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## Mark Scheme (Results)

Summer 2022

Pearson Edexcel GCSE  
In Statistics (1ST0) Foundation Tier  
Paper 2F

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## General marking guidance

These notes offer general guidance, but the specific notes for examiners appertaining to individual questions take precedence.

- 1** All candidates must receive the same treatment. Examiners must mark the last candidate in exactly the same way as they mark the first.

Where some judgement is required, mark schemes will provide the principles by which marks will be awarded; exemplification/indicative content will not be exhaustive. When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the response should be sent to review.

- 2** All the marks on the mark scheme are designed to be awarded; mark schemes should be applied positively. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme. If there is a wrong answer (or no answer) indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

**Questions where working is not required:** In general, the correct answer should be given full marks.

**Questions that specifically require working:** In general, candidates who do not show working on this type of question will get no marks – full details will be given in the mark scheme for each individual question.

- 3** **Crossed out work**

This should be marked **unless** the candidate has replaced it with an alternative response.

- 4** **Choice of method**

If there is a choice of methods shown, mark the method that leads to the answer given on the answer line.

If no answer appears on the answer line then mark both methods **as far as they are identical** and award these marks.

- 5** **Incorrect method**

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.

**6 Follow through marks**

Follow through marks which involve a single stage calculation can be awarded without working as you can check the answer, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

**7 Ignoring subsequent work**

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question or its context. (eg an incorrectly cancelled fraction when the unsimplified fraction would gain full marks).

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect (eg incorrect algebraic simplification).

**8 Probability**

Probability answers must be given as a fraction, percentage or decimal. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

**9 Range of answers**

Unless otherwise stated, when an answer is given as a range (eg 3.5 – 4.2) then this is inclusive of the end points (eg 3.5, 4.2) and all numbers within the range.

### Guidance on the use of abbreviations within this mark scheme

<b>M</b>	method mark awarded for a correct method or partial method
<b>A</b>	accuracy mark (awarded after a correct method; if no method is seen then full marks for the question are implied but see individual mark schemes for more details)
<b>B</b>	unconditional accuracy mark (no method needed)
<b>oe</b>	or equivalent
<b>cao</b>	correct answer only
<b>ft</b>	follow through (when appropriate as per mark scheme)
<b>sc</b>	special case
<b>dep</b>	dependent (on a previous mark)
<b>indep</b>	independent
<b>awrt</b>	answer which rounds to
<b>isw</b>	ignore subsequent working

Question	Answer	Additional guidance	Mark
<b>1(a)</b>	M1A1 Frequencies: 9, 5, 5, (0), 1	M1 At least one (non zero) tally or frequency correct A1 All frequencies correct (Tallies not required and incorrect tallies can be ignored if frequencies correct)	<b>(2)</b>
<b>(b)</b>	B1ft 1	B1ft Follow through mode from their frequencies.	<b>(1)</b>
<b>(c)</b>	B2ft Either: e.g. nearly half/majority of cars have one person/mode is 1,1 has the highest frequency so opinion is supported/scheme is not working OR e.g More than half the cars survey (11) had more than one person in so her opinion is not supported/scheme is working OR e.g. we do not know previous results, so we cannot tell (does/doesn't support )	B2ft for a correct conclusion with supporting statement. Allow either option.  For opinion is supported condone for reason: 9 cars had one person in.  (B1ft for correct reasoning with incorrect/no conclusion.)	<b>(2)</b>
<b>(d)</b>	B1 For any one of <ul style="list-style-type: none"> <li>• only includes those using car park</li> <li>• only includes those arriving in morning</li> <li>• may be different each day</li> <li>• small sample size</li> </ul>	B1 for appropriate reason why results may not be reliable, recognising the limitations of her survey. Allow equivalent appropriate reasons.	<b>(1)</b>

