# AS
# MATHEMATICS
# 7356/2

Paper 2

**Mark scheme**

June 2022

Version: 1.0 Final Mark Scheme

226A7356/2/MS

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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# Mark scheme instructions to examiners

## General

The mark scheme for each question shows:
- the marks available for each part of the question
- the total marks available for the question
- marking instructions that indicate when marks should be awarded or withheld including the principle on which each mark is awarded. Information is included to help the examiner make his or her judgement and to delineate what is creditworthy from that not worthy of credit
- a typical solution. This response is one we expect to see frequently. However credit must be given on the basis of the marking instructions.

If a student uses a method which is not explicitly covered by the marking instructions the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

**Key to mark types**

| | |
|---|---|
| M | mark is for method |
| R | mark is for reasoning |
| A | mark is dependent on M marks and is for accuracy |
| B | mark is independent of M marks and is for method and accuracy |
| E | mark is for explanation |
| F | follow through from previous incorrect result |

**Key to mark scheme abbreviations**

| | |
|---|---|
| CAO | correct answer only |
| CSO | correct solution only |
| ft | follow through from previous incorrect result |
| 'their' | indicates that credit can be given from previous incorrect result |
| AWFW | anything which falls within |
| AWRT | anything which rounds to |
| ACF | any correct form |
| AG | answer given |
| SC | special case |
| OE | or equivalent |
| NMS | no method shown |
| PI | possibly implied |
| sf | significant figure(s) |
| dp | decimal place(s) |

# AS/A-level Maths/Further Maths assessment objectives

| AO | | Description |
|---|---|---|
| **AO1** | AO1.1a | Select routine procedures |
| | AO1.1b | Correctly carry out routine procedures |
| | AO1.2 | Accurately recall facts, terminology and definitions |
| **AO2** | AO2.1 | Construct rigorous mathematical arguments (including proofs) |
| | AO2.2a | Make deductions |
| | AO2.2b | Make inferences |
| | AO2.3 | Assess the validity of mathematical arguments |
| | AO2.4 | Explain their reasoning |
| | AO2.5 | Use mathematical language and notation correctly |
| **AO3** | AO3.1a | Translate problems in mathematical contexts into mathematical processes |
| | AO3.1b | Translate problems in non-mathematical contexts into mathematical processes |
| | AO3.2a | Interpret solutions to problems in their original context |
| | AO3.2b | Where appropriate, evaluate the accuracy and limitations of solutions to problems |
| | AO3.3 | Translate situations in context into mathematical models |
| | AO3.4 | Use mathematical models |
| | AO3.5a | Evaluate the outcomes of modelling in context |
| | AO3.5b | Recognise the limitations of models |
| | AO3.5c | Where appropriate, explain how to refine models |

Examiners should consistently apply the following general marking principles:

**No Method Shown**

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to students showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the student to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

**Otherwise we require evidence of a correct method for any marks to be awarded.**

**Diagrams**

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

**Work erased or crossed out**

Erased or crossed out work that is still legible and has not been replaced should be marked. Erased or crossed out work that has been replaced can be ignored.

**Choice**

When a choice of answers and/or methods is given and the student has not clearly indicated which answer they want to be marked, mark positively, awarding marks for all of the student's best attempts. Withhold marks for final accuracy and conclusions if there are conflicting complete answers or when an incorrect solution (or part thereof) is referred to in the final answer.

