

PP04: Print Neatly with DP

CST501: Advanced Algorithms Programming Project Write-Up

Posting ID: 6421-735

Pledge:

I Becca Little pledge, on my honor, that the work submitted is my own and that I have neither sought nor provided inappropriate help to any other. I understand that I may not share any part of my solution or design (even if I have a bug and want help!) with any person other than the grader or instructor.

I Becca Little further understand that I must submit this completed write-up with my name inserted into the pledge, and also a .zip file containing my source-code as presented here as two separate attachments to the course website.

Highlighted Source Code:

```
1  import sys
2  INFINITY = sys.maxint
```

```
5  def print_neatly(words, M):
    """ Print text neatly.

    Parameters
    -----
    words: list of str
    Each string in the list is a word from the file.
    M: int
    The max number of characters per line including spaces

    Returns
    -----
    cost: number
    The optimal value as described in the textbook.
    text: str
    The entire text as one string with newline characters.
    It should not end with a blank line.

    Details
```

Look at print_neatly_test for some code to test the solution.

"""

```
27     n = len(words)
28     linecost = [[0 for x in range(n)] for x in range(n)]
29     options = [[[0 for x in range(1)] for x in range(2)] for x in range(1)]
30     for i in range(0, n):
31         linecost[i][i] = M - len(words[i])
32         for j in range(i + 1, n):
33             linecost[i][j] = linecost[i][j - 1] - len(words[j]) - 1
34         for j in range(i, n):
35             if (linecost[i][j] < 0):
36                 linecost[i][j] = INFINITY
37             else:
38                 if (j == n - 1):
39                     linecost[i][j] = 0
40                     options.append([[0], [i]])
41                 else:
42                     linecost[i][j] = linecost[i][j] ** 3
43     optimal = -1
44     cost = INFINITY
45     which = 1
46     for i in range(0, len(options) - 1):
47         linestart = -1
48         while (linestart != 0):
49             linestart, addcost = findPreviousLineStart(
50                 linecost, n, options[which][1][0])
51             options[which][1].insert(0, linestart)
52             options[which][0][0] += addcost
53         which += 1
54         if (options[i + 1][0][0] < cost):
55             optimal = i
56             cost = options[i + 1][0][0]
57     text = oneString(words, options[optimal + 1][1], M)
58     return (cost, text)
```

```
61 def oneString(words, indices, M):
62     text = ""
63     lines = len(indices)
64     indices.insert(lines, len(words))
65     for i in range(0, lines - 1):
66         line = ""
67         for j in range(indices[i], indices[i + 1] - 1):
68             line += words[j] + ' '
```

```

69         line += words[indices[i + 1] - 1]
70         numspaces = M - len(line)
71         line += numspaces * ' ' + '\n'
72         text += line
73     for j in range(indices[lines - 1], indices[lines]):
74         text += words[j] + ' '
75     return text

78     def findPreviousLineStart(linecost, n, next):
79         minimum = INFINITY
80         linestart = -1
81         for i in range(0, next - 1):
82             if (linecost[i][next - 1] < minimum):
83                 minimum = linecost[i][next - 1]
84                 linestart = i
85                 addcost = linecost[i][next - 1]
86         return linestart, addcost

```

Example Output:

```

becca@becca-Satellite-E45t-A:~/Desktop/assignment$ flake8 --max-complexity 10
ch15.py
ch15.py:5:1: C901 'print_neatly' is too complex (10)

```

```

-----
magna_carta.txt
-----

```

Magna Carta John, by the grace of God, king of England, lord of Ireland, duke of Normandy and Aquitaine, and count of Anjou, to the archbishops, bishops, abbots, earls, barons, justiciars, foresters, sheriffs, stewards, servants, and to all his bailiffs and faithful subjects, greeting. Know that we, out of reverence for God and for the salvation of our soul and those of all our ancestors and heirs, for the honour of God and the exaltation of holy church, and for the reform of our realm, on the advice of our venerable fathers, Stephen, archbishop of Canterbury, primate of all England and cardinal of the holy Roman church, Henry archbishop of Dublin, William of London, Peter of Winchester, Jocelyn of Bath and Glastonbury, Hugh of Lincoln, Walter of Worcester, William of Coventry and Benedict of Rochester, bishops, of master Pandulf, subdeacon and member of the household of the lord pope, of brother Aymeric, master

