CONFIDENCE INTERVALS

Question 1. The data below are taken from the paper: *Mothers' dental attendance patterns and their children's dental attendance and dental health*, Gratrix *et al.*, 1990, BDJ 168: 441-443). It shows the mean DMFT (total of decayed, missing and filled teeth) of three groups of children along with their standard deviations.

Children's place of attendance	Number of children	Mean DMFT	Standard deviation of DMFT
General Dental Surgery	122	1.75	1.71
Community Dental Surgery	34	1.71	1.64
Non-attenders	21	1.52	1.72

    a. Calculate the 95% confidence interval for each of the means
    b. Assuming that DMFT is a normally distributed variable, between what values would we expect 95% of the DMFT values for the 122 children attending the General Dental Surgery to lie?
    c. Consider your answer to the second part of this question, bearing in mind what DMFT is. What can you deduce about the distribution of DMFT? Is it legitimate or useful to carry out the calculations you did in the first part of the question?

Question 2. True or false?
    d. The 95% confidence interval is wider than the 90% confidence interval.
    e. We would expect about 95% of a sample to lie within the 95% confidence interval of the sample's mean.
    f. There is a 95% probability that the true value of the mean lies within the 95% confidence interval.
    g. A confidence interval is symmetric about the mean.
    h. The 95% confidence interval is a plausible range of values for the population mean.
    i. If we repeatedly sampled a population and constructed a 99% confidence interval for the mean of each sample then, in the long run, 99% of the confidence intervals would include the true value of the mean.
If the statement is false explain why.

Question 3. How wide would a 100% confidence interval be?

Question 4. The data below are taken from the paper: *Fluoride release from glass-ionomer and compomer restorative materials: 6 month data* (Shaw *et al.*, 1998, Journal of Dentistry 26: 355-359). It shows the amount of fluoride released by three restorative materials (in vitro) after 6 months

Material	Number of specimens	Mean fluoride release (mg mm^{-2})	Standard deviation
Ketac-Fil	5	30.62	4.85
Chem-Fil Superior	5	12.69	2.55
Compoglass	5	10.35	1.02

Calculate the 95% confidence intervals for each of the means.
What can you infer about how the different materials compare in the light of your results?

Question 5. The data below are taken from the same paper referred to in *question 4*. They show the numbers of three different types of restoration included in the study and how many failed within 8 years. (Each of the materials is given a code letter to make it easier to refer to it in calculations and tables.)

Material	Code	Number of restorations	Number of failed restorations
Microfilled composite	M	55	9
Fine particle hybrid composite	C	52	8
Relatively coarse particle hybrid composite	P	54	5

Calculate the proportion of failures for each material, along with their confidence intervals.
Draw a graph or diagram which presents your results in a suitable manner.
Interpret your results.