SBCC26: D-LLAMA Instructions

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Clarifications highlighted in green

Guidelines

For each task, teams will run a short, long, and leaderboard prompt and report the tokens/s throughput. The performance on short and long prompts will be evaluated internally, while the performance on the leaderboard prompt will be evaluated in comparison to the leaderboard consisting of all the teams that submit. For all submissions, please set --temperature 0 and --seed 10042026.

Task 1: Llama 3.1 8B Instruct Q40 (base model)

Teams will benchmark the Llama 3.1 8B Instruct Q40 model on provided prompts using the `dllama inference` mode, with 3 worker nodes (4 nodes total), 2 threads per node, and a maximum sequence length of 4096. For this task, teams must use the Llama 3.1 8B Instruct Q40 model and tokenizer provided in the Distributed Llama repository with no changes to the source code. The results from this task will also serve as a baseline for Task 3.

For the leaderboard prompt, you can change the maximum sequence length to the number of steps.

Task 2: Qwen 3 8B Q40 (base model)

Teams will benchmark the Qwen 3 8B Q40 model on provided prompts using the `dllama inference` mode, with 3 worker nodes (4 nodes total). For this task, teams must use the Qwen 3 8B Q40 model and tokenizer provided in the Distributed Llama repository with no changes to the source code; however, teams are allowed to change thread count, maximum sequence length, and other runtime parameters as long as the model, tokenizer, and source code remain unchanged.

Task 3: Llama 3.1 8B Instruct Q40 (optimized)

Teams will benchmark the Llama 3.1 8B Instruct Q40 model on the provided prompts. For this task, teams are encouraged to explore possible optimization (such as modifications to the DLLAMA source code, alternative inference engines, or software/hardware advantages). Model throughput in this task will be evaluated in comparison to the teams' results in Task 1. For the leaderboard results, multi-node runs are preferred and will be weighted accordingly.

Teams were required to submit code for this task (ex. a fork of the source code repository) prior to the start of benchmarking, with well-documented changes and explanations of the optimizations made. The teams' effort and approach to optimization will be taken into account during scoring.

Grading

- Task 1: 20%
  - Short prompt: 6% (completion)
  - Long prompt: 6% (completion)
  - Leaderboard prompt: 4% (completion) + 4% (Task 1 leaderboard)
- Task 2: 30%
  - Short prompt: 11% (completion)
  - Long prompt: 11% (completion)
  - Leaderboard prompt: 4% (completion) + 4% (Task 2 leaderboard)
- Task 3: 50%
  - Short prompt: 11% (improvement relative to Task 1)
  - Long prompt: 11% (improvement relative to Task 1)
  - Leaderboard prompt: 4% (completion) + 4% (Task 3 leaderboard)
  - Optimization strategy: 20%
    - Factors in consideration: approach to optimization, effort, code documentation

Teams that have not submitted the repository for task 3 will not receive points for task 3.

Submission Instructions

For each task and prompt, teams need to submit:

- the D-LLAMA root node's standard output as the file `output.txt`,
- the command they used to run D-LLAMA in the file `run.sh` (note: `run.sh` must contain the `dllama inference` command for tasks 1 and 2), and
- timestamps with the beginning and end of the D-LLAMA run in the file `timestamps.txt`.
  Timestamps should be recorded with the following command:
  `TZ="America/Los_Angeles" date >> timestamps.txt`

Any other scripts that are also used in the process of generating the submission (e.g. Slurm scripts, automated run pipelines) should also be submitted.

Teams will upload a tarball titled `dllama.tar` containing their submission to the shared Google Drive folder. The expected directory structure for the submission is as follows:

```
.
├── task_1
│   ├── leaderboard
│   │   ├── output.txt
```

```
│   │   ├── timestamps.txt
│   │   └── run.sh
│   ├── long
│   │   ├── output.txt
│   │   ├── timestamps.txt
│   │   └── run.sh
│   └── short
│       ├── output.txt
│       ├── timestamps.txt
│       └── run.sh
├── task_2
│   ├── leaderboard
│   │   ├── output.txt
│   │   ├── timestamps.txt
│   │   └── run.sh
│   ├── long
│   │   ├── output.txt
│   │   ├── timestamps.txt
│   │   └── run.sh
│   └── short
│       ├── output.txt
│       ├── timestamps.txt
│       └── run.sh
└── task_3
    ├── leaderboard
    │   ├── output.txt
    │   ├── timestamps.txt
    │   └── run.sh
    ├── long
    │   ├── output.txt
    │   ├── timestamps.txt
    │   └── run.sh
    └── short
        ├── output.txt
        ├── timestamps.txt
        └── run.sh
```

