General Mathematics Unit 3 & 4 — Examination 1 (Practice 3) — Answers & Explanations

Answers to the 20 questions in the free preview.

Data analysis

1. A. categorical ordinal and numerical continuous

Coffee size is a category with a natural order (small < medium < large), so it is ordinal. Waiting time is measured, not counted, so it is numerical continuous.

2. B. 3.32

The mean is 49 ÷ 7 = 7. The squared deviations are 16, 4, 4, 1, 1, 4 and 36, which sum to 66. The sample standard deviation is √(66 ÷ 6) = √11 = 3.32. Dividing by 7 instead of 6 gives 3.07, the population value, which is not what a CAS reports as s_x.

3. E. The distribution is positively skewed.

The median (17) sits close to Q1 (15) and the upper whisker is long, so the distribution is positively skewed. The upper fence is Q3 + 1.5 × IQR = 25 + 1.5 × 10 = 40, and a value must be greater than the fence to be an outlier, so 40 is not one. The IQR is 25 − 15 = 10, and only about 25% of members lie between Q1 and the median.

4. E. 84%

1.5 m is one standard deviation below the mean. 50% of heights lie above the mean and 34% lie between one standard deviation below and the mean, so 50% + 34% = 84% are taller than 1.5 m.

5. A. Dev

Compare standardised scores: Aria (74 − 68) ÷ 4 = 1.5; Ben (81 − 75) ÷ 5 = 1.2; Chloe (66 − 58) ÷ 6 = 1.33; Dev (90 − 84) ÷ 3 = 2.0; Eli (70 − 60) ÷ 8 = 1.25. Dev has the highest z-score, even though Eli's raw score is further above the mean.

6. E. a segmented bar chart

Both variables are categorical, and a segmented bar chart shows the percentage preferring each service within each age group. Scatterplots, stem plots and box plots need at least one numerical variable.

7. A. hot weather increases both ice cream sales and the number of people swimming

A strong correlation does not establish causation. Both variables rise on hot days, when more people buy ice cream and more people swim — a common response to a third variable.

8. E. score = 1.19 + 1.89 × hours

With hours as the explanatory variable, the CAS gives slope 1.89 and intercept 1.19. The value 0.53 is the slope of hours on score, which is what you get by entering the variables the wrong way round.

9. A. the actual time was 1.2 minutes less than the time predicted by the line

A residual is actual value − predicted value. A residual of −1.2 means the actual time was 1.2 minutes below the line's prediction for that distance.

10. D. y against 1/x

If y = k × (1/x), then plotting y against 1/x gives a straight line through the origin with slope k. This is the reciprocal transformation of the explanatory variable.

11. E. 81% of the variation in height can be explained by the variation in arm span.

The coefficient of determination r^2 gives the percentage of variation in the response variable explained by the explanatory variable. Here r = √0.81 = 0.9 (positive for this context), not 0.81.

12. B. 29.4

The five-mean smoothed value for day 4 averages days 2 to 6: (27 + 25 + 31 + 34 + 30) ÷ 5 = 147 ÷ 5 = 29.4. The value 30 is the three-mean smoothed value for day 4, and 28 is the five-mean value for day 3.

13. B. 0.72

The mean quarterly sales are (120 + 150 + 90 + 140) ÷ 4 = 500 ÷ 4 = 125. The seasonal index for Quarter 3 is 90 ÷ 125 = 0.72.

14. A. remove the seasonal pattern so that the underlying trend can be seen more clearly

Deseasonalising divides each value by its seasonal index, which removes the regular seasonal pattern and leaves the trend (and random variation) visible. Smoothing is a different technique.

15. A. 20

About 5% of scores lie more than two standard deviations from the mean, half of them below it, so about 2.5% score more than two standard deviations below the mean: 0.025 × 800 = 20 students. 780 is the number scoring above that value.

16. B. 10

The ten numbers sum to 10 × 12 = 120. Removing 30 leaves a sum of 90 across nine numbers, so the new mean is 90 ÷ 9 = 10.

Recursion and financial modelling

17. C. 26

$T_1 = 0.5 \times 40 + 12 = 32$, $T_2 = 0.5 \times 32 + 12 = 28$ and $T_3 = 0.5 \times 28 + 12 = 26$. The sequence approaches 24 in the long run, which is a common wrong answer.

18. C. 20%

After two years the value is 1536 ÷ 2400 = 0.64 of the purchase price. The yearly multiplier is $\sqrt{0.64} = 0.8$, so the value falls by 20% each year. 36% is the total fall over two years.

19. C. 6 years

The tool loses 0.125 × 3600 = \$450 each year. After 5 years it is worth 3600 − 2250 = \$1350 and after 6 years it is worth 3600 − 2700 = \$900, so it first falls below \$1000 after 6 years.

20. D. \$592

The value after 104 weeks is $7500 \times (1 + 0.038 \div 52)^{104} \approx \$8091.99$, so the interest is about \$592. \$570 is simple interest and \$581 is annual compounding; \$8092 is the final value, not the interest.

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