# Do you need to take the Biostatistics Refresher Course?

Without referring to a statistical textbook, answer the following questions (there may be more than one answer for some questions). At the end of the quiz, compare your responses with the answer document provided.

1. If you correctly answered **less than half** the questions then it is highly recommended that you do this course.
2. If you answered **more than half** the questions correctly then it is recommended that you obtain extra training in the refresher course, specifically concentrating on concepts highlighted by the questions in which you failed to answer correctly.
3. If you answered **all questions** correctly, there is no need for you to do this course.

## QUIZ

1. When you read scientific literature, do you know whether the statistical tests used were appropriate and why they were used?
   a. Always
   b. Mostly
   c. Rarely
   d. Never

2. Which of the following statements are true?
   a. The p-value is the probability of the sample data arising by chance.
   b. The p-value is an arbitrary value, designated as the significance level.
   c. The p-value is the chance of getting an observed effect if the null hypothesis was false.
   d. The p-value is the chance of getting an observed effect if the null hypothesis was true.
   e. A very small p-value allows us to say that there is enough evidence to accept the null hypothesis.

3. Answer true or false for the following statements:
   The 95% confidence interval for the mean:
   a. contains the sample mean with 95% certainty
   b. is less likely to contain the population mean than the 99% confidence interval
   c. contains 95% of the observations in the population
   d. is approximately equal to the sample mean plus and minus two standard deviations
   e. can be used to give an indication of whether the sample mean is a precise estimate of the population mean.

4. A study was conducted into the influence of spaying of bitches on their subsequent development of urinary incontinence. Young adult bitches presenting for spaying were randomly allocated to immediate ovariohysterectomy or to a deferred operation 6 months later. The bitches were followed over the 6 months. What type of variable is ‘development of urinary incontinence’?
   a. Qualitative variable
   b. Quantitative variable
   c. Categorical variable
   d. Binary variable
   e. Continuous variable

5. How would you approach the analysis of this study?

6. What statistical analysis would you use to answer the question in the above study?
    a. Two-sample t-test?
    b. Correlation?
    c. Chi-squared test?
    d. Paired t-test?
    e. Linear regression?

7. Answer true or false for the following statements: The paired t-test:
    a. tests the null hypothesis that the two population means are equal
    b. must have equally sized numbers of observations in each group.
    c. assumes that the data in each group are normally distributed.
    d. is appropriate for comparing the means of independent groups of observations.
    e. when appropriately used, is more powerful when the sample size is large.

8. Answer true or false for the following statements:
   A correlation coefficient:
    a. should not be calculated when there is an underlying relationship between the two variables but it is not linear
    b. does not provide evidence of a causal relationship between two variables
    c. should not be used to judge the biological importance of the relationship between two variables
    d. should be performed only when certain assumptions are satisfied (e.g. variables measured on a random sample of individuals, both the variables are quantitative and at least one of the two variables need to be normally distributed).