Prompts

Short prompt (run for 975 steps):

Cellular respiration is a set of metabolic pathways that allow cells to convert energy stored in organic molecules into ATP. In eukaryotic cells, these processes occur in different cellular compartments and are tightly regulated based on environmental conditions. A team of researchers is investigating how oxygen availability affects ATP production and metabolic pathway usage in cultured animal cells. The researchers grow identical populations of cells under two different conditions: Condition 1 (Aerobic): Cells are supplied with abundant oxygen Condition 2 (Anaerobic): Cells are deprived of oxygen. The researchers measure ATP production, levels of metabolic intermediates, and enzyme activity over time. Their observations include the following: Under aerobic conditions, cells produce large amounts of ATP and show high activity of enzymes involved in the citric acid cycle and oxidative phosphorylation. Under anaerobic conditions, cells produce significantly less ATP overall. However, glycolysis rates increase, and lactate accumulates in the cells. The researchers observe that NAD+ levels decrease initially under anaerobic conditions but are later restored as lactate production increases. In a third experimental setup, the researchers add a chemical inhibitor that blocks the electron transport chain in cells that are otherwise supplied with oxygen. These cells show similar metabolic patterns to anaerobic cells. (a) Describe the role of oxygen in cellular respiration. Include its function in the electron transport chain. (b) Explain why ATP production is lower under anaerobic conditions compared to aerobic conditions. (c) Describe how cells are able to continue producing ATP in the absence of oxygen. Include the role of NAD+. (d) Explain why lactate accumulates in cells under anaerobic conditions. (e) Using the observations from the inhibitor experiment, explain why blocking the electron transport chain leads to similar effects as oxygen deprivation. (f) Predict how the activity of the enzyme phosphofructokinase (PFK), a key regulatory enzyme in glycolysis, would change under anaerobic conditions.

Long prompt (run for 4000 steps):

Answer the question based on the given passages. Only give me the answer and do not output any other words.\n\nThe following are given passages.\nPassage 1:\nBand-e Amir National Park\nBand-e Amir National Park (Persian: \u0628\u0646\u062f \u0627\u0645\u06cc\u0631) Afghanistan established its first national park on April 22, 2009, to promote and protect the natural beauty of a series of intensely blue lakes created by natural dams high in the Hindu Kush. Band-e-Amir is a chain of six lakes in the mountainous desert of central Afghanistan. The lakes formed from mineral-rich water that seeped out of faults and cracks in the rocky landscape. Over time, the water deposited layers of hardened mineral (travertine) that built up into walls that now contain the water. According to the Wildlife Conservation Society, who helped the Afghan government set up the park, Band-e-Amir is one of the few travertine systems in the world.They were created by the carbon dioxide rich water oozing out of the faults and fractures to deposit calcium carbonate precipitate in the form of travertine walls that today store the water of these lakes. Band-e Amir is one of the few rare natural lakes in the world which are created by travertine systems. The site of Band-e Amir has been described as Afghanistan's Grand Canyon, and draws thousands of tourists a year. The river is part of the system of the Balkh River.\n\nHistory\nThe name Band-e Amir literally means \"the Ruler's Dam\" which is believed by some to be a reference to Ali, the fourth Caliph of the Muslims. The area is dominated by ethnic Hazaras, who are estimated to make up about 40 percent of Afghanistan's population.In her 1970 guide to Afghanistan, Nancy Dupree wrote that a full description about Band-e Amir would \"rob the uninitiated of the wonder and amazement it produces on all who gaze upon it\". Parts of the 1975 Bollywood film Dharmatma, with Feroz Khan and Hema Malini, were filmed at the Band-e Amir National Park.In 2004, Band-e Amir was submitted for recognition as a World Heritage site. Efforts to make Band-e Amir a national park started in the 1970s, but were then put on hold due to the wars. In April 2009, Band-e Amir was finally declared Afghanistan's first national park. As of 2013, about 6,000 local tourists visit the Band-e Amir National Park every year. The area is protected by a small number of park rangers.\n\nGeography\nBand-e Amir is situated at approximately 75 km to the north-west of the ancient city of Bamyan, close to the town of Yakawlang. Together with Bamyan Valley, they are the heart of Afghanistan's tourism, attracting thousands of tourists every year and from every corner of the world. The Band-e Amir lakes are primarily a late spring and summertime tourism destination, as the high elevation central Hazarajat region of Afghanistan is extremely cold in winter, with temperatures reaching as low as \u221220 \u00b0C (\u22124.0 \u00b0F). The six constituent lakes of Band-e Amir are:\n\nBand-e Gholaman (Lake of the slaves)\nBand-e Qambar (Lake of Caliph Ali's slave)\nBand-e Haibat (Lake of grandiose)\nBand-e Panir (Lake of cheese)\nBand-e Pudina (Lake of wild mint)\nBand-e Zulfiqar (Lake of the sword of Ali)The white travertine dams created by fault lines, which are prevalent in the Band-e Amir Valley, form the barriers between the lakes. Band-e Haibat is the biggest and the deepest of the six, with an average depth of approximately 150 metres, as estimated by the Provincial Reconstruction Team diving team from

