GCSE Higher Mathematics
Practice Test 8: Statistics

Instructions:
Answer all questions. Show your working clearly.
Calculators may be used unless stated otherwise.
Time allowed: 90 minutes

Section A: Advanced Averages and Spread

1. The table shows the distribution of daily screen time:

Screen time (hours)	Frequency
1-2	6
3-4	13
5-6	19
7-8	25
9-10	17
11-12	11
13-14	7
15-16	4

Calculate:

(a) The total number of people surveyed
(b) An estimate of the mean daily screen time
(c) The modal class
(d) An estimate of the median screen time
(e) An estimate of the range

2. For the data set: 14, 17, 20, 23, 26, 29, 32, 35, 38, 44

(a) Calculate the mean
(b) Find the median and quartiles (Q1 and Q3)
(c) Calculate the interquartile range
(d) Calculate the standard deviation
(e) Identify any outliers using the 1.5 × IQR rule

3. Two data sets have the following properties:

- Set X: mean = 56, standard deviation = 12, n = 26
- Set Y: mean = 64, standard deviation = 16, n = 34

(a) Calculate the combined mean

(b) Calculate the combined standard deviation

(c) Which set is more consistent? Explain.

(d) Calculate the coefficient of variation for each set

4. The completion times (in minutes) of 60 puzzles are summarized:

$$\sum x = 1260, \sum x^2 = 27300$$

(a) Calculate the mean completion time

(b) Calculate the variance

(c) Calculate the standard deviation

(d) If each time is increased by 4 minutes, find the new mean and standard deviation

Section B: Histograms and Frequency Density

5. The histogram shows the distribution of parking fees per hour:

[Imagine a histogram with: £0-2 (density 6.5), £2-4 (density 4.8), £4-6 (density 3.2), £6-10 (density 1.8), £10-15 (density 0.8)]

(a) Complete the frequency table

(b) Calculate the total number of car parks surveyed

(c) Estimate the mean parking fee

(d) Find the modal class

(e) What percentage of car parks charge more than £6 per hour?

6. Draw a histogram for this data about daily calorie intake:

Calories	Frequency
1500-1750	16
1750-2000	34
2000-2100	18
2100-2300	28
2300-2500	22
2500-2750	12

(a) Calculate the frequency density for each class

(b) Draw the histogram

(c) Estimate the median calorie intake

(d) What fraction of people consume more than 2100 calories?

7. A histogram shows data with unequal class widths. The class 150-155 has frequency density 32 and the class 155-165 has frequency 200.

(a) Find the frequency for the 150-155 class

(b) Find the frequency density for the 155-165 class

(c) If the total frequency is 1000, suggest frequencies for other classes

Section C: Cumulative Frequency and Box Plots

8. The table shows the cumulative frequency of monthly rent payments:

Rent (£)	Cumulative Frequency
≤ 600	14
≤ 800	32
≤ 1000	56
≤ 1200	78
≤ 1400	92
≤ 1600	102
≤ 1800	108
≤ 2000	112

   (a) Draw the cumulative frequency curve

   (b) Find the median

   (c) Find the quartiles Q1 and Q3

   (d) Calculate the interquartile range

   (e) Draw a box plot

   (f) Estimate the 90th percentile

9. Two box plots show the distribution of exam preparation hours for two groups:

   [Imagine box plots: Group A (min 8, Q1 16, median 24, Q3 32, max 48), Group B (min 12, Q1 20, median 28, Q3 36, max 52)]

   Compare the distributions by commenting on:

   (a) Central tendency (medians)

   (b) Spread (ranges and IQRs)

   (c) Shape and outliers

   (d) Which group has more variable preparation times?

10. The cumulative frequency curve for loading times (in seconds) passes through these points: (5, 0), (10, 19), (15, 38), (20, 56), (25, 71), (30, 82), (35, 88)

    (a) Find the median loading time

    (b) Find the quartiles

    (c) What percentage have loading times between 12 and 23 seconds?

    (d) Draw the corresponding box plot

Section D: Scatter Graphs and Correlation

11. The table shows data for 10 fitness centers:

Monthly fee (£)	25	35	45	55	65	75	85	95	105	115
Members	320	285	250	215	180	145	110	75	40	5

    (a) Plot a scatter graph

    (b) Describe the correlation

    (c) Calculate the equation of the line of best fit

    (d) Use your line to predict membership for £70 monthly fee

(e) Estimate the fee for a center with 200 members

(f) Calculate the correlation coefficient

12. The equation of a regression line is $y = -2.1x + 180$.

(a) Interpret the gradient

(b) Interpret the y-intercept

(c) If $x = 45$, predict y

(d) If $y = 117$, estimate x

(e) State assumptions made when using this model

13. Classify these correlation coefficients and describe the relationships:

(a) $r = 0.93$

(b) $r = -0.58$

(c) $r = 0.16$

(d) $r = -0.85$

(e) $r = 0.79$

Section E: Advanced Probability

14. A deck contains 11 diamond cards, 8 heart cards, and 6 club cards. Two cards are drawn without replacement.

(a) Draw a tree diagram

(b) Find P(both diamonds)

(c) Find P(both same suit)

(d) Find P(at least one heart)