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **1** | Circles correct answer | 1.1b | B1 | $3x^4 + c$ |
| | **Question 1 Total** | | **1** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **2** | Circles correct answer | 1.1b | B1 | 320° |
| | **Question 2 Total** | | **1** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **3** | Uses fractional power to represent square root<br>PI by $\frac{dy}{dx}$ involving $x^{-\frac{1}{2}}$ | 1.2 | B1 | $y = k\sqrt{x} = kx^{\frac{1}{2}}$ |
| | Differentiates to obtain an expression in $x^{-\frac{1}{2}}$ or $\frac{1}{\sqrt{x}}$ | 1.1a | M1 | $\frac{dy}{dx} = \frac{k}{2}x^{-\frac{1}{2}}$ |
| | Obtains fully correct expression for $\frac{dy}{dx}$ | 1.1b | A1 | $\frac{d^2y}{dx^2} = -\frac{k}{4}x^{-\frac{3}{2}}$ |
| | Differentiates to obtain an expression in $x^{-\frac{3}{2}}$ or $\frac{1}{x\sqrt{x}}$ OE | 1.1a | M1 | At $(4, 2k)$ $\frac{d^2y}{dx^2} = -\frac{k}{32}$ |
| | Obtains $-\frac{k}{32}$ seen anywhere following a correct $\frac{d^2y}{dx^2}$ | 1.1b | A1 | |
| | **Question 3 Total** | | **5** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **4** | Recalls that the discriminant must be negative, seen anywhere in solution | 1.2 | B1 | For no real solutions the discriminant must be negative |
| | Substitutes 9, 4 and $p^2$ into the expression $b^2 - 4ac$ PI | 1.1a | M1 | $4^2 - 4 \times 9 \times p^2 < 0$<br>$p^2 > \frac{4}{9}$ |
| | Deduces correct critical values of $\frac{2}{3}$ and $-\frac{2}{3}$ | 2.2a | A1 | $p > \frac{2}{3}$ or $p < -\frac{2}{3}$ |
| | Obtains two correct inequalities for $p$ | 2.5 | A1 | |
| | **Question 4 Total** | | **4** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **5(a)** | Shows that 3 has been substituted and $f(3) = 0$ and states that Kaya is correct OE | 2.4 | E1 | $f(3) = 54 – 63 – 36 + 45 = 0$<br><br>Kaya is correct that $f(3) = 0$ |
| | States that Kaya is incorrect and gives the correct conclusion Kaya should have reached<br><br>Or<br>States that Kaya is incorrect and that $f(–3) \neq 0$<br><br>Or States that Kaya is incorrect and provides evidence that $(x + 3)$ is not a factor of $f(x)$ | 2.3 | E1 | But Kaya's conclusion is wrong<br><br>$(x – 3)$ is a factor of $f(x)$ |
| | **Subtotal** | | **2** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **5(b)** | Divides $f(x)$ by $x – 3$ or $x + 3$ or uses inspection. Must obtain $2x^2$ or 15<br><br>or finds another root of $f(x) = 0$ | 1.1a | M1 | $(2x^3 – 7x^2 – 12x + 45) / (x – 3)$<br><br>$= 2x^2 – x –15$ |
| | Finds correct quadratic factor or **both** remaining roots of $f(x) = 0$ | 1.1b | A1 | $(x – 3)^2(2x + 5)$ |
| | Factorises $f(x)$ correctly ISW | 1.1b | A1 | |
| | **Subtotal** | | **3** | |

| | | | | |
|---|---|---|---|---|
| | **Question 5 Total** | | **5** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **6(a)** | Obtains 57 AWFW 56 to 57 | 3.3 | B1 | 16ln5 + 31 = 57 years |
| | **Subtotal** | | **1** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **6(b)** | Uses exponential as inverse of logarithm<br>PI by correct value of '$x$'<br><br>Condone use of $10^{\frac{9}{16}}$ for M1 | 1.1a | M1 | $\ln x = \frac{40-31}{16}$<br>$x = e^{\frac{9}{16}}$ |
| | Calculates the correct value of '$x$' , AWFW 1.75 to 1.76<br><br>Or FT '$x$' = 3.65 from using $10^{\frac{9}{16}}$ , AWFW 3.65 to 3.66 | 3.4 | A1F | $x$ = 1.755 |
| | Obtains 21 months<br>or 1 year 9 months<br><br>Or FT Accept 3 years 8 months or 44 months | 3.2a | A1F | = 21 months |
| | **Subtotal** | | **3** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **6(c)** | States what happens to a logarithm for values approaching zero or gives appropriate example | 3.5b | E1 | As $x$ approaches zero ln($x$) becomes negative |
| | States the consequence for the dog's equivalent human age as the dog's age approaches zero | 3.5a | E1 | As the dog age approaches zero the equivalent human age can become negative |
| | **Subtotal** | | **2** | |

