Question 1

“A teacher wants to survey students about how they travel to school. The school has the following numbers of students in each year group.”

1(a) [1 mark]

Answer: Stratified sampling

- **B1:** For "quota" (sample taken from each year group). (Ignore that it’s not proportional—name of method is the key.)

1(b) [2 marks]

Example answers:

- **Advantage:** Ensures all year groups are represented.
- **Disadvantage:** Not proportional to year group sizes, so sample may be biased.

Marking:

- **B1:** Any valid advantage (e.g. “every year group is included”, “more representative than just picking at random from whole school”).
- **B1:** Any valid disadvantage (e.g. “not proportional to year sizes”, “more time-consuming to organise”, “may over-represent small year groups”).

1(c) [1 mark]

Question: “How do you travel to school?”

Correct ticks:

- qualitative
- primary
- **B1:** Both correct boxes ticked and no incorrect box ticked.

Question 2

“On 1 June, the exchange rate is £1 = €1.17. They exchange £850 into euros.”

2(a) [2 marks]

$850 \times 1.17 = 994.5$

Answer: €994.50

- **M1:** Use correct operation: 850×1.17.
- **A1:** €994.50 (or €994.5).

“On 20 June, the exchange rate is £1 = €1.25. They return with €920. Commission 2.8% of euros exchanged.”

2(b) [5 marks]

1. Commission:

0.028×920=25.76

2. Euros actually exchanged:

$$920-25.76=894.24$$

3. Convert to pounds at £1 = €1.25:

$$\text{Pounds}=894.24\,1.25=715.392\approx £715.39$$

Answer: £715.39 (to 2 d.p.)

Marking:

- **M1:** Find commission as a percentage of 920 (e.g. 0.028×920).
- **A1:** Commission = €25.76 (or correct rounded value).
- **M1:** Subtract commission from 920 to get euros exchanged.
- **M1:** Divide euros exchanged by 1.25 (or equivalent correct conversion).
- **A1:** Final answer ≈ £715.39 (allow sensible rounding).

Question 3

“The times (in minutes) taken by 15 students to complete a short test are: 12, 14, 15, 15, 16, 17, 18, 18, 19, 20, 21, 22, 22, 24, 28”

3(a) Median [1 mark]

There are 15 values; median is the 8th value.

Ordered list already given; 8th value = 18.

Answer: 18 minutes

- **B1:** 18

3(b) Lower and upper quartiles [3 marks]

Position of quartiles using (n+1)/4:

- Lower quartile Q1: position $(15+1)/4=4 \rightarrow$ 4th value = 15
- Upper quartile Q3: position $3(15+1)/4=12 \rightarrow$ 12th value = 22

Answers:

- Lower quartile = 15
- Upper quartile = 22

Marking:

- **M1:** Use a correct quartile position method (e.g. (n+1)/4 and 3(n+1)/4 or equivalent).
- **A1:** Q1=15.
- **A1:** Q3=22.

3(c) IQR [1 mark]

$$IQR=Q3-Q1=22-15=7$$

Answer: 7 minutes

- **B1:** 7

3(d) Comment on spread [1 mark]

Example: “The middle 50% of times lie within a 7-minute range, from 15 to 22 minutes.”

- **B1:** Any sensible comment using the IQR, e.g. “The times are fairly close together”, “There is a moderate spread of 7 minutes for the middle half of the data.”

Question 4

“The table shows the ages of 80 visitors at an event.”

Classes and frequencies:

- $10 < x \leq 20$: 6
- $20 < x \leq 30$: 14
- $30 < x \leq 40$: 22
- $40 < x \leq 55$: 26
- $55 < x \leq 70$: 12

Cumulative frequencies:

- up to 20: 6
- up to 30: 6 + 14 = 20
- up to 40: 20 + 22 = 42
- up to 55: 42 + 26 = 68
- up to 70: 68 + 12 = 80

4(a) Cumulative frequency graph [4 marks]

Points to plot (age on x-axis, cumulative frequency on y-axis):

- (20, 6)
- (30, 20)
- (40, 42)
- (55, 68)
- (70, 80)

Joined with a smooth curve or straight-line segments; start at (10, 0) if using lower boundary.

Marking (typical structure):

- **B1:** Correct cumulative frequencies (at least 3 correct).
- **M1:** Plot points correctly on the given grid.
- **M1:** Join points in order with a suitable curve/line.
- **A1:** Overall reasonable cumulative frequency curve (monotonically increasing, no major plotting errors).

