

**Topic:** Statistics 1, 2 and 3 in Book 2 (Topics 26 to 32 and 85 to 89)

**Q1.** The following table shows the length of time for which 120 people have been unemployed.

Time (Months)	0-2	2-4	4-6	6-8	8-10	10-12
People	14	17	24	36	18	11

- (i) Write down the modal class.  
 (ii) Is the data discrete or continuous?  
 (iii) Calculate the mean time and the standard deviation, correct to 1 decimal place, using the mid-interval values.  
 (iv) Hence, estimate the number of people who have been unemployed for a time which is within one standard deviation of the mean time.

**Ans:** (i) 6 - 8 (iii) 2.9, 6 (iv) 78

**Q4.** In a market research survey, 34 people out of a random sample of 100 from a certain area said that they use a particular brand of toothpaste. Find the 95% confidence interval for the proportion of people in this area who use this brand of toothpaste. **Ans:** 25% - 43%

**Q6.** (i) A random sample of 100 students in a university was asked to calculate how much money they had earned during their last summer break. The mean of the sample was €3500. Can we say that the mean amount of money earned by the students during the last summer break in this university was €3500? Justify your answer.

- (ii) Calculate the margin of error if the confidence level is cited at 95%.  
 (iii) If the margin of error is required to be 5%, calculate the sample size.

**Ans:** (i) No, sample mean (ii) 10% (iii) 400

**Q9.** The marks of all students who sat a test are normally distributed with mean 66% and standard deviation 12%. Dylan's Dad promised him a present if he scores in the top 15% of all the students who sat the test. What is the minimum mark that Dylan must achieve to get the present?

**Ans:** 78%

**Q2.** Some IQ tests are standardised to a normal model with a mean of 100 and std deviation of 16.

- (i) Using the empirical rule, draw the model for these IQ scores. Clearly label the drawing. Show what the empirical rule predicts about the scores. (ii) From the diagram, what percentage of people should have a score of: (a) below 100 (b) below 132 (c) below 84 (d) above 84 (e) above 68

**Ans:** (a)50% (b)97.5% (c)16% (d)84% (e)97.5%

**Q3.** A claim that 40% of people eat fruit at least once a day is rejected on the basis of a sample proportion of 37%. What is the least number of people that could have been surveyed to justify the rejection?

**Ans:** 1112

**Q5.** In a Maths exam, the marks are normally distributed, with mean 55 and standard deviation 15. Sean scores 46. In what percentile is his score?

**Ans:** 27<sup>th</sup> percentile

**Q7.** In an opinion poll carried out before a local election, 513 people out of a random sample of 950 declare that they will vote for a one of two candidates contesting the election. Construct the 95% limits for the true proportion of all voters that will vote for this candidate. Is there significant evidence that this candidate will win the election?

**Ans:** [50.8%-57.2%]; yes, there's enough evidence.

**Q8.** Use your calc to show that the correlation coefficient of the following set of data is 0.86.

X	1	1	1	2	2	2	3	3	3	9
Y	1	2	3	1	2	3	1	2	3	8

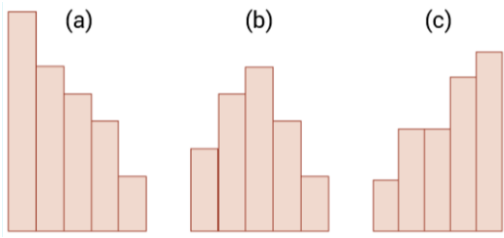
**Q10.** The following are cholesterol readings for a randomly selected group of 12 adults.

523	755	213	543	611	1187
202	321	715	653	332	615

- (i) Find the lower and upper quartiles.  
 (ii) Calculate the interquartile range.  
 (iii) Calculate the 15<sup>th</sup> and 80<sup>th</sup> percentiles.

**Ans:** (i) LQ:326.5 UQ:684 (ii) 357.5 (iii) 207.5, 735

**Q11.** Describe the shape of the distributions below:



**Q12.** (i) What sample size would be required to have a margin of error of 1%? (ii) Are there any problems associated with acquiring a sample of this size? Explain.

