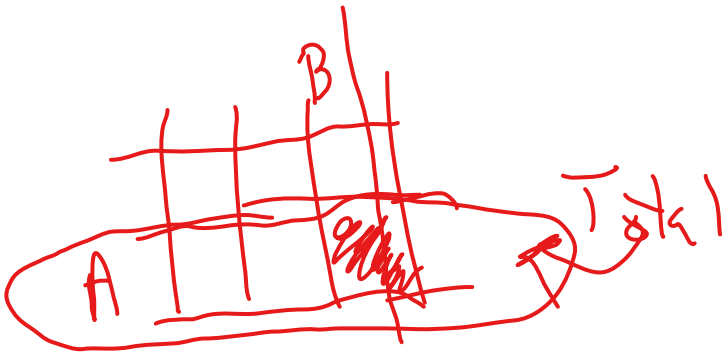
Given the points P(2, -1) and Q(-9, -6), what are the coordinates of the point on the directed line segment $\overline{PQ}$ that partitions $\overline{PQ}$ in the ratio 3:2.

A. $\left(-\frac{23}{5}, -4\right)$

B. $\left(-\frac{12}{5}, -3\right)$

C. $\left(\frac{5}{3}, \frac{8}{3}\right)$

D. $\left(-\frac{5}{3}, \frac{8}{3}\right)$



Conditional Probability

- Conditional Probability contains a condition that may limit the sample space for an event.
- You can write a conditional probability using the notation

$$P(B|A)$$

- This reads "the probability of event B, given event A"

Conditional Probability

Ex. 1 The table shows the results of a class survey.

Find *P*(own a pet | female)

given

Do you own a pet?

	yes	no	
female	8	6	14
male	5	7	12
	13	13	26

$\frac{8 \text{ own a pet}}{14 \text{ females}} = \frac{4}{7}$ or 0.57

Conditional Probability

Ex. 2 The table shows the results of a class survey.

Find *P*(wash the dishes | male) denominator

Did you wash the dishes last night?

	yes	no	
female	7	6	13
male	7	8	15
	14	14	28

$P(\text{yes} \mid \text{male}) = \frac{\text{male and yes}}{\text{male}}$ $\frac{7}{15}$ or .47

Let's Try One

Using the data in the table, find the probability that a sample of not recycled waste was plastic.

$P(\text{plastic} \mid \text{non-recycled})$

$= P(P \mid \text{non})$

$\frac{P(P \cap \text{non})}{P(\text{non})}$

$\frac{20.4}{156.3} = .1305$

Material	Recycled	Not Recycled
Paper	34.9	48.9
Metal	6.5	10.1
Glass	2.9	9.1
Plastic	1.1	20.4
Other	15.3	67.8

156.3

The probability that the non-recycled waste was plastic is about 13.05 %.

about 13 %

Conditional Probability Formula

- For any two events A and B from a sample space with P(A) does not equal zero

$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

A given B = overlap / B

Conditional Probability

Researchers asked people who exercise regularly whether they jog or walk. Fifty-eight percent of the respondents were male. Twenty percent of all respondents were males who said they jog. Find the probability that a person randomly selected jogs given they are male.

$P(A|B) = \frac{P(A \cap B)}{P(B)}$

$P(\text{mak}) = .58$

$P(\text{mak} \cap \text{jog}) = .2$

$P(J|m) = \frac{P(M \cap J)}{P(m)} = \frac{.2}{.58} = .34$

The probability that a male respondent jogs is about 34 %.

Conditional Probability – Pets Revisited

The table shows the results of a class survey.

Find *P*(own a pet | female) $= \frac{P(\text{own} \cap F)}{P(F)} = \frac{8}{14} = \frac{4}{7}$ or .57

Do you own a pet?

	yes	no
female	8	6
male	6	7

14
13
27

8/27
14/27
$\frac{8}{14} : \frac{14}{27}$

Therefore, *P*(own a pet | female) equals 57 %.

GSE Geometry Unit 6 - Probability

Name: _____ Date: _____

The Conditional Probability from Tables

The frequencies of the marbles in a bag are shown in the table.

	GREEN	BLUE
LARGE	2	4
SMALL	8	12

_____ 1. Find P(small)

_____ 2. Find P(green | large)

A town planning committee is considering a new system for public transit. Residents of the town were randomly selected to answer two questions: "Do you work less than 5 miles from home?" and "Would you use the new system to get to work, if it were available?" The results are shown in the table below.

		Work less than 5 miles from home?	
		YES	NO
Use new system?	YES	24	32
	NO	44	20

_____ 3. If residents work less than 5 miles from home, what is the probability that they would use the new system?

_____ 4. If residents are willing to use the new system, what is the probability that they don't work less than 5 miles from home?

The table shows the results of a poll of randomly selected high school students who were asked if they prefer to hear all school announcements in the morning or afternoon.

	Underclassmen	Upperclassmen
Morning	8	14
Afternoon	18	10

_____ 5. Find P(Morning | Underclassmen)

_____ 6. Find P(Afternoon | Upperclassmen)

GSE Geometry Unit 6 - Probability

The table shows the results of a customer satisfaction survey for a cellular service provider, by location of the customer. In the survey, customers were asked whether they would recommend a plan with the provider to a friend.

_____ 7. Find P(Yes)

_____ 8. Find P (Yes | Arlington)

_____ 9. Are the 2 probabilities independent?

	Arlington	Towson	Parkville
Yes	40	35	41
No	18	10	6

Roberto is the owner of a car dealership. He is assessing the success rates of his top three sales people in order to offer one of them a promotion. Over two months, for each attempted sale, he records whether the sales person made a successful sale or not. The results are shown in the cart below.

_____ 10. Find P(Successful | Becky)

_____ 11. Find P(Unsuccessful | Darrell)

	Successful	Unsuccessful
Becky	6	6
Raul	4	5
Darrell	6	9

Conditional Probability Equations

$P(A \cap B) = P(A) \cdot P(B \mid A)$ $\quad P(B \mid A) = \frac{P(A \cap B)}{P(A)}$

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12. For two events S and Q, it is known that P(Q) = 0.45 and $P(S \cap Q) = 0.32$. Find P(S | Q). $= 32/45 = .71$

13. For two events B and C, it is known that P(C | B) = 0.61 and $P(C \cap B) = 0.48$. Find P(B). $= .48/.61 = .79$

$P(C|B) = \frac{P(C \cap B)}{P(B)}$ $\quad P(B) = \frac{P(C \cap B)}{P(C|B)}$ $= \frac{.48}{.61}$

14. For two events V and W, it is known that P(W) = 2/9 and P(V | W) =5/11. Find $P(V \cap W)$. $= P(W) \cdot P(V|W) = (2/9)(5/11) = 10/99$

15. For two events G and H, it is known that P(H | G) = 5/14 and $P(H \cap G) = 1/3$. Explain why you can't determine the value of P(H).

$P(H) = \frac{P(H \cap G)}{P(G|H)}$

We are not given $P(G|H)$ so we cannot find $P(H)$.

$P(G) \frac{P(H|G)}{P(H|G)} = \frac{P(H \cap G)}{P(G)} \cdot \frac{P(G)}{P(H|G)}$

$P(G) = \frac{P(H \cap G)}{P(H|G)} = \frac{1/3}{5/14} = 14/15$