What's the probability that class will be an enjoyable experience given that you're in math?

focuses your denominator

Th:

M: Paper

W: Preview

F: Days

T: 2 - Ask a Rog's

If © = 0.4 and ß = 0.65, find the value of Ω if the following statement is true:

$$4©Ω = \frac{ß}{3}$$

$$4(0.4)x = \frac{0.65}{3}$$

Calc

$$\frac{\cancel{1.6}x}{\cancel{1.6}} = \frac{13/60}{1.6}$$

$$x = 13/96$$

Today's learning objective:

By the end of class, I will be able to manipulate probability formulas algebraically to solve problems.

No context probability

Today's language objective:

Given that...

5.5	Probability of an event A	$\mathrm{P}(A)=\dfrac{n(A)}{n(U)}$
	Complementary events	$\mathrm{P}(A)+\mathrm{P}(A')=1$
5.6	Combined events	$\mathrm{P}(A\cup B)=\mathrm{P}(A)+\mathrm{P}(B)-\mathrm{P}(A\cap B)$
	Mutually exclusive events	$\mathrm{P}(A\cup B)=\mathrm{P}(A)+\mathrm{P}(B)$
	Conditional probability	$\mathrm{P}(A\cap B)=\mathrm{P}(A)\,\mathrm{P}(B\mid A)$
	Independent events	$\mathrm{P}(A\cap B)=\mathrm{P}(A)\,\mathrm{P}(B)$
5.7	Expected value of a discrete random variable X	$\mathrm{E}(X)=\mu=\sum_x x\,\mathrm{P}(X=x)$
5.8	Binomial distribution	$X\sim \mathrm{B}(n,p) \;\Rightarrow\; \mathrm{P}(X=r)=\binom{n}{r}p^r(1-p)^{n-r},\; r=0,1,\ldots,n$
	Mean	$\mathrm{E}(X)=np$
	Variance	$\mathrm{Var}(X)=np(1-p)$
5.9	Standardized normal variable	$z=\dfrac{x-\mu}{\sigma}$

33.) Let A and B be independent events, where $P(A) = 0.6$ and $P(B) = x$.

(a) Write down an expression for $P(A \cap B)$.

$P(A \cap B) = 0.6x$

(b) Given that $P(A \cup B) = 0.8$,

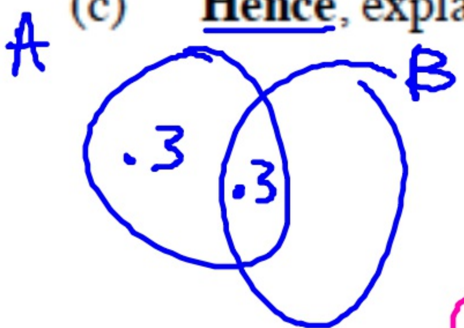
(i) find x; $0.8 = 0.6 + x - 0.6x$

$\frac{0.2}{0.4} = \frac{\cancel{0.4}x}{\cancel{0.4}}$ $x = 0.5$

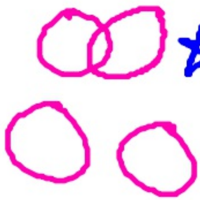
(ii) find $P(A \cap B)$.

$P(A \cap B) = 0.6(0.5) = 0.3$

(c) **Hence**, explain why A and B are **not** mutually exclusive.



In mutually exclusive events $P(A \cap B) = 0$; here $P(A \cap B) = 0.3$



★ Combined events	$P(A \cup B) = P(A) + P(B) - P$
~~Mutually exclusive events~~	$P(A \cup B) = P(A) + P(B)$ +
Conditional probability	$P(A \cap B) = P(A)P(B \mid A)$
Independent events	$P(A \cap B) = P(A)P(B)$

25.) Consider the independent events A and B. Given that $P(B) = 2P(A)$, and $P(A \cup B) = 0.52$, find $P(B)$.

CALC

$$P(A \cap B) = P(A)P(B)$$

$$P(A \cap B) = P(A)\,2P(A)$$

$$P(A \cap B) = 2P(A)^2$$

$$0.52 = P(A) + 2P(A) - 2P(A)^2$$

$$0.52 = 3x - 2x^2$$

$$2x^2 - 3x + 0.52 = 0$$

$$P(A) = 0.2$$

$$\boxed{P(B) = 0.4}$$

* Combined events	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
Mutually exclusive events	$P(A \cup B) = P(A) + P(B) + 0$
Conditional probability	$P(A \cap B) = P(A)P(B \mid A)$
Independent events	$P(A \cap B) = P(A)P(B)$

44.) Consider the events A and B, where $P(A) = \frac{2}{5}$, $P(B') = \frac{1}{4}$ and $P(A \cup B) = \frac{7}{8}$.

Non-calc

(a) Write down $P(B)$ $= 3/4$

(b) Find $P(A \cap B)$.

$$7/8 = \frac{2}{5} + \frac{3}{4} - P(A \cap B)$$

$$\frac{35}{40} = \frac{16}{40} + \frac{30}{40} - x$$

$$+\frac{11}{40} = +x = P(A \cap B)$$

(c) Find $P(A \mid B)$.

$$\frac{\frac{11}{40}}{3/4} = \frac{\cancel{\frac{3}{4}} P(A \mid B)}{\cancel{3/4}}$$

$$\frac{11}{\cancel{40}_{10}} \cdot \frac{\cancel{4}^{1}}{3} = \boxed{\frac{11}{30}}$$

Choose 1

★Combined events	$P(A \cup B) = P(A) + P(B) - P($
~~Mutually exclusive events~~	$\cancel{P(A \cup B) = P(A) + P(B)}$

Choose 1

★Conditional probability	$P(A \cap B) = P(A)\,P(B \mid A)$ $= P(B)P(A \mid B)$
Independent events	$P(A \cap B) = P(A)\,P(B)$

Non-calc

54.) Let A and B be independent events such that $P(A) = 0.3$ and $P(B) = 0.8$.

