Topic: Joint distributions

Question: The table shows Addie's poll of the children in her neighborhood and their cartoon watching habits. Which description comes from the joint distribution section of the table?

	< 2 hours cartoons	> 2 hours cartoons	Total
Watched on the T.V.	37%	19%	**56%**
Watched on a different device	7%	37%	**44%**
Total	**44%**	**56%**	**100%**

Answer choices:

A The percentage of children who watched less than 2 hours of T.V.

B The percentage of children who watched on a different device

C The percentage of children who watched less than 2 hours of cartoons on the T.V.

D The percentage of children who watched 2 hours or more of cartoons.

Solution: C

The joint distribution or the joint probability distribution is the probability that a pair of events can happen. All of the possible pairs of events happen in the body of the table. For example, the percentage of children who watched less than 2 hours of cartoons on the T.V. is $37\,\%$:

	< 2 hours cartoons	> 2 hours cartoons	Total
Watched on the T.V.	37%	19%	**56%**
Watched on a different device	7%	37%	**44%**
Total	**44%**	**56%**	**100%**

Answer choice C is the only choice that describes a pair of events.

Topic: Joint distributions

Question: The table shows favorite activities of college students. Which description comes from the marginal distribution section of the table?

	Movie	Bowling	Pizza Party	Total
Male	8%	15%	21%	**44%**
Female	13%	19%	24%	**56%**
Total	**21%**	**34%**	**45%**	**100%**

Answer choices:

A The percentage of male student who prefer movies.

B The percentage of students who preferred a pizza party.

C The percentage of female students in the sample.

D Both B and C

Solution: D

The marginal distribution comes from the total column or total row.

Answer choices B and C are both found in the totals sections of the table.

	Movie	Bowling	Pizza Party	Total
Male	8%	15%	21%	**44%**
Female	13%	19%	24%	**56%**
Total	**21%**	**34%**	**45%**	**100%**

Topic: Joint distributions

Question: Every student at a certain high school needs to choose exactly one fine arts elective. The following frequency table shows the enrollment of electives for all students. Jessica is answering a list of questions where she needs to find distributions based off of the table below. Which question would require a conditional distribution to answer?

		Extracurricular Activities			
		Art	**Architecture**	**Music**	**Total**
Grade	**Freshman**	40	25	55	**120**
	Sophomore	52	12	71	**135**
	Junior	56	45	54	**155**
	Senior	30	60	20	**110**
	Total	**178**	**142**	**200**	**520**

Answer choices:

A The percentage of students who are freshman and take art.

B The percentage of seniors enrolled in extracurricular activities.

C The percentage of architecture students.

D The percentage of juniors enrolled in music class of the total students enrolled in music.

Solution: D

Conditional distribution is calculated based on the total of the row or column. In this case we want to think of the problem as the probability of choosing a junior if we know the student is already enrolled in music.

		Extracurricular Activities			
		Art	**Architecture**	**Music**	**Total**
Grade	**Freshman**	40	25	55	**120**
	Sophomore	52	12	71	**135**
	Junior	56	45	54	**155**
	Senior	30	60	20	**110**
	Total	**178**	**142**	**200**	**520**

This would be calculated by taking

$$\frac{54}{200} = 27\,\%$$

So $27\,\%$ of the students enrolled in music class are juniors. That's why it's a conditional probability.