4(b) Median age [1 mark]

Median is the 40th value (since there are 80 visitors). On the graph:

- Draw horizontal line from cumulative frequency 40 to the curve, then down to x-axis.
- Read off age.

Expected answer: Approximately 37–38 years (accept a sensible range depending on graph).

- **B1:** A value in the acceptable range from a correct reading of the candidate's graph.

4(c) Interquartile range [2 marks]

- Q1: 20th value → CF = 20 → read age from graph (around 30 years).
- Q3: 60th value → CF = 60 → read age (around 50 years).
- IQR ≈ 50 − 30 = 20 years (values will vary slightly).

Marking:

- **M1:** Use CF = 20 and CF = 60 to find Q1 and Q3 from the graph.
- **A1:** IQR in a reasonable range (e.g. 18–22 years) consistent with their graph.

4(d) Percentage more than 50 years old [1 mark]

- Read CF at age 50 from graph (say ≈72).
- Number older than 50 ≈ 80 − 72 = 8.
- Percentage:

880×100=10%

Expected answer: About 10%

- **B1:** A percentage in a reasonable range (e.g. 8–12%) consistent with their graph.

Question 5

Assumptions

- States a reasonable assumption for **daily smartphone use** (e.g. 3–5 hours per day).
- States a reasonable assumption for **hours awake per day** (e.g. 16 hours, assuming 8 hours sleep).

1 mark

Calculation of yearly hours

Calculates total smartphone hours in a year

- (e.g. 4×365=1460).

Calculates total awake hours in a year

- (e.g. 16×365=5840).

2 marks

(1 mark for each correct calculation)

Ratio

Writes a correct ratio of

smartphone hours : awake hours

- (e.g. 1460:5840).

Simplifies ratio correctly

- (e.g. 1:4).

1 mark

Marking [4 marks]:

- **B1:** At least one clear, sensible assumption stated (e.g. hours per day).
- **B1:** A second sensible assumption (e.g. number of days per year, or that usage is similar on weekdays and weekends).
- **M1:** Correct multiplication or equivalent calculation using their assumptions.
- **A1:** Final estimate consistent with their assumptions (no major arithmetic error).

(Any reasonable daily usage and days-per-year combination is acceptable if worked through correctly.)

Question 6

“Use Income Tax and National Insurance 2025–2026 from the Preliminary Material. A worker has an annual gross salary of £58 000 and has the standard personal allowance of £12 570.”

Use standard 2025–26 bands (England/Wales/NI): personal allowance £12,570; basic rate 20% on £12,571–£50,270; higher rate 40% above that.

6(a) Taxable income [2 marks]

$$\text{Taxable income} = 58000 - 12570 = 45430$$

Answer: £45,430

- **M1:** Subtract personal allowance from gross salary.
- **A1:** £45,430

6(b) Total income tax [4 marks]

45430-37700 = 7730

Income tax=0.20×37700=7540
0.40×7730 = 3092

7540 + 3092 =10632

Answer: £10,632

Marking:

- **M1:** Recognise that all taxable income is at 20% (or correctly split into bands).
- **M1:** Apply 20% to £45,430 (or equivalent banded calculation).
- **A1:** £9,086 (allow minor rounding if due to intermediate steps).
- **A1:** Correct units and clear statement of annual tax.

6(c) National Insurance [3 marks]

Assume 2025–26 employee NI: 8% between £12,570 and £50,270, and 2% above that.

1. NI at 8%:

$$50270-12570=37700$$
$$0.08\times37700=3016$$

2. NI at 2%:

$$58000-50270=7730$$
$$0.02\times7730=154.6$$

3. Total NI:

$$3016+154.6=3170.6$$

Answer: £3,170.60 (≈ £3,171)

Marking:

- **M1:** Correctly identify income ranges for NI bands.
- **M1:** Apply correct percentages to each band.
- **A1:** Total ≈ £3,170.60 (allow sensible rounding).

6(d) Annual net salary [1 mark]

$$Net=58000-9086-3170.6=45743.4$$

Answer: £45,743.40 (≈ £45,743)

- **B1:** Correct net salary consistent with their tax and NI figures.

