

---

# GCSE MATHEMATICS 8300/1H

Higher Tier Paper 1 Non-Calculator

---

Mark scheme

June 2022

---

Version: 1.0 Final



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.

Further copies of this mark scheme are available from [aqa.org.uk](http://aqa.org.uk)

#### Copyright information

AQA retains the copyright on all its publications. However, registered schools/colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools/colleges to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Copyright © 2022 AQA and its licensors. All rights reserved.

## Glossary for Mark Schemes

GCSE examinations are marked in such a way as to award positive achievement wherever possible. Thus, for GCSE Mathematics papers, marks are awarded under various categories.

If a student uses a method which is not explicitly covered by the mark scheme 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.

|                        |                                                                                                                                        |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>M</b>               | Method marks are awarded for a correct method which could lead to a correct answer.                                                    |
| <b>A</b>               | Accuracy marks are awarded when following on from a correct method. It is not necessary to always see the method. This can be implied. |
| <b>B</b>               | Marks awarded independent of method.                                                                                                   |
| <b>ft</b>              | Follow through marks. Marks awarded for correct working following a mistake in an earlier step.                                        |
| <b>SC</b>              | Special case. Marks awarded for a common misinterpretation which has some mathematical worth.                                          |
| <b>M dep</b>           | A method mark dependent on a previous method mark being awarded.                                                                       |
| <b>B dep</b>           | A mark that can only be awarded if a previous independent mark has been awarded.                                                       |
| <b>oe</b>              | Or equivalent. Accept answers that are equivalent.<br>eg accept 0.5 as well as $\frac{1}{2}$                                           |
| <b>[a, b]</b>          | Accept values between a and b inclusive.                                                                                               |
| <b>[a, b)</b>          | Accept values $a \leq \text{value} < b$                                                                                                |
| <b>3.14...</b>         | Accept answers which begin 3.14 eg 3.14, 3.142, 3.1416                                                                                 |
| <b>Use of brackets</b> | It is not necessary to see the bracketed work to award the marks.                                                                      |

Examiners should consistently apply the following principles.

### **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.

### **Responses which appear to come from incorrect methods**

Whenever there is doubt as to whether a student has used an incorrect method to obtain an answer, as a general principle, the benefit of doubt must be given to the student. In cases where there is no doubt that the answer has come from incorrect working then the student should be penalised.

### **Questions which ask students to show working**

Instructions on marking will be given but usually marks are not awarded to students who show no working.

### **Questions which do not ask students to show working**

As a general principle, a correct response is awarded full marks.

### **Misread or miscopy**

Students often copy values from a question incorrectly. If the examiner thinks that the student has made a genuine misread, then only the accuracy marks (A or B marks), up to a maximum of 2 marks are penalised. The method marks can still be awarded.

### **Further work**

Once the correct answer has been seen, further working may be ignored unless it goes on to contradict the correct answer.

### **Choice**

When a choice of answers and/or methods is given, mark each attempt. If both methods are valid then M marks can be awarded but any incorrect answer or method would result in marks being lost.

### **Work not replaced**

Erased or crossed out work that is still legible should be marked.

### **Work replaced**

Erased or crossed out work that has been replaced is not awarded marks.

### **Premature approximation**

Rounding off too early can lead to inaccuracy in the final answer. This should be penalised by 1 mark unless instructed otherwise.

### **Continental notation**

Accept a comma used instead of a decimal point (for example, in measurements or currency), provided that it is clear to the examiner that the student intended it to be a decimal point.

| Q | Answer      | Mark | Comments |
|---|-------------|------|----------|
| 1 | $y = x - 6$ | B1   |          |

| Q | Answer         | Mark | Comments |
|---|----------------|------|----------|
| 2 | $\frac{7}{20}$ | B1   |          |

| Q | Answer             | Mark | Comments |
|---|--------------------|------|----------|
| 3 | $240 \times 1.075$ | B1   |          |

| Q | Answer | Mark | Comments |
|---|--------|------|----------|
| 4 | RHS    | B1   |          |

| Q | Answer                                                                                                                                                                                                                                                                                                                                                   | Mark | Comments                                                                                                                                                                                                                                                                                                     |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | $4 \times 10^5$                                                                                                                                                                                                                                                                                                                                          | B2   | B1 400 000 oe correct answer not in standard form eg $40 \times 10^4$<br>or $8 \times 10^7$ or $2 \times 10^2$<br>or $8 \times 10^5 \div 2$ or $4 \times 10^7 \div 100$<br>or any value seen and then correctly converted to standard form<br>eg 4 000 000 and $4 \times 10^6$<br>40 000 and $4 \times 10^4$ |
|   | <b>Additional Guidance</b>                                                                                                                                                                                                                                                                                                                               |      |                                                                                                                                                                                                                                                                                                              |
|   | Ignore incorrect position of commas or spacing in long numbers                                                                                                                                                                                                                                                                                           |      |                                                                                                                                                                                                                                                                                                              |
|   | Condone 400 000 and $4 \times 10^5$ on the answer line, in either order                                                                                                                                                                                                                                                                                  |      | B2                                                                                                                                                                                                                                                                                                           |
|   | Condone 40 000 and $4 \times 10^4$ on the answer line, in either order                                                                                                                                                                                                                                                                                   |      | B1                                                                                                                                                                                                                                                                                                           |
|   | 400 000 only on the answer line                                                                                                                                                                                                                                                                                                                          |      | B1                                                                                                                                                                                                                                                                                                           |
|   | Do not award both marks for the correct answer from incorrect working but B1 can be awarded for one or both numbers incorrectly converted to standard form and the result of their division given correctly in standard form<br>eg $(8 \times 10^8) \div (2 \times 10^3) = 4 \times 10^5$<br>eg $(0.8 \times 10^7) \div (2 \times 10^3) = 4 \times 10^5$ |      | B1<br>B0                                                                                                                                                                                                                                                                                                     |
|   | Condone a decimal point and any number of zeros after 4<br>eg $4.00000 \times 10^5$                                                                                                                                                                                                                                                                      |      | B2                                                                                                                                                                                                                                                                                                           |
|   | $8 \times 10^7$ is implied by $(8 \div 2) \times (10^7 \div 10^a)$<br>or condone $(8 \div 2) \times (10^7 \times 10^a)$                                                                                                                                                                                                                                  |      | B1                                                                                                                                                                                                                                                                                                           |
|   | $2 \times 10^2$ is implied by $(8 \div 2) \times (10^b \div 10^2)$<br>or condone $(8 \div 2) \times (10^b \times 10^2)$                                                                                                                                                                                                                                  |      | B1                                                                                                                                                                                                                                                                                                           |