(a) Find $P(A \cap B)$. $= 0.24$

(b) Find $P(A \cup B) = 0.3 + 0.8 - 0.24 = \boxed{0.86}$

(c) Are A and B mutually exclusive? Justify your answer.

No b/c if they were $P(A) + P(B) = 110\%$, & I'm not a MS football coach yet

b/c MS. football coach

choose 1

Combined events ★	$P(A \cup B) = P(A) + P(B) - P($
Mutually exclusive events	$P(A \cup B) = P(A) + P(B)$
Conditional probability	$P(A \cap B) = P(A)P(B \mid A)$
Independent events	$P(A \cap B) = P(A)P(B)$

Non-calc

61.) Events E and F are independent, with $P(E) = \frac{2}{3}$ and $P(E \cap F) = \frac{1}{3}$. Calcul

(a) $P(F)$; $\frac{1}{3} = \frac{2}{3} \cdot P(F)$ $P(F) = \frac{1}{2}$

(b) $P(E \cup F)$. $= \frac{2}{3} + \frac{1}{2} - \frac{1}{3} = \boxed{\frac{5}{6}}$

★ Combined events	$P(A \cup B) = P(A) + P(B) - P($
Mutually exclusive events	$P(A \cup B) = P(A) + P(B)$
Conditional probability	$P(A \cap B) = P(A)P(B \mid A)$
Independent events	$P(A \cap B) = P(A)\,P(B)$

The events A and B are independent such that $P(B) = 3P(A)$ and $P(A \cup B) = 0.68$. Find

Calc

$$P(A \cap B) = P(A)\, 3P(A)$$

$$= 3P(A)^2$$

$$\boxed{P(B) = 0.6}$$

$$0.68 = P(A) + 3P(A) - 3P(A)^2$$

$$0.68 = 4x - 3x^2$$

$$\boxed{x = 0.2 = P(A)}$$

2nd Trace → Zero

Combined events	$P(A \cup B) = P(A) + P(B) - P(A$
Mutually exclusive events	$P(A \cup B) = P(A) + P(B)$ + 0
Conditional probability	$P(A \cap B) = P(A)P(B \mid A)$
★ Independent events	$P(A \cap B) = P(A)\,P(B)$

75.) Let A and B be events such that $P(A) = \frac{1}{2}$, $P(B) = \frac{3}{4}$ and $P(A \cup B) = \frac{7}{8}$.

non-calc

(a) Calculate $P(A \cap B)$. $\frac{7}{8} = \frac{1}{2} + \frac{3}{4} - P(A \cap B) = \boxed{\frac{3}{8}}$

(b) Calculate $P(A | B)$. $\frac{3}{8} = \frac{3}{4} \cdot P(A|B) = \boxed{\frac{1}{2}}$

(c) Are the events A and B independent? Give a reason for your answer.

If indep., $\frac{1}{2} \cdot \frac{3}{4} = \frac{3}{8} = \frac{3}{8}$ yes

★ Combined events	$P(A \cup B) = P(A) + P(B) - P($
Mutually exclusive events	$P(A \cup B) = P(A) + P(B)$
Conditional probability	$P(A \cap B) = P(A)P(B \mid A)$ B A|B
Independent events	$P(A \cap B) = P(A)\,P(B)$

89.) For events A and B, the probabilities are $\mathrm{P}(A) = \frac{3}{11}$, $\mathrm{P}(B) = \frac{4}{11}$.

Calculate the value of $\mathrm{P}(A \cap B)$ if

(a) $\mathrm{P}(A \cup B) = \frac{6}{11}$;

(b) events A and B are independent.

Combined events	$\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B) - \mathrm{P}$
Mutually exclusive events	$\mathrm{P}(A \cup B) = \mathrm{P}(A) + \mathrm{P}(B)$
Conditional probability	$\mathrm{P}(A \cap B) = \mathrm{P}(A)\,\mathrm{P}(B \mid A)$
Independent events	$\mathrm{P}(A \cap B) = \mathrm{P}(A)\,\mathrm{P}(B)$

49.) Two restaurants, *Center* and *New*, sell fish rolls and salads.

Let F be the event a customer chooses a fish roll.

Let S be the event a customer chooses a salad.

Let N be the event a customer chooses neither a fish roll nor a salad.

In the *Center* restaurant $\mathrm{P}(F) = 0.31$, $\mathrm{P}(S) = 0.62$, $\mathrm{P}(N) = 0.14$.

(a) Show that $\mathrm{P}(F \cap S) = 0.07$.

(b) Given that a customer chooses a salad, find the probability the customer also chooses a fish roll.

(c) Are F and S independent events? Justify your answer.

At *New* restaurant, $\mathrm{P}(N) = 0.14$. Twice as many customers choose a salad as choose a fish roll. Choosing a fish roll is **independent** of choosing a salad.

(d) Find the probability that a fish roll is chosen.