of the order of Knights Templar in England, and of the noble men William Marshal earl of Pembroke, William earl of Salisbury, William earl of Warenne, William earl of Arundel, Alan of Galloway constable of Scotland, Warin fitz Gerold, Peter fitz Herbert, Hubert de Burgh seneschal of Poitou, Hugh de Neville, Matthew fitz Herbert, Thomas Basset, Alan Basset, Philip de Aubeney, Robert of Ropsley, John Marshal, John fitz Hugh, and others, our faithful subjects: [1] In the first place have granted to God, and by this our present charter confirmed for us and our heirs for ever that the English church shall be free, and shall have its rights undiminished and its liberties unimpaired; and it is our will that it be thus observed; which is evident from the fact that, before the quarrel between us and our barons began, we willingly and spontaneously granted and by our charter confirmed the freedom of elections which is reckoned most important and very essential to the English church, and obtained confirmation of it from the lord pope Innocent III; the which we will observe and we wish our heirs to observe it in good faith for ever. We have also granted to all free men of our kingdom, for ourselves and our heirs for ever, all the liberties written below, to be had and held by them and their heirs of us and our heirs. [2] If any of our earls or barons or others holding of us in chief by knight service dies, and at his death his heir be of full age and owe relief he shall have his inheritance on payment of the old relief, namely the heir or heirs of an earl $\text{œ}100$ for a whole earl's barony, the heir or heirs of a baron $\text{œ}100$ for a whole barony, the heir or heirs of a knight 100s, at most, for a whole knight's fee; and he who owes less shall give less according to the ancient usage of fiefs. [3] If, however, the heir of any such be under age and a ward, he shall have his inheritance when he comes of age without paying relief and without making fine. [4] The guardian of the land of such an heir who is under age shall take from the land of the heir no more than reasonable revenues, reasonable customary dues and reasonable services and that without destruction and waste of men or goods; and if we commit the wardship of the land of any such to a sheriff, or to any other who is answerable to us for its revenues, and he destroys or wastes what he has wardship of, we will take compensation from him and the land shall be committed to two lawful and discreet men of that fief, who shall be answerable for the revenues to us or to him to whom we have assigned them; and if we give or sell to anyone the wardship of any such land and he causes destruction or waste therein, he shall lose that wardship, and it shall be transferred to two lawful and discreet men of that fief, who shall similarly be answerable to us as is aforesaid. [5] Moreover, so long as he has the wardship of the land, the guardian shall keep in repair the houses, parks, preserves, ponds, mills and other things pertaining to the land out of the revenues from it; and he shall

restore to the heir when he comes of age his land fully stocked with ploughs and the means of husbandry according to what the season of husbandry requires and the revenues of the land can reasonably bear. [6] Heirs shall be married without disparagement, yet so that before the marriage is contracted those nearest in blood to the heir shall have notice. [7] A widow shall have her marriage portion and inheritance forthwith and without difficulty after the death of her husband; nor shall she pay anything to have her dower or her marriage portion or the inheritance which she and her husband held on the day of her husband's death; and she may remain in her husband's house for forty days after his death, within which time her dower shall be assigned to her. [8] No widow shall be forced to marry so long as she wishes to live without a husband, provided that she gives security not to marry without our consent if she holds of us, or without the consent of her lord of whom she holds, if she holds of another. [9] Neither we nor our bailiffs will seize for any debt any land or rent, so long as the chattles of the debtor are sufficient to repay the debt; nor will those who have gone surety for the debtor be distrained so long as the principal debtor is himself able to pay the debt; and if the principal debtor fails to pay the debt, having nothing wherewith to pay it, then shall the sureties answer for the debt; and they shall, if they wish, have the lands and rents of the debtor until they are reimbursed for the debt which they have paid for him, unless the principal debtor can show that he has discharged his obligation in the matter to the said sureties. [10] If anyone who has borrowed from the Jews any sum, great or small, dies before it is repaid, the debt shall not bear interest as long as the heir is under age, of whomsoever he holds; and if the debt falls into our hands, we will not take anything except the principal mentioned in the bond. [11] And if anyone dies indebted to the Jews, his wife shall have her dower and pay nothing of that debt; and if the dead man leaves children who are under age, they shall be provided with necessaries befitting the holding of the deceased; and the debt shall be paid out of the residue, reserving, however, service due to lords of the land; debts owing to others than Jews shall be dealt with in like manner. [12] No scutage or aid shall be imposed in our kingdom unless by common counsel of our kingdom, except for ransoming our person, for making our eldest son a knight, and for once marrying our eldest daughter; and for these only a reasonable aid shall be levied. Be it done in like manner concerning aids from the city of London. [13] And the city of London shall have all its ancient liberties and free customs as well by land as by water. Furthermore, we will and grant that all other cities, boroughs, towns, and ports shall have all their liberties and free customs. [14] And to obtain the common counsel of the kingdom about the assessing of an aid (except in the three cases aforesaid)