| Q    | Answer                                                                                                                                                                             | Mark | Comments                                                                                                                                                                                                                                                                                     |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6(a) | 243                                                                                                                                                                                | B2   | B1<br>$3^{12-7}$ or $3^5$ oe single index<br>or<br>$3 \times 3 \times 3 \times 3 \times 3$ oe multiplication string<br>or<br>531 441 seen as $3^{12}$ or as a numerator<br>or<br>2187 seen as $3^7$ or as a denominator<br>or<br>$3^n$ correctly evaluated, where $n$ is an integer $\geq 4$ |
|      | <b>Additional Guidance</b>                                                                                                                                                         |      |                                                                                                                                                                                                                                                                                              |
|      | Condone $3^5$ and 243 on the answer line, in either order                                                                                                                          |      | B2                                                                                                                                                                                                                                                                                           |
|      | $3^5$ only on the answer line                                                                                                                                                      |      | B1                                                                                                                                                                                                                                                                                           |
|      | Do not allow a misread                                                                                                                                                             |      |                                                                                                                                                                                                                                                                                              |
|      | 12 – 7 is insufficient for B1 unless $3^{12-7}$ or $3^5$ is also seen                                                                                                              |      |                                                                                                                                                                                                                                                                                              |
|      | Do not award B1 for a correct evaluation of $3^n$ not ascribed to a particular value of $n$<br>eg a list 3, 9, 27, 81 ... does not score the mark unless 81 is identified as $3^4$ |      |                                                                                                                                                                                                                                                                                              |

| Q    | Answer   | Mark | Comments                                                                                                                                                                                                                                              |
|------|----------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6(b) | $2^{13}$ | B2   | B1<br>$2^{3+6+4}$<br>or<br>$(8 \Rightarrow) 2 \times 2 \times 2 \text{ or } 2^3$<br>or<br>$(2^6 \times 2^4 \Rightarrow) 2^{6+4}$<br>or<br>$(2^6 \times 2^4 \Rightarrow) 2^{10}$<br>or<br>$2^9 (\times 2^4)$<br>or<br>$2^7 (\times 2^6)$<br>or<br>8192 |
|      |          |      | <b>Additional Guidance</b>                                                                                                                                                                                                                            |
|      |          |      | 8192 and $2^{13}$ on answer line, in either order                                                                                                                                                                                                     |
|      |          |      | B2                                                                                                                                                                                                                                                    |
|      |          |      | 8192 only on the answer line                                                                                                                                                                                                                          |
|      |          |      | B1                                                                                                                                                                                                                                                    |
|      |          |      | Correctly combined powers can be implied<br>eg $8 = 2^4$ with answer $2^{14}$ implies $2^6 \times 2^4 = 2^{10}$                                                                                                                                       |
|      |          |      | B1                                                                                                                                                                                                                                                    |
|      |          |      | Evaluations other than 8192 do not score<br>eg $8 \times 1024$ without seeing $8 \times 2^{10}$<br>eg $8 \times 64 \times 16$                                                                                                                         |
|      |          |      | B0<br>B0                                                                                                                                                                                                                                              |
|      |          |      | Do not award B1 for 8192 if it is in a list of powers of 2 unless it is indicated or it is the highest power evaluated                                                                                                                                |
|      |          |      | Changing terms to numbers with a base of 8 scores zero unless converted to a number with a base of 2                                                                                                                                                  |
|      |          |      |                                                                                                                                                                                                                                                       |

| Q | Answer                                                                                  | Mark | Comments                                                                                                                                    |
|---|-----------------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 7 | Valid criticism referring to one or both sets not being labelled                        | B1   | eg the circles should be labelled<br>or the labels are missing                                                                              |
|   | Valid criticism referring to the numbers not adding to 98                               | B1   | eg the numbers add to 99<br>or 48 should be 47<br>SC1 no written criticisms, but circles labelled correctly and 48 changed to 47 on diagram |
|   | <b>Additional Guidance</b>                                                              |      |                                                                                                                                             |
|   | Accept both statements written in one criticism                                         |      |                                                                                                                                             |
|   | For more than two criticisms mark the best two unless contradicted                      |      |                                                                                                                                             |
|   | Condone written corrections as criticisms eg Add labels                                 |      | B1                                                                                                                                          |
|   | Criticism 1 - There is no A label and Criticism 2 - There is no F label                 |      | B1B0                                                                                                                                        |
|   | Didn't label the diagram                                                                |      | B1                                                                                                                                          |
|   | There are no subjects                                                                   |      | B1                                                                                                                                          |
|   | The diagram doesn't have labels/headings/titles                                         |      | B1                                                                                                                                          |
|   | The diagram doesn't have a label/heading/title                                          |      | B0                                                                                                                                          |
|   | It doesn't show how many study French                                                   |      | B0                                                                                                                                          |
|   | 48 is wrong/one of the numbers is wrong                                                 |      | B1                                                                                                                                          |
|   | There's an extra student                                                                |      | B1                                                                                                                                          |
|   | It doesn't add up correctly/the total is wrong                                          |      | B1                                                                                                                                          |
|   | It doesn't add up                                                                       |      | B0                                                                                                                                          |
|   | The numbers are wrong                                                                   |      | B0                                                                                                                                          |
|   | Do not accept an incorrect statement<br>eg The number doing Art and French should be 47 |      | B0                                                                                                                                          |
|   | If a value is used as evidence it must be correct<br>eg the total is 100, not 98        |      | B0                                                                                                                                          |

| Q | Answer                                                                                               | Mark | Comments                                                                                                                                             |
|---|------------------------------------------------------------------------------------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8 | <b>Alternative method 1: using different time periods</b>                                            |      |                                                                                                                                                      |
|   | 450 ÷ 30 or 15<br>or<br>250 ÷ 10 or 25                                                               | M1   | oe for any section of the basic rate or the overtime rate<br>eg $\frac{450-150}{30-10}$                                                              |
|   | 15 and 25                                                                                            | A1   | implied by any ratio equivalent to 3 : 5<br>do not allow as a ratio in the wrong order<br>eg 25 : 15                                                 |
|   | 3 : 5 or $\frac{3}{5} : 1$ or $1 : \frac{5}{3}$                                                      | B1ft | oe fully simplified<br>ft full simplification of their two values                                                                                    |
|   | <b>Alternative method 2: using equal time periods</b>                                                |      |                                                                                                                                                      |
|   | Four correct readings from equal time periods of at least 5 hours from the two sections of the graph | M1   | eg<br>at 5 and 10 hours and at 35 and 40 hours<br>if a reading from 30 is used, there may only be 3 readings<br>a reading of 0 from 0 may be implied |
|   | 15 and 25<br>or<br>correct totals for their equal time periods                                       | A1   | eg 10 hours = 150 and 10 hours = 250<br>implied by any ratio equivalent to 3 : 5<br>must not be seen as a ratio in the wrong order eg 250 : 150      |
|   | 3 : 5 or $\frac{3}{5} : 1$ or $1 : \frac{5}{3}$                                                      | B1ft | oe fully simplified<br>ft full simplification of their two values                                                                                    |