(e) Find P(different suits)

15. The probability that a drone battery dies during flight is 0.07, independently of other flights.

(a) Find the probability it dies on exactly 1 out of 5 flights

(b) Find the probability it dies on at least 2 out of 5 flights

(c) Find the expected number of battery failures in 30 flights

(d) In 50 flights, find P(more than 4 failures)

16. A knowledge quiz has 22 multiple choice questions, each with 4 options. A participant guesses randomly.

(a) Find P(correct answer on one question)

(b) Find P(exactly 8 correct answers)

(c) Find P(at least 15 correct answers)

(d) Find the expected number of correct answers

(e) Find the most likely number of correct answers

17. Events Q and R are such that P(Q) = 0.46, P(R) = 0.62, and P(Q R) = 0.23.

(a) Find P(Q R)

(b) Find P(Q')

(c) Find P(Q — R)

(d) Find P(R — Q)

(e) Are Q and R independent? Justify your answer

Section F: Conditional Probability and Independence

18. A survey of 360 students about transport methods gives:

    - 216 use public transport
    - 144 cycle to school
    - 72 use both methods

    (a) Draw a Venn diagram
    (b) Find P(uses public transport — cycles)
    (c) Find P(cycles — uses public transport)
    (d) Find P(uses exactly one transport method)
    (e) Are the transport methods independent? Explain

19. In a call center, 70% of calls are handled by Team 1 and 30% by Team 2. Team 1 resolves 94% of issues, Team 2 resolves 88% of issues.

    (a) Draw a tree diagram
    (b) Find the probability an issue is resolved
    (c) If an issue is resolved, find the probability it was handled by Team 1
    (d) If an issue is not resolved, find the probability it was handled by Team 2

20. A game uses 24 attack cards numbered 1-24 and 18 defense cards numbered 1-18. A card is drawn at random.

    (a) Find P(attack card and even number)
    (b) Find P(defense card — number less than 10)
    (c) Find P(number is multiple of 6)
    (d) Are card type and number properties independent?

21. A virus scanner is 96% accurate for infected files and 98% accurate for clean files. 5% of files are infected.

    (a) Find the probability a file is flagged as infected
    (b) If a file is flagged, find the probability it is actually infected
    (c) If a file passes the scan, find the probability it is clean
    (d) Comment on the effectiveness of the virus scanner

Section G: Hypothesis Testing and Sampling

22. A food delivery service is suspected of late deliveries. Out of 42 orders tested, 16 arrive late.

    (a) State the null and alternative hypotheses (promised rate is 30%)
    (b) Calculate the probability of getting 16 or more late deliveries if rate is 30%
    (c) At the 5% significance level, is there evidence of increased lateness?
    (d) What would be a Type I error in this context?

23. A sample of 44 LED bulbs has mean lifetime 18500 hours and standard deviation 2400 hours.

    (a) Calculate a 95% confidence interval for the population mean
    (b) Interpret your confidence interval
    (c) What assumptions are made?

(d) How would the interval change with a larger sample size?

24. An online course claims 88% completion rate. In a sample of 140 students, 118 complete the course.

(a) Test at 5% level whether the claim is justified

(b) Calculate the critical value

(c) State your conclusion

(d) What is the p-value for this test?

Section H: Problem Solving and Integration

25. A supermarket records checkout times over 250 transactions. The data shows:

- Mean = 3.8 minutes
- Standard deviation = 1.4 minutes
- Distribution is approximately normal

(a) Find P(checkout time ¿ 6 minutes)

(b) Find the checkout time exceeded by only 10% of customers

(c) What percentage of transactions take between 2.5 and 5 minutes?

(d) If the supermarket serves 800 customers daily, estimate express lane usage (assuming express for ¡ 2.5 minutes)

26. A manufacturing process samples 16 components every 3 hours. Over 6 sampling periods, the number of defective components found was: 2, 1, 3, 0, 2, 4.

(a) Calculate the mean and standard deviation

(b) Test whether the defect rate exceeds 11%

(c) Create a control chart with warning limits

(d) Comment on process stability

27. Compare these three investment trust options over 15 years:

- Trust A: Mean return 6.8%, standard deviation 4.2%
- Trust B: Mean return 9.5%, standard deviation 7.8%
- Trust C: Mean return 4.1%, standard deviation 2.6%

(a) Calculate the coefficient of variation for each

(b) Which offers the best risk-adjusted return?

(c) Using normal distribution, find P(return ¡ 3%) for each trust

(d) Recommend an option for a balanced investor

28. A music school studies the relationship between practice hours and performance scores. The correlation is 0.76.

(a) What does this correlation suggest?

(b) If practice hours have mean 8.5 and standard deviation 3.2, and performance scores have mean 84 and standard deviation 12, find the regression equation

(c) Predict the performance score for a student practicing 12 hours

(d) Calculate the coefficient of determination and interpret it

29. Design a statistical investigation to determine if flexible working hours improve employee productivity:

    (a) State hypotheses

    (b) Describe the sampling method

    (c) Identify variables and potential confounding factors

    (d) Outline the analysis plan

    (e) Discuss limitations and assumptions

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

For more resources and practice materials, visit:
stepupmaths.co.uk