17TH ANNUAL IAP MYSTERY HUNT
OFFICIAL REGISTRATION FORM

Please make sure that we know how to get in touch with you it the event of changes.

Team Name: _____

Captain's Name: _____

Other Members: _____

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Contact email: _____

Contact phone: _____

Homebase: _____

Anything else we should know? _____

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My dear mystery-hunter,

I am delighted---and enormously grateful---that you have responded to my call for help! The terrible stress that I have gone through since I lost my coin has made me physically ill, and now that Achilles and the Tortoise are lost in the help manual, I am at my wits' end. But I'm getting ahead of myself here, so let me back up and explain what I'm talking about.

You may know who I am if you've read Douglas Hofstadter's book Goedel, Escher, Bach: An Eternal Golden Braid. If not, never mind; suffice it to say that acquiring priceless objects of all kinds is a hobby of mine. This hobby has given me a great deal of pleasure over the years, but there was one occasion not long ago when it caused me great anguish. A mysterious man showed up at my house and told me that he had heard of my priceless Iroquois Hickory Tree Four-Poster bed and wanted to buy it. "Name your price," he said, "and I'll pay it." Naturally, I refused. The man then pulled out a box containing a strange-looking coin and said, "I will give you this coin in return for the bed." Again, I was going to refuse, but for some reason found myself unable to. It was as if I were under some kind of spell. The man gave me the coin and then, to my horror, proceeded to cart off my priceless bed right under my very nose, while I stood there powerless to prevent him. Not until the man had driven out of sight was I able to move normally again.

You can imagine my distress at this incident. I was a basket case for weeks. What finally lifted me out of my depression was the discovery that the coin was in fact the infamous "I Haven't Tolerance For Prices" coin, which can be exchanged for any priceless object, even against the owner's will. When I learned this, I was overjoyed, and thought at first that I had actually benefited enormously from the transaction with the stranger. I soon found, however, that the matter was not quite so simple. It turns out that as soon as you put a price on an object, no matter how high, the coin becomes powerless to purchase it, since the object is no longer priceless. There have been many times when I have found something that I wanted to purchase with the coin, only to find that the object actually had a price tag on it. Nevertheless, I have high hopes that I will be able to use it some day, and thus I have been guarding it very carefully.

Then, last week, disaster struck. My good friends Achilles and the Tortoise were over at my place watching a movie on my Subjunc-TV, a remarkable device that lets you tune in and watch alternative realities (as you may know if you've read Hofstadter's dialogue "Contrafactus"). At the same time, I was also recording my favorite show, "Lifestyles of the Rich and Famous," on my Subjunc-VCR. There was a thunderstorm outside, and suddenly a flash of lightning struck the antenna of my Subjunc-TV. There was a loud bang and the screen went blank. We rushed over to the Subjunc-TV to see what had happened. Nothing seemed to be working, and worst of all, the box containing my IHTFP coin had been sitting near the power cord, and when we opened the box, we found that the coin had vanished!

Telling this story and reliving the shock of the moment when I discovered my loss still disturbs me so much that I can hardly continue, but I must finish. A thorough search of the box revealed a help manual promisingly entitled

subjUnc-TV
RepaIr mAnuaL

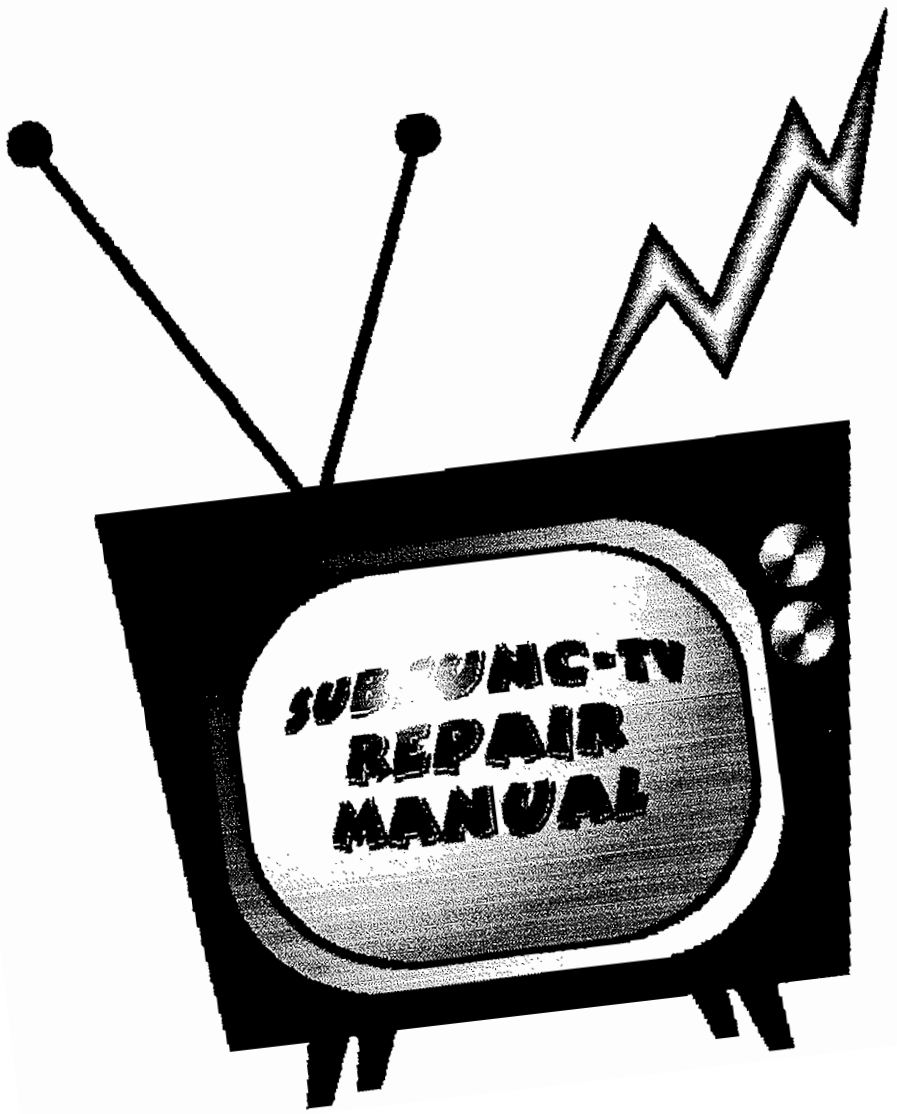
...but unfortunately, when we opened the manual, we found that its contents had also been distorted by the accident. We puzzled over the manual for hours, but couldn't make head or tail of it. Finally, Achilles and the Tortoise decided that they would actually go into the help manual to get a closer look. I thought this was a dangerous idea, but before I could stop them, they drank some pushing-potion and disappeared into the manual. When they didn't come back, I decided that it was time to call for help, so I asked some friends of mine at MIT to place an ad in the IAP guide---written in a way such that casual readers might not be able to distinguish it from an ordinary MIT activity, but such that any true puzzle-sleuth would instantly recognize its true meaning.