Question 7

“Use Student Loans from the Preliminary Material. A graduate is on Plan 2. Their annual gross salary is £39 858. Their outstanding loan balance at the start of the year is £27 500. Threshold £28 470; repayments 9% of income above threshold; RPI 4.3%; interest rate while graduated is RPI + 1.5%.”

7(a) Annual repayment [3 marks]

Income above threshold:

$$39858-28470=11388$$

Repayment:

$$0.09\times11388=1024.92$$

Answer: £1,024.92 (≈ £1,025)

Marking:

- **M1:** Subtract threshold from salary.
- **M1:** Apply 9% to the excess.
- **A1:** £1,024.92 (allow rounding).

7(b) Interest rate [2 marks]

Interest rate = RPI + 1.5%:

$$4.3\%+1.5\%=5.8\%$$

Answer: 5.8%

- **B1:** Use RPI + 1.5%.
- **B1:** 5.8%

7(c) Interest added [3 marks]

$$\text{Interest}=0.058\times27500=1595$$

Answer: £1,595

Marking:

- **M1:** Use loan balance £27,500.
- **M1:** Apply 5.8% correctly.
- **A1:** £1,595

7(d) Loan balance increased or decreased? [2 marks]

Start: £27,500

- interest: £1,595 → £29,095 − repayment: £1,024.92 → £28,070.08

Change:

$$28070.08 - 27500 \approx 570.08$$

So the balance **increases** by about £570.

Marking:

- **M1:** Compare interest added with repayment (or compute final balance).
- **A1:** Correct conclusion: loan balance has increased (with supporting figures).

Question 8

“Use The Party Factory from the Preliminary Material. A machine produces small simple items at a rate between 950 and 1000 items per hour. On one day, the factory needs to produce 18 600 small items.”

8(a) Minimum time [3 marks]

Minimum time occurs at **maximum** rate (1000 items/hour):

$\text{Time} = \frac{18600}{1000} = 18.6$ hours

Convert 0.6 hours to minutes:

$0.6 \times 60 = 36$ minutes

Answer: 18 hours 36 minutes

Marking:

- **M1:** Use 1000 items/hour for minimum time.
- **M1:** Divide 18,600 by 1000.
- **A1:** 18 h 36 min.

8(b) Maximum time [3 marks]

Maximum time occurs at **minimum** rate (950 items/hour):

$$\text{Time} = \frac{18600}{950} \approx 19.5789 \text{ hours}$$

Decimal part:

$$0.5789 \times 60 \approx 34.7 \text{ minutes} \approx 35 \text{ minutes}$$

Answer: About 19 hours 35 minutes

Marking:

- **M1:** Use 950 items/hour for maximum time.
- **M1:** Divide 18,600 by 950.
- **A1:** Time ≈ 19 h 35 min (allow 19 h 34–36 min).

8(c) Consistency with 19 hours [1 mark]

Range of possible times: about 18 h 36 min to 19 h 35 min. 19 hours lies within this range, so it is **consistent**.

- **B1:** Statement that 19 hours is consistent, with reference to the calculated range.

Question 9

“The times (in minutes) taken by 40 runners to complete a course are grouped below.”

Classes and frequencies:

- $10 \leq t < 12$: 6
- $12 \leq t < 14$: 14
- $14 \leq t < 18$: 16
- $18 \leq t < 24$: 4

Class widths: 2, 2, 4, 6

Frequency densities:

- 10–12: $6/2 = 3$
- 12–14: $14/2 = 7$
- 14–18: $16/4 = 4$
- 18–24: $4/6 \approx 0.67$

9(a) Histogram [3 marks]

Bars:

- 10–12: height 3
- 12–14: height 7
- 14–18: height 4
- 18–24: height ≈ 0.67

Marking:

- **M1:** Use frequency density = frequency ÷ class width.
- **M1:** Correct heights for at least three classes.
- **A1:** Fully correct histogram (all bars correct, correctly positioned).

9(b) Number of runners qualifying (t ≤ 15) [1 mark]

Qualification time: 15 minutes or less.

- 10–12: all 6 qualify.
- 12–14: all 14 qualify.
- 14–18: only 14–15 part qualifies.
    - Class 14–18 has width 4 and frequency 16 → density 4.
    - From 14 to 15 is width 1 → frequency = 4×1=4.

Total qualifying:

6+14+4=24

Answer: 24 runners

- **B1:** 24 (from correct use of area/proportion in the 14–18 class).