AP STATISTICS · UNIT 2

Revision Lesson

Past-paper questions with condensed solutions

20
questions

6
topic sections

58
slides in total

Built from the Unit 2 Review past-paper booklet

How to use this lesson

Key points first, then question, then solution

Key points	Each section opens with a summary slide of the ideas you need, with the main point highlighted first.
Question	The question appears on its own slide, with the mark tariff in the corner. Attempt it before you turn the page.
Solution	The next slide gives the condensed solution — the reasoning that earns the mark, not just the answer.
Trap box	Every solution closes with the mistake that costs marks most often in that question.
Mark scheme	The final section lists the mark tariff for every part, plus a one-slide answer key.

01

Random behaviour and expected value

Law of Large Numbers · long-run relative frequency · expected value

- Questions 1 and 4
- What stays fixed, and what settles down in the long run

Key points · random behaviour

Short runs are unpredictable; the long run is lawful

1 **The one test**

The Law of Large Numbers says a relative frequency settles toward the true probability AS N GROWS. It never fixes the next trial.

2 **No memory**

Random processes have no memory. After 15 heads in 20 tosses the coin still has P(heads) = 0.5 on the next toss.

3 **Short runs lie**

Five spins all blue tells you almost nothing. Small samples are dominated by chance variation.

4 **Expected value**

An AVERAGE per trial in the long run, not a promise about any single outcome. It is a mean, not a certainty.

5 **Reading EV**

−$0.85 per spin = players lose an average of 85 cents per spin over many spins.

Question 1

1 mark

Random behaviour and expected value

THE QUESTION

Which of the following statements illustrates the Law of Large Numbers?

I. If a fair coin was flipped 20 times, and 15 of those tosses resulted in heads, then the probability of a head on the next toss is less than 0.5.

II. If a spinner with two sections, blue and green, has been spun 5 times and each result was blue, then it is most likely to be green on the next spin.

III. If a fair die with faces numbered 1 to 6 is rolled, the proportion of tosses that land with an even number facing up will approach 0.5 as the number of tosses increases.

(A) I only (B) II only (C) III only (D) I and II only (E) I, II, and III

Question 1 — solution

1 mark

Random behaviour and expected value

CONDENSED SOLUTION

- Answer: (C) III only.
- I is false: the coin has no memory, so P(heads) is still exactly 0.5 on the next toss.
- II is false: five blue spins is a short run. The spinner is still most likely blue again if the sections are equal — and the long-run claim needs many more trials.
- III is the LLN itself: the relative frequency of evens approaches the true probability 0.5 as the number of tosses increases.

TRAP Random processes have no memory. The LLN is about the long run, never about the next toss.

Question 4

1 mark

Random behaviour and expected value

THE QUESTION

A slot machine is programmed to give players an expected value of −$0.85 per spin. What is the meaning of the expected value, in this context?

(A) The players lose $0.85 every time they spin the slot machine.

(B) The players win $0.85 every time they spin the slot machine.

(C) The players lose an average of $0.85 per spin on the slot machine.

(D) The players win an average of $0.85 per spin on the slot machine.

(E) A player has an 85 percent chance of losing money when playing the slot machine.

Question 4 — solution

1 mark

Random behaviour and expected value

CONDENSED SOLUTION

- Answer: (C).
- Expected value is a long-run AVERAGE per trial: over many spins, the mean loss per spin approaches $0.85.
- (A) is wrong because individual spins vary — some win, some lose.
- (E) confuses an average amount of money with a probability.

TRAP Expected value is a mean, not a certainty and not a probability. Read "−$0.85" as an average loss.

02

Probability rules

Unions, intersections and independence

- Questions 2 and 5
- Addition rule and the $P(A \cap B) = P(A)P(B)$ test

Key points · probability rules

Two rules carry most of the marks

1. **Addition rule** — $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. The subtraction stops double counting the overlap.
2. **Independence test** — A and B are independent exactly when $P(A \cap B) = P(A) \times P(B)$. Check it with numbers, not intuition.
3. **Mutually exclusive** — $P(A \cap B) = 0$. They cannot both happen — so they can never be independent.

