Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK’s largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world’s leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We’ve been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

November 2015
Publications Code UG042921
All the material in this publication is copyright
© Pearson Education Ltd 2015
NOTES ON MARKING PRINCIPLES

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

2. Mark schemes should be applied positively.

3. All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners should be prepared to award zero marks if the candidate’s response is not worthy of credit according to the mark scheme.

4. Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5. Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6. Mark schemes will award marks for the quality of written communication (QWC).
   The strands are as follows:
   i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
      Comprehension and meaning is clear by using correct notation and labelling conventions.
   ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
      Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.
   iii) organise information clearly and coherently, using specialist vocabulary when appropriate.
      The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.
7  **With working**  
   If there is a wrong 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.  
   If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.  
   If it is clear from the working that the “correct” answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.  
   If there is no answer on the answer line then check the working for an obvious answer.  
   Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied). Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.  
   If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8  **Follow through marks**  
   Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, 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.

9  **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: e.g. incorrect cancelling of a fraction that would otherwise be correct  
   It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10  **Probability**  
   Probability answers must be given a fractions, percentages or decimals. 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 answer is given on the answer line using both incorrect and correct notation, award the marks.  
   If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.
11 **Linear equations**
Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 **Parts of questions**
Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 **Range of answers**
Unless otherwise stated, when an answer is given as a range (e.g. 3.5 – 4.2) then this is inclusive of the end points (e.g. 3.5, 4.2) and includes all numbers within the range (e.g. 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

