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

Answers to the 7 questions in the free preview.

Data analysis

1. (6 marks in total)

a. 7.5 minutes [1 mark]

In order: 2, 4, 5, 5, 6, 7, 8, 9, 10, 12, 13, 29. With 12 values, the median is the mean of the 6th and 7th: (7 + 8) ÷ 2 = 7.5.

b. $Q_1 = 5$, $Q_3 = 11$, IQR = 6 [2 marks]

The lower half is 2, 4, 5, 5, 6, 7, so $Q_1 = (5 + 5) \div 2 = 5$. The upper half is 8, 9, 10, 12, 13, 29, so $Q_3 = (10 + 12) \div 2 = 11$. IQR = 11 − 5 = 6. One mark for both quartiles, one for the IQR.

c. Upper fence = 11 + 1.5 × 6 = 20; 29 > 20, so it is an outlier. [2 marks]

Upper fence = Q_3 + 1.5 × IQR = 11 + 9 = 20. Since 29 is greater than 20, it is an outlier. One mark for the fence, one for the comparison.

d. Positively skewed, with an outlier at 29 minutes. [1 mark]

Most trains were a few minutes late and the values tail off to the right, with one extreme value.

2. (6 marks in total)

a. Hours of practice [1 mark]

The variable used to make the prediction is the explanatory variable.

b. score = 1.19 + 1.89 × hours [2 marks]

Using a CAS with hours as x and score as y: slope 1.8916, intercept 1.1867. One mark for each coefficient.

c. On average, score increases by 1.89 points for each additional hour of practice. [1 mark]

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

d. r = 0.998 [1 mark]

From the CAS, r = 0.9979, which rounds to 0.998: a very strong positive linear association.

e. score ≈ 12.5; interpolation [1 mark]

1.1867 + 1.8916 × 6 = 12.54, which is 12.5. Six hours lies within the data range of 2 to 11 hours, so this is interpolation.

3. (6 marks in total)

a. 95% [1 mark]

126 and 174 are two standard deviations either side of the mean, which contains about 95% of values.

b. 16% [1 mark]

162 g is one standard deviation above the mean. 34% lie between the mean and 162 g, so 50% − 34% = 16% lie above it.

c. z = −0.75 [1 mark]

z = (141 − 150) ÷ 12 = −0.75.

d. 50 apples [1 mark]

About 2.5% of apples are more than two standard deviations below the mean: 0.025 × 2000 = 50.

e. 168 g [1 mark]

mass = 150 + 1.5 × 12 = 168 g.

f. z = (200 − 150) ÷ 12 ≈ 4.17, more than three standard deviations above the mean, so it is very unusual. [1 mark]

Fewer than 0.15% of apples are expected more than three standard deviations above the mean.

4. (6 marks in total)

a. 50 [1 mark]

(48 + 62 + 55 + 35) ÷ 4 = 200 ÷ 4 = 50.

b. (62 ÷ 50 + 70 ÷ 55) ÷ 2 = (1.24 + 1.2727) ÷ 2 = 1.26 [1 mark]

The Year 2 mean is 220 ÷ 4 = 55. Average the Quarter 2 ratios for the two years: (1.24 + 1.2727) ÷ 2 = 1.2564, which is 1.26. (Check: the four indices sum to 4.)

c. 54.29 [1 mark]

38 ÷ 0.70 = 54.29.

d. Quarter 4 sales are typically 30% below the quarterly average. [1 mark]

A seasonal index of 0.70 means sales in that quarter are 70% of an average quarter.

e. 75.6 [2 marks]

Quarter 2 of Year 3 is t = 10. Deseasonalised forecast = 45 + 1.5 × 10 = 60. Actual forecast = 60 × 1.26 = 75.6. One mark for t = 10 and the trend value, one for reseasonalising.

Recursion and financial modelling

5. (4 marks in total)

a. $V_0 = 68\,000$, $V_{n+1} = V_n - 6120$ [1 mark]

Flat rate depreciation subtracts the same amount each year.

b. \$37 400 [1 mark]

68 000 − 5 × 6120 = 68 000 − 30 600 = \$37 400.

c. \$35 885.77 [1 mark]

$68\,000 \times 0.88^5 = \$35\,885.77$.

d. 6 years [1 mark]

After 5 years: flat rate \$37 400, reducing balance \$35 885.77. After 6 years: flat rate \$31 280, reducing balance $68\,000 \times 0.88^6 = \$31\,579.48$, so the flat rate value is now lower.

6. (4 marks in total)

a. 0.7% [1 mark]

8.4% ÷ 12 = 0.7% per month.

b. $B_0 = 36\,000$, $B_{n+1} = 1.007B_n - 900$ [1 mark]

Each month the balance grows by 0.7% interest, then the \$900 repayment is subtracted.

c. \$19 129 [1 mark]

Financial solver: N = 24, I% = 8.4, PV = 36 000, PMT = −900 gives FV = −19 129.37, so the balance is \$19 129.

d. 48 [1 mark]

Solving for N with FV = 0 gives N = 47.09, so 47 full repayments are followed by a smaller 48th repayment.

7. (4 marks in total)

a. \$2040 [1 mark]

The monthly rate is 5.1% ÷ 12 = 0.425%, and 0.00425 × 480 000 = \$2040.

b. \$478 040 [1 mark]

480 000 + 2040 − 4000 = \$478 040.

c. \$2040 [1 mark]

A perpetuity withdraws only the interest, so the balance never changes: \$2040 per month.

d. 168 [1 mark]

Solving for N with PV = 480 000, PMT = 4000 and FV = 0 gives N = 168.2, so 168 full withdrawals can be made.

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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 3), with the working behind every mark.

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