| | | | | |
|---|---|---|---|---|
| | **Question 6 Total** | | **6** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **7** | Recalls that correct step is to multiply top and bottom by $2-\sqrt{n}$ PI by subsequent work | 1.2 | M1 | $\frac{3-\sqrt{n}}{2+\sqrt{n}} \times \frac{2-\sqrt{n}}{2-\sqrt{n}}$ |
| | Multiplies numerator and denominator by ( 2 - $\sqrt{n}$) to get correct terms (condone sign errors)<br>Does not need to be simplified<br>PI by correct simplification | 1.1a | M1 | $\frac{6-3\sqrt{n}-2\sqrt{n}+n}{4+2\sqrt{n}-2\sqrt{n}-n}$ |
| | Obtains correct simplified numerator and denominator not necessarily in a fraction | 1.1b | A1 | $\frac{6+n-5\sqrt{n}}{4-n}$ |
| | States correct expressions for $a$ and $b$<br><br>Or gives expression with $a$ and $b$ correctly identified | 1.1b | A1 | $a = \frac{6+n}{4-n}$<br><br>$b = \frac{-5}{4-n}$ |
| | **Question 7 Total** | | **4** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **8(a)(i)** | Explains that $(m + n)$ is the largest side (which must be opposite the largest angle) | 2.4 | E1 | The largest angle must be opposite the largest side which is $(m + n)$ |
| | **Subtotal** | | **1** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **8(a)(ii)** | Substitutes for $a$, $b$, $c$ into cosine rule | 1.1a | M1 | $(m + n)^2 =$ $m^2 + (m - n)^2 - 2m(m - n)\cos A$ |
| | Makes cos*A* the subject | 1.1a | M1 | $\cos A = \frac{m^2 + (m - n)^2 - (m + n)^2}{2m(m - n)}$ |
| | Completes reasoned argument to obtain given result. AG | 2.1 | R1 | $\cos A = \frac{m^2 - 4mn}{2m(m - n)}$ $\cos A = \frac{m - 4n}{2(m - n)}$ |
| | **Subtotal** | | **3** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **8(b)** | Deduces that *A* is 90°, Accept marked on diagram PI by awarding of M1 | 2.2a | B1 | *A* must be 90° So cos*A* = 0 |
| | Substitutes cos*A* = 0 in **part (a)** equation PI by correct value for $n$ Or uses Pythagoras | 3.1a | M1 | $\frac{m - 4n}{2(m - n)} = 0$ $m = 4n$ $n = 2$ |
| | Obtains $n = 2$ | 1.1b | A1 | |
| | **Subtotal** | | **3** | |

| | | | | |
|---|---|---|---|---|
| | **Question 8 Total** | | **7** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **9(a)** | Deduces one correct inequality related to the sloping line or the curve.<br>Condone strict inequalities | 2.2a | B1 | $y \leq x + 2$<br>$y \geq x^2 - 4x - 12$<br>$y \geq 0$ |
| | Deduces the other two correct inequalities<br>Condone strict inequalities | 2.2a | B1 | |
| | **Subtotal** | | **2** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **9(b)** | States $x$ coordinate of *A* is –2 | 1.1b | B1 | *A* is (-2, 0)<br>*B* is (6, 0)<br>$x + 2 = x^2 - 4x - 12$<br>$x^2 - 5x - 14 = 0$<br>$(x + 2)(x - 7) = 0$<br>*C* is point (7, 9) |
| | States $x$ coordinate of *B* is 6 | 1.1b | B1 | |
| | Eliminates $y$ to obtain $x$ coordinate of *C* = 7 | 1.1a | M1 | |
| | Obtains correct $y$ coordinates of *A*, *B* and *C* | 1.1b | A1 | |
| | **Subtotal** | | **4** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **9(c)** | Obtains correct value for area under *AC* | 1.1b | B1 | Area of triangle under *AC*<br>= 0.5 × 9 × 9<br>= 40.5 |
| | Integrates a quadratic expression with $\frac{x^3}{3}$ term correct<br>PI by $\frac{13}{3}$ ACF | 1.1a | M1 | Area below *BC*<br>$= \int_6^7 (x^2 - 4x - 12)\,\mathrm{d}x$ |
| | Integrates $x^2 - 4x - 12$ completely correct<br>Condone inclusion of + $c$ here<br>PI by $\frac{13}{3}$ ACF<br>Condone integration of $x^2 - 5x - 14$ correctly | 1.1b | A1 | $= [\frac{x^3}{3} - 2x^2 - 12x]_6^7$ |
| | Substitutes a pair of limits into their integrated quadratic, must be three terms, including subtraction.<br>PI by $\frac{13}{3}$ ACF | 1.1a | M1 | $= \frac{343}{3} - 98 - 84 - 72 + 72 + 72$ |
| | Uses a correct method to combine areas that lead to the exact area of the shaded region | 3.1a | M1 | Shaded area = $40.5 - 4\frac{1}{3}$ |
| | Obtains $36\frac{1}{6}$ or $\frac{217}{6}$ ISW | 2.1 | R1 | $= 36\frac{1}{6}$ |
| | **Subtotal** | | **6** | |