---

**Guidance on the use of codes within this mark scheme**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>Method mark for appropriate method in the context of the question</td>
</tr>
<tr>
<td>A1</td>
<td>Accuracy mark</td>
</tr>
<tr>
<td>B1</td>
<td>Working mark</td>
</tr>
<tr>
<td>C1</td>
<td>Communication mark</td>
</tr>
<tr>
<td>QWC</td>
<td>Quality of written communication</td>
</tr>
<tr>
<td>oe</td>
<td>or equivalent</td>
</tr>
<tr>
<td>cao</td>
<td>correct answer only</td>
</tr>
<tr>
<td>ft</td>
<td>follow through</td>
</tr>
<tr>
<td>sc</td>
<td>special case</td>
</tr>
<tr>
<td>dep</td>
<td>dependent (on a previous mark or conclusion)</td>
</tr>
<tr>
<td>indep</td>
<td>independent</td>
</tr>
<tr>
<td>isw</td>
<td>ignore subsequent working</td>
</tr>
<tr>
<td>Question</td>
<td>Working</td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
</tr>
<tr>
<td>1</td>
<td>2 3 5 8 9</td>
</tr>
<tr>
<td></td>
<td>3 2 5 7 8 9</td>
</tr>
<tr>
<td></td>
<td>4 1 2 4</td>
</tr>
<tr>
<td></td>
<td>5 1</td>
</tr>
<tr>
<td></td>
<td>6 1 3</td>
</tr>
<tr>
<td>2</td>
<td>(a)</td>
</tr>
<tr>
<td></td>
<td>(b)</td>
</tr>
<tr>
<td></td>
<td>(c)</td>
</tr>
<tr>
<td></td>
<td>(d)</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Working</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
</tr>
</tbody>
</table>
| 5        | $0.65 \times 80 = 52$  
$\frac{5}{8} \times 80 = 50$  
$52 - 50$  
Or  
$\frac{5}{8} = 0.625$  
$0.65 - 0.625 = 0.025$  
$0.025 \times 80$ | 2 | 4 | M1 for method to calculate the time Celina sings  
M1 for method to calculate the time Zoe sings  
M1(dep on at least M1) for finding the difference between two times  
A1 cao  
Or  
M1 for a conversion to a common representation  
M1 (dep on M1) for finding the difference in their chosen representation  
M1 for using their proportional difference multiplied by 80  
A1 cao |
| 6        |         | 40 000 | 2 | M1 for 100 $\times$ 100 isolated or $4 \times 100 \times 100$  
A1 cao |
| *7       |         | No not enough | 5 | M1 for substituting into Pythagoras’ theorem  
M1 for complete correct use of Pythagoras’ theorem  
M1 for a complete method to find the perimeter of their trapezium  
A1 51.(20655..)  
C1 (dep on correct first 2 M marks) for correct conclusion dependent upon supporting calculations |
| *8       |         | 125 m/ | 4 | M1 for a complete method to find the cost per m/ or the number of m/ per £1 for one tube or for a method that results in at least 2 values that can be used to compare 2 tubes  
M1 for a complete method to find all three equivalent figures  
A1 3 correct figures suitable for comparison  
C1(dep on M2) for stating the correct tube size from their calculations |
<table>
<thead>
<tr>
<th>Question</th>
<th>Working</th>
<th>Answer</th>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td></td>
<td>Correct line drawn</td>
<td>2</td>
<td>M1 for two pairs of relevant arcs drawn A1 correct line drawn (with arcs) SC B1 Correct line no arcs visible</td>
</tr>
<tr>
<td>10</td>
<td>(a) 9×6</td>
<td>54</td>
<td>2</td>
<td>M1 for a method to find the speed e.g. 9 ÷ 10, 9 ÷ 0.16 A1 cao</td>
</tr>
<tr>
<td></td>
<td>(b)</td>
<td>Graph completed</td>
<td>3</td>
<td>B1 horizontal line from (30,21) to (45,21) M1 for a complete method to show the return journey is 30 mins or ½ hour evidenced by the line on the graph or by calculation A1 Correct line drawn from Luscoe (x,21) to (x + 30,0)</td>
</tr>
<tr>
<td>11</td>
<td>(a)</td>
<td>±7</td>
<td>2</td>
<td>M1 for intent to divide both sides by 3 as a first step or answer of 7 or -7 A1 ±7</td>
</tr>
<tr>
<td></td>
<td>(b)</td>
<td>0.125 or $\frac{1}{8}$</td>
<td>1</td>
<td>B1 cao</td>
</tr>
<tr>
<td></td>
<td>(c)</td>
<td>$27x^6$</td>
<td>2</td>
<td>M1 for either 27 or $x^6$ in a two term product A1 cao</td>
</tr>
<tr>
<td></td>
<td>(d)</td>
<td>$p = \frac{w + 16}{4}$</td>
<td>2</td>
<td>M1 for $\div 4$ throughout or adding 16 to both sides as a first step A1 $p = \frac{w+16}{4}$ oe</td>
</tr>
<tr>
<td>Question</td>
<td>Working</td>
<td>Answer</td>
<td>Mark</td>
<td>Notes</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>--------</td>
<td>------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| 12       |         | Rotation about (2,1) through 180° | 3    | B1 rotation  
B1 about (2,1)  
B1 through 180°  
Or  
B2 enlargement scale factor −1  
B1 about (2,1)  
Note Award no marks if more than one transformation is given |
| 13 (a)   |         | 5 and 6 | 2    | M1 for evidence that \( x = 4, 5, 6 \) or evidence that \( y = 5, 6, 7, 8 \)  
A1 cao |
| 13 (b)   |         | Region identified | 4    | M1 for two of the lines \( y = -1, y = 3x - 1 \) and \( y = 4 - x \) drawn  
M1 for three of the lines \( y = -1, y = 3x - 1 \) and \( y = 4 - x \) drawn  
M1 any correct shading(in or out) satisfying at least two of the inequalities where the shading must extend from the appropriate line  
A1 Fully correct region shown by either shading in, shading out or the use of R  
Accept lines that are solid or dashed |
| 14 (a)   |         | 76     | 3    | M1 for 89% = 68  
M1 for 68 ÷ 0.89 oe  
A1 for 76 – 76.41 |
| 14 (b)   |         | 11.8   | 2    | M1 for \((68 – 60) ÷ 68 × 100\) oe  
A1 for 11.7 - 12 |
<table>
<thead>
<tr>
<th>Question</th>
<th>Working</th>
<th>Answer</th>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 (a)</td>
<td></td>
<td></td>
<td>1</td>