New Zealand. Another comparable lake is Band-e Azhdahar (The Dragon), located a few kilometres southeast of the town of Bamyan, which has also been created as a result of carbon dioxide rich water oozing out of the faults underground and depositing calcium carbonate precipitate to form the travertine walls of Band-e Amir.\n\nClimate\nHigh in the Hindu Kush at approximately 2,900 metres (9,500 ft) above sea level, the national park has a subarctic climate (Dsc) closely bordering on a warm-summer humid continental climate (Dsb). The climate is extremely severe and the lakes freezing over in winter.\n\nCurrent status\nAfter the formal establishment of the park in 2009, a park office with a park warden and a group of rangers was installed to manage the conservation and protection of park natural resources. Wildlife Conservation Society (WCS) is the only non-government organization with an office in the park. WCS supports park staff and works with the local community to promote conservation and sustainable use of natural resources. Ecotourism is expected to decrease local economic dependency on the park's natural resources. Tourists visit Band-e-Amir primarily in the summer months when the weather is warm. A poor local economy and limited outside investment have hampered efforts to attract winter tourism.\nThe local people in Band-e-Amir National Park rely heavily on the park's natural resources for their livelihood. Grazing of livestock, collection of shrubs for fuel and winter fodder and rain-fed farming is still widely practiced within the park boundary. Although the illegal hunting of birds and a few mammals living in the park is formally prohibited by the park office, there is no current data to evaluate the status of wildlife and biodiversity.\n\nImportant Bird Area\nA 41,000 ha tract overlapping the national park has been designated an Important Bird Area (IBA) by BirdLife International because it supports populations of Himalayan snowcocks, Hume's larks, white-winged snowfinches, Afghan snowfinches and Eurasian crimson-winged finches.\n\nSee also\nList of dams and reservoirs in Afghanistan\nNatural areas of Afghanistan\nWakhan National Park\nNuristan National Park\nPassage 2:\nQasim Oryakhail\nQasim Oryakhail (born 10 January 1992) is an Afghan cricketer. He made his Twenty20 debut for Band-e-Amir Dragons in the 2017 Shpageeza Cricket League on 12 September 2017. He made his first-class debut for Speen Ghar Region in the 2017\u201318 Ahmad Shah Abdali 4-day Tournament on 20 October 2017. He made his List A debut for Kabul Region in the 2018 Ghazi Amanullah Khan Regional One Day Tournament on 15 July 2018.\nPassage 3:\nSamim Sultani\nSamim Sultani is an Afghan cricketer. He made his Twenty20 debut for Band-e-Amir Dragons in the 2017 Shpageeza Cricket League on 14 September 2017.\nPassage 4:\nFitratullah Khawari\nFitratullah Khawari (born 29 January 1997) is an Afghan cricketer. He made his List A debut for Mis Ainak Region in the 2017 Ghazi Amanullah Khan Regional One Day Tournament on 10 August 2017. He made his Twenty20 debut for Band-e-Amir Dragons in the 2017 Shpageeza Cricket League on 18 September 2017. He made his first-class debut for Speen Ghar Region in the 2017\u201318 Ahmad Shah Abdali 4-day Tournament on 20 October 2017.In September 2018, he was named in Kabul's squad in the first edition of the Afghanistan Premier League tournament.\nPassage 5:\nIkram Faizi\nIkram Alikhil (Pashto: \u0627\u06a9\u0631\u0627\u0645 \u0641\u064a\u0636\u064a \u0639\u0644\u064a\u062e\u06d0\u0644; born 29 September 2000) is an Afghan cricketer. He