And now, dear mystery-hunter, I must thank you again for responding to my ad and coming to my aid. You will have my everlasting gratitude if you can recover the IHTFP coin for me. I have enclosed a copy of the help manual (if you glance inside you will see snatches of conversation between Achilles and the Tortoise as they were wandering through its pages) and a copy of the Subjunc-VCR tape, in case that helps. Unfortunately, my Subjunc-VCR no longer works, and I have been unable to locate an acceptable replacement in any of the stores around here. However, you may notice that the VCR tape is backwards-compatible with audio cassette players, so that you can listen to the audio portion at least. One other thing---while we were studying the help manual, Achilles and the Tortoise mentioned that they thought that a copy of Hofstadter's Goedel, Escher, Bach would be an invaluable tool; I do not understand exactly how that could be, but you may wish to obtain a copy of the book in any case. (My friends should be able to help you locate a copy if you have trouble finding one.) I also encourage you to use any other resources you have at your disposal---the MIT libraries, the World-Wide Web, your friends and family---to help you find the coin. And remember that the coin is everything! The help manual is only a means towards an end; you don't necessarily have to follow all the instructions in the help manual to the letter if you can figure out a clever way to bypass them and still find the coin.

I wish I could be there to help you in person, but I am still recovering from my illness and cannot leave my bed. However, my friends David Reiley, MK Lucking Reiley, Timothy Chow, Jonathan Walton, Arthur Mateos, Grace Chang Mateos, and Philip Lin will be available (except between midnight and 9 a.m.) to help you in any way they can. You can reach them by email at puzzle@mit.edu (or by phone at 3-7353).

Good luck! I hope to hear news of your success soon.

Yours truly,
The Crab.


SUE VNC-TV
REPAIR
MANUAL

Tortoise: Well, here we are.

Achilles: That wasn' t as bad as I expected. Where are we now? Oh yes, I recognize this part of the manual. It' s certainly much easier to see what' s going on when we' re close up.

Tortoise: On the other hand, we have to expend a lot more effort moving around. This could take a long time.

Achilles: So let' s get started right away. Do you have the notes we made before we drank the pushing potion?

Find the number of calories burned by a 150 lb. person working out on a Stairmaster 4000 PT (found in the weight room in the Gym) on level 5, interval training, for 20 minutes. Plug that number into the following formula:

$$3n^6 - 51n^5 + 315n^4 - 765n^3 + 42n^2 + 2616n - 2851$$

and take the remainder upon dividing by 360 to find the answer.

Achilles: Hey, I recognize this picture! It' s Escher' s lithograph *Above and Below.*

Tortoise: Very astute, Achilles. I don' t think I' ve ever seen it before. It looks pointillistic. Were all those colored speckles in the original work?

Achilles: No, not at all. It looks to me as though someone took a black-and-white scan and randomly sprinkled colored dots all over it.

Tortoise: I know you won' t believe this, but this reminds me of the MU-picture in Hofstadter' s book.

Achilles: I know you won' t believe this, but I was thinking the same thing. How curious. . .

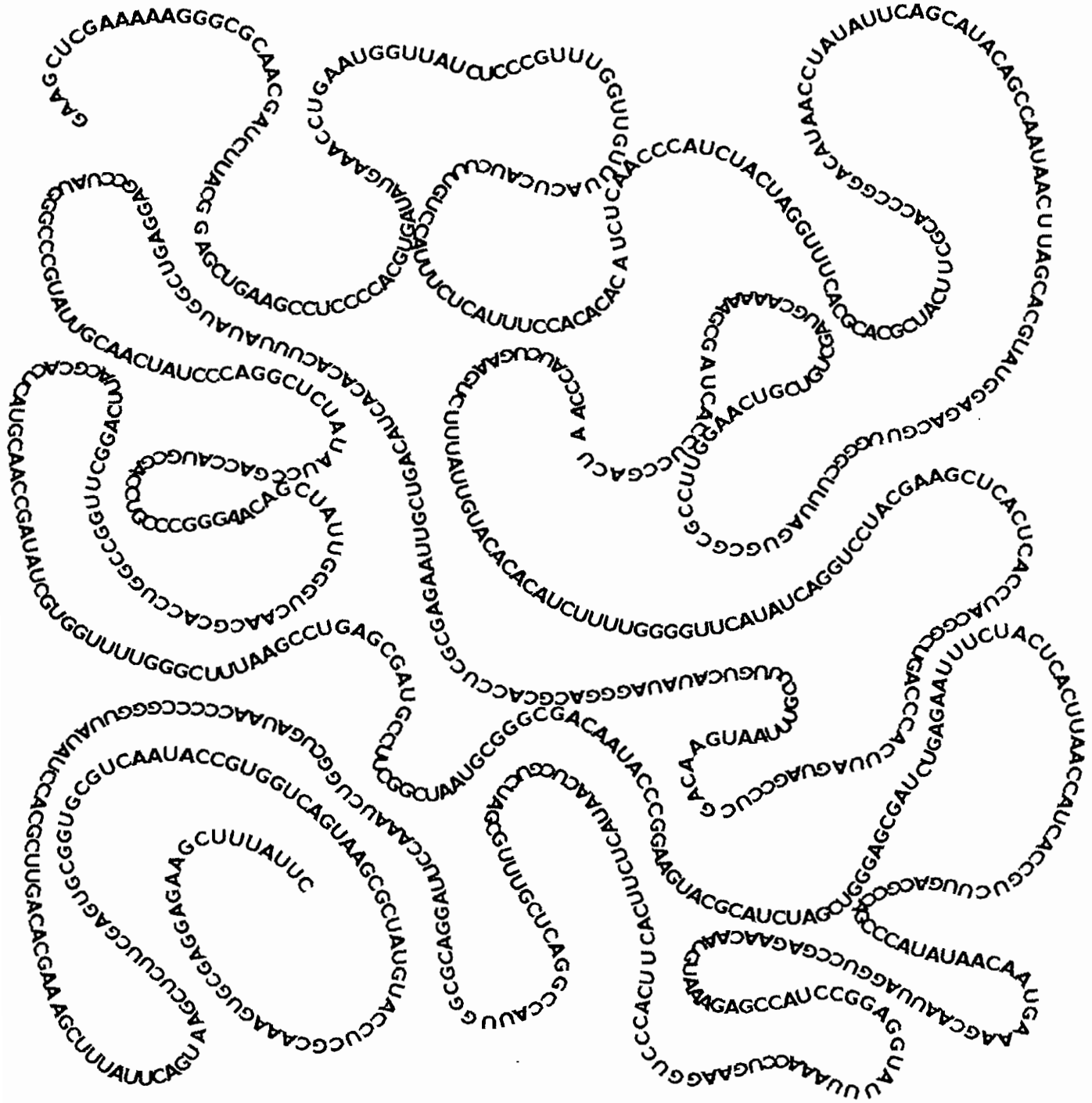
add puzzle
add graphics
xv /mit/puzzle/escher.gif

Achilles: More jumbled-up text! Where will it all end?