<td>C1 for a complete reason eg Angles in a semicircle are 90°, alternate segment theorem</td>
</tr>
</tbody>
</table>
| (b)      |         | 2.75   | 4    | M1 for 7 × sin 35  
M1 for 7 × sin 35 × 2  
M1 (indep) for “DB”× cos 70  
A1 2.74 - 2.75 |
| 16 (a)   |         | 6.4 × 10⁸ | 1    | B1 cao |
| (b)      |         | 5 × 10⁵ | 2    | M1 for 3 ÷ 6 × 10⁻⁴ or 0.5 × 10³ or 500 or 30 000 000÷60 000  
A1 cao |
| 17       |         | y = 3x−5 | 3    | M1 for recognition that the gradient of L₂ is 3  
M1 for substitution of x=3 and y=4 into y= “m”x+c  
A1 y = 3x−5 oe  
(S C B2 for ‘3x−5’ or L₂ = 3x−5 ) |
| 18 (a)   |         | 37     | 1    | B1 cao |
| (b)      |         | 36     | 2    | M1 for identifying LQ and UQ e.g 35 – 71  
A1 cao |
| *(c)     |         |        | 2    | C1 for a correct comparison of medians ft (a)  
C1 for a correct comparison of a measure of spread with correct figures ft (b)  
For the award of both marks at least one of the comparisons must be interpretative |
<table>
<thead>
<tr>
<th>Question</th>
<th>Working</th>
<th>Answer</th>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 (a)</td>
<td></td>
<td>4.25</td>
<td>1</td>
<td>B1 cao</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.20-7.21</td>
<td>3</td>
<td>B1 4.35 or 0.35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M1 for $4.35 + \frac{1}{0.35}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A1 7.2(0)-7.21 or $\frac{1009}{140}$ from a correct method seen</td>
</tr>
<tr>
<td>20</td>
<td>$\pi 2^2 \times 2 = 8\pi$&lt;br&gt;$\pi 2^2 \times \frac{20}{360} \times 3 + \pi 2^2 \times \frac{340}{360} \times 2$&lt;br&gt;$8\pi \div \frac{9}{\pi}$&lt;br&gt;$72 : 74$&lt;br&gt;Or&lt;br&gt;$\frac{20}{360} \times 3 + \frac{340}{360} \times \frac{37}{18}$&lt;br&gt;$\frac{37}{18}$&lt;br&gt;$36:37$</td>
<td>36:37</td>
<td>4</td>
<td>M1 method to find relative cost of design A e.g. $\pi 2^2$, $k \times \pi 2^2$&lt;br&gt;M1 for a complete method to find the relative cost of the watch face for design B e.g. $\pi 2^2 \times \frac{20}{360} \times \frac{3}{5} + \pi 2^2 \times \frac{340}{360} \times \frac{2}{5}$&lt;br&gt;M1 (dep on M1, M1) for the cost of design A: cost of design B&lt;br&gt;A1 cao&lt;br&gt;Or&lt;br&gt;M1 for method to find fraction of the sectors in design B $\frac{20}{360} \times \frac{340}{360}$&lt;br&gt;M1 for complete method to find the relative cost of the watch face for design B&lt;br&gt;M1 (dep on M1, M1) for the cost of design A: cost of design B&lt;br&gt;A1 cao</td>
</tr>
<tr>
<td>Question</td>
<td>Working</td>
<td>Answer</td>
<td>Mark</td>
<td>Notes</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>---------</td>
<td>------</td>
<td>-------</td>
</tr>
</tbody>
</table>
| 21       |         | 9 or 10 | 2    | M1 for 35÷148×40  
A1 9 or 10 |
| 22       |         | 2x² + 7x + 4 = 0 | 3    | M1 for finding a correct coefficient  
M1 for a method to find a and c or b and c  
A1 2x² + 7x + 4 = 0 or a = 2, b = 7, c = 4 |
| 23 (a)   |         | Graph drawn | 2    | B2 correct graph drawn  
(B1 for a graph translated up/down) |
| 23 (b)   |         | Graph drawn | 2    | B2 for correct graph drawn  
(B1 for a graph reflected in the x axis or stretched by sf 2 parallel to the y axis) |
| 24       |         | 31.1     | 5    | M1 for \(\frac{1}{2} \times 8.4 \times x \times \sin 40 = 100\)  
M1 for 100÷(0.5×8.4×\sin 40) (= 37.(041...))  
M1 (dep on 1st M1) for substituting the appropriate figures into the cosine rule  
eg 8.4²+'37.041'²-2×8.4×'37.041'\cos 40°  
M1 (dep on previous M1) for correct order of evaluation or \(c^2=\)  
965.(897...)  
A1 31.07 - 31.1 |
<table>
<thead>
<tr>
<th>Question</th>
<th>Working</th>
<th>Answer</th>
<th>Mark</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>( \frac{18 \times 12}{30} + \frac{7 \times 23}{30} + \frac{5 \times 25}{30} ) or ( 1 - \left( \frac{18}{30} \times \frac{17}{29} + \frac{7}{30} \times \frac{6}{29} + \frac{5}{30} \times \frac{4}{29} \right) ) or ( \frac{18 \times 7}{30} + \frac{18 \times 5}{30} + \frac{7 \times 18}{30} ) + ( \frac{7 \times 5}{30} + \frac{5 \times 18}{30} + \frac{5 \times 7}{30} ) + ( \frac{5 \times 25}{30} + \frac{5 \times 25}{30} )</td>
<td>( \frac{502}{870} )</td>
<td>4</td>
<td>B1 for a second ‘branch’ probability seen (could be seen in a tree) M1 for a product of any first and second stage correct probabilities M1 for a complete method to find the required probability A1 for ( \frac{502}{870} ) oe Note if decimals used they must be correct to 2 decimal places</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SC with replacement B2 for ( \frac{502}{900} ) oe B0 M1 ( \frac{18 \times 12}{30} + \frac{7 \times 23}{30} + \frac{5 \times 25}{30} ) or ( \frac{18 \times 12}{30} + \frac{7 \times 23}{30} + \frac{5 \times 25}{30} ) or ( \frac{5 \times 25}{30} + \frac{5 \times 25}{30} )</td>
</tr>
<tr>
<td>Q8</td>
<td>Per 25ml</td>
<td>Per ml</td>
<td>Per £</td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>----------</td>
<td>--------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>50ml</td>
<td>54.5</td>
<td>2.18</td>
<td>45.87155…</td>
<td></td>
</tr>
<tr>
<td>75ml</td>
<td>56</td>
<td>2.24</td>
<td>44.64285..</td>
<td></td>
</tr>
<tr>
<td>125ml</td>
<td>53.8</td>
<td>2.152</td>
<td>46.46840..</td>
<td></td>
</tr>
</tbody>
</table>
**Modifications to the mark scheme for Modified Large Print (MLP) papers.**

