General Marking Instructions

1. In general, a correct answer merits all the marks allocated to that part, unless a particular method has been specified in the question.

2. In the marking scheme, marks are classified into the following three categories:
   - ‘M’ marks awarded for correct methods being used;
   - ‘A’ marks awarded for the accuracy of the answers;
   - Marks without ‘M’ or ‘A’ awarded for correctly completing a proof or arriving at an answer given in a question.

   In a question consisting of several parts each depending on the previous parts, ‘M’ marks should be awarded to steps or methods correctly deduced from previous answers, even if these answers are erroneous. However, ‘A’ marks for the corresponding answers should NOT be awarded (unless otherwise specified).

3. Marks may be deducted for wrong units (u) or poor presentation (pp).
   a. The symbol \( u - 1 \) should be used to denote 1 mark deducted for \( u \). At most deduct 1 mark for \( u \) for the whole paper.
   b. The symbol \( pp - 1 \) should be used to denote 1 mark deducted for \( pp \). At most deduct 3 marks for \( pp \) for the whole paper. For similar \( pp \), deduct 1 mark for the first time that it occurs. Do not penalize candidates twice in the paper for the same \( pp \).
   c. At most deduct 1 mark in each question. Deduct the mark for \( u \) first if both marks for \( u \) and \( pp \) may be deducted in the same question.
   d. In any case, do not deduct any marks for \( pp \) or \( u \) in those steps where candidates could not score any marks.

4. All fractional answers must be simplified.
SECTION A      Short questions. (80 marks)
Answer ALL questions in this section and write your answers in the spaces provided.

1.   (a) Put the correct symbol ‘<’ or ‘>’ between the two given numbers. (Steps are not required for this question.)

   (i)   \(-\frac{1}{2}, -\frac{1}{4}\)            (1 mark)

   (ii)  \(-5\frac{1}{4}, -5\frac{3}{7}\)       (1 mark)

   (iii) \((-2)^2, (-2)^3\)                  (1 mark)

   (b) Arrange \(-\frac{1}{2}, -5\frac{1}{4}, (-2)^2, \frac{1}{4}, -5\frac{3}{7}, (-2)^3\) in descending order.    (2 marks)

   (5 marks)

   (a)  (i) \(-\frac{1}{2} < -\frac{1}{4}\)            1A

        (ii) \(-5\frac{1}{4} > -5\frac{3}{7}\)          1A

        (iii) \((-2)^2 > (-2)^3\)                  1A

   (b)  \((-2)^2, -\frac{1}{4}, -\frac{1}{2}, -5\frac{1}{4}, -5\frac{3}{7}, (-2)^3\)  2A for all correct 1A for ascending order

2.   It is given that \(y\) is a function of \(x\), and \(y = 3(4 - 2x)\). Find the value of \(y\) when \(x\) is

   (a)  7,                                                      (3 marks)

   (b)  -5.                                                    (3 marks)

   (6 marks)

   (a)  \(y = 3(4 - 2 \times 7)\)  1A for correct substitution

        \(= 3(4 - 14)\)  1M for \((4 - 14)\)

        \(= -30\)  1A

   (b)  \(y = 3[4 - 2 \times (-5)]\)  1A for correct substitution

        \(= 3(4 + 10)\)  1M for \((4 + 10)\)

        \(= 42\)  1A
3. In the formula $T = a + (n - 1)d$,
   (a) Find $T$ if $a = -8$, $n = 6$, $d = 3$.
   (3 marks)
   (b) Find $n$ if $T = -27$, $a = -5$, $d = -2$.
   (4 marks)
   (7 marks)

(a) $T = a + (n - 1)d$
\[
T = -8 + (6 - 1)3
= -8 + 15
= 7
\]
   1A for correct substitution