**Ans:** (i) 10,000 (ii) costs and the efforts reqd to collect such a sample might be too large

**Q13.** In the weeks before an election a sample of 200 were asked their voting preference. 92 said they would vote Fianna Fáil.

(i) Construct a 95% C.I. for FF's support level.  
(ii) If 26% voted for FF in the election, does this validate our poll?

(iii) If FF claimed 45% support on the day of the poll, would you agree with them?

**Ans:** (i)  $0.391 \leq FF \text{ Vote} \leq 0.529$  (ii) No. Our CI referred to the support level on the day of the survey. Opinions change a lot in the weeks before an election (iii) As 45% lies within the CI, we accept the claim to a 95% degree of certainty.

**Q14.** The average daily temperature and the number of lawnmowers sold by a large hardware store over a number of days in July are recorded in the table below:

Temp (°C)	13	17	15	19	22	25	27
No of Lawnmowers sold	8	15	17	10	6	3	4

(i) Represent the data on a scatterplot. (ii) Calculate the correlation coefficient,  $r$ .

(iii) Draw the line of best fit, and find its slope. What does this slope tell us?

(iv) If one of the data points is considered an outlier, name this point.

**Ans:** (ii) -0.74 (iii) -0.7619, for every 1° rise in temperature, the number of lawnmowers sold goes down by 0.7619 (iv) (13, 8)

**Q15.** A machine produces metal discs. The radii of the discs are normally distributed with mean 10cm and std deviation 0.05cm.

(i) Calculate the probability that the radius of a disc selected at random has a radius greater than 10.08cm. (ii) A disc is rejected if its radius is less than 9.9cm or greater than 10.12cm. Calculate the probability that a disc selected at random is rejected.

(iii) If 1000 good discs are required for a customer, calculate how many discs should be produced to obtain this number of good discs.

**Ans:** (i) 0.0548 (ii) 0.969 (iii) 1031

**Q16.** In the last election, 62.5% of voters supported the Good Party. In a sample of 200 voters, it is now found that 107 support them.

(i) Estimate the margin of error for the distribution of the sample proportion.

(ii) Determine if there is evidence, at the 5% level of significance, that the support for the Good Party has changed since the last election.

**Ans:** (i) 0.07 (ii) There is evidence to show that support for the Good Party has changed since the last election.

**Q17.** A political party wants to gauge the support for its candidate in an upcoming bi-election. So, it commissions a survey which predicts, with 95% confidence, that the party's candidate will receive between 28% and 36% of the first preference vote. Calculate the size of the sample of voters taken.

**Ans:** 625

**Q18.** A producer of electric light bulbs claims that its bulbs have a mean life of 1600 hours and a standard deviation of 250 hours. A random sample of 300 of these bulbs is found to have a mean life of 1571 hours. (i) Obtain the test statistic for the sample mean. (ii) Calculate the p-value. (iii) Is this result significant at the 5% level of significance?

**Ans:** (i) -2.01 (ii) 0.0444 (iii)  $\alpha = 0.05$  As the p-value is less than  $\alpha$ , the result is significant at the 5% level of significance.

**Q19.** In a far country, the government claims that the mean hourly rate earned by workers is €23.42. The political opposition decide to test this claim. A random sample of 800 workers is chosen and found to have a mean hourly rate of €22.92, with a standard deviation of €8.56.

(i) Obtain the test statistic for the sample mean.

(ii) Calculate the p-value for the sample statistic.

(iii) Is this result significant at the 5% level of significance? Give a reason.

**Ans:** (i) -1.65 (ii) 0.099 (iii)  $\alpha = 0.05$  As the p-value is greater than  $\alpha$ , the result is not significant at the 5% level of significance.

**Q20.** The mean mark for all students taking a certain Leaving Cert subject at Higher Level in 2016 was 67.5 with a standard deviation of 10. A random sample of 100 students who sat the Leaving Cert exam in the same subject in 2017 revealed a sample mean of 69. Is there evidence to conclude that the students have improved in a year?

**Ans:** No evidence the students have improved