Question 2

1 mark

Probability rules

THE QUESTION

A particular middle school has a band program and a choir program. 32 percent of the students are enrolled in band, 26 percent are enrolled in choir, and 43 percent are enrolled in at least one of the two music programs. What is the probability that a student selected at random from the school is enrolled in both band and choir?

(A) 0.06 (B) 0.08 (C) 0.11 (D) 0.15 (E) 0.25

Question 2 — solution

1 mark

Probability rules

CONDENSED SOLUTION

- Answer: (D) 0.15.
- Addition rule: P(band ∪ choir) = P(band) + P(choir) − P(band ∩ choir).
- 0.43 = 0.32 + 0.26 − P(both), so P(both) = 0.58 − 0.43 = 0.15.

TRAP The subtraction term is not optional. Leaving it out gives 0.58, and the 43% figure is there to stop exactly that.

Question 5

1 mark

Probability rules

THE QUESTION

The probability that Isa rides her bike to school on a randomly selected day (Event A) is 0.6. The probability that Sarah rides her bike to school on a randomly selected day (Event B) is 0.45. The probability that they both ride to school on a randomly selected day (Event A and B) is 0.35.
Which of the following statements must be true according to this observation?
(A) A and B are mutually exclusive and are independent.
(B) A and B are mutually exclusive and are not independent.
(C) A and B are not mutually exclusive and are independent.
(D) A and B are not mutually exclusive and are not independent.
(E) A and B are not mutually exclusive and independence cannot be determined with the information given.

Question 5 — solution

1 mark

Probability rules

CONDENSED SOLUTION

- Answer: (D).
- Not mutually exclusive: $P(A \cap B) = 0.35 > 0$, so they can and do happen together.
- Not independent: independence needs $P(A \cap B) = P(A) \times P(B) = 0.6 \times 0.45 = 0.27$, but $0.35 \neq 0.27$.

TRAP Two separate checks — do not blur them. $0.35 > 0$ answers exclusivity; compare 0.35 with 0.27 for independence.

03

Counting outcomes and two-way tables

At-least-one calculations · marginal and conditional frequencies

- Questions 3 and 6
- Complements, and what “no association” means in a table

Key points · counting outcomes and two-way tables

Use the complement, and use the totals

1	**At least one**	P(at least one) = 1 − P(none). Always faster and safer than adding up the cases.
2	**No association**	In a two-way table, no association means every row shows the same percentages — each cell equals its row total × column share.
3	**Expected cell**	The no-association value of a cell is (row total × column total) ÷ table total. That is exactly how a = 64 is found.
4	**Marginal frequencies**	The totals in the margins. They answer questions about one variable on its own.

Question 3

1 mark

Counting outcomes and two-way tables

THE QUESTION

The manager of a delivery company has become concerned that 20% of the packages shipped through one of the branches are delivered late. If he randomly selects 5 packages from this branch and checks their delivery records, what is the probability that at least one of the selected packages was delivered late?

(A) 0.00032 (B) 0.32768 (C) 0.4096 (D) 0.67232 (E) 0.99968

Question 3 — solution

1 mark

Counting outcomes and two-way tables

CONDENSED SOLUTION

- Answer: (D) 0.67232.
- P(at least one late) = 1 − P(none late) = 1 − 0.8^5.
- 0.8^5 = 0.32768, so the answer is 1 − 0.32768 = 0.67232.
- (B) is the trap: it answers a different question — the chance that NONE are late.

TRAP Read the question twice: “at least one” signals the complement. Choosing 0.32768 means you answered “none”.

Question 6

1 mark

Counting outcomes and two-way tables

THE QUESTION

A school is considering modifying a policy to allow only grade 12 students to leave campus during lunchtime. The 120 Grade 11 students and the 150 Grade 12 students were surveyed. The marginal frequencies are shown below.