<b>Question</b>	<b>Answer</b>	<b>Additional guidance</b>	<b>Mark</b>
<b>2 (a)</b>	B1 Sponsored (someone for a charity)	B1 Condone misspelling if meaning clear	<b>(1)</b>
<b>(b)</b>	B1 45 – 64	B1	<b>(1)</b>
<b>(c)</b>	B2 Females aged 45-64	B2 for complete answer with both aspects (B1 for one correct aspect) Allow equivalent statements	<b>(2)</b>
<b>(d)</b>	B1 e.g. proportion/percentage giving goods increases with age, accept positive correlation o.e.	B1 for recognising the upward trend in donations with age Allow: older people give to charity more (than younger people) o.e. BUT do not allow reference to one age group.	<b>(1)</b>
<b>(e)</b>	Without percentages quoted: B1 Females have a higher percentage that sponsor someone for charity (than males) OR overall females tend to take part in activities more than males  With percentages quoted: B1 The percentage for females is 13% and/whereas the percentage for males is 9% OR for percentages 13% female and 11% all or 9% male and 11% all	B1 for comparison of appropriate figures from table. (e.g. Allow 13% >9%) Allow people in place of percentage.	<b>(1)</b>

Question	Answer	Additional guidance	Mark
3 (a)	B3 D placed on 2nd arrow, then A, C, B	B3 for all four correct, or (B2 for three correct) (B1 for one correct)	(3)
(b)	B1 e.g. flip the coin a number of times (and use proportion of heads as estimate of probability)	B1 for stating or describing an experimental approach.  Condone: Answers which imply non singular flips of the coin.  Accept: Flipping the coin until you get a head.  Do not allow an answer which suggests just one flip of the coin. e.g. 'flip the coin to see what he gets' alone is B0	(1)

Question	Answer	Additional guidance	Mark
4 (a)	B2 Male/Diesel 18, Female/Petrol 32, Total/ Diesel 35	B2 for 3 correct values in table  (B1 for 1 or 2 correct values found)	(2)
(b)	M1 $\frac{3}{50} \times 360$ A1 = 21.6 (°)	M1 for correct equivalent calculation  A1 accept 21.6, 21 or 22 (without working)  SC: If M0A0 scored, B1 for answer 20	(2)



(c)	<p><u>First conclusion</u>  B1 first conclusion not correct  B1 ...as Diesel is not the largest section of the pie charts/petrol has the largest section of the pie chart/petrol is the most common.</p> <p><u>Second conclusion</u>  B1 second conclusion is supported...  B1 ...as electric sector is larger in the male pie chart/males have a larger proportion/percentage/angle than females.</p> <p><u>Reliability</u>  B1 e.g.  Conclusions reliable due to large sample size.  OR  Conclusions not reliable as</p> <ul style="list-style-type: none"> <li>• Sample not random</li> <li>• May not be representative of population/ only done in one car park</li> <li>• Car may be driven by both male and females (one car family)</li> </ul>	<p>B1 for rejecting first conclusion  B1 for equivalent supporting reason  For the first two B marks ignore reference to figures.</p> <p>B1 for accepting second conclusion  B1 for equivalent supporting reason  For the 4<sup>th</sup> B mark do not allow reference to figures from the two-way table only.</p> <p>B1 for a comment on reliability supported by appropriate reasoning</p>	(5)