9. Review the follow four figures and answer the questions below.

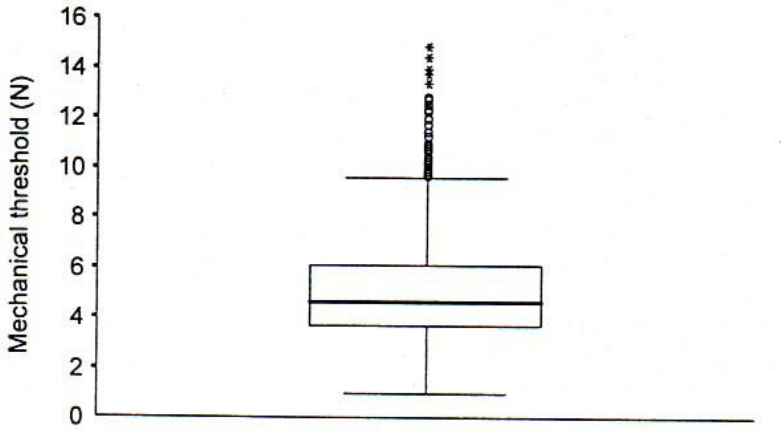


Figure 1

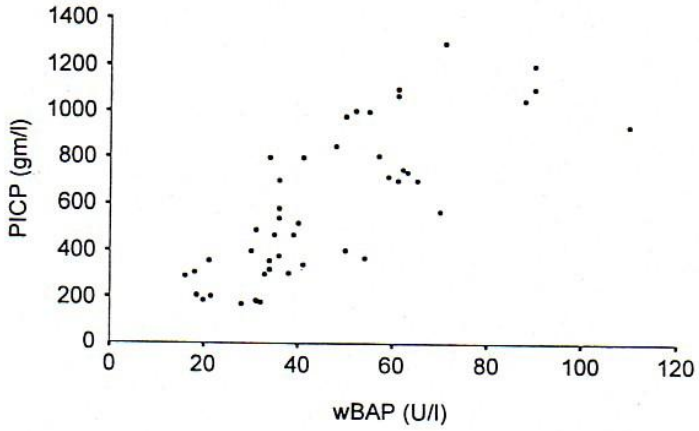


Figure 2

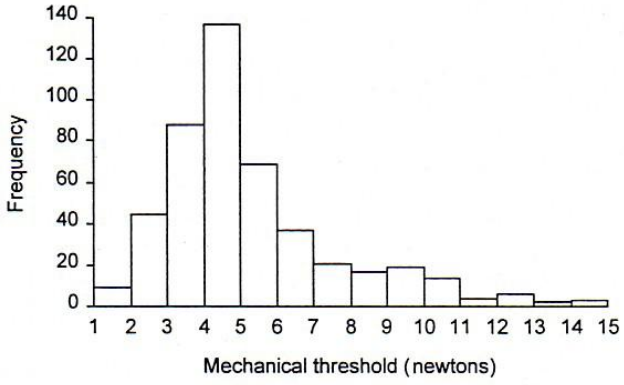


Figure 3

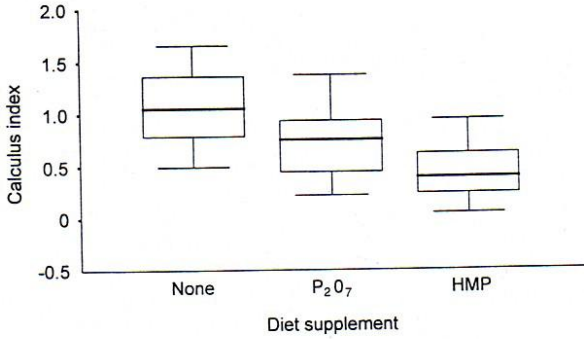


Figure 4

Answer true or false for the following statements:

a. The horizontal line within the box in a box-and-whisker plot in Figure 1 indicates the median value.
b. The scatter diagram in Figure 2 is useful to present data when we are interested in examining the relationship between two quantitative variables.
c. The histogram in Figure 3 is skewed to the right (or positively skewed) and can be transformed into a Normal distribution using a logarithmic transformation of the data.
d. The box plots in Figure 4 demonstrate that the data for three groups of dogs are normally distributed.
e. Figure 1 is an appropriate distribution for a continuous variable.

10. A study was conducted to investigate the relationship between sheep live weight (kg) and its chest girth (cm). A random sample of 66 sheep was weighed and simultaneously had their chest girth measured. Answer true or false for the following statements:
    a. Analysis of the data from this study could be performed using a two-sample t-test.
    b. A scatter diagram should be used to present the data.
    c. Chest girth measurement is a categorical variable.
    d. Simple linear regression could be used to describe the straight-line relationship between sheep live weight and chest girth.
    e. Sheep live weight can be predicted by measuring chest girth as long as the relationship between these variables is linear and chest girth is measured without error.