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

Answers to the 7 questions in the free preview.

Data analysis

1. (6 marks in total)

a. 25 °C [1 mark]

With 15 values, the median is the 8th: 25.

b. 9 °C [1 mark]

Q_1 is the median of the lower seven values, 21, and Q_3 is the median of the upper seven, 30. IQR = 30 − 21 = 9.

c. Upper fence = 30 + 1.5 × 9 = 43.5; 41 < 43.5, so it is not an outlier. [2 marks]

One mark for the upper fence, one for the comparison.

d. Mean 25.8 °C; standard deviation 6.2 °C [1 mark]

Using a CAS: $\bar{x} = 25.8$ and $s_x = 6.155$.

e. 20% [1 mark]

Three days (31, 33 and 41) out of 15.

2. (6 marks in total)

a. Hours of sunshine [1 mark]

The variable used to make the prediction.

b. energy = 0.30 + 1.86 × sunshine [2 marks]

Using a CAS: intercept 0.3036, slope 1.8585. One mark for each coefficient.

c. On average, energy generated increases by 1.86 kWh for each additional hour of sunshine. [1 mark]

The slope is the average change in the response per unit change in the explanatory variable.

d. $r^2 = 0.998$: 99.8% of the variation in energy generated is explained by the variation in hours of sunshine. [1 mark]

$r = 0.9992$.

e. 0.26 kWh [1 mark]

Predicted = 0.3036 + 1.8585 × 7.5 = 14.24, and 14.5 − 14.24 = 0.26. Using the rounded coefficients gives 0.25, which is also accepted.

3. (6 marks in total)

a. The association is not linear, so a linear model is not appropriate even though r is high. [1 mark]

A random scatter of residuals is needed to support linearity.

b. distance = 5.849 + 0.007279 × speed² [2 marks]

Using a CAS with speed² as x: intercept 5.8485, slope 0.0072793. One mark for each coefficient.

c. 0.9996 [1 mark]

$r = 0.99979$.

d. 93.9 m [1 mark]

5.8485 + 0.0072793 × 12 100 = 93.93.

e. It is an extrapolation: 110 km/h lies outside the range of speeds in the data (40 to 100 km/h). [1 mark]

The model has not been tested beyond the data.

4. (6 marks in total)

a. An increasing trend with irregular fluctuations. [1 mark]

Visitor numbers rise over the ten days, with ups and downs from day to day.

b. 174.7 [1 mark]

(171 + 165 + 188) ÷ 3 = 174.67.

c. 171.6 [2 marks]

Days 3 to 6 average (149 + 171 + 165 + 188) ÷ 4 = 168.25 and days 4 to 7 average (171 + 165 + 188 + 176) ÷ 4 = 175. Centring: (168.25 + 175) ÷ 2 = 171.625. One mark for the two averages, one for centring.

d. 233 [1 mark]

136.5 + 6.88 × 14 = 232.8.

e. On average, the number of visitors increases by about 6.9 each day. [1 mark]

The slope is the average daily change.

Recursion and financial modelling

5. (4 marks in total)

a. $V_0 = 9600$, $V_{n+1} = V_n - 1200$ [1 mark]

1500 × 0.80 = $1200 per year.

b. 6 years [1 mark]

After 5 years the value is 9600 − 6000 = $3600; after 6 years it is $2400.

c. $4340.37 [1 mark]

$9600 \times 0.82^4 = 4340.37$.

d. Unit cost, by $40.90 [1 mark]

Unit cost: $3600. Reducing balance: $9600 \times 0.82^5 = \$3559.10$.

6. (4 marks in total)

a. $3312.33 [1 mark]

Financial solver: N = 300, I% = 5.88, PV = 520 000, FV = 0 gives PMT = −3312.33.

b. $466 837 [1 mark]

N = 60 with PMT = −3312.33 gives FV = −466 837.

c. $473 699 [1 mark]

300 × 3312.33 − 520 000 = 473 699.

d. $3508.15 [1 mark]

N = 240, I% = 6.6, PV = 466 836.99, FV = 0 gives PMT = −3508.15.

7. (4 marks in total)

a. $V_0 = 2000$, $V_{n+1} = 1.0035V_n + 400$ [1 mark]

The monthly rate is 4.2% ÷ 12 = 0.35%.

b. $17 586.08 [1 mark]

Financial solver: N = 36, I% = 4.2, PV = −2000, PMT = −400 gives FV = 17 586.08.

c. $1186.08 [1 mark]

17 586.08 − 2000 − 36 × 400 = 1186.08.

d. $529.72 [1 mark]

N = 48, I% = 4.2, PV = −2000, FV = 30 000 gives PMT = −529.72.

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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 4), with the working behind every mark.

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