made his international debut for the Afghanistan cricket team in March 2019.\n\nDomestic and U19 career\nHe made his Twenty20 debut for Band-e-Amir Dragons in the 2017 Shpageeza Cricket League on 14 September 2017. Prior to his T20 debut, he was part of Afghanistan's squad for the 2016 Under-19 Cricket World Cup. He also scored an unbeaten century in the final of the 2017 ACC Under-19 Asia Cup and helped Afghanistan to win their maiden ACC Under-19 Cup title.In December 2017, he was named in Afghanistan's squad for the 2018 Under-19 Cricket World Cup.He made his first-class debut for Speen Ghar Region in the 2018 Ahmad Shah Abdali 4-day Tournament on 1 March 2018. He made his List A debut for Speen Ghar Region in the 2018 Ghazi Amanullah Khan Regional One Day Tournament on 10 July 2018.In September 2018, he was named in Balkh's squad in the first edition of the Afghanistan Premier League tournament.\n\nInternational career\nIn December 2018, he was named in Afghanistan's under-23 team for the 2018 ACC Emerging Teams Asia Cup.In February 2019, he was named in Afghanistan's Test and One Day International (ODI) squads for their series against Ireland in India. He made his ODI debut for Afghanistan against Ireland on 2 March 2019. He made his Test debut for Afghanistan against Ireland on 15 March 2019.On 6 June 2019, he was added to Afghanistan's squad for the 2019 Cricket World Cup. He replaced Mohammad Shahzad, who was ruled out of the tournament due to a knee injury.\nPassage 6:\nArif Khan (cricketer)\nArif Khan (born 5 June 2001) is an Afghan cricketer. He made his List A debut for Band-e-Amir Region in the 2017 Ghazi Amanullah Khan Regional One Day Tournament on 10 August 2017. He made his Twenty20 debut for Band-e-Amir Dragons in the 2017 Shpageeza Cricket League on 17 September 2017. He made his first-class debut for Speen Ghar Region in the 2017\u201318 Ahmad Shah Abdali 4-day Tournament on 7 November 2017.\nPassage 7:\nMuslim Musa\nMuslim Musa (born 15 January 1997) is an Afghan cricketer. He made his List A debut for Amo Region in the 2017 Ghazi Amanullah Khan Regional One Day Tournament on 10 August 2017. Before his List A debut, he was part of Afghanistan's squad for the 2016 Under-19 Cricket World Cup.He made his Twenty20 debut for Band-e-Amir Dragons in the 2017 Shpageeza Cricket League on 12 September 2017. He made his first-class debut for Speen Ghar Region in the 2017\u201318 Ahmad Shah Abdali 4-day Tournament on 20 October 2017.In September 2018, he was named in Kabul's squad in the first edition of the Afghanistan Premier League tournament.\nPassage 8:\nBand-e-Amir Dragons\nBand-e-Amir Dragons (Pashto: \u0628\u0646\u062f \u0627\u0645\u064a\u0631 \u069a\u0627\u0645\u0627\u0631\u0627\u0646 Band-e-Am\u012br Kh\u0101m\u0101r\u0101n / Sh\u0101m\u0101r\u0101n; Dari: \u0628\u0646\u062f \u0627\u0645\u06cc\u0631 \u0634\u0627\u0645\u0627\u0631\u0627\u0646) or Band-e-Amir Region is one of eight regional first-class cricket teams in Afghanistan. In the 2017 Shpageeza team auction, the Band-e-Amir Dragons team was bought by Paragon Business Group, a Finance and investment company, and it will play as the Paragon Band-e-Amir Dragons in this competition. The Region represents the following provinces in the centre of Afghanistan: Ghazni, Bamyan, Daykundi, and Maidan Wardak. The team is named after Band-e Amir, a series of six deep blue lakes in Bamyan Province.\nBand-e-Amir Region compete in the Ahmad Shah Abdali 4-day

Tournament, which has had first-class status from 2017 onwards. In October 2017, they lost their opening fixture of the tournament, against Mis Ainak Region, by 262 runs.They also play in the Ghazi Amanullah Khan Regional One Day Tournament, which was granted List A status from 2017. and the Afghan Shpageeza Cricket League Twenty20 competition (which has Twenty20 status from 2017) using the name Band-e-Amir Dragons.\nPassage 9:\nShahidullah (cricketer)\nShahidullah (born 6 February 1999) is an Afghan cricketer. He made his List A debut for Afghanistan A against Zimbabwe A during their tour to Zimbabwe on 27 January 2017. Prior to his List A debut, he was named in Afghanistan's squad for the 2014 Under-19 Cricket World Cup. He made his international debut for the Afghanistan cricket team in March 2021.\n\nCareer\nShahidullah made his Twenty20 debut for Band-e-Amir Dragons in the 2017 Shpageeza Cricket League on 12 September 2017. He made his first-class debut for Mis Ainak Region in the 2017\u201318 Ahmad Shah Abdali 4-day Tournament on 19 November 2017. He was the leading run-scorer for Mis Ainak Region in the 2018 Ahmad Shah Abdali 4-day Tournament, with 663 runs in eight matches.In September 2018, Shahidullah was named in Kabul's squad in the first edition of the Afghanistan Premier League tournament. In December 2018, he was named in Afghanistan's under-23 team for the 2018 ACC Emerging Teams Asia Cup.In August 2019, Shahidullah was named in Afghanistan's Twenty20 International (T20I) squad for the 2019\u201320 Bangladesh Tri-Nation Series. In November 2019, he was named in Afghanistan's squad for the 2019 ACC Emerging Teams Asia Cup in Bangladesh. In February 2021, he was named in Afghanistan's Test squad for their series against Zimbabwe. He made his Test debut for Afghanistan, against Zimbabwe, on 10 March 2021.In July 2021, Shahidullah was named in Afghanistan's One Day International (ODI) squad for their series against Pakistan. In January 2022, he was named in Afghanistan's ODI squad for their series against the Netherlands in Qatar. He made his ODI debut on 21 January 2022, for Afghanistan against the Netherlands.\nPassage 10:\nJaveed Khan\nJaveed Khan is an Afghan cricketer. He made his Twenty20 debut for Band-e-Amir Dragons in the 2017 Shpageeza Cricket League on 21 September 2017.\n\nAnswer the question based on the given passages. Only give me the answer and do not output any other words.\n\nWhich film had parts filmed in the Band-e Amir National Park?\nAnswer:

Leaderboard prompt (run for 6000 steps):

CHAPTER 1\n\nMY UNCLE MAKES A GREAT DISCOVERY\n\n\nLooking back to all that has occurred to me since that eventful day, I\nam scarcely able to believe in the reality of my adventures. They were\ntruly so wonderful that even now I am bewildered when I think of them.\n\nMy uncle was a German, having married my mother's sister, an\nEnglishwoman. Being very much attached to his fatherless nephew, he\ninvited me to study under him in his home in the fatherland. This home\nwas in a large town, and my uncle a professor of philosophy, chemistry,\ngeology, mineralogy, and many other ologies.\n\nOne day, after passing some hours in the laboratory--my uncle being\nabsent at the time--I suddenly felt the necessity of renovating the\ntissues--i.e., I was hungry, and was about to rouse up our old French\ncook, when my uncle, Professor Von Hardwigg, suddenly opened the street\ndoor, and came rushing upstairs.\n\nNow Professor Hardwigg, my worthy uncle, is by no means a bad sort of\nman; he is, however, choleric and original. To bear with him means to\nobey; and scarcely had his heavy feet resounded within our joint\ndomicile than he shouted for me to attend upon him.\n\n"Harry--Harry--Harry--"\n\nI hastened to obey, but before I could reach his room, jumping three\nsteps at a time, he was stamping his right foot upon the landing.\n\n"Harry!" he cried, in a frantic tone, "are you coming up?"\n\nNow to tell the truth, at that moment I was far more interested in the\nquestion as to what was to constitute our dinner than in any problem of\nscience; to me soup was more interesting than soda, an omelette more\ntempting than arithmetic, and an artichoke of ten times more value than\nany amount of asbestos.\n\nBut my uncle was not a man to be kept waiting; so adjourning therefore\nall minor questions, I presented myself before him.\n\nHe was a very learned man. Now most persons in this category supply\nthemselves with information, as peddlers do with goods, for the benefit\nof others, and lay up stores in order to diffuse them abroad for the\nbenefit of society in general. Not so my excellent uncle, Professor\nHardwigg; he studied, he consumed the midnight oil, he pored over heavy\ntomes, and digested huge quartos and folios in order to keep the\nknowledge acquired to himself.\n\nThere was a reason, and it may be regarded as a good one, why my uncle\nobjected to display his learning more than was absolutely necessary: he\nstammered; and when intent upon explaining the phenomena of the heavens,\nwas apt to find himself at fault, and allude in such a vague way to sun,\nmoon, and stars that few were able to comprehend his meaning. To tell\nthe honest truth, when the right word would not come, it was generally\nreplaced by a very powerful adjective.\n\nIn connection with the sciences there are many almost unpronounceable\nnames--names very much resembling those of Welsh villages; and my uncle\nbeing very fond of using them, his habit of stammering was not thereby\nimproved. In fact, there were periods in his discourse when he would\nfinally give up and swallow his discomfiture--in a glass of water.\n\nAs I said, my uncle, Professor Hardwigg, was a very learned man; and I\nnow add a most kind relative. I was bound to him by the double ties of\naffection and interest. I took deep interest in all his doings, and\nhoped some day to be almost as learned myself. It was a rare thing for\nme to be absent from his lectures. Like him, I preferred