**Additional Guidance for this question is on the next page**

| 8<br>cont | Additional Guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                          |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|           | In alt 2, only three readings are needed if a reading from 30 hours is included in both time periods or a reading of 0 is used<br>eg readings of 300 from 20, 450 from 30 and 700 from 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | M1                       |
|           | Readings from 10, 20, 30 and 40 should be 150, 300, 450 and 700<br>For readings from other numbers of hours not giving a multiple of £10 allow the multiple of 10 above or below the reading or any value between, which can then be used to score all three marks<br>eg allow [220, 230] for a reading at 15 hours<br>eg alt 1 readings of 70 at 5 hours, 380 at 25 hours, 450 at 30 hours and 700 at 40 hours, followed by hourly rates of 15.50 and 25 and an answer of 31 : 50<br>eg alt 2 readings of 370 at 25 hours, 450 at 30 hours, 580 at 35 hours and 700 at 40 hours, followed by totals of 80 and 120 or hourly rates of 16 and 24 and an answer of 2 : 3 | M1A1B1ft<br><br>M1A1B1ft |
|           | For $1\frac{2}{3}$ allow 1.67 or better with correct rounding                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                          |
|           | 450 : 250 = 45 : 25 does not get the mark for 25, but gets the final mark if simplified to 9 : 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                          |
|           | Ignore units throughout eg answer £3 : £5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | M1A1B1                   |
|           | 15 : 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | M1A1B0                   |
|           | 25 : 15 or 25 : 10 not simplified                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | M1A0B0                   |
|           | 25 : 15 with answer 5 : 3 or 25 : 10 with answer 5 : 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | M1A0B1ft                 |
|           | Answer 5 : 3 without working implies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | M1A0B1ft                 |
|           | 15 : 17.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | M1A0B0                   |
|           | 15 : 17.5 followed by 6 : 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | M1A0B1ft                 |
|           | 20 : 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | M1A0B0                   |
|           | 20 : 25 followed by 4 : 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | M1A0B1ft                 |
|           | 3 : 5 in working with answer 1.5 : 2.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | M1A1B0                   |
|           | 30 : 10 = 3 : 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | M0A0B1ft                 |

| Q    | Answer                                                                                             | Mark | Comments                                                                                |
|------|----------------------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------|
| 9(a) | Two fractions less than 1 with product $\frac{3}{10}$                                              | B1   | eg $\frac{3}{5}$ and $\frac{1}{2}$ or $\frac{6}{10}$ and $\frac{5}{10}$<br>either order |
|      | <b>Additional Guidance</b>                                                                         |      |                                                                                         |
|      | Accept negatives if each processed fraction is less than 1<br>eg $-\frac{3}{2}$ and $-\frac{1}{5}$ |      | B1                                                                                      |
|      | eg $-\frac{1}{2}$ and $\frac{3}{5}$                                                                |      | B1                                                                                      |
|      | eg $-\frac{3}{2}$ and $\frac{1}{5}$                                                                |      | B0                                                                                      |
|      | Do not accept decimals within the fractions eg $\frac{0.6}{1}$ and $\frac{0.5}{1}$                 |      | B0                                                                                      |
|      | $\frac{11}{10}$ and $\frac{3}{11}$                                                                 |      | B0                                                                                      |
|      | $\frac{3}{10}$ and $\frac{1}{1}$                                                                   |      | B0                                                                                      |
|      | 0.6 and 0.5                                                                                        |      | B0                                                                                      |

| Q    | Answer                                        | Mark | Comments                                                                            |
|------|-----------------------------------------------|------|-------------------------------------------------------------------------------------|
| 9(b) | Two decimals less than 1 with product 0.06    | B1   | eg 0.3 and 0.2 or 0.60 and 0.10<br>or 0.5 and 0.12 or 0.75 and 0.08<br>either order |
|      | <b>Additional Guidance</b>                    |      |                                                                                     |
|      | Accept negatives eg $-0.3$ and $-0.2$         |      | B1                                                                                  |
|      | Condone negative integers eg $-6$ and $-0.01$ |      | B1                                                                                  |
|      | 0.06 and 1                                    |      | B0                                                                                  |
|      | 6 and 0.01                                    |      | B0                                                                                  |
|      | $\frac{3}{10}$ and $\frac{2}{10}$             |      | B0                                                                                  |

| Q  | Answer                                                                                                                                                                              | Mark | Comments                                                                                                                                          |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 | <b>Alternative method 1</b>                                                                                                                                                         |      |                                                                                                                                                   |
|    | Pair of arcs, equal radii ( $\pm 2$ mm), centre $B$ , intersecting $AB$ and $BC$                                                                                                    | M1   | oe eg single arc, centre $B$ , intersecting $AB$ and $BC$<br>or<br>single arc, centre $B$ , radius $BC$ ( $\pm 2$ mm), intersecting $AB$          |
|    | Pair of intersecting arcs, equal radii ( $\pm 2$ mm), centres the intersections on $AB$ and $BC$<br>and<br>angle bisector drawn from $B$ at least to the intersection of their arcs | A1   | dashed line or condone solid line                                                                                                                 |
|    | Correct region $R$ shown as the area between $AB$ and a straight line from $B$ to within 2 mm of $AD$                                                                               | B1   | $R$ may be labelled or shaded<br>arcs not required for this mark only<br>SC1 angle bisector for a different angle correctly constructed with arcs |
|    | <b>Alternative method 2</b>                                                                                                                                                         |      |                                                                                                                                                   |
|    | Concentric arcs from $B$ , each intersecting $AB$ and $BC$                                                                                                                          | M1   | intersections with $AB$ and $BC$ must be seen, but full arcs are not necessary                                                                    |
|    | Two lines from the $AB$ intersection of one arc to the $BC$ intersection of the other arc<br>and<br>angle bisector drawn from $B$ at least to the intersection of their lines       | A1   | dashed line or condone solid line                                                                                                                 |
|    | Correct region $R$ shown as the area between $AB$ and a straight line from $B$ to within 2 mm of $AD$                                                                               | B1   | $R$ may be labelled or shaded<br>arcs not required for this mark only<br>SC1 angle bisector for a different angle correctly constructed with arcs |
|    | <b>Additional Guidance</b>                                                                                                                                                          |      |                                                                                                                                                   |
|    | Mark any correct construction, ignoring incorrect attempts                                                                                                                          |      |                                                                                                                                                   |
|    | Unless shaded incorrectly, ignore construction arcs or other lines in the region labelled                                                                                           |      |                                                                                                                                                   |
|    | Bisector drawn with no construction arcs, but region correctly identified                                                                                                           |      | M0A0B1                                                                                                                                            |