Which value of a would indicate that there is NO association between grade level and opinion about the policy?
(A) a = b (B) a = c (C) a = 0 (D) a = 64 (E) Not enough information

	Favor	Oppose	Total
Grade 11	*a*	b	120
Grade 12	*c*	d	150
Total	144	126	270

Question 6 — solution

1 mark

Counting outcomes and two-way tables

CONDENSED SOLUTION

- Answer: (D) a = 64.
- No association means opinion is distributed the same way in each grade: the share in favour is the same for Grade 11 as for Grade 12.
- So a should equal its expected count: a = (144 × 120) ÷ 270 = 64.
- Check: 64/120 = 53.3% of Grade 11 in favour, and 144 − 64 = 80, so 80/150 = 53.3% of Grade 12 — identical shares.

TRAP "No association" does not mean a = 0 or a = b. It means equal PERCENTAGES — the expected-count calculation.

04

Probability distributions

Building a distribution from a tree diagram

- Question 7
- Multiply along branches, add across outcomes

Key points · probability distributions

Build it from the tree, then check it sums to 1

1. **Multiply along branches** — P(second shot makes it) DEPENDS on the first — conditional probabilities multiply along each path.
2. **Add across outcomes** — X = 1 can happen two ways (make-miss and miss-make), so their probabilities ADD.
3. **Check the sum** — P(0) + P(1) + P(2) must equal 1. Use it to catch arithmetic slips.

Question 7

1 mark

Probability distributions

THE QUESTION

Matteo plays basketball for his school. Whenever he shoots two free throws during a game, he has a 60% chance of making the first shot. If he makes the first shot, he has a 70% chance of making the second shot. If he misses the first shot, he has only a 40% chance of making the second shot. Let X be the number of shots made in a two free throw situation. Which of the following is the correct probability distribution of X?

Question 7 — solution

1 mark

Probability distributions

CONDENSED SOLUTION

- Draw the tree. Paths: make-make, make-miss, miss-make, miss-miss.
- $P(X = 2) = 0.6 \times 0.7 = 0.42$.
- $P(X = 1) = 0.6 \times 0.3 + 0.4 \times 0.4 = 0.18 + 0.16 = 0.34$.
- $P(X = 0) = 0.4 \times 0.6 = 0.24$.
- Check: $0.42 + 0.34 + 0.24 = 1$ ✓. The correct option is the one with 0.24, 0.34, 0.42.

TRAP The second-shot probability is CONDITIONAL. Using 0.7 for every path ignores the confidence effect and gives wrong columns.

05

Scatterplots, correlation and regression

Describing, interpreting and validating linear models

- Questions 8 to 17
- Direction, form, strength — then slope, residual and r^2

Key points · scatterplots, correlation and regression

Describe the pattern, then trust the model only where the data lives

1. **Describe with three words** — Direction (positive/negative), form (linear/nonlinear), strength (strong/weak). Two variables is all you need.
2. **Correlation in context** — r ≠ linearity proof. Always interpret r as a TENDENCY, never as cause and never as a percent.
3. **Slope in context** — “For each additional 1 [unit of x], the predicted [y] increases/decreases by [slope] [units of y].” Predicted — not actual.
4. **Residual = $y - \hat{y}$** — Observed minus predicted. Positive means the model UNDERpredicts; negative means it overpredicts.
5. **Extrapolation** — Predicting outside the range of the x-data is not justified, no matter how good the model looks.

Question 8

7 marks

Scatterplots, correlation and regression

THE QUESTION

Researchers studying the health of elderly people collected data on age (x) and the amount of time spent doing physical activity each day (y), in minutes. A scatterplot revealed a relationship described as negative, linear, and weak.

a. Explain what is meant by each of the following words:
i. Negative ii. Linear iii. Weak

The data were used to create the least squares regression equation $\hat{y} = 72.88 - 0.54x$.
b. Interpret the meaning of the slope of the least squares regression line in context.
c. One person in the study was 73 years old and had a residual of 23.7. How many minutes per day did this person exercise?

