Exam 1 Practice Questions
Psych 3101

Vocabulary

Define the following terms.

1. Sample _____
2. Random assignment _____
3. Outlier _____
4. Variance _____

Conceptual questions

Imagine you are evaluating a new form of cognitive meditation training designed to make people smarter by enhancing their attentional focus.

1. You start by recruiting subjects, being careful that every person in your target population has an equal chance of becoming a subject.
What is this procedure called? _____

2. You assign half of your subjects to receive the training, and half of them to take part in an unrelated activity instead.
What is the first group called? _____
What is the second group called? _____

3. Unfortunately, the unrelated activity of the second group was poorly chosen because it had a negative effect on intelligence (maybe you had them sniff glue for an hour).
What critical feature of good experiment design does this violate? _____

4. After the training phase, you test everyone's intelligence using a standard IQ test.
What is the independent variable? _____
What is the dependent variable? _____

5. The meditation group has a mean IQ three points higher than that of the other group. Then you run a new experiment, with the same procedures and same number of subjects, which measures digit span instead of IQ. You find that the mean span is three digits longer for the meditation group than for the other group.
Which experiment has the more reliable finding? _____
Why? _____

Math questions

You don't need to show your work, but I will give partial credit for partial answers.

1. What is the interquartile range of {11, 7, 3, 11, 2, 13, 5, 3}? _____

2. What is the standard deviation of the population {7, 10, 6, 4, 8}?_____

3. What is the frequency of the value 2 in the population {5, 6, 43, 2, 7, 4, 2, 55}? _____

4. What is $F(7)$ – the cumulative distribution at the value 7 – for the population in question 3? _____

5. When you get a burrito at Illegal Pete's, they're inconsistent about how much they put in it. Half the time you get two scoops of beans, but 30% of the time you only get one, and 20% of the time you get three. If you were to go there for lunch tomorrow, what would be the expected value of how much beans you'd get?

R questions

1. What statistic is being computed by the following R commands? _____

```
> step1 = X - mean(X)
> step2 = step1^2
> answer = sum(step2)/length(X)
```

2. List three R functions, showing an example command you would enter and a verbal description of what the command does.

	Command	Description
Example	`> mean(X)`	computes the mean of a vector X
1	>	
2	>	
3	>	

3. What is the result of the following computations? Feel free to write the intermediate results next to each line (this can earn partial credit), or just enter the final result at the bottom.

```
> X = 1:5
> Y = X[X>mean(X)]
> Z = min(Y)
→ Z = ____
```

4. Suppose you have the following data frame.

```
> data
  sex age height
1   m  19     67
2   m  23     63
3   f   4     49
4   f  35     74
5   f  34     57
```

Write a command to display all the data from just your female subjects.

_____

Answers

Vocabulary

Note: There's no single correct answer for definitions. It's best if you can use your own words, but quoting the book or the lecture is okay too.

1. Sample – the set of data you have access to in a scientific study

2. Random assignment – a required procedure in any experiment, in which the value of the independent variable assigned to each subject is determined purely by chance

3. Outlier – a member of a sample that is noticeably far from the rest of the distribution

4. Variance – a measure of variability in a distribution, equal to the average squared deviation from the mean

Conceptual

1. Random selection

2. Experimental group; control group

3. Control

4. Form of training (meditation vs. glue); IQ score

5. The second is more reliable, because there is more variability in IQ scores than in digit spans.

Math

1. The 1st and 3rd quartiles are 3 and 11, so the interquartile range is 11 – 3 = 8

2. $\mu = 7$
   $X - \mu = [0, 3, -1, -3, 1]$
   $(X - \mu)^2 = [0, 9, 1, 9, 1]$
   $\Sigma(X - \mu)^2 = 20$
   $\sigma^2 = \Sigma(X - \mu)^2/N = 4$
   $\sigma = \sqrt{4} = 2$

3. 2 (two occurrences of that value)

4. 6 out of 8 scores are less than or equal to 7. $F(7) = 6$

5. $\sum_x x \cdot P(x) = 1 \cdot 0.3 + 2 \cdot 0.5 + 3 \cdot 0.2 = 1.9$

R

1. Population variance

2. Many possible answers

3.
```
X = [1, 2, 3, 4, 5]
mean(X) = 3
X>mean(X) = [FALSE FALSE FALSE  TRUE  TRUE]
Y = [4, 5]
Z = 4
```

4. `data[data$sex=="f",]` or `data[data[,1]=="f",]`