| Q  | Answer                                                                                                                             | Mark  | Comments                                                                                                                               |
|----|------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------|
| 11 | $20^2 (\times \pi)$ or $400 (\times \pi)$<br>or<br>$15^2 (\times \pi)$ or $225 (\times \pi)$                                       | M1    | oe                                                                                                                                     |
|    | $\frac{3}{4} \times 20^2 (\times \pi)$ or $300 (\times \pi)$<br>or<br>$\frac{1}{3} \times 15^2 (\times \pi)$ or $75 (\times \pi)$  | M1dep | oe                                                                                                                                     |
|    | $\frac{3}{4} \times 20^2 (\times \pi)$ or $300 (\times \pi)$<br>and<br>$\frac{1}{3} \times 15^2 (\times \pi)$ or $75 (\times \pi)$ | M1dep |                                                                                                                                        |
|    | $300 (\times \pi)$<br>and<br>$75 (\times \pi)$<br>and<br>4                                                                         | A1    | Accept $P = 4Q$ for 4<br>SC2<br>$40 (\times \pi)$ and $30 (\times \pi)$<br>and $30 (\times \pi)$ and $10 (\times \pi)$<br>and answer 3 |
|    | <b>Additional Guidance</b>                                                                                                         |       |                                                                                                                                        |
|    | Answer 4 with no working                                                                                                           |       | M0A0                                                                                                                                   |
|    | Condone inconsistent use of $\pi$ eg $300\pi$ and 75 and 4                                                                         |       | M3A1                                                                                                                                   |
|    | Condone, for example, $\pi 400$ for $400\pi$                                                                                       |       |                                                                                                                                        |
|    | Allow use of a numerical value for $\pi$ for method marks and for the A mark with answer 4                                         |       |                                                                                                                                        |
|    | Ignore units throughout                                                                                                            |       |                                                                                                                                        |

| Q            | Answer                                                                       | Mark | Comment                            |
|--------------|------------------------------------------------------------------------------|------|------------------------------------|
| <b>12(a)</b> | Yes $\frac{3}{5}$ and No $\frac{2}{5}$ for Bag A                             | B1   | oe fraction, decimal or percentage |
|              | Yes $\frac{1}{10}$ and No $\frac{9}{10}$ for both pairs of branches on Bag B | B1   | oe fraction, decimal or percentage |

| Q            | Answer                                                                                     | Mark  | Comment                                                                                                                |
|--------------|--------------------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------------------------|
| <b>12(b)</b> | their $\frac{3}{5} \times$ their $\frac{1}{10}$ or $\frac{3}{50}$                          | M1    | oe may be on tree diagram<br>ft their tree diagram if their $\frac{3}{5}$ and their $\frac{1}{10}$ are $> 0$ and $< 1$ |
|              | their $\frac{3}{5} \times$ their $\frac{1}{10} \times 450$<br>or $\frac{3}{50} \times 450$ | M1dep | oe<br>their $\frac{3}{50}$ must be $> 0$ and $< 1$                                                                     |
|              | 27                                                                                         | A1ft  | ft their tree diagram if their $\frac{3}{5}$ and their $\frac{1}{10}$ are $> 0$ and $< 1$                              |

**Additional Guidance for this question is on the next page**

| Additional Guidance |                                                                                                                                                                                                                                                                                 |                              |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|
|                     | For the first mark, accept the correct probability shown on the tree diagram and ignore other probabilities                                                                                                                                                                     |                              |
|                     | For the first mark, do not allow $\frac{3}{5} \times \frac{1}{10}$ seen as part of a longer multiplication string of probabilities<br>eg $\frac{3}{5} \times \frac{1}{10} \times \frac{9}{10}$                                                                                  | M0                           |
|                     | Check tree diagram for working                                                                                                                                                                                                                                                  |                              |
|                     | $\frac{27}{450}$ implies                                                                                                                                                                                                                                                        | M1M1A0                       |
|                     | Students with incorrect probabilities on the tree diagram can score marks for follow through in part (b) or from the correct probabilities recovered<br>eg probabilities of $\frac{3}{4}$ and $\frac{9}{10}$ on the top row of the tree diagram but an answer of 27 in part (b) | B0B0 in (a)<br>M1M1A1 in (b) |
|                     | Allow follow through from values rather than probabilities on the branches, with denominator 5 for Bag A and 10 for Bag B<br>eg from 2 on Bag A and 9 on Bag B allow $\frac{2}{5} \times \frac{9}{10} \times 450 = 162$                                                         | M1M1A1ft                     |
|                     | For A1ft allow a correct decimal answer or the answer truncated or rounded up to the nearest integer<br>eg from $\frac{3}{4}$ and $\frac{1}{10}$ leading to $\frac{3}{40} \times 450$ accept 33 or 33.75 or 34                                                                  | M1M1A1ft                     |

| Q  | Answer                                                                                                                                                                                                                                                                                                                                     | Mark | Comments                                                                                                                                                                                              |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 13 | $2w = \frac{4}{5} \times 15$ or $2w = \frac{60}{5}$<br>or $2w = 12$<br>or $\frac{2w}{15} = \frac{12}{15}$<br>or $\frac{w}{3} = \frac{2}{1}$ or $\frac{w}{2} = \frac{3}{1}$<br>or $\frac{w}{15} = \frac{4}{5} \div 2$ or $\frac{w}{15} = \frac{2}{5}$<br>or $2w \times 5 = 4 \times 15$ or $10w = 60$<br>or $\frac{4}{5} \div \frac{2}{15}$ | M1   | oe in the form $aw = n$ where $a$ is an integer and $n$ is an integer, fraction or decimal<br><br>oe in the form $\frac{bw}{x} = \frac{c}{x}$ where $x$ is a common denominator<br><br>oe calculation |
|    | 6                                                                                                                                                                                                                                                                                                                                          | A1   |                                                                                                                                                                                                       |
|    | <b>Additional Guidance</b>                                                                                                                                                                                                                                                                                                                 |      |                                                                                                                                                                                                       |
|    | Embedded answer 6 eg $\frac{2 \times 6}{15} = \frac{4}{5}$                                                                                                                                                                                                                                                                                 |      | M1A0                                                                                                                                                                                                  |