Question	Answer	Additional guidance	Mark
5 (a)	B1 All items/people (in a population) have an <b>equal/fair chance</b> of being included (in the sample).	B1 for an equivalent statement but must have reference to <b>equal chance</b> o.e. B0 even chance	(1)
(b)	B1 B1 B1 Any three from... <ul style="list-style-type: none"> <li>• Not random</li> <li>• Excludes any without an appointment (next Monday)/only asking on one day.</li> <li>• Many may not return the questionnaire/complete questionnaire at the doctors as may not return it.</li> <li>• Likely to be a small sample compared with number of patients registered</li> <li>• Could include some who are not registered</li> <li>• A questionnaire is a good way to collect opinions</li> </ul>	B1 for equivalent of each of three appropriate bullets from the list. (‘Not effective’ on its own is B0)	(3)
(c)	B1 e.g. <ul style="list-style-type: none"> <li>• No response boxes, or</li> <li>• Answers will not be easy to analyse, or</li> <li>• Too many different ways to answer the question, or</li> <li>• Patients may not know what sort of answer is wanted, or</li> <li>• Patients might not respond as have to write a response etc</li> </ul>	B1 for equivalent statements indicating the problems of (dealing with) answers to open questions. ‘It is an open question or it is not a closed question’ alone is B0	(1)
(d)	B1 e.g. How long do you think should be allowed for appointments?  B1 <input type="checkbox"/> 5 minutes <input type="checkbox"/> 6 to 9 minutes <input type="checkbox"/> 10 minutes <input type="checkbox"/> less than 5 minutes <input type="checkbox"/> more than 10 minutes	B1 for an unbiased question about duration of appointments B1 for at least three non-overlapping options which include units in either answer boxes or question. (Condone non-exhaustive options)	(2)

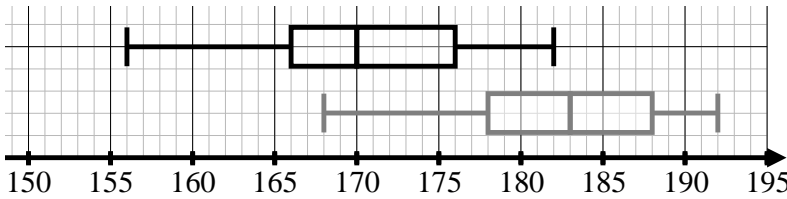
<b>(e)</b>	B2 Tick options 2, 3 and 5	B2 for correct three options ticked only Otherwise: B1 for two correct and no more than one incorrect.	<b>(2)</b>
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Question	Answer	Additional guidance	Mark
6	<p><u>Data collection (maximum B3)</u>            B1 B1 B1 any three from:</p> <ul style="list-style-type: none"> <li>• Sample will include non loyalty card members</li> <li>• Sample excludes anyone not able to visit first thing Monday</li> <li>• Sample not random</li> </ul> <p>Could be improved by...</p> <ul style="list-style-type: none"> <li>• Using a random sample</li> <li>• Select sample from register of loyalty card members</li> <li>• Select customers at other times also</li> </ul> <p><u>Analysis of results (maximum B3)</u>            B1 B1 B1 any three from:</p> <ul style="list-style-type: none"> <li>• Bar chart showing each amount spent not appropriate (as all values likely to be different)</li> <li>• Data will need to be grouped/placed in a table.</li> <li>• Histogram (or frequency polygon, or c-f diagram) for grouped data would be more appropriate</li> <li>• Finding the mean uses all of the data</li> <li>• Finding the median (to compare with the mean)</li> <li>• The mean may be affected by large purchases</li> <li>• Finding a measure of spread (range, IQR etc) would be appropriate</li> </ul>	<p>B1 for each of three appropriate comments about data collection.</p> <p>If B0 scored for data collection, allow B1 for suggesting 50 is a suitable sample size.</p> <p>B1 for each of three appropriate comments about analysis of results.</p> <p>Accept suggestion of box plot, but not pie chart or scatter diagram (to show distribution)</p> <p>Ignore excess comments if not contradictory.</p>	(6)

Question	Answer	Additional guidance	Mark
7 (a)	B1 0.6, 0.4 for first set branches B1 0.5 on all second set branches	Accept fractions, decimals or percentages	(2)
(b)	M1 $0.4 \times 0.5$  A1ft $= 0.2$	M1 for product of probabilities from their tree A1ft for 0.2 or follow through their tree	(2)
(c)	B2ft e.g. One day in five is equivalent to 0.2 or $5 \times 0.2 = 1$ so Hinata is correct.	B2ft for correct conclusion with equivalent corresponding reasoning. Allow follow through from their 0.2  (B1 for correct reasoning with no conclusion)	(2)

