1. Write your class, class number in the spaces provided on this cover.
2. This paper consists of TWO sections, A and B. Section A carries 80 marks. Section B carries 40 marks.
3. Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book.
4. Unless otherwise specified, numerical answers should either be exact or correct to 3 significant figures.
5. All the working steps should be shown clearly.
6. The diagrams in this paper are not necessarily drawn to scale.
7. Total marks in this paper is 120.

<table>
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<tr>
<th>Question No.</th>
<th>Max. marks</th>
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1. State all possible number of significant figures in each of the following (6 marks)

(a) 7.011
(b) 0.0040
(c) 40100
(d) 15.2

4 sig. fig.
2 sig. fig.
3 sig. fig., 4 sig. fig. and 5 sig. fig.
3 sig. fig.

2. A teacher has bought 200 books of the same kind through the On-line bookshop. If the weight of each book is 0.8 kg correct to the nearest 0.1 kg and the shipping cost is $30 per kg.

(a) find the maximum error of the weight of a book. (2 marks)

(b) find the maximum and minimum weight of all the books. (4 marks)

(c) If the price of a book is $150, what is the maximum amount that needs to pay for each book upon delivery? (4 marks)

(a) Maximum error = \( \frac{0.1}{2} \times 0.8 \) kg = 0.04 kg

(b) The maximum weight of all the books
\[ 200 \times (0.8 + 0.1) = 170 \text{ kg} \]

The minimum weight of all the books
\[ 200 \times (0.8 - 0.1) = 150 \text{ kg} \]

(c) The maximum amount that needs to pay for each book upon delivery:
\[ $150 + (170 \times $30) = $17.5 \times 200 \]
3. (a) Simplify the polynomial \( \frac{5}{x} (2x^3 - 7x + 4x^4) - \frac{3}{x^2} (x^3 - 3x^2 - 2x^4) \) and arrange the terms in descending powers of the variable \( x \). (5 marks)

\[
\begin{align*}
\text{(a)} & \quad \frac{5}{x} (2x^3 - 7x + 4x^4) - \frac{3}{x^2} (x^3 - 3x^2 - 2x^4) \\
& = \frac{5}{x} \cdot 2x^3 + \frac{5}{x} \cdot 4x^4 - \frac{3}{x^2} \cdot x^3 + \frac{3}{x^2} \cdot 3x^2 + \frac{3}{x^2} \cdot 2x^4 \\
& = \left( 10x^4 + 20x^7 \right) - \left( 3x^5 - 9x^2 - 6x^2 \right) \\
& = 10x^4 - 3x^5 + 2x^7 + 9x^2 + 6x^2 \\
& = 12x^7 + 2x^5 + 10x^4 - 26 \\
\end{align*}
\]

(b) Find the quotient and remainder of \( (-5x - 15 + 16x^3) \div (4x-3) \). (7 marks)

\[
\begin{align*}
\begin{array}{c|cccc}
\text{Quotient} & 4x^2 + 3x + 1 \\
\text{Remainder} & -12 \\
\end{array}
\end{align*}
\]

\[
\begin{align*}
\text{Quotient} & = 4x^2 + 3x + 1 \\
\text{Remainder} & = -12.
\end{align*}
\]
4. (a) Prove: \((3x-4)^2 = 3(3x-2)(x-2)+4\) (8 marks)

(b) Hence, find the values of A, B and C of the following identity
\[ A(3x-2)(x+B-C) + C-2 = (3x-4)^2 \] (6 marks)

\[(a) \quad L.H.S = (3x-4)^2 = (3x)^2 - 2(3x)(4) + (4)^2 \]
\[= 9x^2 - 24x + 16 \]

R.H.S. = \[2(3x-2)(x-2) + 4 \]
\[= 2(3x^2 - 6x + 4) + 4 \]
\[= 6x^2 - 12x + 8 + 4 \]
\[= 6x^2 - 12x + 12 \]

\[L.H.S = R.H.S \]

By (a)

\[(b) \quad A(3x-2)(x+B-C) + C-2 = 3(3x-2)(x-2)+4 \]

By comparing the coefficients,

\[ A = 3 \]
\[ B-C = -2 \quad (1) \]
\[ C-2 = 4 \quad (2) \]

From (2) \(C = 6\)

Substitute \(C = 6 \) into (1)

\[B-6 = -2 \]
\[ B = 4 \]

The values are \(A = 3\), \(B = 4\) and \(C = 6\).
5. Factorize:
(a) \( ac + 2ab - 2bc - 4b^2 \) (4 marks)
(b) \( (b - 2a)^2 - (a + b)^2 \) (5 marks)
(c) Simplify \( \frac{(b - 2a)^2 - (a + b)^2}{ac + 2ab - 2bc - 4b^2} \) (2 marks)

\[(a) \quad ac + 2ab - 2bc - 4b^2 = a(c + 2b) - 2b(c + 2b) = (c + 2b)(a - 2b)\]

\[(b) \quad (b - 2a)^2 - (a + b)^2 = (b - 2a + a + b)(b - 2a - a - b) = (2b - a)(-3a) = 3a(a - 2b)\]

\[(c) \quad \frac{(b - 2a)^2 - (a + b)^2}{ac + 2ab - 2bc - 4b^2} = \frac{3a(a - 2b)}{(c + 2b)(a - 2b)} = \frac{3a}{c + 2b}\]
6. It is given that the formula is \( \frac{d + cx - x}{x - b} = a \).