| Q  | Answer                                                  | Mark  | Comment                                                             |
|----|---------------------------------------------------------|-------|---------------------------------------------------------------------|
| 14 | $15 \times 8$ or 120<br>or<br>60 (workers) for 2 (days) | M1    | oe<br><br>correct number of workers for any number of days except 8 |
|    | $15 \times 8 \div 6$ or 20                              | M1dep | oe<br>eg $15 \times \frac{8}{6}$ or $15 \div \frac{6}{8}$           |
|    | 5                                                       | A1    | ignore units                                                        |
|    | <b>Additional Guidance</b>                              |       |                                                                     |
|    | Award M1 for correct working within multiple attempts   |       |                                                                     |

| Q  | Answer  | Mark | Comment |
|----|---------|------|---------|
| 15 | $n + 2$ | B1   |         |

| Q  | Answer | Mark | Comments                       |
|----|--------|------|--------------------------------|
| 16 | A      | B1   | accept letter or graph circled |

| Q  | Answer                                                                                                                                               | Mark   | Comment                                                                                                                       |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------|
| 17 | Any two correct readings of<br>13 at 50 (years)<br>30 at 60 (years)<br>66 at 70 (years)                                                              | B1     | may be seen on the graph<br>implied by a difference (frequency) of<br>17 for 50s<br>or 36 for 60s                             |
|    | Correct difference (frequency) for<br>any two readings<br>eg difference (frequency) of 14 for<br>readings of 7 at 45 (years) and 21<br>at 55 (years) | M1     | must be from two readings correct for<br>those ages<br>a difference (frequency) of<br>17 for 50s<br>or 36 for 60s scores B1M1 |
|    | 17 and 36 and Yes                                                                                                                                    | A1     | Yes can be implied eg $34 < 36$                                                                                               |
|    | <b>Additional Guidance</b>                                                                                                                           |        |                                                                                                                               |
|    | Readings of 3, 13 and 30 (from 40, 50 and 60) with differences<br>(frequencies) of 10 and 17                                                         | B1M1A0 |                                                                                                                               |
|    | Award the B1 mark for any two of the three possible correct readings,<br>even if multiple readings are taken from the graph                          |        |                                                                                                                               |
|    | Their readings and differences (frequencies) must be integers to gain<br>marks                                                                       |        |                                                                                                                               |
|    | For readings not giving an integer value allow the integer above or<br>below the reading<br>eg for a reading at 53 allow 17 or 18                    |        |                                                                                                                               |
|    | Readings of 11 or 12 at 49, 27 or 28 at 59 and 64 or 65 at 69, leading to<br>differences (frequencies) of 15, 16 or 17 and 36, 37 or 38              | B0M1A0 |                                                                                                                               |
|    | Differences (frequencies) other than 17 and 36 must come from<br>readings seen on the graph or linked to ages in working                             |        |                                                                                                                               |

| Q  | Answer                                                                                                                                                               | Mark | Comment                                            |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------------------------------|
| 18 | $2ax^3 + 2x^2 + 4x - 10$ and $bx^2 + cx$<br>or<br>$2ax^3 + (2 + b)x^2 + (4 + c)x - 10$<br>or<br>$2a = 12$ or $a = 6$                                                 | M1   | oe correct expansions<br><br>allow $2ax^3 = 12x^3$ |
|    | $2 + b = 7$ or $b = 5$<br>or<br>$4 + c = 3$ or $c = -1$                                                                                                              | M1   | oe equation                                        |
|    | $a = 6$ and $b = 5$ and $c = -1$                                                                                                                                     | A1   | SC2 any two of<br>$a = 6$ and $b = 5$ and $c = -1$ |
|    | <b>Additional Guidance</b>                                                                                                                                           |      |                                                    |
|    | One correct value without working only scores one mark<br>eg $a = 6$ and $b = -5$ and $c = 1$ with no working<br>eg $a = -6$ and $b = 5$ and $c = 1$ with no working |      | M1M0A0<br>M0M1A0                                   |
|    | Condone an incorrect $-10$ in the expansion if A1 is awarded                                                                                                         |      | M1M1A1                                             |

| Q     | Answer   | Mark | Comment |
|-------|----------|------|---------|
| 19(a) | $x^2y^3$ | B1   |         |

| Q     | Answer                         | Mark | Comment |
|-------|--------------------------------|------|---------|
| 19(b) | Could be either in top row     | B1   |         |
|       | Must be negative in bottom row | B1   |         |

| Q  | Answer                                                                                                                                                             | Mark  | Comment                    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------|
| 20 | <b>Alternative method 1</b>                                                                                                                                        |       |                            |
|    | $xy = 5x + 9$                                                                                                                                                      | M1    |                            |
|    | $xy - 5x = 9$<br>or $5x - xy = -9$                                                                                                                                 | M1dep | oe collection of terms     |
|    | $x(y - 5) = 9$<br>or<br>$x(5 - y) = -9$<br>or<br>$\frac{9}{y - 5}$ or $\frac{-9}{5 - y}$                                                                           | M1dep |                            |
|    | $x = \frac{9}{y - 5}$ or $x = \frac{-9}{5 - y}$                                                                                                                    | A1    |                            |
|    | <b>Alternative method 2</b>                                                                                                                                        |       |                            |
|    | $y = 5 + \frac{9}{x}$ or $y - \frac{9}{x} = 5$                                                                                                                     | M1    | allow $\frac{5x}{x}$ for 5 |
|    | $y - 5 = \frac{9}{x}$ or $5 - y = -\frac{9}{x}$                                                                                                                    | M1dep |                            |
|    | $\frac{1}{y - 5} = \frac{x}{9}$<br>or $x(y - 5) = 9$ or $x(5 - y) = -9$<br>or<br>$\frac{1}{5 - y} = -\frac{x}{9}$<br>or<br>$\frac{9}{y - 5}$ or $\frac{-9}{5 - y}$ | M1dep |                            |
|    | $x = \frac{9}{y - 5}$ or $x = \frac{-9}{5 - y}$                                                                                                                    | A1    |                            |