Tortoise: Don't despair, Achilles. I'm sure we can make some sense out of it.

Achilles: Hmm... A, C, G, ... those are all musical notes, aren't they? Maybe this is a piece of music. But what does U represent?

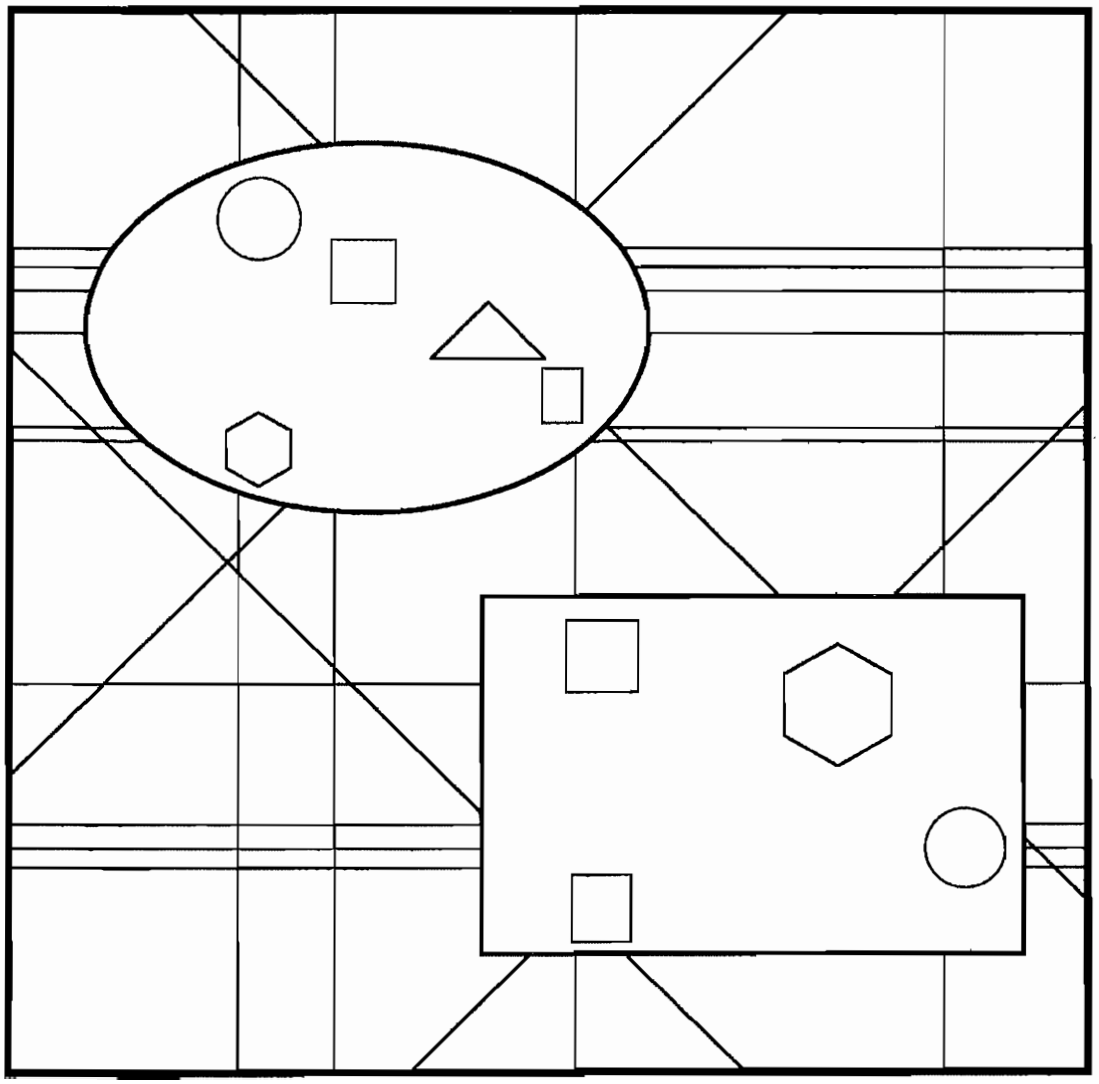
Tortoise: I have an idea. Let's see... where to begin?



Achilles: This one' s a baffler if anything is. There are no instructions at all!

Tortoise: It certainly is hard to see how to extract any information out of this. But surely the information must be there, no matter how inexplicitly.

Achilles: That doesn' t mean that we' ll be able to decode it. Doesn' t quantum mechanics tell us that some things are inherently unknowable?



Achilles: This is strange. . . I don' t remember seeing this part of the manual before.

Tortoise: What' s strange about that? There were several parts of the manual that we didn' t look at before we pushed in.

Achilles: Really? I hadn' t realized that. Anyway, this game is rather like Nim, don' t you think?

Tortoise: Nim? What' s that?

Achilles: It' s just like this game except that instead of transferring the chips from one pile to another, you simply remove them entirely until they' re all gone.

Tortoise: Is there a known winning strategy?

Achilles: Oh yes, you can read about it in many puzzle books, such as T. H. O' Beirne' s *Puzzles and Paradoxes*. It involves binary numbers in a surprising way.

Tortoise: Do you suppose that winning strategy could help us here?

Achilles: Maybe, but I wouldn' t count on it.

Shift-It is a two-player game that is played as follows: there are some number of chips in each of five piles, which we shall call A, B, C, D, and E. A move consists of moving one or more chips from A to B, or B to C, or C to D, or D to E. Once in E the chips cannot be moved. Players alternate moves, and the last player to move wins.

The game 1 1 2 4 2 means there is one chip in pile A, one in B, two in C, four in D, and two in E.

In each of the five games below, the first player to move has a winning move. Write down the number of chips moved and concatenate these five numbers to obtain the final answer. For example, suppose that in Game 1 moving 14 chips from B to C wins, in Game 2 moving 1 chip from D to E wins, in Game 3 moving 100 chips from A to B wins, in Game 4 moving 2 chips from C to D wins, and in Game 5 moving 7 chips from C to D wins. Concatenating 14, 1, 100, 2 and 7 gives the number 14,110,027.

Game 1:	**12**	**18**	**26**	**20**	**5**
Game 2:	**7**	**42**	**1**	**50**	**0**
Game 3:	**103**	**13**	**12**	**19**	**17**
Game 4:	**6**	**0**	**2**	**21**	**12**
Game 5:	**3**	**6**	**993**	**1**	**2**

Tortoise: What beautiful birdcalls! Do you recognize any of them, Achilles?

Achilles: Isn' t that one a thrush?

