Feedback — Quiz 1

Help

You submitted this quiz on **Wed 7 May 2014 11:23 PM PDT**. You got a score of **8.00** out of **8.00**.

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?

Express your answer as a percentage to the nearest percentage point.

You entered:

11

Your Answer		Score	Explanation
11	✔	1.00	Correct!
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 $0 \leq x \leq 1$.) What is it's 75th percentile?

Express your answer to two decimal places.

You entered:

0.75

Your Answer		Score	Explanation
0.75	✔	1.00	Correct!
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 in 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
○ $\frac{p}{1-p} = \frac{X}{Y}$			
○ $X = Y$			
◉ $\frac{p}{1-p} = \frac{Y}{X}$	✔	1.00	
○ $p = \frac{X}{Y}$			
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

You are playing a game with a friend where you flip a coin and if it comes up heads you give her 1 dollar and if it comes up tails she gives you one dollar. What would be the variance of your earnings?

Express your answer to two decimal places.

You entered:

1.00

Your Answer		Score	Explanation
1.00	✔	1.00	
Total		1.00 / 1.00	

Question Explanation

Let X be random variables that take the value -1 with probability $.5$ and 1 with probability. Note that $E[X] = 0$. Also notice that $Var(X) = .5(-1)^2 + .5(1)^2 = 1$.

Question 5

Let $X_1, \ldots, X_{n_1}$ be random variables independent of $Y_1, \ldots, Y_{n_2}$, where both groups are iid with associated population means μ_1 and μ_2 and population variances σ_1^2 and σ_2^2, respectively. Let $\bar{X}$ and $\bar{Y}$ be their sample means. What is the variance of $\bar{X} + \bar{Y}$?

Your Answer		Score	Explanation
○ $\sigma_1^2 - \sigma_2^2$			
○ $\sigma_1^2 + \sigma_2^2$			
○ $\frac{\sigma_1^2}{n_1} - \frac{\sigma_2^2}{n_2}$			
◉ $\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}$	✔	1.00	
Total		1.00 / 1.00	

Question Explanation

$\mathrm{Var}(\bar{X} + \bar{Y}) = \mathrm{Var}(\bar{X}) + \mathrm{Var}(\bar{Y}) = \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}$.

Question 6

If a random variable, X, is so that $E[X] = \mu$ and $Var(X) = \sigma^2$ what is the mean and variance of $Z = \frac{X-\mu}{\sigma}$?

Your Answer		Score	Explanation
Z has mean μ and variance 1			
Z has mean 0 and variance 1	✔	1.00	
Z has mean μ and variance σ^2			
Z has mean 0 and variance σ^2			
Total		1.00 / 1.00	

Question Explanation

$E[Z] = \frac{E[X]-\mu}{\sigma} = 0.$

$Var(Z) = \frac{1}{\sigma^2} Var(X) = 1.$

Question 7

If a continuous density that never touches the horizontal axis is symmetric about zero, can we say that its associated median is zero?

Your Answer		Score	Explanation
Yes, the median must be 0.	✔	1.00	
No, the median is definitely not 0.			
We can't conclude that the median is 0.			
Total		1.00 / 1.00	

Question Explanation

Yes, 50% of the mass is below zero.

Question 8

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? Express your answer to one decimal place.

You entered:

3.0

Your Answer		Score	Explanation
3.0	✔	1.00	
Total		1.00 / 1.00	

Question Explanation

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

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