Additional Guidance for this question is on the next page

| 20<br>cont | Additional Guidance                                                |          |
|------------|--------------------------------------------------------------------|----------|
|            | $\frac{9}{y-5}$ on answer line with $x = \frac{9}{y-5}$ in working | M1M1M1A1 |
|            | Allow the equation with $x$ on the right, eg $\frac{9}{y-5} = x$   | M1M1M1A1 |
|            | Allow appropriate $\times$ or $\div$ signs throughout              |          |

| Q  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Mark  | Comment                                                                                                                                                                                                                                                                                                                                                              |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21 | $3\mathbf{a} + \mathbf{b} + \mathbf{a} + 6\mathbf{b}$ or $4\mathbf{a} + 7\mathbf{b}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | M1    | $\overrightarrow{EH}$<br>may be seen on diagram or as part of a longer vector sum                                                                                                                                                                                                                                                                                    |
|    | $2 \times \text{their } (4\mathbf{a} + 7\mathbf{b})$ or $8\mathbf{a} + 14\mathbf{b}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | M1dep | $\overrightarrow{FG}$<br>may be seen on diagram                                                                                                                                                                                                                                                                                                                      |
|    | Any correct path from $F$ to $E$<br>eg<br>their $(8\mathbf{a} + 14\mathbf{b}) + (-2\mathbf{a} - 15\mathbf{b})$<br>or<br>their $(8\mathbf{a} + 14\mathbf{b}) - (2\mathbf{a} + 15\mathbf{b})$<br>or<br>$(-2\mathbf{a} - 15\mathbf{b}) + (3\mathbf{a} + \mathbf{b}) + (\mathbf{a} + 6\mathbf{b})$<br>or $2\mathbf{a} - 8\mathbf{b}$<br>and<br>their $(8\mathbf{a} + 14\mathbf{b}) + \text{their } (2\mathbf{a} - 8\mathbf{b}) + (-\mathbf{a} - 6\mathbf{b}) + (-3\mathbf{a} - \mathbf{b})$<br>or their $(8\mathbf{a} + 14\mathbf{b}) + \text{their } (2\mathbf{a} - 8\mathbf{b}) + \text{their } (-4\mathbf{a} - 7\mathbf{b})$ | M1dep | $\overrightarrow{FG} + \overrightarrow{GE}$<br>$\overrightarrow{FG} - \overrightarrow{EG}$<br>oe $\overrightarrow{GE} + \overrightarrow{ED} + \overrightarrow{DH}$<br>oe $\overrightarrow{GH}$<br>oe $\overrightarrow{FG} + \overrightarrow{GH} + \overrightarrow{HD} + \overrightarrow{DE}$<br>oe $\overrightarrow{FG} + \overrightarrow{GH} + \overrightarrow{HE}$ |
|    | $6\mathbf{a} - \mathbf{b}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | A1    | SC3 $-6\mathbf{a} + \mathbf{b}$ or $\mathbf{b} - 6\mathbf{a}$                                                                                                                                                                                                                                                                                                        |
|    | <b>Additional Guidance</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |       |                                                                                                                                                                                                                                                                                                                                                                      |
|    | Missing brackets and incorrect addition or subtraction signs can be recovered for all four marks<br>eg $8\mathbf{a} + 14\mathbf{b} - 2\mathbf{a} + 15\mathbf{b}$ recovered to $6\mathbf{a} - \mathbf{b}$<br>Condone missing brackets for the third mark<br>eg $8\mathbf{a} + 14\mathbf{b} - 2\mathbf{a} + 15\mathbf{b}$ and answer $6\mathbf{a} + 29\mathbf{b}$                                                                                                                                                                                                                                                             |       | M1M1M1A1<br>M1M1M1A0                                                                                                                                                                                                                                                                                                                                                 |
|    | To receive marks expressions must be in terms of $\mathbf{a}$ and $\mathbf{b}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                                                                                                                                                                                                                                                                                                                                                      |
|    | Allow subtractions shown in vertical form<br>eg $8\mathbf{a} + 14\mathbf{b}$<br>$- 2\mathbf{a} + 15\mathbf{b}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       | M1M1M1                                                                                                                                                                                                                                                                                                                                                               |

| Q  | Answer                                      | Mark  | Comment                                                                                                 |
|----|---------------------------------------------|-------|---------------------------------------------------------------------------------------------------------|
| 22 | <b>Alternative method 1</b>                 |       |                                                                                                         |
|    | $0.2\dot{3}$ or $0.23\dots$                 | M1    | implied by $10x = 2.33\dots$                                                                            |
|    | $10x = 2.33\dots$<br>(and $x = 0.23\dots$ ) | M1dep | oe multiplication by a power of 10<br>any letter                                                        |
|    | $10x - x = 2.1$<br>or $9x = 2.1$            | M1dep | oe subtraction to eliminate recurring digits<br>eg $100x - 10x = 23.3\dots - 2.3\dots$<br>or $90x = 21$ |
|    | $\frac{21}{90}$                             | A1    | oe fraction<br>eg $\frac{231}{99}$                                                                      |
|    | $\frac{7}{30}$                              | A1ft  | ft full simplification of their $\frac{21}{90}$ with all M marks awarded                                |

This scheme continues on the next page

| Q                  | Answer                                                                                                          | Mark  | Comment                                                                                                                                                                 |
|--------------------|-----------------------------------------------------------------------------------------------------------------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>22<br/>cont</b> | <b>Alternative method 2</b>                                                                                     |       |                                                                                                                                                                         |
|                    | $10x = 6.88\dots$<br>(and $x = 0.68\dots$ )<br>or<br>$10y = 4.55\dots$<br>(and $y = 0.45\dots$ )                | M1    | oe multiplication by a power of 10<br>any letter                                                                                                                        |
|                    | $10x - x = 6.88\dots - 0.68\dots$<br>or $9x = 6.2$<br>and<br>$10y - y = 4.55\dots - 0.45\dots$<br>or $9y = 4.1$ | M1dep | oe subtractions to eliminate recurring digits<br>eg $100x - 10x = 68.8\dots - 6.8\dots$<br>or $90x = 62$<br>and<br>$100y - 10y = 45.5\dots - 4.5\dots$<br>or $90y = 41$ |
|                    | $\frac{62}{90}$ and $\frac{41}{90}$                                                                             | M1dep | oe fractions<br>the fractions do not need to have a common denominator                                                                                                  |
|                    | $\frac{21}{90}$                                                                                                 | A1    | oe fraction<br>eg $\frac{231}{99}$                                                                                                                                      |
|                    | $\frac{7}{30}$                                                                                                  | A1ft  | ft full simplification of their $\frac{21}{90}$ with all M marks awarded                                                                                                |

**This scheme continues on the next page**

| Q                  | Answer                        | Mark  | Comment                                                                  |
|--------------------|-------------------------------|-------|--------------------------------------------------------------------------|
| <b>22<br/>cont</b> | <b>Alternative method 3</b>   |       |                                                                          |
|                    | $0.2\dot{3}$ or $0.23\dots$   | M1    | implied by $(0.0\dot{3} =) \frac{3}{90}$ oe fraction                     |
|                    | $(0.0\dot{3} =) \frac{3}{90}$ | M1dep | oe fraction                                                              |
|                    | $\frac{2}{10} + \frac{3}{90}$ | M1dep | oe fractions                                                             |
|                    | $\frac{21}{90}$               | A1    | oe fraction<br>eg $\frac{231}{99}$                                       |
|                    | $\frac{7}{30}$                | A1ft  | ft full simplification of their $\frac{21}{90}$ with all M marks awarded |