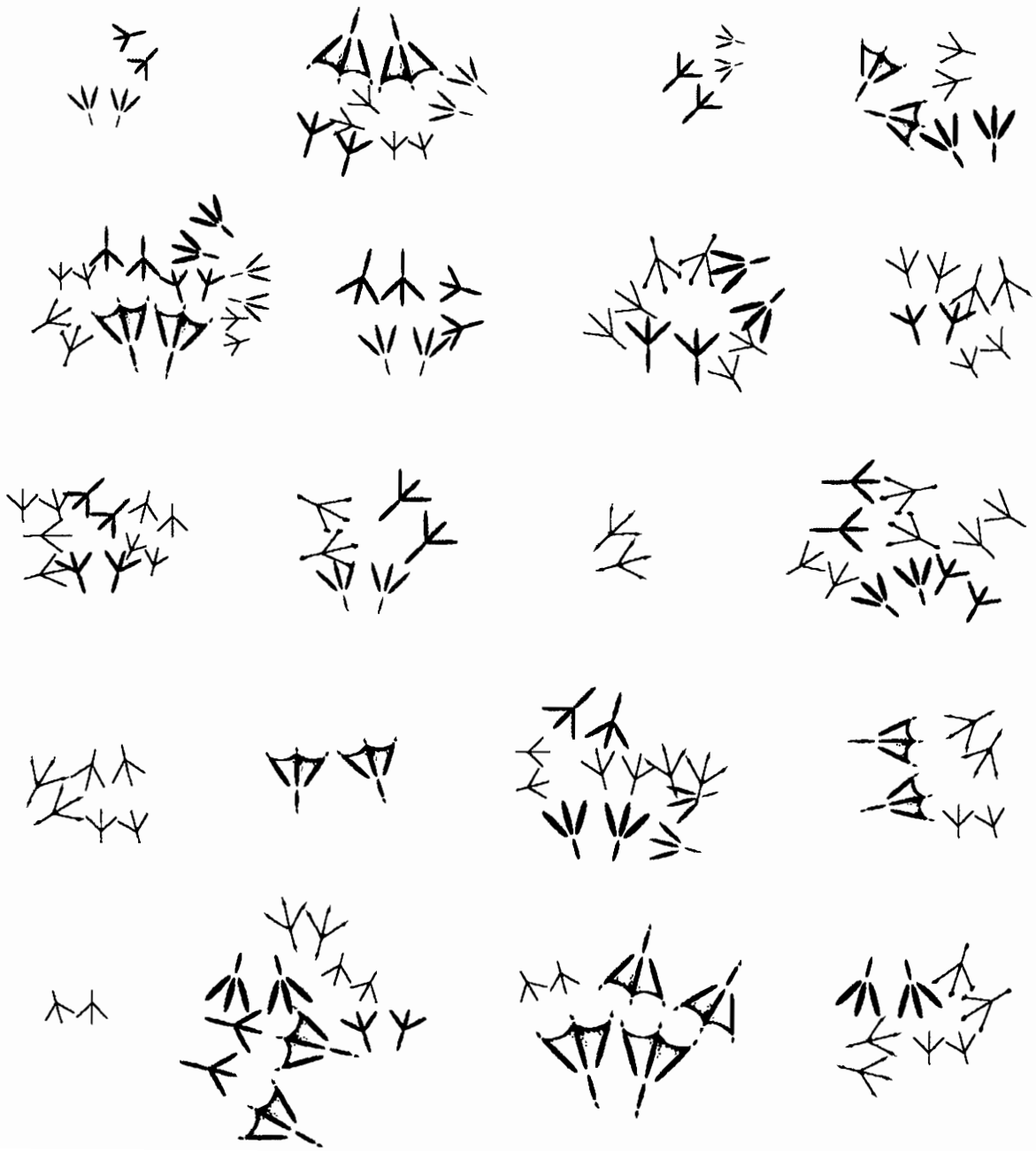
Tortoise: I have no idea, but it certainly sounds very pretty.

Achilles: You don' t suppose we have to identify all the birds, do you?

Tortoise: Maybe the birds are actually speaking to us in bird-language, trying to tell us something.

Achilles: Really, Mr. T, I do think the absurdity of the atmosphere here is beginning to get to you. Besides, even if there were such a thing as bird language, wouldn' t every species speak a different language?

VCR tape segment #3



Tortoise: I' m starting to get tired from all this walking around; let me kneel down and take a rest.

Achilles: You certainly seem to be wheezing pretty hard; are you sure you' re not coming down with something?

Tortoise: I think I' ll be all right. What do we have here?

Achilles: It' s a bunch of Boggle grids. I' m pretty good at these, actually. I can see "TRICKY," "ENIGMA," "CLUEING" and even some eight- letter words like "EIGHTIES" and "GAZELLES," but I don' t see any nine- letter words yet.

Find a nine-letter word in each of the following Boggle grids.

K R O M W A E I D E T V J O C U	I S H I W G E T I N L C E U F E	R W T D E C I O T R E S H A Y M
W R E D O P A F L I N M R E G S	S U I E U C D R R O U K E G L A	G T F O A U S A Z E L Y I E L S
D E M I I E M A H P S A A Y P O	O H A E I C T S D U Y U A N N K	A T R T I C R I P U Y C R E T K

Now list all the unused letters and take every consonant that appears exactly three times in this list and every vowel that appears exactly six times in this list. (**Y** counts as a consonant.) Anagram these letters, using each letter exactly once, to form the one-word answer to this puzzle. For example, if **G** and **K** were the only two consonants that appeared exactly three times in the list of unused letters and **E** were the only vowel that appeared exactly six times, then the answer would be **KEG**.

Achilles: I think I' m hearing things, Mr. T.

Tortoise: Of course you are, Achilles. I' m playing the music excerpts on the audio tape, so that we can start identifying the composers.

Achilles: No, I mean I think my imagination is running a bit wild. I could swear I just heard a familiar voice calling me.

Tortoise: That just demonstrates the emotional power of great music. I' m also finding myself rather moved.

Achilles: Some of these pieces sound awfully familiar, even to a musical novice like me. If we put our heads together, surely we can manage to descramble this section of the help manual. . .

Identify the composers of the music excerpts on tape segment #1. List the composers according to the order in which the pieces of music were composed. To find the solution, put the pieces in chronological order, and then take the following letters from each of the composers' names:

1.	5th letter	**9.**	2nd letter
2.*	3rd letter	**10.**	3rd letter
3.*	2nd letter	**11.**	4th letter
4.	1st letter	**12.**	2nd letter
5.	1st letter	**13.**	7th letter
6.	2nd letter	**14.**	3rd letter
7.	7th letter	**15.**	6th letter
8.	2nd letter	**16.**	8th letter

***Note: There is some ambiguity as to the order in which the second and third pieces were composed. To eliminate this ambiguity, use the date of first performance of the second piece, and the date of publication of the third piece.**

Achilles: I' m starting to get a bit lonely. We haven' t seen a single living thing since we entered the manual.