(b) $T = a + (n - 1)d$
\[
-27 = -5 + (n - 1)(-2)
-22 = (n - 1)(-2) \quad \text{Or} \quad -27 = -5 - 2n + 2
11 = n - 1
-27 = -2n - 3
n = 12
n = 12
\]
   1M for ‘+15’

4. Solve $\frac{9}{2} - \frac{1}{6} (3x - 1) = -\frac{2}{3} (3x + 2)$
   (7 marks)

(a) $\frac{9}{2} - \frac{1}{6} (3x - 1) = -\frac{2}{3} (3x + 2)$
\[
6 \times \frac{9}{2} - 6 \times \frac{1}{6} (3x - 1) = \frac{2}{3} \times 6 (3x + 2)
6 \times \frac{9}{2} - 6 \times \frac{1}{6} (3x - 1) = -4 (3x + 2)
27 - (3x - 1) = -12 x - 8
27 - 3x + 1 = -12 x - 8
9x = -36
x = -4
\]
   1M for ‘multiply’ 6/12/18… to L.H.S.
   1M for ‘multiply’ 6/12/18… to R.H.S.
   1A for ‘27 – 3x + 1’
   1A for ‘9x’ or ‘–36’
5. (a) Evaluate \( \frac{1}{6}(-3 - 12) + \frac{7}{2} - \frac{2}{3}(-3 + 21) \)  

(b) Evaluate \( \left(-1 - \frac{4}{7}\right) \div \left(\frac{13}{21} - 3\right) \)
6. Peter wanted to store some cans of soft drinks in a box. It was known that 2 layers of cans could be stacked up in the box and each layer contained $3 \times 4$ cans. The height and the diameter of each can had been measured to be 12.5 cm and 7 cm respectively. Estimate the smallest possible volume of the box correct to the nearest 1 000 cm$^3$.

(8 marks)

<table>
<thead>
<tr>
<th>smallest possible volume</th>
<th>$= (3 \times 7) \times (4 \times 7) \times (2 \times 12.5)$</th>
<th>3M</th>
<th>1M for each bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$= 21 \times 28 \times 25$</td>
<td>3A</td>
<td>1A for each measurement</td>
</tr>
<tr>
<td></td>
<td>$= 14700 \text{ cm}^3$</td>
<td>1A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\approx 15000 \text{ cm}^3$</td>
<td>1A</td>
<td></td>
</tr>
</tbody>
</table>

$\approx 15000 \text{ cm}^3$  
$\pm 1 \text{ pp}$ For replacing ‘$\approx$’ with ‘$\approx$’

7. Joe wants to swim in a club which is open for members only. The membership fee is $50 and the price of an admission ticket for each session is $x$.

(a) If the total amount he has to pay for the membership fee and 8 admission tickets is not more than $250,

(i) write an inequality in $x$ to express this. (2 marks)

(ii) write down all integers from 22 to 30 that can satisfy the inequality in part (i). (2 marks)

(b) If Joe pays exactly $242 for the membership fee and 8 admission tickets, find $x$. (4 marks)

(8 marks)

<table>
<thead>
<tr>
<th>(a) (i)</th>
<th>$50 + 8x \leq 250$</th>
<th>1A</th>
<th>for ‘L.H.S.’</th>
</tr>
</thead>
<tbody>
<tr>
<td>or</td>
<td>$8x \leq 200$</td>
<td>1A</td>
<td>for ‘$\leq$ R.H.S.’</td>
</tr>
<tr>
<td>or</td>
<td>$x \leq 25$</td>
<td>1A</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>22, 23, 24, 25</td>
<td>2A</td>
<td>1A for 2–3 correct answers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2A for all answers correct.</td>
</tr>
<tr>
<td>(b)</td>
<td>$50 + 8x = 242$</td>
<td>1A</td>
<td>for ‘$50 + 8x$’</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1A</td>
<td>for ‘$\approx 242$’</td>
</tr>
<tr>
<td></td>
<td>$8x = 192$</td>
<td>1M</td>
<td>for ‘$192$’</td>
</tr>
<tr>
<td></td>
<td>$x = 24$</td>
<td>1A</td>
<td></td>
</tr>
</tbody>
</table>
8. The marked price of a camera in a shop was $500.
   (a) If the shop can sell the camera, the owner would have a profit per cent of 25%. Find the cost of the camera. (3 marks)

   \[
   \text{cost} = \frac{\$500}{1 + 25\%} = \frac{\$500}{1.25} = \$400
   \]