or of a scutage, we will cause to be summoned the archbishops, bishops, abbots, earls and greater barons, individually by our letters-and, in addition, we will cause to be summoned generally through our sheriffs and bailiffs all those holding of us in chief-for a fixed date, namely, after the expiry of at least forty day, and to a fixed place; and in all letters of such summons we will specify the reason for the summons. And when the summons has thus been made, the business shall proceed on the day appointed, according to the counsel of those present, though not all have come who were summoned. [15] We will not in future grant any one the right to take an aid from his free men, except for ransoming his person, for making his eldest son a knight and for once marrying his eldest daughter, and for these only a reasonable aid shall be levied.

[16] No one shall be compelled to do greater service for a knight's fee or for any other free holding than is due from it. [17] Common pleas shall not follow our court, but shall be held in some fixed place. [18] Recognitions of novel disseisin, of mort d'ancestor, and of darrein presentment, shall not be held elsewhere than in the counties to which they relate, and in this manner-we, or, if we should be out of the realm, our chief justiciar, will send two justices through each county four times a year, who, with four knights of each county chosen by the county, shall hold the said assizes in the county and on the day and in the place of meeting of the county court. [19] And if the said assizes cannot all be held on the day of the county court, there shall stay behind as many of the knights and freeholders who were present at the county court on that day as are necessary for the sufficient making of judgments, according to the amount of business to be done. [20] A free man shall not be amerced for a trivial offence except in accordance with the degree of the offence, and for a grave offence he shall be amerced in accordance with its gravity, yet saving his way of living; and a merchant in the same way, saving his stock-in-trade; and a villein shall be amerced in the same way, saving his means of livelihood-if they have fallen into our mercy: and none of the aforesaid amercements shall be imposed except by the oath of good men of the neighbourhood. [21] Earls and barons shall not be amerced except by their peers, and only in accordance with the degree of the offence. [22] No clerk shall be amerced in respect of his lay holding except after the manner of the others aforesaid and not according to the amount of his ecclesiastical benefice. [23] No vill or individual shall be compelled to make bridges at river banks, except those who from of old are legally bound to do so. [24] No sheriff, constable, coroners, or others of our bailiffs, shall hold pleas of our crown. [25] All counties, hundreds, wapentakes and tithings shall be at the old rents without any additional payment, except our demesne manors. [26] If anyone holding a lay fief of us dies

and our sheriff or bailiff shows our letters patent of summons for a debt that the deceased owed us, it shall be lawful for our sheriff or bailiff to attach and make a list of chattels of the deceased found upon the lay fief to the value of that debt under the supervision of law-worthy men, provided that none of the chattels shall be removed until the debt which is manifest has been paid to us in full; and the residue shall be left to the executors for carrying out the will of the deceased. And if nothing is owing to us from him, all the chattels shall accrue to the deceased, saving to his wife and children their reasonable shares. [27] If any free man dies without leaving a will, his chattels shall be distributed by his nearest kinsfolk and friends under the supervision of the church, saving to every one the debts which the deceased owed him. [28] No constable or other bailiff of ours shall take anyone's corn or other chattels unless he pays on the spot in cash for them or can delay payment by arrangement with the seller. [29] No constable shall compel any knight to give money instead of castle-guard if he is willing to do the guard himself or through another good man, if for some good reason he cannot do it himself; and if we lead or send him on military service, he shall be excused guard in proportion to the time that because of us he has been on service. [30] No sheriff, or bailiff of ours, or anyone else shall take the horses or carts of any free man for transport work save with the agreement of that freeman. [31] Neither we nor our bailiffs will take, for castles or other works of ours, timber which is not ours, except with the agreement of him whose timber it is. [32] We will not hold for more than a year and a day the lands of those convicted of felony, and then the lands shall be handed over to the lords of the fiefs. [33] Henceforth all fish-weirs shall be cleared completely from the Thames and the Medway and throughout all England, except along the sea coast. [34] The writ called Praeceptum shall not in future be issued to anyone in respect of any holding whereby a free man may lose his court. [35] Let there be one measure for wine throughout our kingdom, and one measure for ale, and one measure for corn, namely "the London quarter"; and one width for cloths whether dyed, russet or halberget, namely two ells within the selvages. Let it be the same with weights as with measures. [36] Nothing shall be given or taken in future for the writ of inquisition of life or limbs: instead it shall be granted free of charge and not refused. [37] If anyone holds of us by fee-farm, by socage, or by burgage, and holds land of another by knight service, we will not, by reason of that fee-farm, socage, or burgage, have the wardship of his heir or of land of land of his that is of the fief of the other; nor will we have custody of the fee-farm, socage, or burgage, unless such fee-farm owes knight service. We will not have custody of anyone's heir or land which he holds of another

