Appendix II

TASKS USED AS CONTENT

TASK No. 1(a) Write as many numbers as you can which consists of 6 digits and are divisible by the following:
(i) 3  (ii) 4  (iii) 5  (iv) 9  (v) 25
(b) Write as many numbers as you can which are divisible by 7, 11, 13 at the same time.

TASK No.2. What pattern is followed in the following squares?

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>9</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>5</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>2</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>4</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>9</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>16</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>29</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

TASK No.3. Find the missing numbers:

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>4</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>?</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>?</td>
<td>?</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>3</th>
<th>12</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>?</td>
<td>?</td>
<td>?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>6</th>
<th>2</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>?</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

TASK No.4 Write down as many terms as you can which follow the same pattern in the following series:

(i) $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \ldots , \ldots , \ldots , \ldots$
(ii) $1 \times 3 \times 5, 2 \times 4 \times 6, 3 \times 5 \times 7, \ldots , \ldots , \ldots , \ldots$
(iii) $1, 3, 6, 10, \ldots , \ldots , \ldots , \ldots$
(iv) $0, 1, 1, 2, 3, 5, 8, 13, \ldots , \ldots , \ldots , \ldots$
(v) $17, 15, 26, 22, 35, 29, \ldots , \ldots , \ldots , \ldots$
(vi) $6, 24, 60, 120, 210, 336, \ldots , \ldots , \ldots , \ldots$
(vii) $(3, 4), (1, 2), (7, 8), (5, 6), (\ldots ), (\ldots ), (\ldots ), (\ldots )$
(viii) 

\[
\begin{array}{ccccccc}
1 & 1 & 1 \\
1 & 2 & 1 \\
1 & 3 & 3 & 1 \\
1 & 4 & 6 & 4 & 1 \\
1 & 1 & 1 & 1 & 1 & 1 & 1 \\
\end{array}
\]
TASK No. 5  Here is given a sketch. Can you alter the numbers in different possible ways so that the sum of any two adjacent numbers is equal to the sum of the pair of numbers at the other ends of the diameters.

![Diagram of a circle with numbers]

TASK No. 6  Can you arrange the numbers 1 to 9 in different ways as to have one of them in the centre and the rest at the end of the diameters? The sum of the three numbers on each diameter should be 15.

![Diagram of a circle with 1 in the center and numbers 1 to 9 arranged in a circle]

TASK No. 7  Here is a clock with Roman numerals on its dial. It fell down and dial broke into four parts. The numerals in each part in every case summed to a total of 20.

Can you show how the four parts of the clock dial were broken? Give as many possibilities as you can.

![Diagram of a clock dial with Roman numerals broken into four parts]
TASK No.8 You are given the following numbers to add:

\[ 1 + 2 + 3 + 4 + \ldots + 97 + 98 + 99 + 100 \]

If you add these 100 numbers in a traditional way, it will take a long time. Find some time-saving different methods for this addition.

TASK No.9 Can you write 1000 by using eight identical digits? In doing so you may, in addition to digits, use signs of operations.

One solution using eight 8's is: \[ 888 + 88 + 8 + 8 + 8 \]

Find as many solutions as you can.

TASK No.10 Using the numeral 4 just four times, only combining it with any mathematical symbols +, -, x, ÷, \( \sqrt{\quad} \) or indices, can you form each of these natural numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

Example:

\[ 1 = \frac{4+4}{4+4} \quad \text{or} \quad 2 = \frac{(4+4)-4}{4} = \frac{4}{4} \]

Find as many solutions as you can for each number.

TASK No.11 Write 10 using five 9's. Write it in as many ways as you can.

Example:

\[ 9 + \frac{99}{99} = 10 \]

Find other solutions.

TASK No.12 You are given nine digits in the fixed order i.e. 1, 2, 3, 4, 5, 6, 7, 8, 9.

Can you arrange these in the same order using signs of operations so as to produce a result of 100?

Ex. (i) \[ 123 - 45 - 67 + 89 = 100 \]

Find other combinations.

TASK No.13 Write 1 by using all the ten digits i.e. 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

You can use signs of operations, \( \sqrt{\quad} \) or indices.