   (b) Many customers think the camera is expensive and ask for a discount. The shop finally sells it at a discount of 40% of the marked price. Find
   (i) the selling price of the camera. (3 marks)
   (ii) the loss per cent. (4 marks)

   (10 marks)

<table>
<thead>
<tr>
<th>(a)</th>
<th>cost = $500 ( \frac{1}{1 + 25%} )</th>
<th>1A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( = \frac{$500}{1.25} )</td>
<td>1M</td>
</tr>
<tr>
<td></td>
<td>( = $400 )</td>
<td>1A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(b) (i)</th>
<th>selling price = $500 ( \times 1 - 40% )</th>
<th>1A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( = $500 \times 0.6 )</td>
<td>1M</td>
</tr>
<tr>
<td></td>
<td>( = $300 )</td>
<td>1A</td>
</tr>
</tbody>
</table>

(ii) Loss per cent = \( 100\% \times \frac{400 - 300}{400} \) for writing (a) – (b) as numerator / loss for writing (a) as denominator / cost

| (ii) Loss per cent = $100\% \times \frac{400 - 300}{400} | 1M |
| --------|-----------------------------------------------------|----|
|         | \( = \frac{100 \times 100}{400} \)                 | 1M |
|         | \( = 25\% \)                                        | 1A |
9. Consider the sequence: \( \frac{1}{5}, \frac{1}{10}, \frac{1}{15}, \frac{1}{20} \)............

(a) Write down the next 2 terms of the sequence.  

(b) (i) Use an algebraic expression to represent the general term \( a_n \) of the sequence. Give reasons to support your answer.

(ii) Use the result of (b)(i) to find \( a_{30} \), the 30\(^{\text{th}}\) term of the sequence.

(iii) If the \( n \)th term of this sequence is 0.025, find the value of \( n \).  

<table>
<thead>
<tr>
<th>(a)</th>
<th>the next 2 terms are ( \frac{1}{25}, \frac{1}{30} ).</th>
<th>2A</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) (i)</td>
<td>( a_1 / 1^{\text{st}} ) term ( \frac{1}{5} = \frac{1}{5(1)} )</td>
<td>1M</td>
</tr>
<tr>
<td></td>
<td>( a_2 / 2^{\text{nd}} ) term ( \frac{1}{10} = \frac{1}{5(2)} )</td>
<td>For writing ( \frac{1}{5} = \frac{1}{5(1)} ) &amp; ( \frac{1}{10} = \frac{1}{5(2)} )</td>
</tr>
<tr>
<td></td>
<td>( a_3 / 3^{\text{rd}} ) term ( \frac{1}{15} = \frac{1}{5(3)} )</td>
<td>1M</td>
</tr>
<tr>
<td></td>
<td>( a_4 / 4^{\text{th}} ) term ( \frac{1}{20} = \frac{1}{5(4)} )</td>
<td>For writing ( \frac{1}{15} = \frac{1}{5(3)} ) &amp; ( \frac{1}{20} = \frac{1}{5(4)} )</td>
</tr>
<tr>
<td></td>
<td>( \therefore a_n = \frac{1}{5n} ).</td>
<td>1A</td>
</tr>
</tbody>
</table>

(ii) the 30\(^{\text{th}}\) term \( \frac{1}{5(30)} \) | 1M |
| | \( = \frac{1}{150} \) | For substitution. |