Tortoise: Let' s not brood on that; we have work to do. You know what? These cards remind me of my younger days, when they still used stacks of hole- punched cards to program computers.

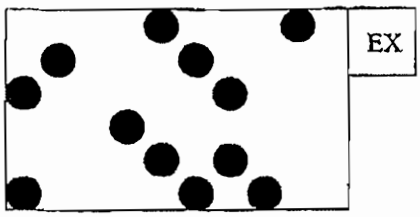
Achilles: An interesting observation, Mr. T. Do you recall ever putting tags like these on the cards to indicate what order they should go in?

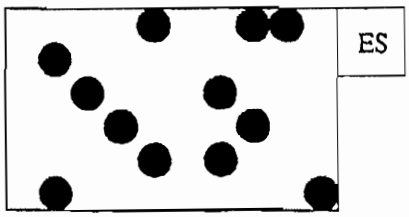
Tortoise: No, I don' t recognize the sequencing scheme at all. It must be an ancient sequence that predates my time.

Achilles: A couple of the tags, like the JO and the EX, seem similar to the cwm finks message we saw just now. Do you suppose there' s any connection?

Order the hole-punched cards according to the labels. If the ordering is done correctly, then the revealed letters will spell a person's name.

3C CONT.


EX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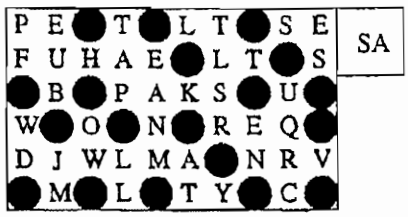
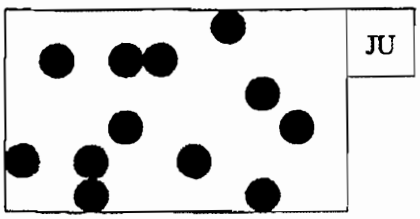

SA
P E T L T S E
F U H A E L T S
B P A K S U
W O N R E Q
D J W L M A N R V
M L T Y C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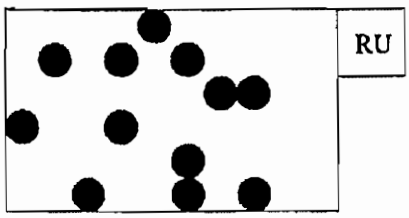
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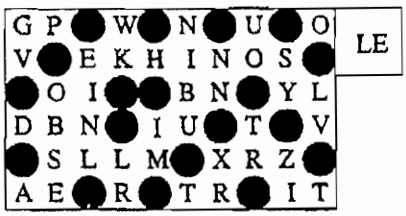
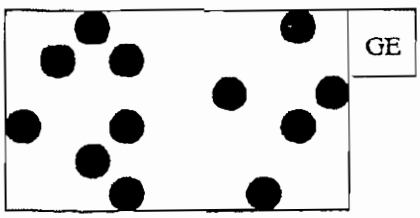

LE
G P W N U O
V E K H I N O S
O I B N Y L
D B N I U T V
S L L M X R Z
A E R T R I T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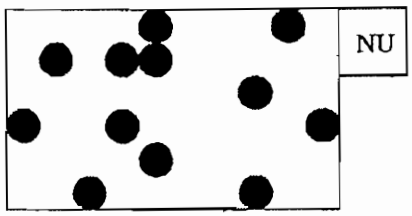
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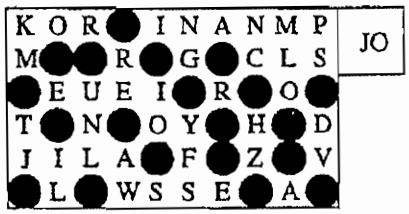
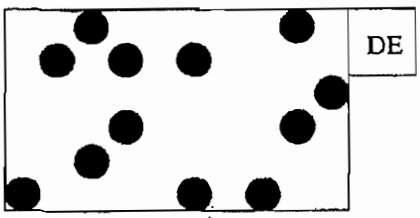

JO
K O R I N A N M P
M R G C L S
E U E I R O
T N O Y H D
J I L A F Z V
L WS S E A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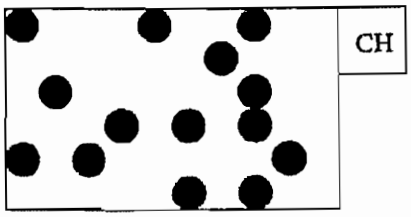
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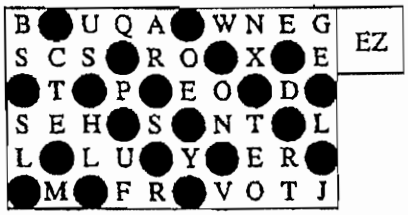
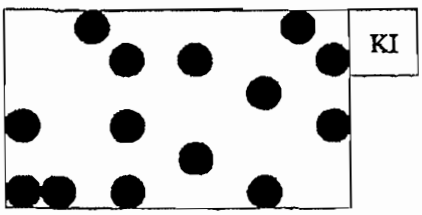

EZ
B U Q A W N E G
S C S R O X E
T P E O D
S E H S N T L
L L U Y E R
M F R V O T J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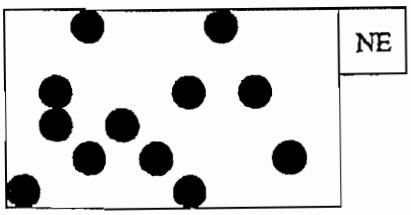
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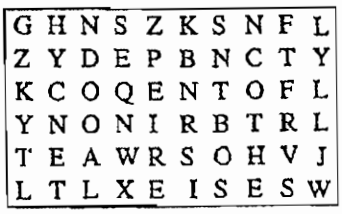

G H N S Z K S N F L
Z Y D E P B N C T Y
K C O Q E N T O F L
Y N O N I R B T R L
T E A W R S O H V J
L T L X E I S E S W

Tortoise: This music sounds much better live than recorded.
Achilles: It' s still not that easy to transcribe, though.
Tortoise: If only there were a musical analogue of RNA, that would do transcription automatically!
Achilles: I' m sure we could find one on one of the Subjunc- TV channels– if we have the good fortune to figure out how to fix it, that is.
Tortoise: Was that laughing on the tape?
Achilles: What laughing?
Tortoise: Didn' t you hear a "Ho ho ho" just now?
Achilles: No.
Tortoise: Well, maybe I was just hearing things. Let' s see, what key is this music in?

Transcribe both the words and melody of the song on tape segment #4. The song is in the key of G.

Next, compose a list of "spellsung" words. A word is "spellsung" if it is sung at a pitch equal to one of the letters in the spelling of that word. For example, if the word THE is sung on the melody note E, it is spellsung. If it is sung at any other note (A through G - ignore sharps and flats),
it is not spellsung. For multisyllabic words, the word is spellsung if at least one of the pitches sung equals one of the letters in the spelling of the word.