mineralogy to\nall the other sciences. My anxiety was to gain real knowledge of the\nearth. Geology and mineralogy were to us the sole objects of life, and\nin connection with these studies many a fair specimen of stone, chalk,\nor metal did we break with our hammers.\n\nSteel rods, loadstones, glass pipes, and bottles of various acids were\noftener before us than our meals. My uncle Hardwigg was once known to\nclassify six hundred different geological specimens by their weight,\nhardness, fusibility, sound, taste, and smell.\n\nHe corresponded with all the great, learned, and scientific men of the\nage. I was, therefore, in constant communication with, at all events the\nletters of, Sir Humphry Davy, Captain Franklin, and other great men.\n\nBut before I state the subject on which my uncle wished to confer with\nme, I must say a word about his personal appearance. Alas! my readers\nwill see a very different portrait of him at a future time, after he has\ngone through the fearful adventures yet to be related.\n\nMy uncle was fifty years old; tall, thin, and wiry. Large spectacles\nhid, to a certain extent, his vast, round, and goggle eyes, while his\nnose was irreverently compared to a thin file. So much indeed did it\nresemble that useful article, that a compass was said in his presence to\nhave made considerable N (Nasal) deviation.\n\nThe truth being told, however, the only article really attracted to my\nuncle's nose was tobacco.\n\nAnother peculiarity of his was, that he always stepped a yard at a time,\nclenched his fists as if he were going to hit you, and was, when in one\nof his peculiar humors, very far from a pleasant companion.\n\nIt is further necessary to observe that he lived in a very nice house,\nin that very nice street, the Konigstrasse at Hamburg. Though lying in\nthe centre of a town, it was perfectly rural in its aspect--half wood,\nhalf bricks, with old-fashioned gables--one of the few old houses spared\nby the great fire of 1842.\n\nWhen I say a nice house, I mean a handsome house--old, tottering, and\nnot exactly comfortable to English notions: a house a little off the\nperpendicular and inclined to fall into the neighboring canal; exactly\nthe house for a wandering artist to depict; all the more that you could\nscarcely see it for ivy and a magnificent old tree which grew over the\ndoor.\n\nMy uncle was rich; his house was his own property, while he had a\nconsiderable private income. To my notion the best part of his\npossessions was his god-daughter, Gretchen. And the old cook, the young\nlady, the Professor and I were the sole inhabitants.\n\nI loved mineralogy, I loved geology. To me there was nothing like\npebbles--and if my uncle had been in a little less of a fury, we should\nhave been the happiest of families. To prove the excellent Hardwigg's\nimpatience, I solemnly declare that when the flowers in the drawing-room\npots began to grow, he rose every morning at four o'clock to make them\ngrow quicker by pulling the leaves!\n\nHaving described my uncle, I will now give an account of our interview.\n\nHe received me in his study; a perfect museum, containing every natural\ncuriosity that can well be imagined--minerals, however, predominating.\nEvery one was familiar to me, having been catalogued by my own hand. My\nuncle, apparently oblivious of the fact that he had summoned me to his\npresence, was absorbed in a book. He was particularly fond of early\neditions, tall copies, and unique works.\n\n"Wonderful!" he cried, tapping his forehead. "Wonderful--wonderful!"\n\nIt was one of those yellow-leaved volumes now rarely found on stalls,\nand to me it appeared to possess but little value. My uncle, however,\nwas in

