</b>	<b>(l)</b>

<sup>1</sup> In an actual experiment, these sentences would need to be designed differently to encourage participants to pay attention to the image. For instance, instead of saying "I drive a rocking chair", we might say, "In a minute, we will ask you to point at what I drive. I drive a rocking chair." In this problem, to save space, we use the shorter prompts shown here.

<sup>2</sup> A cardinal is a type of bird. A carp is a type of fish. A lamb is a young sheep. An amp is a device that makes instruments louder. A clamp is a tool for holding items together. The Milky Way is the galaxy containing the Earth.






## (D) Made You Look! (2/4)

**D1.** Fill in the missing slots in the table on the previous page.

For the rest of this problem we will assume that **Hypothesis 5** is correct. Of course, actual human sentence processing is more complex than Hypothesis 5, but Hypothesis 5 is still a better description of human sentence processing than the other four hypotheses.

Suppose that we now use this grid of images for an experiment:

<b>AA</b> 	<b>BB</b> 	<b>CC</b> 	<b>DD</b> 
<b>EE</b> 	<b>FF</b> (MISSING)	<b>GG</b> 	<b>HH</b> 
<b>II</b> 	<b>JJ</b> 	<b>KK</b> 	<b>LL</b> 

Participants are read the following sentence:

My cousin has a pet **\*dolphin\***

**D2.** Image HH is ambiguous: it can be viewed as a rabbit or as a duck. What trajectory will a participant's eyes follow if they view Image HH as a rabbit? What trajectory will their eyes follow if they view Image HH as a duck?

As a rabbit:

As a duck:

Another participant is read this sentence, and her eyes follow the trajectory EE, DD, FF, LL:

Alice was thirsty after her run, so she ordered some **\*sushi\***

**D3.** Image DD depicts a carbonated beverage. Does this participant refer to carbonated beverages as *pop*, *soda*, *coke*, or *fizzy drink*? Circle one:

*pop*

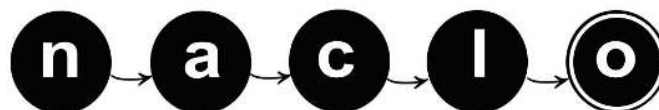
*soda*

*coke*

*fizzy drink*














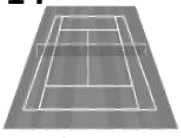






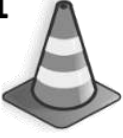






**D4.** After the experiment, we somehow lost Image FF! What is Image FF? Your answer should be one word.

Answer:



## (D) Made You Look! (3/4)

In a final experiment, participants are familiarized with this array of images:

<b>F01</b>  truck	<b>F02</b>  tractor	<b>F03</b>  car	<b>F04</b>  campfire		<b>F05</b>  pencil
<b>F06</b>  bicycle	<b>F07</b>  bricks	<b>F08</b>  camera		<b>F09</b>  cat	<b>F10</b>  tennis ball
<b>F11</b>  sand		<b>F12</b>  boat	<b>F13</b>  candle	<b>F14</b>  tennis court	
<b>F15</b>  bowtie	<b>F16</b>  sticks	<b>F17</b>  cake	<b>F18</b>  camel		<b>F19</b>  tent
<b>F20</b>  straws	<b>F21</b>  traffic cone		<b>F22</b>  present	<b>F23</b>  tower	<b>F24</b>  pen
	<b>F25</b>  strawberries	<b>F26</b>  dog			<b>F27</b>  castle



## (D) Made You Look! (4/4)

**D5.** The table below, when completed, encodes a secret message which could serve as an alternate title for this problem. This message is 7 letters long (a 3-letter word followed by a 4-letter word). Fill in the missing slots in the table so that the intended secret message is still communicated. *Hint:* Every image is used at least once.

Remember: we are assuming that participants behave according to Hypothesis 5. When you write the sentences, you should include asterisks, but you don't need to include bolding. You can still get partial credit for correct sentences and trajectories even if you don't figure out the secret message. For the sentences, there are many correct answers.

	<i>Sentence</i>	<i>Trajectory</i>
i	I bought my friend a birthday <b>*campfire*</b>	<b>(a)</b>
ii	<b>(b)</b>	<b>(c)</b>
iii	<b>(d)</b>	F27, F23, F19, F14, F10
iv	My neighbor rides to work every morning in my <b>*bow tie*</b>	<b>(e)</b>
v	He signed his name with a dark blue <b>*pencil*</b>	<b>(f)</b>
vi	My neighbor rides to work every morning in my <b>*traffic cone*</b>	<b>(g)</b>
vii	Outside the construction site there was a pile of <b>*strawberries*</b>	<b>(h)</b>

**D6.** What is the secret message mentioned in D5? Enter one letter per box:

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