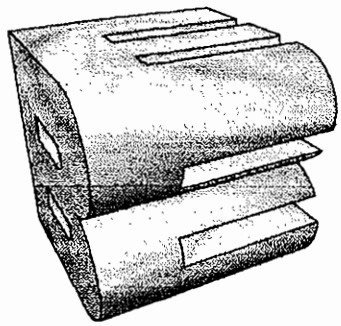
Once you have a complete list of spellsung words (in order of their appearance in the song), perform the following operations on the list:

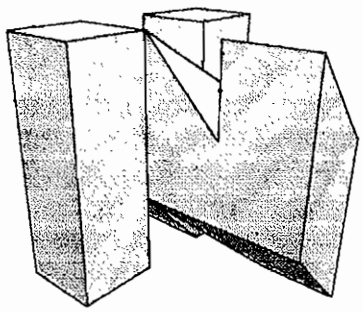
If there is any word on the list whose immediate predecessor equals its immediate successor, delete all three words from the list.
If any of the remaining words appears more than once, delete all occurrences of the word except the first.
Reverse the twelvth and nineteenth words on the list.
Take the last letters of the 7th, 15th, 24th, 33rd, 38th, and 48th.
Take the first letters of the 35th, 32nd, 25th, 19th, 18th, 12th and 8th.

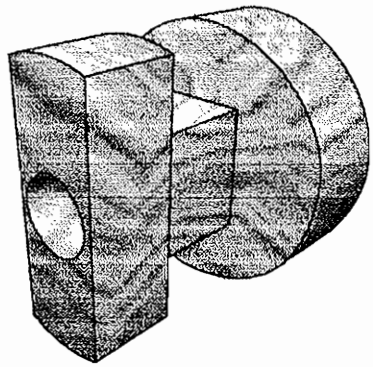
Achilles: Say, those strange objects remind me of the front cover of one of the books written by my friend Douglas Hofstadter.
Tortoise: You mean, *Copper, Silver, Gold: An Indestructible Metal Alloy*?
Achilles: No, I think it' s called *Elephants, Giraffes, Baboons: An Equatorial Grasslands Bestiary*.
Tortoise: Ah, yes. I remember now. The wooden blocks on the cover yield projections of the letters G, E, and B, in three different dimensions.
Achilles: You know, Hofstadter actually designed and cut those wooden blocks himself. He calls them trip- lets.
Tortoise: They' re very pretty. I' ve often wondered whether it would be possible to design a trip- let for other combinations of three letters, or whether other combinations would be physically impossible to construct.
Achilles: You should talk to Scott Kim. You remember, the artist who drew the *FIGURE-FIGURE* figure? Anyway, he claims that any three letters you want can be combined into a physical trip- let. . .

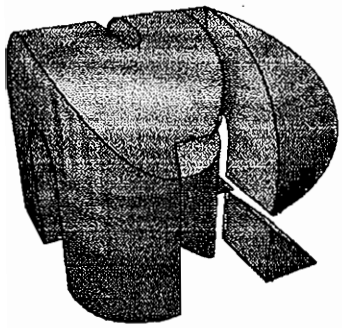
4B CONT.

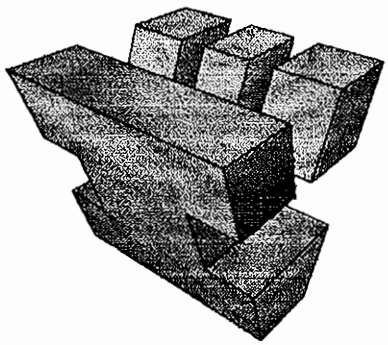
Figure out what the letters are that form each of the following six trip-lets. Then, starting at the top and proceeding around the group clockwise three times, choose one letter at a time from each trip-let to form a quote from *Gödel, Escher, Bach.*

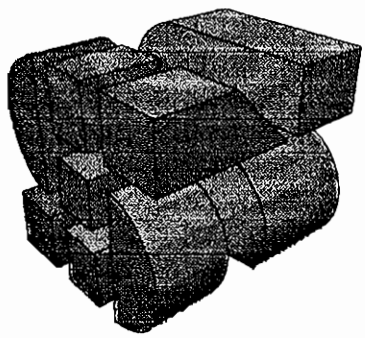












Find the location of this quote of *Godel, Escher, Bach* and consider the period of that sentence to be the origin of a coordinate system. The final answer to this puzzle is two words. The first word of the answer is the word whose first letter is 50 mm away from the origin, and whose last letter is 60 mm away from the origin. The second word is made up of the letters at the following (x,y)-coordinate locations:
(58,54), (-7,-4), (-28,1), (7,-22), (-23,18), (6,18).

Tortoise: I' m ready to go back. We don' t seem to be making much progress. That minesweeper really made my head spin. And it' s getting dark again, too.

Achilles: Come on–we' ve been through twenty- seven sections of the manual already, so we' re getting near the end. I don' t want to go back until we' ve seen everything.

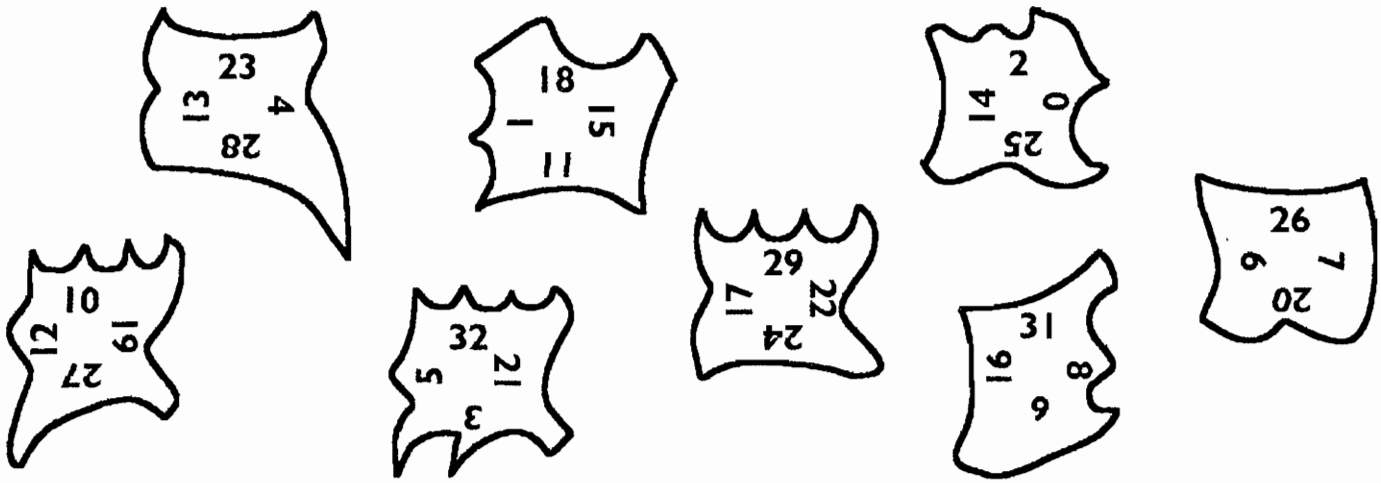
Complete the following series:

0 __ 18 3 12 __ __ __ 24 1 10 __ 4 __ __ 7 16 __ ...

