General Mathematics Unit 3 & 4 — Examination 2 (Practice 2) — Answers & Explanations

Answers to the 7 questions in the free preview.

Data analysis

1. (8 marks in total)

a. 20 minutes [1 mark]

With 11 values the median is the 6th value in order, which is 20.

b. Q1 = 17, Q3 = 25, IQR = 8 [2 marks]

Excluding the median, the lower half is 12, 15, 17, 18, 18 with median 17, and the upper half is 22, 23, 25, 29, 41 with median 25. IQR = 25 − 17 = 8. One mark for both quartiles, one for the IQR.

c. Upper fence = 25 + 1.5 × 8 = 37, and 41 > 37. [1 mark]

An outlier lies more than 1.5 × IQR above Q3.

d. Mean 21.82 minutes; standard deviation 7.93 minutes [2 marks]

The sum is 240, so the mean is 240/11 ≈ 21.82. A calculator gives the sample standard deviation ≈ 7.93. One mark each.

e. Positively skewed, with an outlier at 41 minutes. [1 mark]

Most values are clustered between 12 and 29, with a long tail towards the higher values.

f. The mean changes more: it falls from 21.82 to 19.9, while the median falls only from 20 to 19. [1 mark]

The mean is affected by the size of every value, including the outlier; the median depends only on the middle value(s).

2. (6 marks in total)

a. 95% [1 mark]

22 and 46 are two standard deviations either side of the mean.

b. 16% [1 mark]

40 is one standard deviation above the mean. 68% lie within one standard deviation, leaving 32% outside, half of which (16%) is above.

c. 320 workers [1 mark]

28 is one standard deviation below the mean, so 16% of 2000 = 320.

d. z = 1.5 [1 mark]

z = (43 − 34)/6 = 1.5.

e. 36 minutes [1 mark]

x = 40 + (−0.5) × 8 = 36.

f. Lena, because Lena's standardised score (30 − 34)/6 ≈ −0.67 is lower than Ravi's −0.5. [1 mark]

Standardised scores allow comparison across different distributions; the lower score is further below its own mean.

PrepNest

3. (6 marks in total)

a. Arm span [1 mark]

The explanatory variable is the one used to predict the other.

b. height = 4.16 + 0.978 × arm span [2 marks]

A calculator gives intercept ≈ 4.164 and slope ≈ 0.9779. One mark for each coefficient, with the variables named.

c. On average, height increases by 0.978 cm for each 1 cm increase in arm span. [1 mark]

The slope is the average change in the response variable for a one-unit increase in the explanatory variable.

d. r ≈ 0.982: a strong, positive, linear association [1 mark]

The calculator gives r ≈ 0.9825, so r^2 ≈ 0.965: about 96.5% of the variation in height is explained by the variation in arm span.

e. −2.6 cm [1 mark]

Predicted height = 4.16 + 0.978 × 163 ≈ 163.57. Residual = actual − predicted = 161 − 163.57 ≈ −2.6. (Unrounded coefficients also give −2.6.)

4. (4 marks in total)

a. 44.67 [1 mark]

(36 + 51 + 47)/3 = 134/3 ≈ 44.67.

b. 45.875 [1 mark]

The four-point averages of t = 2 to 5 and t = 3 to 6 are 174/4 = 43.5 and 193/4 = 48.25. Centring gives (43.5 + 48.25)/2 = 45.875.

c. 50 [1 mark]

Deseasonalised value = actual/seasonal index = 55/1.1 = 50.

d. 5184 visitors (51.84 hundred) [1 mark]

The deseasonalised forecast is 38.4 + 1.6 × 12 = 57.6 hundred. Reseasonalising: 57.6 × 0.9 = 51.84 hundred, which is 5184 visitors.

Recursion and financial modelling

5. (4 marks in total)

a. $V_0 = 12\,000$, $V_{n+1} = 0.85V_n$ [1 mark]

Each year the machine keeps 85% of its value from the year before.

b. $6264.08 [1 mark]

$12\,000 \times 0.85^4 = 6264.075$, which is $6264.08.

c. $1433.98 per year [1 mark]

The total depreciation over four years is 12 000 − 6264.08 = 5735.92, and 5735.92/4 = $1433.98.

d. 9 years [1 mark]

After 8 years the value is about $3269.89 and after 9 years about $2779.40.

6. (4 marks in total)

a. $2899.36 [1 mark]

Financial solver: N = 300, I% = 6, PV = 450 000, FV = 0, 12 payments per year, giving PMT ≈ −2899.36.

b. $404 694.13 [1 mark]

Financial solver with N = 60 and PMT = −2899.36 gives FV ≈ −404 694.13.

c. $128 655.73 [1 mark]

Total repayments are 60 × 2899.36 = 173 961.60, and the principal repaid is 450 000 − 404 694.13 = 45 305.87. Interest = 173 961.60 − 45 305.87 = $128 655.73.

d. 221 repayments [1 mark]

Financial solver: PV = 404 694.13, I% = 5.4, PMT = −2899.36, FV = 0 gives N ≈ 220.3, so 221 repayments are needed — 19 fewer than the 240 originally remaining.

7. (4 marks in total)

a. $2250.00 [1 mark]

A perpetuity pays exactly the interest earned each month: 600 000 × 0.045/12 = $2250.

b. $578 561.41 [1 mark]

Financial solver: N = 12, I% = 4.5, PV = −600 000, PMT = 4000 gives FV ≈ 578 561.41.

c. 221 withdrawals [1 mark]

Setting FV = 0 and solving for N gives N ≈ 220.9, so 221 withdrawals, the last of them smaller.

d. 4.59% [1 mark]

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$(1 + 0.045/12)^{12} - 1 \approx 0.0459$, which is 4.59%.

PrepNest

PREVIEW

That’s the end of the preview answers

These are the answers to the 7 preview questions. The full answer key covers all 13 questions in General Mathematics Unit 3 & 4 — Examination 2 (Practice 2), with the working behind every mark.

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