This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners’ meeting before marking began.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates’ scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2007 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.
Mark Scheme Notes

Marks are of the following three types:

M Method mark, awarded for a valid method applied to the problem. Method
marks are not lost for numerical errors, algebraic slips or errors in units.
However, it is not usually sufficient for a candidate just to indicate an intention
of using some method or just to quote a formula; the formula or idea must be
applied to the specific problem in hand, e.g. by substituting the relevant
quantities into the formula. Correct application of a formula without the
formula being quoted obviously earns the M mark and in some cases an M
mark can be implied from a correct answer.

A Accuracy mark, awarded for a correct answer or intermediate step correctly
obtained. Accuracy marks cannot be given unless the associated method
mark is earned (or implied).

B Mark for a correct result or statement independent of method marks.

• When a part of a question has two or more "method" steps, the M marks are
generally independent unless the scheme specifically says otherwise; and similarly
when there are several B marks allocated. The notation DM or DB (or dep*) is used
to indicate that a particular M or B mark is dependent on an earlier M or B
(asterisked) mark in the scheme. When two or more steps are run together by the
candidate, the earlier marks are implied and full credit is given.

• The symbol √ implies that the A or B mark indicated is allowed for work correctly
following on from previously incorrect results. Otherwise, A or B marks are given for
correct work only. A and B marks are not given for fortuitously "correct" answers or
results obtained from incorrect working.

• Note: B2 or A2 means that the candidate can earn 2 or 0.
   B2/1/0 means that the candidate can earn anything from 0 to 2.

The marks indicated in the scheme may not be subdivided. If there is genuine doubt
whether a candidate has earned a mark, allow the candidate the benefit of the
doubt. Unless otherwise indicated, marks once gained cannot subsequently be lost,
e.g. wrong working following a correct form of answer is ignored.

• Wrong or missing units in an answer should not lead to the loss of a mark unless
the scheme specifically indicates otherwise.

• For a numerical answer, allow the A or B mark if a value is obtained which is correct
to 3 s.f., or which would be correct to 3 s.f. if rounded (1 d.p. in the case of an
angle). As stated above, an A or B mark is not given if a correct numerical answer
arises fortuitously from incorrect working. For Mechanics questions, allow A or B
marks for correct answers which arise from taking \(g\) equal to 9.8 or 9.81 instead of
10.

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The following abbreviations may be used in a mark scheme or used on the scripts:

- **AEF** Any Equivalent Form (of answer is equally acceptable)
- **AG** Answer Given on the question paper (so extra checking is needed to ensure that the detailed working leading to the result is valid)
- **BOD** Benefit of Doubt (allowed when the validity of a solution may not be absolutely clear)
- **CAO** Correct Answer Only (emphasising that no "follow through" from a previous error is allowed)
- **CWO** Correct Working Only - often written by a ‘fortuitous’ answer
- **ISW** Ignore Subsequent Working
- **MR** Misread
- **PA** Premature Approximation (resulting in basically correct work that is insufficiently accurate)
- **SOS** See Other Solution (the candidate makes a better attempt at the same question)
- **SR** Special Ruling (detailing the mark to be given for a specific wrong solution, or a case where some standard marking practice is to be varied in the light of a particular circumstance)

**Penalties**

- **MR -1** A penalty of MR -1 is deducted from A or B marks when the data of a question or part question are genuinely misread and the object and difficulty of the question remain unaltered. In this case all A and B marks then become "follow through √" marks. MR is not applied when the candidate misreads his own figures - this is regarded as an error in accuracy. An MR -2 penalty may be applied in particular cases if agreed at the coordination meeting.

- **PA -1** This is deducted from A or B marks in the case of premature approximation. The PA -1 penalty is usually discussed at the meeting.
| 1 (i) | $-73.2/24 (= -3.05)$  
\[ a = 8.95 + 3.05 = 12 \]  
OR  
\[ 8.95 \times 24 (= 214.8) \]  
\[ \Sigma x - \Sigma a = -73.2 \]  
\[ \Sigma a = 288 \]  
\[ a = 12 \] | M1  
A1 | Accept (-72.4 + anything)/ 24  
Correct answer  
M1  
A1 2 | For 8.95×24 seen  
Correct answer obtained using $\Sigma x$ and $\Sigma a$  
M1  
A1 2 | For $\frac{2115}{24} - (± \text{their coded mean})^2$  
Correct answer  
M1  
A1 | For $\frac{\Sigma x^2}{24} - 8.95^2$ where $\Sigma x^2$ is obtained  
from expanding $\Sigma (x - a)^2$ with $2a \Sigma x$ seen  
Correct answer  
M1  
A1 2 |
| 2 (i) | $2p + p + 3p = 1$  
\[ p = 1/6 (= 0.167) \] | M1  
A1 2 | Equation involving $ps$ and summing to 1  
Correct answer  
M1  
A1 | Using correct formula for $E(x)$, in terms of $p$ or their $p < 1$  
Correct expectation ft on their $p$ if $p \leq 1/3$  
M1  
A1ft | Substitution in their $\Sigma px^2$ – their $E^2(x)$ need 2 terms  
Correct answer  
M1  
A1 4 |
| 3 (i) | $\frac{6!}{3!} = 120$ | M1  
A1 2 | For dividing by 3!  
Correct answer  
M1  
A1 | For identifying different cases  
M1  
B1 | For 4!/2! seen  
B1 | For 4! alone seen or in a sum or product  
B1 | Correct final answer  
A1 4 |
### Question 4