Question	Answer	Additional guidance	Mark
8 (a)	M1 $774\,835 \times 1000 \div 65\,648\,000$ A1 $= 11.8$	M1 for equivalent calculation (condone use of 65 648 implied by an answer of awrt 11803) A1 for awrt 11.8	(2)
(b)	M1 $497.9 \times 9.6$ or $\frac{497900 \times 9.6}{1000}$ (= 4779.84) A1 $= 4780$	M1 for equivalent calculation, implied by 4779.84 (condone use of 497.9 in second method implied by an answer of 5) A1 for 4780 or 4779 (must be integer)	(2)
(c)	B2 crude birth rate is higher <b>and</b> the population is greater	B2 for correct equivalent reasoning referring to both aspects. Otherwise: B1 for reasoning with reference to only one aspect. Note :Just listing the figures is B0	(2)

Question	Answer	Additional guidance	Mark
9 (a)	B1 $\frac{9}{30}$ or 0.3 or 30%	B1 for correct equivalent fraction, decimal or percentage	(1)
(b)	B1 $\left(\frac{13}{30} \div \frac{9}{30} =\right) \frac{13}{9}$ or 1.4(44...)	B1 for correct fraction or awrt 1.4	(1)
(c)	B1 (Relative risk of rain in July is) less than 1 (so it is less likely to rain in July than in June) OR there would only be ( $13 \times 0.8=10.4$ ) 10/11 days of rainfall in July	B1 for a correct interpretation of relative risk.	(1)

Question	Answer	Additional guidance	Mark										
<p><b>10 (a)</b></p>	<p>M1 A1 A1</p> 	<p>M1 for box with at least one whisker with at least one correct value</p> <p>1st A1 for 3 correct values plotted from 156, 166, 170, 176, 182</p> <p>2nd A1 fully correct plot</p>	<p><b>(3)</b></p>										
<p><b>(b)</b></p>	<p>B1 B1 B1 B1</p> <table border="1" data-bbox="385 630 1227 1040"> <thead> <tr> <th data-bbox="385 630 810 683">Comparison</th> <th data-bbox="810 630 1227 683">Interpretation</th> </tr> </thead> <tbody> <tr> <td data-bbox="385 683 810 778">Basketball <u>median</u> &gt; rugby median</td> <td data-bbox="810 683 1227 778">Basketballers are taller (on average)</td> </tr> <tr> <td data-bbox="385 778 810 826">Basketball <u>IQR</u> = rugby IQR</td> <td data-bbox="810 778 1227 826">Similar variation in height</td> </tr> <tr> <td data-bbox="385 826 810 922">Basketball <u>range</u> &lt; rugby range</td> <td data-bbox="810 826 1227 922">Basketballers' heights (slightly) more consistent</td> </tr> <tr> <td data-bbox="385 922 810 1040">Basketball <u>no skew/symmetric(al) and Rugby positive skew</u></td> <td data-bbox="810 922 1227 1040">Rugby players more varied above median (basketball same either side)</td> </tr> </tbody> </table>	Comparison	Interpretation	Basketball <u>median</u> > rugby median	Basketballers are taller (on average)	Basketball <u>IQR</u> = rugby IQR	Similar variation in height	Basketball <u>range</u> < rugby range	Basketballers' heights (slightly) more consistent	Basketball <u>no skew/symmetric(al) and Rugby positive skew</u>	Rugby players more varied above median (basketball same either side)	<p>B1 Correct comparison of medians</p> <p>B1 Correct comparison of spread (IQR or range)</p> <p>B1 One further correct comparison</p> <p>B1 One correct interpretation</p> <p>Allow equivalent/converse statements but underlined words must be seen.</p> <p>Do not allow 'normally distributed' or 'symmetrical skew' for symmetrical</p> <p>For skew comment also allow alternative comparison considering whiskers. (i.e. both show <u>negative skew</u>)</p>	<p><b>(4)</b></p>
Comparison	Interpretation												
Basketball <u>median</u> > rugby median	Basketballers are taller (on average)												
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Basketball <u>no skew/symmetric(al) and Rugby positive skew</u>	Rugby players more varied above median (basketball same either side)												
<p><b>(c)</b></p>	<p>B2 Comparisons may be unreliable because (any one from)</p> <ul style="list-style-type: none"> <li>• No indication that samples were random/representative</li> <li>• Based on secondary data/reliability of sources unknown</li> <li>• Samples were small /only based on 15 players</li> </ul>	<p>B2 for unreliable with a correct supporting reason</p> <p>(B1 for unreliable with attempt at reason OR appropriate consideration of reliability without a conclusion)</p>	<p><b>(2)</b></p>										