Give as many solutions as you can.
TASK No. 14 The biggest number that can be written by means of three digits is \(9^3\) which is the third super power of 9.

\[
\begin{align*}
9^3 = 9 \\
\end{align*}
\]

This figure is so enormous that no comparison can help to gauge its immensity. The total no. of electrons in the visible universe is a pigmy beside this towering giant.

Problem: Find the biggest number using three 2’s.

It is not always wise to proceed by analogy. Try it.

TASK No. 15 Write down the smallest number/integer that can be written by using two digits. Give different solutions.

TASK No. 16 You have 24 coins. Arrange these in 6 rows with each row comprising of 5 coins. Give as many arrangements as you can.

TASK No. 17 Can you place 10 coins in such a way that they lie in 5 lines and on each line there are 4 coins. Give different possible arrangements.

TASK No. 18 A boy collected 8 spiders and beetles in a little box. He counted the legs and found there were altogether 108. How many spiders and how many beetles did he collected? (Spider has 8 legs and bettle 6). Give different methods by which you reached at different solutions.

TASK No. 19 Here is a house made up of 10 equal length matchsticks, it faces left. Now move only two of the matchsticks to make the house facing to the right. Specify different procedures.
TASK No.20  You are given six arrows in a row, the left three pointing up, and the right three pointing down. The problem is to transform these arrows into an alternating sequence such that the left-most arrow points up, the second down, third up, fourth down, fifth up and the sixth down. Note: You cannot invert one arrow at a time but must invert two arrows at a time, and the two arrows must be adjacent.

\[
\begin{array}{cccccc}
1 & 2 & 3 & 4 & 5 & 6 \\
\uparrow & \uparrow & \downarrow & \downarrow & \downarrow & \downarrow \\
\end{array}
\]

There are six equivalent solutions.

TASK No.21  You are given six coins arranged in two rows (as shown on the left side of figure given below) so that each coin touches the coins immediately above or below it and to the left or right of it. Specify a procedure for moving exactly two coins so as to achieve the hexagonal arrangement shown on the right side.

\[
\begin{array}{ccc}
1 & 2 & 3 \\
4 & 5 & 6 \\
\end{array}
\]

\[
\begin{array}{ccc}
1 & 2 & 3 \\
4 & 5 & 6 \\
\end{array}
\]

Now form a ring in three moves. Try it both ways.
TASK No.22 You are given 12 matchsticks each 1 cm long.
(i) Build a figure of a cross with area equal to 5 sq. sm.

(ii) Now rearrange the matchsticks to form a different figure but having the same area.

(iii) Can you arrange the matches in such a way as to cover an area equal to only four match squares i.e. 4 sq. cm.

(iv) Now go on rearranging them so as to get different area each time till you enclose minimum and maximum possible area.

TASK No.23 Here is given a formation with some matchsticks. By shifting just 2 of the matchsticks, form four squares instead of five.

 TASK No.24 Arrange a batch of tooth-picks in the formation shown here, to form nine squares (a) Now remove eight of the toothpicks so that only two squares are left.

(Hint : Squares may be unequal in size)

Now remove just eight toothpicks leaving three squares.
TASK No.25 Can you divide the following crescent in six parts by drawing just two straight lines?

![Crescent](image)

TASK No. 26 Cut a circular pie into 8 pieces by making only 3 cuts. You are not permitted to cut the pie in half and then put the pieces atop one another before making the next cut. Find different solutions if you can.

![Circular Pie](image)

TASK No.27 You have two old fashioned sand glass timers, one takes 7 minutes for the sand to filter through and the other takes 11 minutes.

![Sand Glass Timers](image)

Find the most efficient way of using the two sand glass timers to time the cooking of a 15 minute hard boiled egg. Starting from the instant the first sand glass timer is upturned, how would you calculate the overall time in which the cooking can be completed. Find other solutions.
TASK No. 28 A man running a shop has only four weights at his disposal. But he can weigh any measure from 1 kg to 40 kg by using only these four weights. Problem – Find the four weights.

TASK No. 29 A man goes to a well with 3 cans whose capacities are 3 gallons, 5 gallons and 8 gallons. Explain how he can obtain exactly 4 gallons of water from the well. Find as many solutions as you can.

TASK No. 30 A farmer built a fence around his square shaped cowshed. He used 27 fence poles on each side of the square. How many poles did he need altogether?

TASK No. 31 It takes a clock 30 seconds to strike 6 'O' clock. How long does it take the clock to strike 12 'O' clock?