A B C D E F G H

For part one of the answer, match the pieces to their corresponding letters below::

A B C D E F G H



For part two of the answer, substitute the appropriate values into this formula:

A·G + B·H + C + F – E

Tortoise: Perhaps we should be more systematic in our efforts instead of jumping around haphazardly in the manual like we' ve been doing so far. We should start at the beginning and work step by step through the pages. Or else we should start with the more easily deciphered parts first and work our way up.

Achilles: Yes, that would have been a smart idea, wouldn' t it? But it' s a bit late to start thinking about that now.

Tortoise: Oh well. Can you understand any of these language samples?

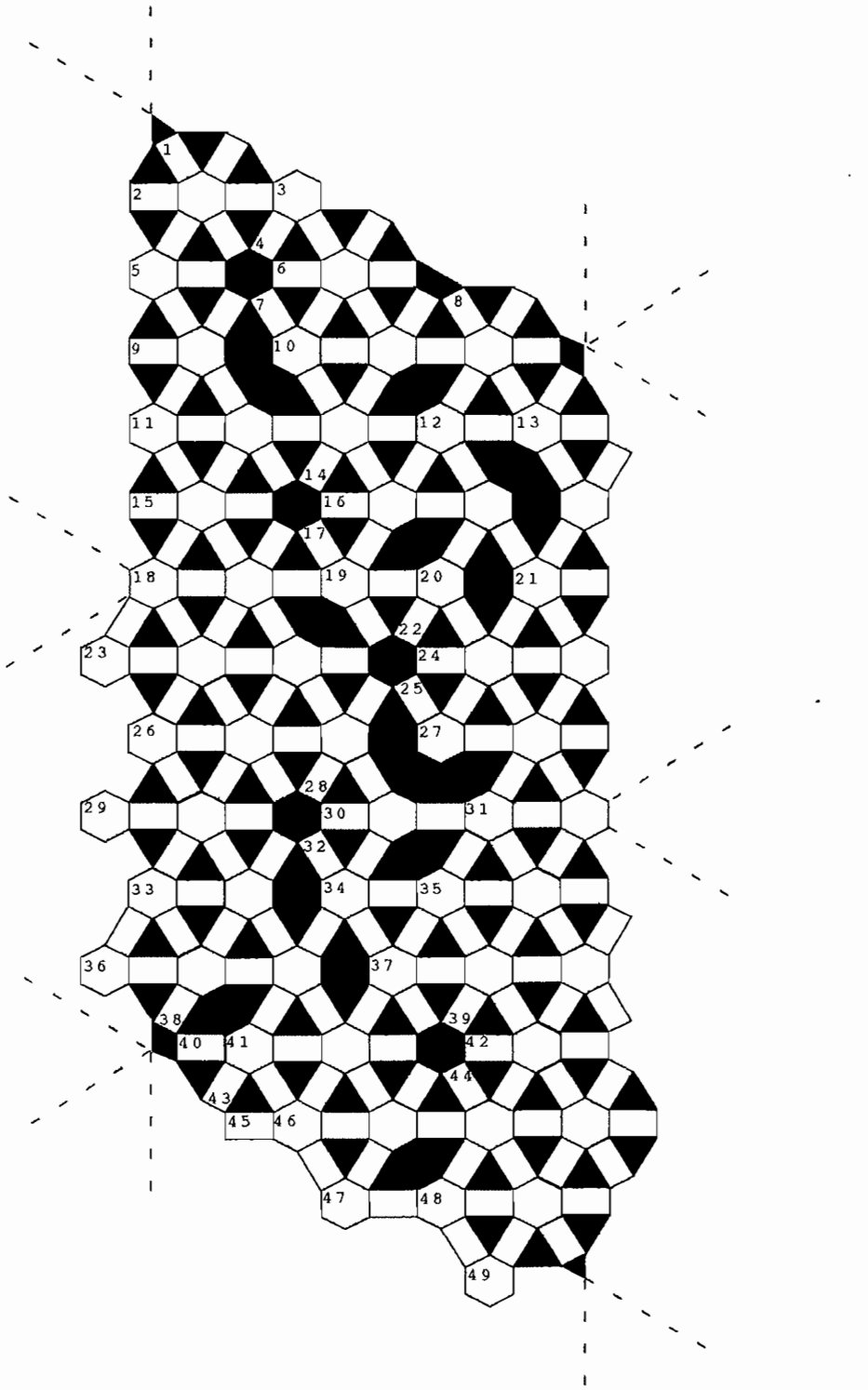
Achilles: A few, but I' m not sure about the rest.

Tortoise: Speaking of rest, I think maybe we should try to catch some sleep. Want to grab a bite to eat and call it a day?

Achilles: Sounds good to me.

Program #2 on your subjunc-VCR tape

Tortoise: We need to sleep. Sunday' s supposed to be a day of rest, but we haven' t slept for twenty- four hours.
Achilles: Yes, you' re right. And we' re almost done–this is just about the last section of the manual. I think we can afford to take a nap.



Across →

2 snare
5 as easy as a number
6 large flightless bird
9 foreign gold
10 ditcher (2 words)
11 ocean washouts
15 nighttime banker
16 press or steam
18 a stately musical group
21 word of simile
23 not powdered nor jelly-filled
24 the cutting side; cross this to find the answer
26 clean by rubbing
27 young, tiny
29 gloom; not marathon
30 not sage
33 MIT used book trader
34 priestly admission
36 firestarter
37 who's lady of Paris?
40 cranky tool
42 pleasant animal; old computer
45 running water holder
47 main thoroughfare

Down ↘

1 tax thieves
3 wild American cats or shoes
5 pompous procession
7 question stopper
8 hot and dry
11 shape of this puzzle when complete
12 weighty boat tax
17 comic magazine
18 largest river in the Americas
20 loud enough
25 childbirth studies (abbr.)
26 tummy trouble
31 in the same place
32 Dracula
33 for tit
35 color-spotted
41 inside
44 sanding board
48 a backwards engineering school

Up ↗

4 canned news (abbr)
5 divide
10 unfeeling, usually from cold
11 rubber roller
13 in reference to (abbr)
14 turn or twirl
19 oxygenation
22 amplification
23 given; allowed
26 magical priest
27 Dakota attraction
28 bad food service
36 time-keeper
38 what's in a haystack; Buzzsucker
39 contend against
43 midday
46 high tech trash talk
47 distortion (abbr)
48 felled trees
49 spoiled

(Achilles and the Tortoise experience a strange feeling of deja vu.)