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:

- Angles: ±5°
- Measurements of length: ±5 mm

<table>
<thead>
<tr>
<th>Question</th>
<th>Modification</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q01</td>
<td>MLP only: basis given for stem and leaf diagram.</td>
<td>B2 for a fully correct ordered stem and leaf (B1 for a correct unordered stem and leaf or for an ordered stem and leaf with at most 1 error or omission) B1 (indep) for a correct key (units not required)</td>
</tr>
<tr>
<td>Q02</td>
<td>Grid enlarged. Crosses changed to filled in circles. Right axis labelled</td>
<td>B1 cao</td>
</tr>
</tbody>
</table>

- B1 cao

M1 for a single line segment with a positive gradient that could be used as a line of best fit or a vertical line from 10 or a point plotted at (10, y) where y is in the range 18 - 22 A1 18 - 22 B1 cao
<table>
<thead>
<tr>
<th>Question</th>
<th>Modification</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Q07      | Diagram enlarged and labelled ABCD clockwise from the top right. Measurement lines removed. Information about the length of lines given in the text. | M1 for substituting into Pythagoras’ theorem  
M1 for complete correct use of Pythagoras’ theorem  
M1 for a complete method to find the perimeter of their trapezium  
A1 51.20655..  
C1 (dep on correct first 2 M marks) for correct conclusion dependent upon supporting calculations |
| Q08      | Diagram removed. | M1 for a complete method to find the cost per m² or the number of m² per £1 for one tube or for a method that results in at least 2 values that can be used to compare 2 tubes  
M1 for a complete method to find all three equivalent figures  
A1 3 correct figures suitable for comparison  
C1(dep on M2) for stating the correct tube size from their calculations |
| Q09      | AB = 9 cm. | M1 for two pairs of relevant arcs drawn  
A1 correct line drawn ( with arcs)  
SC B1 Correct line no arcs visible |
| Q15      | Diagram enlarged. Measurement line remove – MLP. 7 cm and measurement line removed – Braille only. | C1 for a complete reason eg Angles in a semicircle are 90°, alternate segment theorem  
M1 for 7 × sin 35  
M1 for 7 × sin 35 × 2  
M1 (indep) for “DB” × cos 70  
A1 2.74 - 2.75 |
<table>
<thead>
<tr>
<th>Question</th>
<th>Modification</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Q18      | Diagrams enlarged  
Dotty shading added  | B1 40 cao  
M1 for identifying LQ and UQ e.g. 35 – 70  
A1 35 cao  
C1 for a correct comparison of medians ft (a)  
C1 for a correct comparison of a measure of spread with correct figures ft (b)  
For the award of both marks at least one of the comparisons must be interpretative |
| Q20      | Diagrams enlarged.  | M1 method to find relative cost of design A e.g. $\pi^2 \times k \times \pi^2$  
M1 for a complete method to find the relative cost of the watch face for design B e.g. $\pi^2 \times \frac{20}{360} \times \frac{3}{5} + \pi^2 \times \frac{340}{360} \times \frac{2}{5}$  
M1 (dep on M1, M1) for the cost of design A: cost of design B  
A1 cao  
Or  
M1 for method to find fraction of the sectors in design B $\frac{20}{360}$  
M1 for complete method to find the relative cost of the watch face for design B  
M1 (dep on M1, M1) for the cost of design A: cost of design B  
A1 cao |
<table>
<thead>
<tr>
<th>Question</th>
<th>Modification</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Q23      | Diagrams enlarged. | B2 correct graph drawn  
(B1 for a graph translated up/down)  
B2 for correct graph drawn  
(B1 for a graph reflected in the \( x \) axis or stretched by sf 2 parallel to the \( y \) axis) |
| Q24      | Diagrams enlarged. | M1 for \( \frac{1}{2} \times 8.4 \times x \times \sin 40 = 100 \)  
M1 for \( 100 \div (0.5 \times 8.4 \times \sin 40) = 37.041 \ldots \)  
M1 (dep on 1st M1) for substituting the appropriate figures into the cosine rule  
eg 8.4^2 + 37.041^2 - 2 \times 8.4 \times 37.041 \cos 40 \)  
M1 (dep on previous M1) for correct order of evaluation or \( c^2 = \)  
965.897\ldots  
A1 31.07 - 31.1 |