Question 8 — solution

7 marks

Scatterplots, correlation and regression

CONDENSED SOLUTION

- a i. NEGATIVE (1): as age increases, predicted activity time tends to decrease.
- a ii. LINEAR (1): the pattern follows a straight-line trend, so a line is a reasonable form for the model.
- a iii. WEAK (1): the points are widely scattered around the line, so predictions carry a lot of uncertainty.
- b SLOPE (2): for each additional year of age, the predicted daily physical activity decreases by 0.54 minutes.
- c (2): $\hat{y} = 72.88 - 0.54(73) = 33.46$ minutes predicted. Residual = $y - \hat{y}$, so $y = 33.46 + 23.7 = 57.16$ minutes.

TRAP The slope interpretation needs all four pieces: each 1 unit of x, the word predicted, the direction, and the units of y (minutes).

Question 9

1 mark

Scatterplots, correlation and regression

THE QUESTION

A sociologist collected data on the number of minutes after 7 a.m. that a student arrived at school and the number of friends that student has on social media. The correlation indicated a strong negative relationship.
Which of the following is an appropriate interpretation of the correlation?
(A) Students who arrive early to school have more friends on social media.
(B) Students who arrive late to school have more friends on social media.
(C) As the number of minutes of arriving after 7 a.m. increases, the number of friends on social media tends to increase.
(D) As the number of minutes of arriving after 7 a.m. increases, the number of friends on social media tends to decrease.

Question 9 — solution

1 mark

Scatterplots, correlation and regression

CONDENSED SOLUTION

- Answer: (D).
- A correlation describes a TENDENCY across the data set, not a statement about individuals.
- Minutes after 7 a.m. up → number of friends tends to go down, because r is negative.

TRAP (A) and (B) talk about students rather than the variables. The correct interpretation names both variables and the word “tends”.

Question 10

1 mark

Scatterplots, correlation and regression

THE QUESTION

Jacques, an artisan cheese maker, records data on every step of the cheese-making process. He observed that the daily high temperature in his shop on the day a batch was made seemed related to the cheese's pH level the following morning. The correlation between the daily high temperature and the pH of the cheese is −0.64.

What information does the correlation provide about the relationship?

(A) The relationship is linear because the correlation is negative.

(B) The relationship is not linear because the correlation is negative.

(C) The morning pH tends to be higher when the daily high temperature is warmer, compared to when it is cooler.

(D) The morning pH tends to be higher when the daily high temperature is cooler, compared to when it is warmer.

Question 10 — solution

1 mark

Scatterplots, correlation and regression

CONDENSED SOLUTION

- Answer: (D).
- The negative sign tells you the DIRECTION: as temperature rises, pH tends to fall.
- So pH tends to be higher on cooler days. (A) and (B) are wrong because r says nothing about FORM — only direction and strength.

TRAP The sign of r is about direction only. Linearity is a form statement, judged from the scatterplot, not from r.

Question 11

1 mark

Scatterplots, correlation and regression

THE QUESTION

A botanist found a correlation between the length of an aspen leaf and its surface area to be 0.94. Why does the correlation value of 0.94 not necessarily indicate that a linear model is the most appropriate model for the relationship?

(A) The value must be exactly 1 or −1 to indicate a linear model is the most appropriate model.

(B) A causal relationship should be established first before determining the most appropriate model.

(C) The value of 0.94 implies that only 88% of the data have a linear relationship.

(D) Even with a correlation value of 0.94, it is possible that the relationship could still be better represented by a nonlinear model.

Question 11 — solution

1 mark

Scatterplots, correlation and regression

CONDENSED SOLUTION

- Answer: (D).
- A high r does not certify linearity — a curved relationship can still produce a large r.
- A residual plot or the scatterplot itself is the evidence for form. 0.94 alone cannot settle it.
- (A) sets an impossible standard; (C) misunderstands r^2, which is about variation explained, not “percent of data points”.

TRAP Always LOOK at the scatterplot or residual plot. A big r with a curved pattern is a classic exam trap.

Question 12

1 mark

Scatterplots, correlation and regression

THE QUESTION

In baseball, ERA and WHIP measure pitcher quality (smaller is better). Computer output from predicting ERA using WHIP in a least-squares regression gives:

Intercept: −5.0 WHIP: 6.8

Which statement is the best interpretation of the value 6.8?