raptures.\n\nHe admired its binding, the clearness of its characters, the ease with\nwhich it opened in his hand, and repeated aloud, half a dozen times,\nthat it was very, very old.\n\nTo my fancy he was making a great fuss about nothing, but it was not my\nprovince to say so. On the contrary, I professed considerable interest\nin the subject, and asked him what it was about.\n\n"It is the Heims-Kringla of Snorre Tarleson," he said, "the celebrated\nIcelandic author of the twelfth century--it is a true and correct\naccount of the Norwegian princes who reigned in Iceland."\n\nMy next question related to the language in which it was written. I\nhoped at all events it was translated into German. My uncle was\nindignant at the very thought, and declared he wouldn't give a penny for\na translation. His delight was to have found the original work in the\nIcelandic tongue, which he declared to be one of the most magnificent\nand yet simple idioms in the world--while at the same time its\ngrammatical combinations were the most varied known to students.\n\n"About as easy as German?" was my insidious remark.\n\nMy uncle shrugged his shoulders.\n\n"The letters at all events," I said, "are rather difficult of\ncomprehension."\n\n"It is a Runic manuscript, the language of the original population of\nIceland, invented by Odin himself," cried my uncle, angry at my\nignorance.\n\nI was about to venture upon some misplaced joke on the subject, when a\nsmall scrap of parchment fell out of the leaves. Like a hungry man\nsnatching at a morsel of bread the Professor seized it. It was about\nfive inches by three and was scrawled over in the most extraordinary\nfashion.\n\nThe lines shown here are an exact facsimile of what was written on the\nvenerable piece of parchment--and have wonderful importance, as they\ninduced my uncle to undertake the most wonderful series of adventures\nwhich ever fell to the lot of human beings.\n\nMy uncle looked keenly at the document for some moments and then\ndeclared that it was Runic. The letters were similar to those in the\nbook, but then what did they mean? This was exactly what I wanted to\nknow.\n\nNow as I had a strong conviction that the Runic alphabet and dialect\nwere simply an invention to mystify poor human nature, I was delighted\nto find that my uncle knew as much about the matter as I did--which was\nnothing. At all events the tremulous motion of his fingers made me think\nso.\n\n"And yet," he muttered to himself, "it is old Icelandic, I am sure of\nit."\n\nAnd my uncle ought to have known, for he was a perfect polyglot\ndictionary in himself. He did not pretend, like a certain learned\npundit, to speak the two thousand languages and four thousand idioms\nmade use of in different parts of the globe, but he did know all the\nmore important ones.\n\nIt is a matter of great doubt to me now, to what violent measures my\nuncle's impetuosity might have led him, had not the clock struck two,\nand our old French cook called out to let us know that dinner was on the\ntable.\n\n"Bother the dinner!" cried my uncle.\n\nBut as I was hungry, I sallied forth to the dining room, where I took up\nmy usual quarters. Out of politeness I waited three minutes, but no sign\nof my uncle, the Professor. I was surprised. He was not usually so blind\nto the pleasure of a good dinner. It was the acme of German\nluxury--parsley soup, a ham omelette with sorrel trimmings, an oyster of\nveal stewed with prunes, delicious fruit, and sparkling Moselle. For the\nsake of poring over this musty old piece of parchment, my uncle forbore\nto share our meal. To satisfy my conscience, I ate for both.\n\nThe old cook and housekeeper was nearly out of her mind. After taking so\nmuch

trouble, to find her master not appear at dinner was to her a sad\ndisappointment--which, as she occasionally watched the havoc I was\nmaking on the viands, became also alarm. If my uncle were to come to\ntable after all?\n\nSuddenly, just as I had consumed the last apple and drunk the last glass\nof wine, a terrible voice was heard at no great distance. It was my\nuncle roaring for me to come to him. I made very nearly one leap of\nit--so loud, so fierce was his tone.\n\n\n\n\nCHAPTER 2\n\nTHE MYSTERIOUS PARCHMENT\n\n\n[Illustration: Runic Glyphs]\n\n"I Declare," cried my uncle, striking the table fiercely with his fist,\n"I declare to you it is Runic--and contains some wonderful secret, which\nI must get at, at any price."\n\nI was about to reply when he stopped me.\n\n"Sit down," he said, quite fiercely, "and write to my dictation."\n\nI obeyed.\n\n"I will substitute," he said, "a letter of our alphabet for that of the\nRunic: we will then see what that will produce. Now, begin and make no\nmistakes."\n\nThe dictation commenced with the following incomprehensible result:\n\n\n mm.rnlls esruel seecJde\n sgtssmf unteief niedrke\n kt,samn atrateS Saodrrn\n emtnaeI nuaect rrilSa\n Atvaar .nscrc ieaabs\n ccdrmi eeutul frantu\n dt,iac oseibo KediiY\n\n\nScarcely giving me time to finish, my uncle snatched the document from\nmy hands and examined it with the most rapt and deep attention.\n\n"I should like to know what it means," he said, after a long period.\n\nI certainly could not tell him, nor did he expect me to--his\nconversation being uniformly answered by himself.\n\n"I declare it puts me in mind of a cryptograph," he cried, "unless,\nindeed, the letters have been written without any real meaning; and yet\nwhy take so much trouble? Who knows but I may be on the verge of some\ngreat discovery?"\n\nMy candid opinion was that it was all rubbish! But this opinion I kept\ncarefully to myself, as my uncle's choler was not pleasant to bear. All\nthis time he was comparing the book with the parchment.\n\n"The manuscript volume and the smaller document are written in different\nhands," he said, "the cryptograph is of much later date than the book;\nthere is an undoubted proof of the correctness of my surmise. [An\nirrefragable proof I took it to be.] The first letter is a double M,\nwhich was only added to the Icelandic language in the twelfth\ncentury--this makes the parchment two hundred years posterior to the\nvolume."\n\nThe circumstances appeared very probable and very logical, but it was\nall surmise to me.\n\n"To me it appears probable that this sentence was written by some owner\nof the book. Now who was the owner, is the next important question.\nPerhaps by great good luck it may be written somewhere in the volume."\n\nWith these words Professor Hardwigg took off his spectacles, and, taking\na powerful magnifying glass, examined the book carefully.\n\nOn the fly leaf was what appeared to be a blot of ink, but on\nexamination proved to be a line of writing almost effaced by time. This\nwas what he sought; and, after some considerable time, he made out these\nletters:\n\n[Illustration: Runic Glyphs]\n\n"Arne Saknussemm!" he cried in a joyous and triumphant tone, "that is\nnot only an Icelandic name, but of a learned professor of the sixteenth\ncentury, a celebrated alchemist."\n\nI bowed as a sign of respect.\n\n"These alchemists," he continued, "Avicenna, Bacon, Lully, Paracelsus,\nwere the true, the only learned men of the day. They made surprising\ndiscoveries. May not this Saknussemm, nephew mine, have hidden on this\nbit of parchment some astounding invention? I believe the cryptograph

