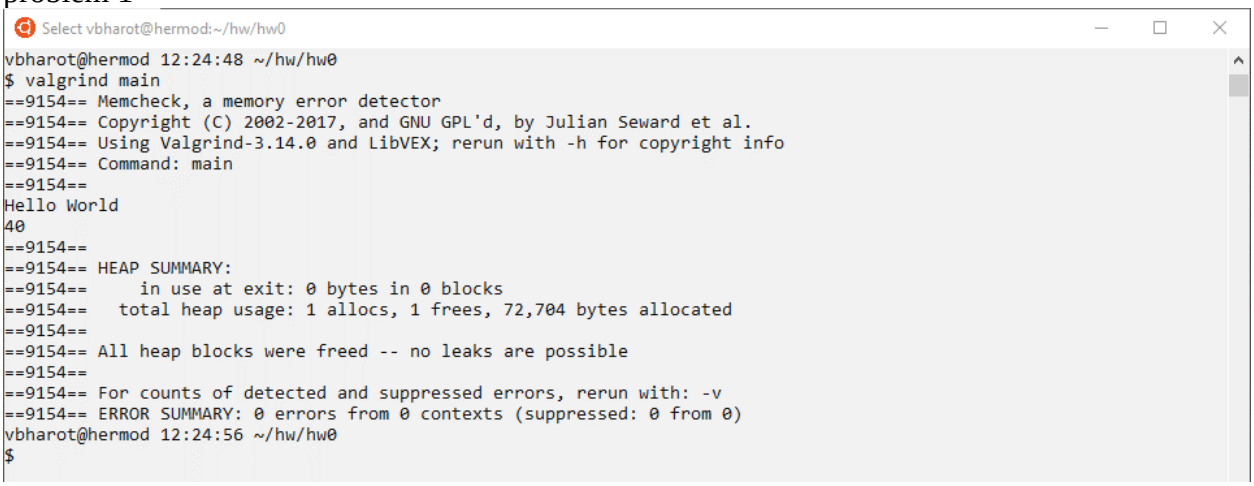
==========start of the write-up==========

problem 1



==========end of the write-up==========