(A) ERA is predicted to increase by 6.8 units for each 1 unit increase of WHIP.

(B) WHIP is predicted to increase by 6.8 units for each 1 unit increase of ERA.

(C) For a pitcher with 0 units of WHIP, the ERA is predicted to be approximately 6.8 units.

(D) For a pitcher with 0 units of ERA, the WHIP is predicted to be approximately 6.8 units.

Question 12 — solution

1 mark

Scatterplots, correlation and regression

CONDENSED SOLUTION

- Answer: (A).
- 6.8 is the SLOPE on WHIP, and ERA is the response.
- Slope: for each additional 1 unit of WHIP, predicted ERA increases by 6.8 units.

TRAP (C) and (D) describe intercepts, and (B) swaps the roles of the variables. The coefficient sits on the explanatory variable.

Question 13

1 mark

Scatterplots, correlation and regression

THE QUESTION

An organization collects data on three variables per city: Asthma (percentage of adults diagnosed with asthma), Physical inactivity (percentage reporting no leisure-time physical activity), and Air pollution (average daily fine particulate concentration). Which of the following correctly describes the scatterplot that would display the association when asthma is used to predict physical inactivity?

(A) physical inactivity is the explanatory variable and air pollution is the response

(B) air pollution is the explanatory variable and asthma is the response

(C) asthma is the explanatory variable and physical inactivity is the response

(D) physical inactivity is the explanatory variable and asthma is the response

Question 13 — solution

1 mark

Scatterplots, correlation and regression

CONDENSED SOLUTION

- Answer: (C).
- The variable used to predict goes on the x-axis: asthma is the explanatory variable.
- The variable being predicted is the response: physical inactivity goes on the y-axis.
- Air pollution is not part of this plot at all.

TRAP Read the question stem: “when asthma is used to predict physical inactivity” fixes both roles. Anything mentioning air pollution is a distractor.

Question 14

1 mark

Scatterplots, correlation and regression

THE QUESTION

Danny models calories from fat for 12 breakfast items, using $\hat{y} = 110.98 + 13.78x$. One item contains 24 g of fat and 520 kcal. Based on the model, which statement is true about the residual for that item?

(A) The residual is −78.3, and the model underpredicts the calories.

(B) The residual is −78.3, and the model overpredicts the calories.

(C) The residual is 78.3, and the model underpredicts the calories.

(D) The residual is 78.3, and the model overpredicts the calories.

Question 14 — solution

1 mark

Scatterplots, correlation and regression

CONDENSED SOLUTION

- Predicted: $\hat{y} = 110.98 + 13.78(24) = 110.98 + 330.72 = 441.7$ kcal.
- Residual = $y - \hat{y} = 520 - 441.7 = +78.3$.
- Positive residual means the actual value sits ABOVE the line, so the model underpredicted. Answer: (C).

TRAP The sign convention: residual = observed − predicted. Getting it backwards flips both the number and the conclusion.

Question 15

1 mark

Scatterplots, correlation and regression

THE QUESTION

A shop owner created a linear regression model to predict the number of new customers visiting the shop based on how many times a radio advertisement is played. What is the explanatory variable and what is the response variable for the linear regression model?

(A) Explanatory: new customers; response: times the advertisement is played

(B) Explanatory: times the advertisement is played; response: number of new customers

(C) Explanatory: times the advertisement is played; response: purchases made by customers

(D) Explanatory: purchases made by customers; response: times the advertisement is played

Question 15 — solution

1 mark

Scatterplots, correlation and regression

CONDENSED SOLUTION

- Answer: (B).
- “Predict the number of new customers BASED ON how many times the advert is played” fixes the roles.
- The predictor (times played) is explanatory and sits on x; new customers is the response on y.

TRAP Base it on the wording “based on”: whatever follows “based on” is the explanatory variable.