(a) Make \( x \) the subject of the formula. (5 marks)

(b) If \( a = -4, b = 3, c = 7 \) and \( d = 2 \), find the value of \( x \). (5 marks)

\[
\begin{align*}
(a) & \quad \frac{d + (x - x)}{x - b} = a \\
& \quad d + c - x = a(x - b) \\
& \quad d + cx - x = ax - ab \\
& \quad d + ab = ax - cx + x \\
& \quad d + ab = \chi (a - c + 1) \\
& \quad x = \frac{d + ab}{a - c + 1} \\
(b) & \quad x = \frac{2 + (-4)(3)}{-4 - 7 + 1} \\
& \quad = \frac{2 - 12}{-10} = \frac{10}{-10} = 1
\end{align*}
\]

7. Simplify \( \frac{1}{2x + 4} - \frac{x}{x^2 - 4} \). (8 marks)

\[
\begin{align*}
& \quad \frac{1}{2x + 4} - \frac{x}{x^2 - 4} \\
& \quad = \frac{1}{2(x + 2)} - \frac{x}{(x + 2)(x - 2)} \\
& \quad = \frac{x - 2}{2(x + 2)(x - 2)} \\
& \quad = -\frac{1}{2(x - 2)} \\
& \quad = -\frac{1}{2(x + 2)(x - 2)} \\
& \quad = -\frac{1}{2(x - 2)} \\
& \quad = -\frac{1}{2(x - 2)} \\
& \quad = -\frac{1}{2(x - 2)} \quad \text{OR} \quad -\frac{1}{2(x - 2)} \\
& \quad = \frac{1}{2(x - 2)} \\
& \quad = \frac{1}{2(x - 2)}(4 - 2x)
\end{align*}
\]
8. In a test there were 20 questions. X marks were awarded for each correct answer while y marks were deducted for each wrong answer or if no answer was given. Peter answered 10 questions correctly and got 50 marks. Mary answered 15 questions correctly and got 85 marks. Find the values of x and y. (10 marks)

\[
\begin{align*}
10x - 10y &= 50 \quad (1) \\
15x - 5y &= 85 \quad (2)
\end{align*}
\]

\[
(2) \times 2, \quad 30x - 10y = 170 \quad (3)
\]

\[
(3) - (1), \quad 20x = 120 \]

\[
x = 6
\]

Substitute \( x = 6 \) into (1)

\[
10(6) - 10y = 50
\]

\[
-10y = 50 - 60
\]

\[
y = 1
\]

\[\therefore \text{The values are } x = 6 \text{ and } y = 1.\]
9. (a) Solve the \[ \begin{cases} 4x + 15y = 7 \\ 8x - 9y = 1 \end{cases} \] by the method of elimination. (10 marks)

(b) Hence, solve the \[ \begin{cases} \frac{4}{u+v} + \frac{15}{u-v} = 7 \\ \frac{8}{u+v} - \frac{9}{u-v} = 1 \end{cases} \] (10 marks)

(a) \[ \begin{align*} 4x + 15y &= 7 \\ 8x - 9y &= 1 \end{align*} \] ---- (1)

(b) \[ \begin{align*} (u+v) \times 2 \\ 8x + 3uy &= 14 \end{align*} \] ---- (3)

(c) \[ \begin{align*} (3)-(2) \\ 3y &= 13 \\ y &= \frac{13}{3} \end{align*} \]

Substitute \[ y = \frac{13}{3} \] into (1).

\[ \begin{align*} 4x + 15 \left( \frac{13}{3} \right) &= 7 \\ 6x &= 7 - 5 \\ x &= \frac{2}{4} \end{align*} \]

\[ x = \frac{1}{2} \]

The solution is \[ x = \frac{1}{2}, \ y = \frac{13}{3} \].

By the results of (a),

\[ \frac{1}{u+v} = x \quad \frac{1}{u-v} = y \]

\[ \begin{align*} \frac{1}{u+v} &= \frac{1}{2} \\ \frac{1}{u-v} &= \frac{1}{3} \end{align*} \]

\[ u+v = 2 \quad (1) \quad u-v = 3 \quad (2) \]
(1) \((2)\) \[2u = 5\]
\[u = \frac{5}{2}\]

\((1) - (2)\) \[2v - l = 1\]
\[v = -\frac{1}{2}\]

Solution \(\therefore u = \frac{5}{2}\) and \(v = -\frac{1}{2}\).

10. The following lists the weights (g) of 30 magazines.

\[
\begin{array}{cccccccccccc}
650 & 670 & 750 & 810 & 620 & 850 & 670 & 730 & 760 & 770 \\
810 & 820 & 690 & 860 & 760 & 680 & 730 & 830 & 670 & 820 \\
760 & 760 & 720 & 780 & 790 & 860 & 760 & 730 & 680 & 0
\end{array}
\]

(a) Complete the frequency distribution table below. (7 marks)

<table>
<thead>
<tr>
<th>Weight</th>
<th>Tally</th>
<th>Class boundary</th>
<th>Class mark</th>
<th>Frequency</th>
</tr>
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<tbody>
<tr>
<td>650 - 690</td>
<td>HHHH</td>
<td>645 - 695</td>
<td>670</td>
<td>7</td>
</tr>
<tr>
<td>700 - 740</td>
<td>HHH</td>
<td>695 - 745</td>
<td>720</td>
<td>4</td>
</tr>
<tr>
<td>750 - 790</td>
<td>HHHHHH</td>
<td>745 - 795</td>
<td>770</td>
<td>9</td>
</tr>
<tr>
<td>800 - 840</td>
<td>HHHH</td>
<td>795 - 845</td>
<td>825</td>
<td>7</td>
</tr>
<tr>
<td>850 - 890</td>
<td>HHH</td>
<td>845 - 865</td>
<td>870</td>
<td>3</td>
</tr>
</tbody>
</table>
(b) According to the frequency distribution table obtained in (a), construct a histogram for the weights. 

(c) How many magazines weigh less than 705g? 

\[ 7 + 4 + 3 = 20. \]