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Ex-2-2

1/23/17

(a) We concern ourselves only with the number of allowable strings of length 70. If each character has a possible 65 options, then there are 65\*\*70=8015580221908051830252864620266291701029887523957704759968266340081437847271082289810940901819691362106823362410068511962890625 allowable lines.

From python Idle shell:

>>> 65\*\*70

8015580221908051830252864620266291701029887523957704759968266340081437847271082289810940901819691362106823362410068511962890625

(b) On a page with line length of 70 and number of lines equal to twenty-five, then there are (as given) 1820 characters per page. If the choices of characters are independent for all of the characters on the page, then we have 65\*\*1820 (value given below) possible combinations of characters on a page.

From python Idle shell:

>>> 65\*\*1820

317913587582476615957537710011060014378361157957848857839631640678726091546783357570575260693860253921647496812788244972244812660814539599670137698736665598023670671268013807718623674397480600993280007572497081739755803555577520387053474083958648900666184675429844870840318934141133019891230803614150444698310187796425796432578134732506345060073691522177952700071923417913949178391021541168910563521634194985265638037155748244744937545349474276813413807680984887796727446570254792050855251725024342148293745532444024307334803383999953576460819523135159877174306423162081661446280712609717929496804924770443480493500808587018069683344800463364412773174316719517195312733801135111700689149641162406213730156478920440787970762080850347682481268400595345225543002312932458225582345202216142409920461385820199178668572692579309751598627467187686123993858582229548781782255978497991741232694629845094620985261568721397032850646913422162283192398399768052840984512099947648396863657917997650854996595265505658436305928641508775254016183099684647881428966428012943094930287865259399502853728911522287629085387046577642718932577933629783003870989711549195490476469804795614365532259842538504793978862160705431310668411410758074979001298020324422531112917649068897379265453829569919604085714293871924609450902886381580152304908195453204220280758190726489302723608472062738209397396448212176275687087037330222222568234307178276136315371772027134481375756943638034903255602022682262808599983191912048601109380868124667911992384980178776334643073782152302270586429597739573547188886748471065927159891206014347307420860275159737488809783666567892411788873949317742428652543791541525638792708468286884865827431182058203917792375283618553761379795266635130480414733526860955653987134798675995825055725814330120750741115165917790585414018194688810295186034640877643088971997439853828867007267917658019413731567843389843597633366991417640027281348705852052855421659232013757163941971498025578040881078953017381476148201786871696095141195261131291384357017986980687949062992564125656500275359949413000788300694917704983074527296883951487570914559287157660681456829780586358527787488038676101405332073586470412683891273299534737059536855494521707915174986447851150555140670748834333331582819960386386197012343391565470531153999354161153398912295582388545109718785818868306254921089357124674312565368151425038555655981102928180553737087091235361949631986037549800443872831118511962284433774338181657181348023051836089650470849791611175308233568119365671028427959750217410443537501043987931282525744349292590424117403241581796792576649593801549980768526755542729379734735064050666778168101986016746916637897231928650966847711369585758831560835256108097628496904413815741033299845104313326636257057518915019417660559420361633191784370759092943520974142616371820047894929209317991013619493512252017459862129710465051697305108050688847084120371726483082610012840666491414800413644767996203657159616560904219302727246737307205454256862814639405167764227646482186717882338584783713785494635691733560496363275178922287781784937369027757900595760052276413014135709234099248327292080549124639584496418351652869531721146601055018804246090106082361772689572258631307237274213913453283498187530720091586999842547811567783355712890625

(c) In a book of 188 pages with 1820 characters per page, there are 188\*1820=342160 characters. Assuming the choice of characters is independent, then there are 65\*\*342160 allowable combinations of letters for a book. When we try to do the computation in the shell, the shell tries to execute the command for a little while, and then eventually crashes.

Bonus: We know that there are 620,307 digits because in the case of overflow in mathematical computation, we can take the logarithm of a given number to approximate the value of the number to the correct order of magnitude. Thus, we can write (using the accepted base 10 logarithm) Log(65\*\*342160)=342160\*Log(65) (from basic properties of logarithms). But, 342160\*Log(65)= 620306.4341089193. This tells us that 65\*\*342160 is between 10\*\*620306 and 10\*\*620307, thus there are 620307 in a decimal expansion of 65\*\*342160

From the python Idle shell:

>>> import math

>>> math.log(65,10)

1.8129133566428552

>>> 342160\*1.8129133566428552

620306.4341089193