| | | | | |
|---|---|---|---|---|
| | **Question 9 Total** | | **12** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **10(a)** | Obtains 14 | 3.3 | B1 | $a = 14$ |
| | **Subtotal** | | **1** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **10(b)** | Substitutes 12 and 10 into given equation | 3.4 | M1 | $12 = 20 - 14e^{-10k}$ |
| | Forms a fully correct equation FT their value for $a$ | 1.1a | A1F | |
| | Obtains correct value of $k$ AWRT | 1.1b | A1 | $k$ = 0.056 |
| | **Subtotal** | | **3** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **10(c)** | Substitutes their $k$ and other values correctly into given model | 3.4 | B1 | $18 = 20 - 14e^{-0.056t}$ |
| | Solves their model equation to obtain a value for $t$, where $t > 10$ | 1.1a | M1 | |
| | Obtains correct value of $t$ including units AWRT 35 | 3.2a | A1 | $t$ = 35 minutes |
| | **Subtotal** | | **3** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **10(d)** | Explains that the conditions may change. Eg. Someone may have drunk the water OE OR states that after 3 hours the water will be effectively at room temperature. | 3.5b | E1 | It is not likely that the room temperature will stay at 20°C over such a long period |
| | **Subtotal** | | **1** | |

| | | | | |
|---|---|---|---|---|
| | **Question 10 Total** | | **8** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **11** | Circles correct answer | 2.5 | B1 | Negatively skewed |
| | **Question 11 Total** | | **1** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **12** | Circles correct answer | 2.2a | B1 | Cluster |
| | **Question 12 Total** | | **1** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **13(a)** | States mean = 0.026 AWRT | 1.1b | B1 | Mean = 0.026 |
| | States the correct standard deviation AWRT 0.021 or 0.022 | 1.1b | B1 | Standard deviation = 0.021 |
| | **Subtotal** | | **2** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **13(b)(i)** | Finds 'their' % drop<br><br>Or calculates 'their' mean as a % of 0.122<br><br>Or calculates 25% or 75% of 0.122 ( = 0.0305 or 0.0915) … | 1.1a | M1 | % drop = $\frac{(0.122-0.026)}{0.122} \times 100$<br><br>= 78.7% |
| | Compares 'their' 79% to 75<br><br>Or compares 'their' 21% to 25<br><br>Or …and shows that 'their' mean < 0.0305 or (0.122 – 'their' mean) > 0.0915 | 2.2b | A1F | 78.7% > 75% |
| | **Subtotal** | | **2** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **13(b)(ii)** | Makes one appropriate comment on the validity of the claim | 2.4 | E1 | The LDS only includes a limited number of makes of car so cannot make a claim about all makes of cars |
| | Makes a second (different) comment on the validity of the claim<br><br>Also accept:<br><br>This is too small a sample to make any significant comment about the change in NOX emissions<br><br>Limited NOX emission data in LDS | 2.4 | E1 | The LDS does not include cars from all areas of the UK so cannot make a claim about cars from all areas of the UK |
| | **Subtotal** | | **2** | |