This scheme continues on the next page

|            |                                                                                                                       |       |                                                                             |
|------------|-----------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------|
| 22<br>cont | <b>Alternative method 4</b>                                                                                           |       |                                                                             |
|            | $(0.\dot{0}\dot{8} =) \frac{8}{90}$<br>or<br>$(0.0\dot{5} =) \frac{5}{90}$                                            | M1    | oe fraction                                                                 |
|            | $(0.\dot{0}\dot{8} =) \frac{8}{90}$<br>and<br>$(0.0\dot{5} =) \frac{5}{90}$                                           | M1dep | oe fractions                                                                |
|            | $\frac{6}{10} + \frac{8}{90} - (\frac{4}{10} + \frac{5}{90})$                                                         | M1dep | oe<br>condone missing brackets                                              |
|            | $\frac{21}{90}$                                                                                                       | A1    | oe fraction<br>eg $\frac{231}{99}$                                          |
|            | $\frac{7}{30}$                                                                                                        | A1ft  | ft full simplification of their $\frac{21}{90}$ with all M<br>marks awarded |
|            | <b>Additional Guidance</b>                                                                                            |       |                                                                             |
|            | For the second mark in alt 1 and the first mark in alt 2, accept multiplication by a power of 10 seen without algebra |       |                                                                             |
|            | Accept fractions with non-recurring decimal numerator and/or denominator up to the first A1<br>eg $\frac{2.1}{9}$     |       | M1M1M1A1                                                                    |
|            | $\frac{7}{30}$ with no incorrect working                                                                              |       | M1M1M1A1A1                                                                  |
|            | If their incorrect fraction cannot be simplified the final mark cannot be awarded                                     |       |                                                                             |

| Q                                                                                                                        | Answer                                                                                                                                                 | Mark | Comment                                                                                                                                                                                                                                                                              |  |
|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 23                                                                                                                       | Correct dashed lines for $x = 3$ and $y = 1$<br>and<br>correct solid line for $x + y = 7$<br>and<br>correct region identified                          | B3   | B2<br>correct dashed lines for $x = 3$ and $y = 1$<br>and correct solid line for $x + y = 7$<br>and no or incorrect region identified<br>or<br>correct lines for $x = 3$ and $y = 1$ and $x + y = 7$ with any or all of the lines of the wrong type<br>and correct region identified |  |
|                                                                                                                          |                                                                                                                                                        |      | B1<br>correct lines for $x = 3$ and $y = 1$ and $x + y = 7$ with any or all of the lines of the wrong type<br>and no or incorrect region identified<br>or<br>any correct line of the correct type                                                                                    |  |
|                                                                                                                          |                                                                                                                                                        |      | Additional Guidance                                                                                                                                                                                                                                                                  |  |
|                                                                                                                          |                                                                                                                                                        |      | Mark intention to draw correct lines                                                                                                                                                                                                                                                 |  |
|                                                                                                                          |                                                                                                                                                        |      | The region can be identified by being labelled R or being shaded or being left unshaded with all external regions shaded                                                                                                                                                             |  |
|                                                                                                                          | $x = 3$ must go from (3, 1) to at least (3, 4)<br>$y = 1$ must go from (3, 1) to at least (6, 1)<br>$x + y = 7$ must go at least from (3, 4) to (6, 1) |      |                                                                                                                                                                                                                                                                                      |  |
| For B2 or B1 ignore other lines on the grid<br>For B3 ignore other lines on the grid if the correct region is identified |                                                                                                                                                        |      |                                                                                                                                                                                                                                                                                      |  |

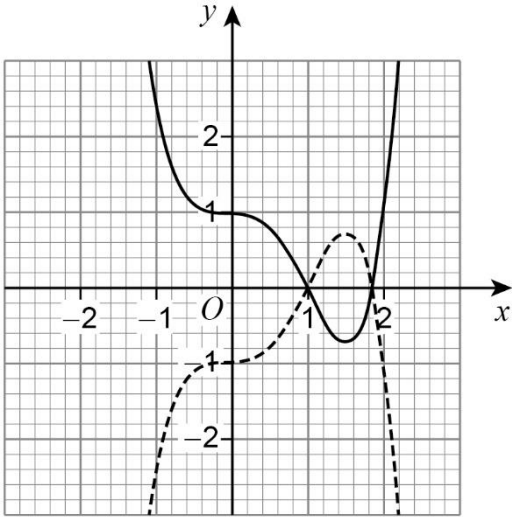
| Q     | Answer                                                                                                                                                                                                      | Mark | Comment                                                                                   |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------|
| 24(a) | $\left(\frac{6}{a} = \right) \frac{24}{4a}$<br>or<br>converts both fractions to a common denominator<br>or<br>correct unsimplified fraction<br>eg $\frac{26}{8a}$ or $\frac{13a}{4a^2}$ or $\frac{3.25}{a}$ | M1   | oe eg $\frac{48}{8a}$ and $\frac{22}{8a}$<br>or $\frac{24a}{4a^2}$ and $\frac{11a}{4a^2}$ |
|       | $\frac{13}{4a}$                                                                                                                                                                                             | A1   |                                                                                           |
|       | <b>Additional Guidance</b>                                                                                                                                                                                  |      |                                                                                           |
|       | Do not ignore further work eg $\frac{13}{4a}$ followed by answer $\frac{3.25}{a}$                                                                                                                           |      | M1A0                                                                                      |
|       | Allow a division sign rather than a fraction line for M1 only<br>eg $26 \div 8a$<br>eg $13 \div 4a$                                                                                                         |      | M1A0<br>M1A0                                                                              |

| Q     | Answer                                                                                                                                                                       | Mark | Comment                                                                              |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------------------------------------------------------------------------------------|
| 24(b) | $y(y - 3)$                                                                                                                                                                   | M1   |                                                                                      |
|       | $(y + 7)(y + 3)$                                                                                                                                                             | M1   |                                                                                      |
|       | $(y + 3)(y - 3)$                                                                                                                                                             | M1   |                                                                                      |
|       | $y(y + 7)$ or $y^2 + 7y$                                                                                                                                                     | A1   | SC1<br>$y^4 - 3y^3 + 10y^3 - 30y^2 + 21y^2 - 63y$<br>or<br>$y^4 + 7y^3 - 9y^2 - 63y$ |
|       | <b>Additional Guidance</b>                                                                                                                                                   |      |                                                                                      |
|       | $y(y + 7)$ or $y^2 + 7y$ with no other working                                                                                                                               |      | M1M1M1A1                                                                             |
|       | Answer $\frac{y(y+7)}{1}$ or $\frac{y^2+7y}{1}$                                                                                                                              |      | M1M1M1A0                                                                             |
|       | Ignore the consistent use of a different variable within a factorisation                                                                                                     |      |                                                                                      |
|       | Award SC1 only if there are no correct factorisations<br>eg correct factorisation to $(y + 7)(y + 3)$ and correct expansion to<br>$y^4 - 3y^3 + 10y^3 - 30y^2 + 21y^2 - 63y$ |      | M1 only                                                                              |