Question 16

1 mark

Scatterplots, correlation and regression

THE QUESTION

A cell phone plan charges a fee of 1 for each international call plus 0.02 for each second of talk time. A business owner tracked the time and cost for each international call made by employees. What is the appropriate value of the correlation between time and cost?

(A) The appropriate value is 1.02 because each call takes at least one second.

(B) The appropriate value is 1 because there is a perfect linear relationship between the time of the call and how much it costs.

(C) The appropriate value is 0.97 because there is a strong positive relationship between the time and cost of a call.

(D) The appropriate value is 0 because there is no variability in the cost of the calls.

Question 16 — solution

1 mark

Scatterplots, correlation and regression

CONDENSED SOLUTION

- Answer: (B).
- Cost is an EXACT linear function of time: cost = 1 + 0.02t.
- When every point sits exactly on a line with positive slope, r = 1.
- (A) confuses the slope with r, and r can never exceed 1.

TRAP r measures how tightly points hug a line. If the relationship is deterministic and linear, r is exactly ±1.

06

Regression FRQs

Income and vacation cost · height and foot length

- Questions 17 to 20
- Calculate r and r^2, justify the model, predict — and know when to stop

The scenario in one slide

Two data sets carry Questions 17 to 20

17–18: Income and vacations

8 families: income and annual vacation spend in dollars.

41,100 / 2,700 53,000 / 2,400 27,400 / 1,700 34,400 / 2,500
65,800 / 2,800 98,100 / 5,100 72,000 / 4,200 56,700 / 3,200

19–20: Height and foot length

65 seniors: foot length (cm) vs height (cm). Computer output:

$\hat{y} = 83.056 + 3.483x$ $S = 6.548$ $r^2 = 60.61\%$
SE(foot length) = 0.354

Question 17

2 marks

Regression FRQs

THE QUESTION

Part A. Using the income/vacation table, respond to the following. Show your working.

i. Calculate the correlation coefficient.

ii. Calculate the coefficient of determination.

Question 17 — solution

2 marks

Regression FRQs

CONDENSED SOLUTION

- i. (1 mark) r = 0.9219. Working: with n = 8, compute the means (income 56,062.5; vacation 3,075), then
- $r = \Sigma(x-\bar{x})(y-\bar{y}) / \sqrt{[\Sigma(x-\bar{x})^2 \cdot \Sigma(y-\bar{y})^2]} = 0.9219$.
- ii. (1 mark) $r^2 = (0.9219)^2 = 0.8498$, so about 85% of the variation in vacation spending is accounted for by the linear relationship with income.

TRAP Show the substitution, not just the answer. And say r^2 in CONTEXT — "85% of the variation in vacation cost is explained by income", never "r^2 is 85%".

Question 18

2 marks

Regression FRQs

THE QUESTION

Part B. Determine whether a linear model is appropriate for describing the relationship between income and vacation costs. Justify your answer.

Question 18 — solution

2 marks

Regression FRQs

CONDENSED SOLUTION

- Yes, a linear model is appropriate (1 mark for the decision).
- Justification (1 mark): the scatterplot shows a linear pattern with no curvature, and $r^2 = 0.8498$ is high, so about 85% of the variation in vacation cost is explained by the linear model with income. The points cluster closely around a straight line with no obvious outliers.
- A complete justification references BOTH the scatterplot pattern and the strength measure.

TRAP "r is high" alone is not a form justification. The scatterplot decides linearity; r^2 speaks to strength.

Question 19

2 marks

Regression FRQs

THE QUESTION

Part A. Using the computer output for the height/foot-length study ($\hat{y} = 83.056 + 3.483x$), calculate the predicted height for:

i. a senior with a foot length of 23 cm

ii. a senior with a foot length of 27 cm

Show the work that leads to your answers.

Question 19 — solution

2 marks

Regression FRQs

CONDENSED SOLUTION

- i. (1 mark) $\hat{y} = 83.056 + 3.483(23) = 83.056 + 80.109 = 163.165 \approx 163.2$ cm.
- ii. (1 mark) $\hat{y} = 83.056 + 3.483(27) = 83.056 + 94.041 = 177.097 \approx 177.1$ cm.

