Feedback — Quiz 1

Help

You submitted this quiz on **Thu 7 Aug 2014 7:16 PM PDT**. You got a score of **7.00** out of **7.00**.

Question 1

Consider influenza epidemics for two parent heterosexual families. Suppose that the probability is 17% that at least one of the parents has contracted the disease. The probability that the father has contracted influenza is 12% while the probability that both the mother and father have contracted the disease is 6%. What is the probability that the mother has contracted influenza?

Your Answer		Score	Explanation
6%			
17%			
5%			
11%	✔	1.00	
Total		1.00 / 1.00	

Question Explanation

A=Mother, B = Father, $P(A \cup B) = 17\%$, $P(B) = 12\%$, $P(A \cap B) = 6\%$. Since we know $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ we get $17\% = P(A) + 12\% - 6\%$.

Question 2

A random variable, X is uniform, a box from 0 to 1 of height 1. (So that it's density is $f(x) = 1$ for $0 \le x \le 1$.) What is it's 75th percentile?

Your Answer		Score	Explanation
0.25			
0.75	✔	1.00	
0.50			
0.10			
Total		1.00 / 1.00	

Question Explanation

This density looks like a box. The point so that the area below it is 0.75 is 0.75. Alternatively

```
qunif(0.75)
```

```
## [1] 0.75
```

Question 3

You are playing a game with a friend where you flip a coin and if it comes up heads you give her X dollars and if it comes up tails she gives you Y dollars. The probability that the coin is heads is p (some number between 0 and 1.) What has to be true about X and Y to make so that both of your expected total earnings is 0. (The game would then be called “fair”.)

Your Answer		Score	Explanation
$\frac{p}{1-p} = \frac{Y}{X}$	✔	1.00	
$X = Y$			
$\frac{p}{1-p} = \frac{X}{Y}$			
$p = \frac{X}{Y}$			
Total		1.00 / 1.00	

Question Explanation

Your expected earnings is −pX+(1−p)Y=0 Then it must be the case that p1−p=YX Or that the ratio of the payouts has to equal the odds. So consider, for example, if p1−p=2. The game is 2 to 1 against you, p=2/3; she is twice as likely to win as you. Then she will have to pay out twice as much if you win to make the game fair.

Question 4

A density that looks like a normal density (but may or may not be exactly normal) is exactly symmetric about zero. (Symmetric means if you flip it around zero it looks the same.) What is its median?

Your Answer		Score	Explanation
○ We can't conclude anything about the median.			
◉ The median must be 0.	✔	1.00	
○ The median must be 1.			
○ The median must be different from the mean.			
Total		1.00 / 1.00	

Question Explanation

The median must be 0 since 50 percent of the mass is below 0 and 50% is above

Question 5

Consider the following PMF generated in R

```
x <- 1:4
p <- x/sum(x)
temp <- rbind(x, p)
rownames(temp) <- c("X", "Prob")
temp
```

```
##      [,1] [,2] [,3] [,4]
## X     1.0  2.0  3.0  4.0
## Prob  0.1  0.2  0.3  0.4
```

What is the mean?

Your Answer		Score	Explanation
4			
1			
3	✔	1.00	
2			
Total		1.00 / 1.00	

Question Explanation

```
sum(x * p)
```

```
## [1] 3
```

Question 6

When at the free-throw line for two shots, a basketball player makes at least one free throw 90% of the time. 80% of the time, the player makes the first shot, 80% of the time the player makes the second shot and 70% of the time she makes both shots. What is the conditional probability that the player makes the second shot given that she missed the first?

Your Answer	Score	Explanation
25%		
75%		
10%		

50%	✔	1.00
Total		1.00 / 1.00

Question Explanation

Let A be the event that the player makes the first shot and B be the event that she makes the second. Then, $P(A \cup B) = .9$, $P(A) = .8$, $P(A \cap B) = .70$. Then $P(B) = .8$. We want $P(B|A^c) = P(B \cap A^c)/P(A^c) = \frac{P(B) - P(A \cap B)}{P(A^c)}$. Thus, it is $\frac{.8 - .7}{.2} = 50\%$

Question 7

A web site (www.medicine.ox.ac.uk/bandolier/band64/b64-7.html) for home pregnancy tests cites the following: "When the subjects using the test were women who collected and tested their own samples, the overall sensitivity was 75%. Specificity was also low, in the range 52% to 75%." Assume the lower value for the specificity. Suppose a subject has a positive test and that 30% of women taking pregnancy tests are actually pregnant. What number is closest to the probability of pregnancy given the positive test?

Your Answer		Score	Explanation
30%			
20%			
10%			
40%	✔	1.00	
Total		1.00 / 1.00	

Question Explanation

$$P(Preg|+) = \frac{P(+|Preg)P(Preg)}{P(+|Preg)P(Preg) + P(+|Preg^c)P(Preg^c)} = \frac{.75 \times .30}{.75 \times .30 + (1 - .52) \times (1 - .3)} \approx 0.40$$