to\nhave a profound meaning--which I must make out."\n\nMy uncle walked about the room in a state of excitement almost\nimpossible to describe.\n\n"It may be so, sir," I timidly observed, "but why conceal it from\nposterity, if it be a useful, a worthy discovery?"\n\n"Why--how should I know? Did not Galileo make a secret of his\ndiscoveries in connection with Saturn? But we shall see. Until I\ndiscover the meaning of this sentence I will neither eat nor sleep."\n\n"My dear uncle--" I began.\n\n"Nor you neither," he added.\n\nIt was lucky I had taken double allowance that day.\n\n"In the first place," he continued, "there must be a clue to the\nmeaning. If we could find that, the rest would be easy enough."\n\nI began seriously to reflect. The prospect of going without food and\nsleep was not a promising one, so I determined to do my best to solve\nthe mystery. My uncle, meanwhile, went on with his soliloquy.\n\n"The way to discover it is easy enough. In this document there are one\nhundred and thirty-two letters, giving seventy-nine consonants to\nfifty-three vowels. This is about the proportion found in most southern\nlanguages, the idioms of the north being much more rich in consonants.\nWe may confidently predict, therefore, that we have to deal with a\nsouthern dialect."\n\nNothing could be more logical.\n\n"Now," said Professor Hardwigg, "to trace the particular language."\n\n"As Shakespeare says, 'that is the question,'" was my rather satirical\nreply.\n\n"This man Saknussemm," he continued, "was a very learned man: now as he\ndid not write in the language of his birthplace, he probably, like most\nlearned men of the sixteenth century, wrote in Latin. If, however, I\nprove wrong in this guess, we must try Spanish, French, Italian, Greek,\nand even Hebrew. My own opinion, though, is decidedly in favor of\nLatin."\n\nThis proposition startled me. Latin was my favorite study, and it seemed\nsacrilege to believe this gibberish to belong to the country of Virgil.\n\n"Barbarous Latin, in all probability," continued my uncle, "but still\nLatin."\n\n"Very probably," I replied, not to contradict him.\n\n"Let us see into the matter," continued my uncle; "here you see we have\na series of one hundred and thirty-two letters, apparently thrown\npell-mell upon paper, without method or organization. There are words\nwhich are composed wholly of consonants, such as mm.rnlls, others\nwhich are nearly all vowels, the fifth, for instance, which is unteief,\nand one of the last oseibo. This appears an extraordinary combination.\nProbably we shall find that the phrase is arranged according to some\nmathematical plan. No doubt a certain sentence has been written out and\nthen jumbled up--some plan to which some figure is the clue. Now, Harry,\nto show your English wit--what is that figure?"\n\nI could give him no hint. My thoughts were indeed far away. While he was\nspeaking I had caught sight of the portrait of my cousin Gretchen, and\nwas wondering when she would return.\n\nWe were affianced, and loved one another very sincerely. But my uncle,\nwho never thought even of such sublunary matters, knew nothing of this.\nWithout noticing my abstraction, the Professor began reading the\npuzzling cryptograph all sorts of ways, according to some theory of his\nown. Presently, rousing my wandering attention, he dictated one precious\nattempt to me.\n\nI mildly handed it over to him. It read as follows:\n\n\n\nmmessunkaSenrA.icefdoK.segnittamurtn\n ecertserrette,rotaivsadua,ednecsedsadne\n lacartniiilrJsiratracSarbmutabiledmek\n meretarcsilucoYsleffenSnI.\n\n\nI could scarcely keep from laughing, while my uncle, on

the contrary,\ngot in a towering passion, struck the table with his fist, darted out of\nthe room, out of the house, and then taking to his heels was presently\nlost to sight.