Question	Answer	Additional guidance	Mark
		SC: For B2 allow 'reliable since data comes from trustworthy website' (oe)	
<b>11 (a)</b>	B1 e.g. countries with higher percentage of <b>urban population</b> have higher <b>life expectancy</b>	B1 for an appropriate statement linking urban population (oe) and life expectancy (oe). Condone e.g. 'people living in urban areas live longer' for this mark. A question scores B0.	<b>(1)</b>
<b>(b)</b>	B1 Either: Data is <u>paired</u> / <u>bivariate</u> Or: Scatter diagram will show any <u>correlation</u>	B1 for an appropriate justification for a scatter diagram. Underlined words are needed.	<b>(1)</b>
<b>(c)</b>	B1 <b>Urban population(%)</b> is the explanatory variable... depB1 ...because Irina believes this affects life expectancy, or ...because life expectancy is determined by this, or ...because life expectancy is the response variable	B1 for identifying the explanatory variable. B1 for correct reasoning Accept equivalent comments if meaning is clear	<b>(2)</b>
<b>(d)</b>	B2 e.g. <u>positive correlation</u> , so hypothesis is supported	B2ft for correct conclusion with reference to positive correlation and consistent with their hypothesis in (a).  If B0 scored in part (a), then max score is B1  (B1ft for an incomplete answer, e.g. missing vocab. OR correct reasoning with incorrect/no conclusion)	<b>(2)</b>



(e)	B2 Line of best fit drawn through (63.9, 77.8)	B2 for appropriate line of best fit with positive gradient through given mean point. (Mean point need not be plotted).  (B1 for plotting the double mean point or for an appropriate line with positive gradient not through double mean point)	(2)
(f)	B1 e.g. for every extra 1% in urban <b>population</b> , life expectancy increases by 0.19 <b>years</b> (accept appropriate use of their gradient if found)	B1 for a complete equivalent numerical interpretation of gradient including population (oe) and years (oe)	(1)
(g)	B1 For any one from <ul style="list-style-type: none"> <li>• lower <b>life expectancy</b> value than expected</li> <li>• (65, 63) plotted correctly</li> <li>• life expectancy for 65% should be around 77/78(years)</li> <li>• life expectancy read off their line of best fit</li> </ul> B1 Anomaly / does not fit with other data	B1 for correct reasoning          B1 for correct conclusion Condone 'outlier'	(2)

Question	Answer	Additional guidance	Mark
<b>12 (a)</b>	M1 $4650 \times 1.069$ or $4650 \times 0.069 + 4650 (= 4970.85)$ A1 $= (\pounds) 4971$	M1 for equivalent calculation A1 for answer in range 4970 to 4971	<b>(2)</b>
<b>(b)</b>	B3 Incorrect because... <ul style="list-style-type: none"> <li>• it is 3.9% of the 2015 cost or Thomas is not using the base year in his calculations.</li> <li>• he should have done <math>\frac{110.8}{106.9} \times 100 (- 100 = 3.6)</math> or <math>\frac{110.8}{106.9} = 1.036</math> so the increase was 3.6%</li> <li>• the index number is an average</li> </ul>	B3 for Thomas is incorrect with two correct equivalent reasons (B2 Thomas is incorrect and one correct reason)  (B1 for an incomplete answer, e.g. one correct reason with no conclusion, or correct conclusion with attempt at reason)	<b>(3)</b>