by knight service by reason of any petty serjeanty which he holds of us by the service of rendering to us knives or arrows or the like. [38] No bailiff shall in future put anyone to trial upon his own bare word, without reliable witnesses produced for this purpose. [39] No free man shall be arrested or imprisoned or disseised or outlawed or exiled or in any way victimised, neither will we attack him or send anyone to attack him, except by the lawful judgment of his peers or by the law of the land. [40] To no one will we sell, to no one will we refuse or delay right or justice. [41] All merchants shall be able to go out of and come into England safely and securely and stay and travel throughout England, as well by land as by water, for buying and selling by the ancient and right customs free from all evil tolls, except in time of war and if they are of the land that is at war with us. And if such are found in our land at the beginning of a war, they shall be attached, without injury to their persons or goods, until we, or our chief justiciar, know how merchants of our land are treated who were found in the land at war with us when war broke out, and if ours are safe there, the others shall be safe in our land. [42] It shall be lawful in future for anyone, without prejudicing the allegiance due to us, to leave our kingdom and return safely and securely by land and water, save, in the public interest, for a short period in time of war-except for those imprisoned or outlawed in accordance with the law of the kingdom and natives of a land that is at war with us and merchants (who shall be treated as aforesaid). [43] If anyone who holds of some escheat such as the honour of Wallingford, Nottingham, Boulogne, Lancaster, or of other escheats which are in our hands and are baronies dies, his heir shall give no other relief and do no other service to us than he would have done to the baron if that barony had been in the baron's hands; and we will hold it in the same manner in which the baron held it. [44] Men who live outside the forest need not henceforth come before our justices of the forest upon a general summons, unless they are impleaded or are sureties for any person or persons who are attached for forest offences. [45] We will not make justices, constables, sheriffs or bailiffs save of such as know the law of the kingdom and mean to observe it well. [46] All barons who have founded abbeys for which they have charters of the kings of England or ancient tenure shall have the custody of them during vacancies, as they ought to have. [47] All forests that have been made forest in our time shall be immediately disafforested; and so be it done with river banks that have been made preserves by us in our time. [48] All evil customs connected with forests and warrens, foresters and warreners, sheriffs and their officials, riverbanks and their wardens shall immediately be inquired into in each county by twelve sworn knights of the same county, and within forty days of the completion of the inquiry shall be

utterly abolished by them so as never to be restored, provided that we, or our justiciar if we are not in England, know of it first. [49] We will immediately return all hostages and charters given to us by Englishmen, as security for peace or faithful service. [50] We will remove completely from office the relations of Gerard de Athee so that in future they shall have no office in England, namely Engelard de Cigogne, Peter and Guy and Andrew de Chanceaux, Guy de cigogne, Geoffrey de Maartigny and his brothers, Philip Marc and his brothers and his nephew Geoffrey, and all their following. [51] As soon as peace is restored, we will remove from the kingdom all foreign knights, cross-bowmen, serjeants, and mercenaries, who have come with horses and arms to the detriment of the kingdom. [52] If anyone has been disseised of or kept out of his lands, castles, franchises or his right by us without the legal judgment of his peers, we will immediately restore them to him: and if a dispute arises over this, then let it be decided by the judgment of the twenty-five barons who are mentioned below in the clause for securing the peace: for all the things, however, which anyone has been disseised or kept out of without the lawful judgment of his peers by king Henry, our father, or by king Richard, our brother, which we have in our hand or are held by others, to whom we are bound to warrant them, we will have the usual period of respite of crusaders, excepting those things about which a plea was started or an inquest made by our command before we took the cross; when however we return from our pilgrimage, or if by any chance we do not go on it, we will at once do full justice therein. [53] We will have the same respite, and in the same manner, in the doing of justice in the matter of the disafforesting or retaining of the forests which Henry our father or Richard our brother afforested, and in the matter of the wardship of lands which are of the fief of another, wardships of which sort we have hitherto had by reason of a fief which anyone held of us by knight service, and in the matter of abbeys founded on the fief of another, not on a fief of our own, in which the lord of the fief claims he has a right; and when we have returned, or if we do not set out on our pilgrimage, we will at once do full justice to those who complain of these things. [54] No one shall be arrested or imprisoned upon the appeal of a woman for the death of anyone except her husband. [55] All fines made with us unjustly and against the law of the land, and all amercements imposed unjustly and against the law of the land, shall be entirely remitted, or else let them be settled by the judgment of the twenty- five barons who are mentioned below in the clause for securing the peace, or by the judgment of the majority of the same, along with the aforesaid Stephen, archbishop of Canterbury, if he can be present, and such others as he may wish to associate with himself for this purpose, and if he cannot be present the business shall nevertheless proceed