| | | | | |
|---|---|---|---|---|
| | **Question 13 Total** | | **6** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **14(a)** | Uses 1 – P(no bananas)<br>(at least 1 – $p^4$ for $0 < p < 1$ seen)<br>or<br>Uses P(1) + P(2) + P(3) + P(4)<br>Or<br>Uses P($x \geq 1$) using B(4, 0.35) | 3.1b | M1 | P(at least 1 banana)<br>= 1 – P(no bananas)<br>= $1 - 0.65^4$ |
| | Obtains correct probability<br>AWFW 0.821 to 0.822<br>Accept 0.82 | 1.1b | A1 | = 0.82149 |
| | **Subtotal** | | **2** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **14(b)** | Calculates the correct three terms, not necessarily evaluated and not necessarily added | 3.1b | M1 | $0.2^4 + 0.35^4 + 0.45^4$ |
| | Obtains correct answer<br>(AWRT 0.058) | 1.1b | A1 | = 0.0576125 |
| | **Subtotal** | | **2** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **14(c)** | Uses $0.2^2$ or $0.45^2$ anywhere or fraction equivalents | 1.1b | B1 | P(apple twice and cake twice) |
| | Uses ($k \times$ ) $0.2^2 \times 0.45^2$ ($\times 0.35^0$) or fraction equivalents and no other terms<br>PI by correct answer | 3.1b | M1 | $= 6 \times 0.2^2 \times 0.45^2$ |
| | Obtains correct answer CAO | 1.1b | A1 | = 0.0486 |
| | **Subtotal** | | **3** | |

| | | | | |
|---|---|---|---|---|
| | **Question 14 Total** | | **7** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **15(a)** | Obtains $9k$ | 1.1b | B1 | $9k$ |
| | **Subtotal** | | **1** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **15(b)** | Uses probabilities c, 2c, 9k, 16k | 1.1b | B1 | $c + 2c + 9k + 16k = 1$ |
| | Uses $\Sigma p = 1$ to obtain an equation in $k$ and $c$, at least one term in $k$ or $c$ correct<br>or<br>Uses ratio of 1:3(:4) to obtain an equation either in $c$ related to 0.25 or in $k$ related to 0.75. At least one term in $k$ or $c$ correct<br>[$c + 2c = 0.25$; $9k + 16k = 0.75$] | 3.1a | M1 | $3c + 25k = 1$ |
| | Uses ratio of 1:3 to find an equation in $k$ and $c$, at least one term in $k$ or $c$ correct<br>or<br>Obtains a second equation in $k$ or $c$ using the ratio of 1:3(:4), at least one term in $k$ or $c$ correct | 1.1a | M1 | $9k + 16k = 3(c + 2c)$<br>$25k = 9c$ |
| | Obtains correct exact values for $k$ and $c$ (ACF but must be exact) | 1.1b | A1 | $c = \frac{1}{12}$<br>$k = \frac{3}{100}$ |
| | **Subtotal** | | **4** | |

| | | | | |
|---|---|---|---|---|
| | **Question 15 Total** | | **5** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **16(a)(i)** | Obtains correct answer from model AWRT 0.247<br>Accept 0.25 and % | 3.4 | B1 | 0.24706 |
| | **Subtotal** | | **1** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **16(a)(ii)** | Obtains correct mean (CAO)<br>Do not ISW | 1.1b | B1 | Mean = $np$<br>= 7 × 0.7<br>= 4.9 |
| | **Subtotal** | | **1** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **16(b)** | States both hypotheses correctly for a one-tailed test.<br>Accept population proportion for p. Accept 70%, but not $H_0 = 0.7$<br>or $x =$ or $\overline{x} =$ or $\mu =$ | 2.5 | B1 | $Y$ is 'No of times the coin lands heads'<br>$H_0$: p = 0.7<br>$H_1$: p > 0.7 |
| | States model used (PI by AWRT 0.13, 0.068, 0.038, 0.065, 0.87<br>Or critical region >28) | 3.3 | M1 | Under $H_0$: $Y \sim B(35, 0.7)$ |
| | Evaluates $P(Y \geq 28)$ using calculator = 0.13 (AWRT) OE | 1.1b | A1 | $P(Y \geq 28) = 1 - P(Y \leq 27)$<br>= 1 – 0.86735 …<br>= 0.13265<br>= 0.133 |
| | Compares 0.13 to 0.1<br>Or 0.87 to 0.9<br>Or 28 to justified critical region of 29 or more<br>**And** makes appropriate inference | 2.2b | A1 | As 0.133 > 0.1<br><br>Accept $H_0$ |
| | Concludes correctly in context CSO 'insufficient evidence' OE required. Only award for full complete correct solution. | 3.2a | R1 | There is insufficient evidence to suggest that the probability of getting a head is more than 0.7. |
| | **Subtotal** | | **5** | |

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|---|---|---|---|---|
| | **Question 16 Total** | | **7** | |

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|---|---|---|---|---|
| | **Question Paper Total** | | **80** | |