The following questions refer to the R Instructions and the HairEyeColor example of the Chi-squared Tests page.

Run the following code in R. (This data is fabricated to mimick reality, but is not actual data.)

```
> glasses <- cbind( Males = c(Glasses = 5, Contacts = 12, None = 18), Females = c(Glasses = 4, Contacts = 14, None = 22))
> glasses
> barplot(glasses, beside=TRUE, legend.text=TRUE, args.legend=list(x = "topleft", bty="n"))
```

Which of the following statements are correct interpretations of the bar plot that the above code generated in R?

- [ ] The gender of an individual seems to be strongly associated with whether they wear glasses, contacts, or no eye correction because the pattern of the bars is dramatically different for males than for females.
- [x] The gender of an individual does not seem to be associated with whether a person wears glasses, contacts, or no eye correction because the pattern of the bars is essentially the same for males and females.
- [ ] The data shows that the most common result for either males or females is to not wear glasses or contacts. It also shows that the least common result for both genders is to wear glasses. In other words, the pattern for both genders is the same.

The correct null and alternative hypotheses for these data are

H_0 : Corrective eye wearing and gender are independent .

H_a : Corrective eye wearing and gender are associated .

Run the following code in R to determine if a chi-squared test of independence is appropriate for the glasses data.

```
> chis.glasses <- chisq.test(glasses)
> chis.glasses$expected
```

Are the requirements for this test satisfied?

- ( ) Yes, the requirements are met because all expected counts are greater than 5.
- (•) Yes, the requirements are met because the average of the expected counts is greater than 5 and all expected counts are greater than 1, even though some expected counts are less than 5.
- ( ) No, the requirements are not met because some of the expected counts are less than 5.

Run the following code in R to view the results of your test.

```
> chis.glasses
```

$\chi^2 =$ 0.3331

degrees of freedom = 2

p-value = 0.8466

This confirms our original suspicion that we saw in the graphic. There is insufficient evidence to conclude that corrective eye wearing and gender are associated. We will continue to assume the null hypothesis that whether someone wears glasses, contacts, or no corrective eye wear is independent of their gender.

Since we failed to reject the null there is no interpretation to make for these data so we are not interested in the Pearson Residuals. However, so that you get the opportunity to see what the Pearson Residuals look like when we fail to reject, run the following code in R and notice that none of the residuals stand out as being exceptionally large in magnitude. This is always the case when we fail to reject the null hypothesis in a chi-squared test of independence.

```
> chis.glasses$residuals
```