(iii) \( \frac{1}{5n} = 0.025 \) | 1A |
| | \( \frac{1}{5} = \frac{25}{1000} \) | |
| | \( \frac{1}{5} \times 40 = n \) | 1M |
| | \( n = 8 \) | For transposing factors correctly. |
10. (a) Follow each of the instructions below to find an estimated value of the expression: 362 + 237 + 184 + 209

(i) Round off each number correct to the nearest ten. (3 marks)

(ii) Round up each number correct to the nearest ten. (3 marks)

(iii) Round down each number correct to the nearest ten. (3 marks)

(b) In a shop, Ann wanted to buy 4 bottles of wine of prices $362, $237, $184 and $209 respectively. If she only had $1000 in her wallet, she should use which method in (a) to estimate whether she had enough money to pay for the 4 bottles of wine, why? (2 marks)

(11 marks)

(a) (i) \[362 + 237 + 184 + 209 \approx 360 + 240 + 180 + 210 \]

\[= 990 \]

1M 1A for rounding off to any place.

(ii) \[362 + 237 + 184 + 209 \approx 370 + 240 + 190 + 210 \]

\[= 1010 \]

1M 1A for rounding up to any place.

(iii) \[362 + 237 + 184 + 209 \approx 360 + 230 + 180 + 200 \]

\[= 970 \]

1M 1A for rounding down to any place.

(b) She should use method (ii): rounding up to estimate, because the other 2 methods may give estimates smaller than the exact value.

1M
11. In 2000, Joe was 53 years old and Tom was 23 years old.

(a) What percentage of Tom’s age was Joe’s age in 2007?  
\[ \text{Percentage required} = 100\% \times \frac{53 + 7}{23 + 7} \]
\[ = 100\% \times \frac{60}{30} \]
\[ = 200\% \]

(b) If \( x \) years before 2000, Joe’s age was 3 times that of Tom’s age. Find \( x \).

\[ 53 - x = 3 (23 - x) \]
\[ 53 - x = 69 - 3x \]
\[ 3x - x = 69 - 53 \]
\[ 2x = 16 \]
\[ x = 8 \]

(c) How many years after 2000, will Joe’s age be 13 years less than twice Tom’s age?

Let \( y \) years after 2000, Joe’s age will be 13 years less than twice Tom’s age.

\[ (53 + y) + 13 = 2(23 + y) \]
\[ 53 + y + 13 = 46 + 2y \]
\[ 53 + 13 - 46 = 2y - y \]
\[ y = 20 \]
12. Mr. Li is a hawker. He borrowed $8 000 from his friend at 15% p.a. simple interest. He used all the money to buy 200 glasses from a factory. He marked the price at $60 each but could only sell 150 glasses. He then sold the rest of the glasses to a restaurant at a discount of 40% of his marked price. 10 months after the day he borrowed the money, he returned the principal together with the interest to his friend. Find

(a) the total selling price of the first 150 glasses. (3 marks)
(b) the total selling price of the rest of the glasses. (5 marks)
(c) the amount he should return to his friend. (6 marks)
(d) the overall profit percent made by Mr. Li, if he included the interest he paid as part of the cost in buying the 200 glasses. (6 marks)

(a) selling price of the first 150 glasses

\[ \text{selling price of the first } 150 \text{ glasses} = 60 \times 150 = 9000 \]

(b) selling price of the rest of the glasses

\[ \text{selling price of the rest of the glasses} = 60(1-0.40 \times (200-150)) = 60 \times 0.6 \times 50 = 36 \times 50 = 1800 \]

(c) the amount he returned

\[ \text{the amount he returned} = 8000(1 + 15\% \times \frac{10}{12}) = 8000(1.125) = 9000 \]

(d) the overall profit percent

\[ \text{the overall profit percent} = 100\% \times \frac{9000 + 1800 - 9000}{9000} = 100\% \times \frac{1800}{9000} = 20\% \]