| Q     | Answer | Mark | Comment |
|-------|--------|------|---------|
| 25(a) | 0      | B1   |         |

| Q     | Answer                                   | Mark | Comment                                                                                                                                                                                                                                                                  |
|-------|------------------------------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 25(b) | $\frac{1}{2} \times (50 + 30) \times 20$ | M1   | oe complete method to work out the area of the trapezium<br>eg<br>$\frac{1}{2} \times 10 \times 20 + 20 \times 30 + \frac{1}{2} \times 10 \times 20$<br>or<br>$50 \times 20 - \frac{1}{2} \times 10 \times 20 - \frac{1}{2} \times 10 \times 20$<br>or<br>$40 \times 20$ |
|       | 800                                      | A1   |                                                                                                                                                                                                                                                                          |
|       | <b>Additional Guidance</b>               |      |                                                                                                                                                                                                                                                                          |
|       |                                          |      |                                                                                                                                                                                                                                                                          |

| Q  | Answer                                                                                                                                                                                                                                                                     | Mark  | Comment                                                                                              |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------------------------------------------------------------------|
| 26 | $(P(3) =) \frac{1}{6}$<br>or<br>$(P(1, 2) =) \text{ or } (P(2, 1) =)$<br>$\frac{1}{6} \times \frac{1}{6} \text{ or } \frac{1}{36}$                                                                                                                                         | M1    | oe 3 on first roll<br>or<br>1 on first roll and 2 on second<br>or<br>2 on first roll and 1 on second |
|    | $\frac{1}{6} \text{ and } \frac{1}{6} \times \frac{1}{6}$<br>or $\frac{1}{6} \text{ and } \frac{1}{36}$<br>or<br>$\frac{1}{6} \times \frac{1}{6} \times 2$<br>or $\frac{1}{36} \times 2$<br>or $\frac{2}{6} \times \frac{1}{6} \text{ or } \frac{2}{36}$                   | M1dep | oe                                                                                                   |
|    | $\frac{1}{6} + \frac{1}{6} \times \frac{1}{6} \times 2 \text{ or } \frac{1}{6} + \frac{2}{36}$                                                                                                                                                                             | M1dep | oe                                                                                                   |
|    | $\frac{2}{9} \text{ or } \frac{8}{36} \text{ or } \frac{4}{18}$                                                                                                                                                                                                            | A1    | oe fraction, decimal or percentage                                                                   |
|    | <b>Additional Guidance</b>                                                                                                                                                                                                                                                 |       |                                                                                                      |
|    | For the first and second marks, do not allow $\frac{1}{6}$ seen only as part of a multiplication string, but do allow it seen only in an addition                                                                                                                          |       |                                                                                                      |
|    | For the first and second marks, do not allow $\frac{1}{6} \times \frac{1}{6} (\times 2)$ or $\frac{2}{6} \times \frac{1}{6}$ seen only as part of a longer multiplication string or in $1 - (\frac{1}{6} \times \frac{1}{6})$ , but do allow them seen only in an addition |       |                                                                                                      |
|    | Allow working in decimals rounded correctly to at least 2 dp for M marks, but answer must be given correctly as $0.\dot{2}$ or $22.\dot{2}\%$                                                                                                                              |       |                                                                                                      |
|    | Ignore an incorrect simplification or conversion of a correct value                                                                                                                                                                                                        |       | M1M1M1A1                                                                                             |

| Q  | Answer                                                                                                                                                                           | Mark | Comment        |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------|
| 27 | Reflection of given graph in the $x$ -axis                                                                                                                                       | M1   | mark intention |
|    | Correct shape of graph<br>from $([-1.5, -1], -3)$<br>through $(0, -1)$<br>through $(1, 0)$<br>maximum at $([1.4, 1.6], [0.6, 0.8])$<br>through $(1.8, 0)$<br>to $([2, 2.5], -3)$ | A1   |                |
|    | <b>Additional Guidance</b>                                                                                                                                                       |      |                |
|    |                                                                                                |      | M1A1           |
|    | Feathering or double lines or a split line, but intention to reflect in the $x$ -axis                                                                                            |      | M1A0           |

| Q  | Answer                                                                                                                                                                                                                                                                   | Mark  | Comment                                                                                                                                    |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------|
| 28 | $(\cos 30 =) \frac{\sqrt{3}}{2}$<br>or $(\sin 45 =) \frac{\sqrt{2}}{2}$ or $\frac{1}{\sqrt{2}}$<br>or $(\tan 60 =) \sqrt{3}$                                                                                                                                             | M1    | oe correct trig function may be implied by position in multiplication string<br>may be seen in a table                                     |
|    | $\left(\frac{\sqrt{3}}{2} \times \frac{\sqrt{2}}{2} \times \sqrt{3}\right)^2$<br>or<br>$\left(\frac{\sqrt{3}}{2}\right)^2 \times \left(\frac{\sqrt{2}}{2}\right)^2 \times (\sqrt{3})^2$<br>or<br>$\frac{3\sqrt{2}}{4}$ or $\frac{3}{2\sqrt{2}}$ or $\frac{\sqrt{18}}{4}$ | M1dep | oe with all values correct<br><br>oe single term not squared                                                                               |
|    | $\left(\frac{3\sqrt{2}}{4}\right)^2$ or $\left(\frac{3}{2\sqrt{2}}\right)^2$ or $\left(\frac{\sqrt{18}}{4}\right)^2$<br>or<br>$\frac{3}{4} \times \frac{1}{2} \times 3$<br>or<br>$\frac{\sqrt{324}}{16}$                                                                 | M1dep | oe with all values correct<br>oe single term squared<br><br>oe multiplication string without surds<br><br>oe single fraction with one surd |
|    | $\frac{9}{8}$ or $1\frac{1}{8}$ or 1.125                                                                                                                                                                                                                                 | A1    | oe fraction, mixed number or decimal                                                                                                       |
|    | <b>Additional Guidance</b>                                                                                                                                                                                                                                               |       |                                                                                                                                            |
|    | Ignore an incorrect attempt to simplify or convert a correct answer<br>eg $\frac{9}{8} = 1.8$                                                                                                                                                                            |       | M1M1M1A1                                                                                                                                   |