**Part (i)**

\[ z = \pm 1.68 \]

\[ z = \frac{5.5 - 4.5}{\sigma} \]

\[ \sigma = 0.595 \text{ accept } 25/42 \]

**Part (ii)**

\[ z_1 = \frac{3.8 - 4.5}{0.5952} = -1.176 \]

\[ z_2 = \frac{4.8 - 4.5}{0.5952} = 0.504 \]

\[ \text{prob} = \Phi(0.504) - (1 - \Phi(1.176)) = 0.6929 - (1 - 0.8802) = 0.573 \]

**Mark Scheme**

- **B1** Number rounding to 1.68 seen
- **M1** Standardising and attempting to solve with their \( z \); must be \( z \) value, no cc, no \( \sigma^2 \), no \( \sqrt{\sigma} \)
- **A1 3** Correct answer

**Mark Scheme**

- **B1** Number rounding to 1.68 seen
- **M1** For standardising 3.8 or 4.8, mean 4.5 not 5.5, their \( \sigma \) or \( \sqrt{\sigma} \) or \( \sigma^2 \) in denom
- **A1** One correct \( z \)-value, ft on their \( \sigma \)
- **M1** Correct area ie \( \Phi_1 + \Phi_2 - 1 \) or \( \Phi_1 - \Phi_2 \) if \( \mu \) taken to be 5.5
- **A1 4** Correct answer only

### Question 5

**Part (i)**

Some trains were up to 2 minutes early

**Part (ii)**

**Mark Scheme**

- **B1 1** Or sensible equivalent, must use the idea ‘early’ 2 not needed
- **M1** Attempt at C F table with upper limits no halves
- **M1** Uniform linear scales from at least 0 to 10 and 0 to 204 and at least one axis labelled, CF or mins or t
- **M1** Attempt at graph their 5 points. (-2, 0) not nec (could be midpoints or lower bounds not f d)
- **M1** Attempt at median along 102 or 102.5 line
- **M1** Attempt at LQ along 51/52 line and UQ along 153/154 line from graph
- **M1** Correct median
- **A1 7** Correct IQ range allow from midpoints etc

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6 (i) \( P(X=5) = (0.65)^5 \times (0.35)^2 \times C_5 \)
\[= 0.298 \text{ allow } 0.2985 \]

(ii) \( \mu = 50 \times 0.65 = 32.5 \),
\( \sigma^2 = 50 \times 0.65 \times 0.35 = 11.375 \)

\[ P(\text{fewer than } 29) = \Phi \left( \frac{28.5 - 32.5}{\sqrt{11.375}} \right) \]
\[= 1 - \Phi(1.186) \]
\[= 1 - 0.8822 \]
\[= 0.118 \]

(iii) 0.65 \( n \geq 8 \)
smallest \( n = 13 \)

7 (i) \( P(W, R) = \frac{1}{6} \times \frac{7}{10} = \frac{7}{60} = 0.117 \)

(ii) \( P(R, R) = \frac{5}{6} \times \frac{8}{10} = \frac{40}{60} = 0.667 \)
\( P(\text{red}) = 47/60 = 0.783 \)

(iii) \( P(R|R) = \frac{P(R \cap R)}{P(R)} = \frac{40}{47} = 0.851 \)

(iv) \( P(R, W) = \frac{5}{6} \times \frac{2}{10} = \frac{10}{60} \)
\( P(W, W) = \frac{1}{6} \times \frac{3}{10} = \frac{3}{60} \)

<table>
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<th>( x )</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P(X=x) )</td>
<td>3/60</td>
<td>17/60</td>
<td>40/60</td>
</tr>
</tbody>
</table>