Assignment1

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ICSE 2017 Board Paper Question 4(c):

Solve the following inequation and represent the solution set on a number line $-8\frac{1}{2} < -\frac{1}{2} - 4x \le 7\frac{1}{2}$, $x \in I$.

Solution:

$-8\frac{1}{2} < -\frac{1}{2} - 4x \le 7\frac{1}{2}$

$\Rightarrow -\frac{17}{2} < -\frac{1}{2} - 4x \le \frac{15}{2}$

$\Rightarrow -\frac{17}{2} + \frac{1}{2} < -4x \le \frac{15}{2} + \frac{1}{2}$

$\Rightarrow -8 < -4x \le 8$

Now, dividing the inequality by -4, we get
$2 > x \ge -2$
(Since on dividing/multiplying an inequality by a negative number, the inequality gets reversed)
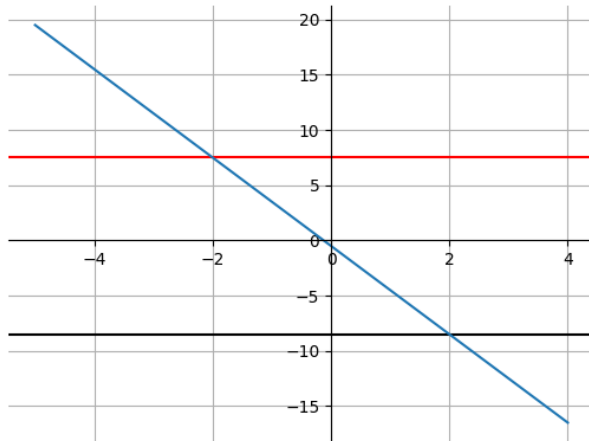Hence, we have $-2 \le x < 2$, and $x \in I$
Therefore, $x = -2, -1, 0, 1$. This is the required solution.
The solution can be represented on the real number line (as asked in the question):

The output of the python code used

to verify the solution:

The graph above contains the lines
$y = -\frac{1}{2} - 4x$, $y = -8\frac{1}{2}$, and $y = 7\frac{1}{2}$
We need to be concerned about the
portion of the line $y = -\frac{1}{2} - 4x$ be-
tween the lines $y = -8\frac{1}{2}$, and $y = 7\frac{1}{2}$.
The values of x within this portion
of line is the required solution, i.e., it
can be clearly seen that $y = -\frac{1}{2} - 4x$
intersects $y = -8\frac{1}{2}$ at $x = -2$ and
intersects $y = 7\frac{1}{2}$ at $x = 2$. So the
range of x would be from -2 to 2
(with $x = 2$ excluded).
And since only integer solutions
are required between [-2,2) so the
solution set would be -2, -1, 0, 1.
Hence, the answer is verified.