TRAP Substitute into the full equation and keep the units. Rounding early can shift the answer enough to lose the mark.

Question 20

2 marks

Regression FRQs

THE QUESTION

Part B. An administrator would like to estimate the height of students who have a foot length of 35 cm. Determine whether it is appropriate to use the linear regression model to predict the height of these students. Justify your answer using features of the scatterplot.

Question 20 — solution

2 marks

Regression FRQs

CONDENSED SOLUTION

- No, it is not appropriate (1 mark).
- A foot length of 35 cm lies OUTSIDE the range of foot lengths in the sample — the data only reach about the low 30s in cm (1 mark).
- Predicting beyond the observed data is extrapolation: the linear pattern has not been verified there, so the model may not hold.

TRAP Extrapolation is marked wrong even when the model is excellent. Check the x-range of the data before every prediction.

Mark scheme · multiple choice

One mark each, no partial credit, no penalty for a wrong answer

Q1	**C**	Only III states the LLN: relative frequency settles in the long run
Q2	**D**	0.32+0.26−0.43 = 0.15 via the addition rule
Q3	**D**	$1 - 0.8^5 = 0.67232$ (complement)
Q4	**C**	EV is an average per spin, in the long run
Q5	**D**	0.35 > 0 so not exclusive; 0.35 ≠ 0.27 so not independent
Q6	**D**	a = 144×120/270 = 64 for no association
Q7	**C**	P: 0.24 / 0.34 / 0.42 from the conditional tree
Q9	**D**	Tendency statement naming both variables
Q10	**D**	Negative r: pH higher on cooler days
Q11	**D**	High r does not prove linearity — check the plot
Q12	**A**	Slope 6.8: predicted ERA per 1 WHIP
Q13	**C**	Asthma on x (explanatory), inactivity on y (response)
Q14	**C**	Residual = 520 − 441.7 = +78.3 → underprediction
Q15	**B**	Adverts played = explanatory; new customers = response
Q16	**B**	Perfectly linear deterministic relation → r = 1

Total: 15 marks. Q8 is worked in full on its solution slide.

Mark scheme · free response

Mark by part, award for reasoning

Q8	**7**	a i direction 1 · a ii form 1 · a iii strength 1 · b slope in context 2 · c predict + add residual 2
Q17	**2**	1 r with working · 1 r^2 with context statement
Q18	**2**	1 decision (yes) · 1 justification using scatterplot pattern AND r^2
Q19	**2**	1 for 163.2 cm with substitution · 1 for 177.1 cm with substitution
Q20	**2**	1 decision (no) · 1 justification: 35 cm is outside the data range (extrapolation)

Free response total: 15 marks. Lesson total: 30 marks (15 MCQ + 15 FRQ).

Answer key

Fast self-check across all 20 questions

MULTIPLE CHOICE

- Q1 C
- Q2 D
- Q3 D
- Q4 C
- Q5 D
- Q6 D
- Q7 C
- Q9 D
- Q10 D
- Q11 D
- Q12 A
- Q13 C
- Q14 C
- Q15 B
- Q16 B

FREE RESPONSE

- Q8 a: negative, linear, weak (3) · slope: −0.54 min per year (2) · y = 57.16 min (2)
- Q17 r = 0.9219; r^2 = 0.8498 (≈ 85% of variation explained)
- Q18 Yes — linear scatterplot pattern and high r^2
- Q19 $\hat{y}(23) \approx 163.2$ cm; $\hat{y}(27) \approx 177.1$ cm
- Q20 No — 35 cm is outside the data range (extrapolation)

FIVE THINGS TO DO IN THE EXAM

Do these and you will not lose Unit 2 marks

- The LLN is about the long run. It never fixes the next toss.
- “At least one” → use the complement: 1 − P(none).
- Independence is $P(A \cap B) = P(A)P(B)$. Check it with numbers.
- Describe scatterplots with three words: direction, form, strength.
- Residual = observed − predicted, and never extrapolate beyond the data.

Questions and condensed solutions drawn from the Unit 2 Review past-paper booklet.