without him, provided that if any one or more of the aforesaid twenty-five barons are in a like suit, they shall be removed from the judgment of the case in question, and others chosen, sworn and put in their place by the rest of the same twenty-five for this case only. [56] If we have disseised or kept out Welshmen from lands or liberties or other things without the legal judgment of their peers in England or in Wales, they shall be immediately restored to them; and if a dispute arises over this, then let it be decided in the March by the judgment of their peers-for holdings in England according to the law of England, for holdings in Wales according to the law of Wales, and for holdings in the March according to the law of the March. Welshmen shall do the same to us and ours. [57] For all the things, however, which any Welshman was disseised of or kept out of without the lawful judgment of his peers by king Henry, our father, or king Richard, our brother, which we have in our hand or which are held by others, to whom we are bound to warrent them, we will have the usual period of respite of crusaders, excepting those things about which a plea was started or an inquest made by our command before we took the cross; when however we return, or if by any chance we do not set out on our pilgrimage, we will at once do full justice to them in accordance with the laws of the Welsh and the foresaid regions. [58] We will give back at once the son of Llywelyn and all the hostages from Wales and the charters that were handed over to us as security for peace. [59] We will act toward Alexander, king of the Scots, concerning the return of his sisters and hostages and concerning his franchises and his right in the same manner in which we act towards our other barons of England, unless it ought to be otherwise by the charters which we have from William his father, formerly king of the Scots, and this shall be determined by the judgment of his peers in our court. [60] All these aforesaid customs and liberties which we have granted to be observed in our kingdom as far as it pertains to us towards our men, all of our kingdom, clerks as well as laymen, shall observe as far as it pertains to them towards their men. [61] Since, moreover, for God and the betterment of our kingdom and for the better allaying of the discord that has arisen between us and our barons we have granted all these things aforesaid, wishing them to enjoy the use of them unimpaired and unshaken for ever, we give and grant them the under-written security, namely, that the barons shall choose any twenty-five barons of the kingdom they wish, who must with all their might observe, hold and cause to be observed, the peace and liberties which we have granted and confirmed to them by this present charter of ours, so that if we, or our justiciar, or our bailiffs or any one of our servants offend in any way against anyone or transgress any of the articles of the peace or the security and the offence be notified to four of the aforesaid twenty-five barons, those four

barons shall come to us, or to our justiciar if we are out of the kingdom, and, laying the transgression before us, shall petition us to have that transgression corrected without delay. And if we do not correct the transgression, or if we are out of the kingdom, if our justiciar does not correct it, within forty days, reckoning from the time it was brought to our notice or to that of our justiciar if we were out of the kingdom, the aforesaid four barons shall refer that case to the rest of the twenty-five barons and those twenty-five barons together with the community of the whole land shall distrain and distress us in every way they can, namely, by seizing castles, lands, possessions, and in such other ways as they can, saving our person and the persons of our queen and our children, until, in their opinion, amends have been made; and when amends have been made, they shall obey us as they did before. And let anyone in the land who wishes take an oath to obey the orders of the said twenty-five barons for the execution of all the aforesaid matters, and with them to distress us as much as he can, and we publicly and freely give anyone leave to take the oath who wishes to take it and we will never prohibit anyone from taking it. Indeed, all those in the land who are unwilling of themselves and of their own accord to take an oath to the twenty-five barons to help them to distrain and distress us, we will make them take the oath as aforesaid at our command. And if any of the twenty-five barons dies or leaves the country or is in any other way prevented from carrying out the things aforesaid, the rest of the aforesaid twenty-five barons shall choose as they think fit another one in his place, and he shall take the oath like the rest. In all matters the execution of which is committed to these twenty-five barons, if it should happen that these twenty-five are present yet disagree among themselves about anything, or if some of those summoned will not or cannot be present, that shall be held as fixed and established which the majority of those present ordained or commanded, exactly as if all the twenty-five had consented to it; and the said twenty-five shall swear that they will faithfully observe all the things aforesaid and will do all they can to get them observed. And we will procure nothing from anyone, either personally or through anyone else, whereby any of these concessions and liberties might be revoked or diminished; and if any such thing is procured, let it be void and null, and we will never use it either personally or through another. [62] And we have fully remitted and pardoned to everyone all the ill-will, indignation and rancour that have arisen between us and our men, clergy and laity, from the time of the quarrel. Furthermore, we have fully remitted to all, clergy and laity, and as far as pertains to us have completely forgiven, all trespasses occasioned by the same quarrel between Easter in the sixteenth year of our reign and the restoration of peace. And, besides, we have caused to be made for them

letters testimonial patent of the lord Stephen archbishop of Canterbury, of the lord Henry archbishop of Dublin and of the aforementioned bishops and of master Pandulf about this security and the aforementioned concessions. [63] Wherefore we wish and firmly enjoin that the English church shall be free, and that the men in our kingdom shall have and hold all the aforesaid liberties, rights and concessions well and peacefully, freely and quietly, fully and completely, for themselves and their heirs from us and our heirs, in all matters and in all places for ever, as is aforesaid. An oath, moreover, has been taken, as well on our part as on the part of the barons, that all these things aforesaid shall be observed in good faith and without evil disposition. Witness the above-mentioned and many others. Given by our hand in the meadow which is called Runnymede between Windsor and Staines on the fifteenth day of June, in the seventeenth year of our reign.

cost = 28508
true cost = 28508
bad lines = 267

kubla_kahn.txt

In Xanadu did Kubla Khan A stately pleasure dome decree: Where Alph, the sacred river, ran Through caverns measureless to man Down to a sunless sea. So twice five miles of fertile ground With walls and towers were girdled round: And there were gardens bright with sinuous rills, Where blossomed many an incense-bearing tree; And here were forests ancient as the hills, Enfolding sunny spots of greenery. But oh! that deep romantic chasm which slanted Down the green hill athwart a cedarn cover! A savage place! as holy and enchanted As e'er beneath a waning moon was haunted By woman wailing for her demon lover! And from this chasm, with ceaseless turmoil seething, As if this earth in fast thick pants were breathing, A mighty fountain momently was forced: Amid whose swift half-intermitted burst Huge fragments vaulted like rebounding hail, Or chafly grain beneath the thresher's flail: And `mid these dancing rocks at once and ever It flung up momently the sacred river. Five miles meandering with a mazy motion Through wood and dale the sacred river ran, Then reached the caverns measureless to man, And sank in tumult to a lifeless ocean: And `mid this tumult Kubla heard from far Ancestral voices prophesying war! The shadow of the dome of pleasure Floated midway on the waves; Where was heard the mingled measure From the fountain and the caves. It was a miracle of rare device, A sunny pleasure

dome with caves of ice! A damsel with a dulcimer In a vision once I saw: It was an Abyssinian maid, And on her dulcimer she played, Singing of Mount Abora. Could I revive within me Her symphony and song, To such a deep delight `twould win me, That with music loud and long, I would build that dome in air, That sunny dome! those caves of ice! And all who heard should see them there, And all should cry, Beware! Beware! His flashing eyes, his floating hair! Weave a circle round him thrice, And close your eyes with holy dread, For he on honeydew hath fed, And drunk the milk of Paradise.

cost = 6489
true cost = 6489
bad lines = 19

Reflection:

For this programming assignment we were supposed to implement the “Print Neatly” problem as described in Chapter 15 of the book.

First I wanted a table where entry (i,j) contains the cost of a line containing words i through j, remembering that there are spaces between words. If the words don’t fit on a line, the cost should be infinity. If its the last line, the cost should be zero. Otherwise, the cost is the number of wasted characters cubed. As I am doing this, I keep track of the indices of words that could possibly start the last line. I examine these cases and then choose the indices of the previous line based on which would result in the lowest cost. Of the options that could possibly be the last line, I choose the one with the lowest total cost after determining the preceding indices. Finally, I combine into a single String by inserting spaces to fill the area after the last word and before the end of each line and then inserting a newline character after each line but the last.

When I first implemented my solution, I had a complexity of 13. By combining some for loops, I was able to reduce my complexity to 10. However, I do have a couple functions, oneString and findPreviousLineStart, which reduce my complexity by an additional 3 and 2, respectively.