TROUBLESHOOTING YOUR SUBJUNC-TV

If there is no picture, or if you see a picture within a picture:
Is the unit plugged in?
Is the unit turned on?
If you are experiencing a PWAP:
Has jumper 23 on board 16Q been accidentally removed?
For all other problems:
Contact your local Subjunc-technician.

Tortoise: What in the world is a PWAP?

Achilles: I think I've finally figured that one out. My guess is that it's a recursive acronym, standing for "PWAP Within A Picture." That's what happened to Mr. C's screen just before it went blank.

Tortoise: If the manual's all this cryptic, then it's going to be impossible to find that coin. Are we even sure we know what's wrong?

Achilles: Everything is wrong. If only we had a full compliment of solutions for all these problems!

Tortoise: Shouldn't we start with a complete list of problems?

Achilles: Why? So that we can methodically fix them one by one?

Tortoise: Absolutely not! We must treat them all as one monsterous problem.

Achilles (seating himself next to the Subjunc-TV and opening the service panel): If we attempt to repair this thing all at once, it'll be quite a surprize if we even make partial progress. Take a look at all this circuitry! I can't even tell top from bottom...if I didn't know better, I'd say it was an Escher picture. I see all sorts of characters listed here, but I don't see any 16K, or whatever board the instructions were talking about.

Tortoise: You're right, as always. So why don't we just ignore every other character, commencing with the first one?

Achilles: What a capitol idea, Mr. T., but there's still a plethora of markings in here. If there are any adjacent markings of more than two consonants or more than two non consonants, all but the first two should be discarded.

Tortoise: That sounds good. Now we're getting somewhere. We should celebrate with some cake!

Achilles: Congradulations would be a little premature right now. Besides, I don't see any cake. We seem to have plenty of pie, though. Perhaps we should change all pie into cake.

Tortoise: Splendid! Now we're cooking! But pie isn't the only thing that's plentiful around here. It looks like there are three operating systems in this Subjunc-TV!

Achilles: So there are! And that's enough to make anything disfunctional. Why don't you just remove them all for now?

Tortoise (sighing): Without those operating systems running, this feels like a regular television. I feel like someone's trying to cue me with what to say next.

Achilles: Yes, I see what you mean. Someone is trying to give you a cue, but they've got it all backwards. I'll throw it out for you.

Tortoise: Thank you, Achilles. You know, I still haven't seen any mention of that board 6K.

Achilles: You're right. Why don't we look for that junction 23 instead?

Tortoise: I'm embarassed to say I don't see any junctions either. I do see a conjunction though. I'm going to take it out to see what happens.

Achilles: What happened?

Tortoise: Unfortunately nothing. Maybe we need to try something more drastic.

Achilles: Okay. I suggest we take the rightmost quarter of these remaining parts, turn them around, and insert them a third of the way towards the left side of this motley collection.

Tortoise: That sure was drastic. I was thinking more along the lines of replacing some components. Replace every component R with the component six smaller. And to balance out the circuit, replace every component N with one six sizes larger.

Achilles (shaking his head): We still haven't found joint 23, have we? I guess we have to be more aggressive. See in the list of problems where it says to take? Well, take it! And then throw it out.

Tortoise: Are you trying to affect repairs or to start a revolution?

Achilles: Actually, Mr. T., I was going to try to start a fad, but I notice that somebody already did. So instead, I'll take away what was started and replace it with the missing ending.

Tortoise: Talking of missing the endings, when you removed that cue for me earlier, you didn't do a very good job. I just realized that this TV has closed captions -- that has to be the worst sort of cue.

Achilles: So it has. Let's just get rid of that too.

Tortoise: Well, we really must stop throwing things away or we won't have any components left to look at. But, first, why don't we substitute an R component for that first A component, and then throw the rest of the A's away.

Achilles: Mr. T., you are obviously not a baseball fan... but it looks like you might have just scored a home run. Look what happens if you reverse those first two characters and also the whole right side of your list!

Tortoise: We may not have found that board jumper, but it looks like we straightened out this part of the manual. Do you think we fixed the Subjunc-TV?

Achilles: I don't know, Mr. T, but with this answer in hand, we could forget about our Subjunc-TV problems if we wanted to!

Tortoise: This looks like Greek to me–so it should be child' s play for you, Achilles!

Achilles: Very droll, Mr. T. . . but I think it looks more like mathematics than Greek. I' ll bet the manual originally had a long division calculation in it, and the Subjunc- TV accident just distorted the digits into Greek letters.

Tortoise: Or maybe at the instant of the lightning flash the Subjunc- TV was tuned into a world where they actually use Greek letters for the digits, and the accident caused a division problem from that world to appear in the manual?

Achilles: Isn' t that effectively the same thing?

Tortoise: Well, let' s not waste time arguing the point. Let' s see. . . rho has to be zero, right?

Achilles: Yes, I think so. Say, are you hungry? I wouldn' t mind having another snack.

$$
\begin{array}{r}
\beta\alpha\chi\mathrm{H} \\
\chi\beta\overline{)\,\chi\varepsilon\rho\Delta\varepsilon\alpha} \\
\underline{\chi\Gamma\Delta} \\
\Delta\beta\Delta \\
\underline{\Delta\varepsilon\mathrm{H}} \\
\varepsilon\,\varepsilon \\
\underline{\alpha\,\varepsilon} \\
\Delta\rho\alpha \\
\underline{\Delta\rho\alpha} \\
\rho
\end{array}
$$

Answer:

$\Gamma\varepsilon\beta,\ \Delta\rho\mathrm{H}$

Tortoise: Say, Achilles, listen to this portion of the Subjunc- VCR tape. Can you figure out what program was recorded here?

Achilles: It sounds to me like Mr. Crab must have tuned in to the wrong subjunctive frequency last time he recorded Robin Leach' s show. This sounds like "Lifestyles of the Smart and Geeky. "

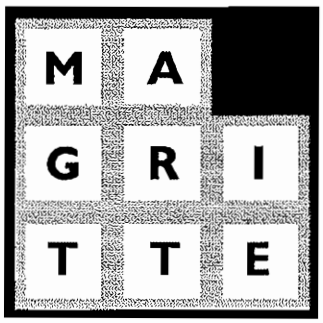
Tortoise: Nevertheless, I' ll bet it yields a clue.

The last VCR tape segment

Tortoise: "Magritte"–isn' t he Mr. Crab' s favorite painter?
Achilles: Yes, he is. Hofstadter' s book contains a number of pictures of his work.
Tortoise: Now that you mention it, I remember seeing some of them. Wasn' t one of them a picture of a bicycle on a cigar?
Achilles: That' s Magritte all right.

This is a sliding piece puzzle. The object is to get from the starting position (MAGRITTE) to the ending position (I'M TARGET) in twenty moves. A move consists of sliding any of the pieces that are orthogonally adjacent to the empty space into the empty space. Sliding two contiguous pieces onto an empty space together is considered two moves. At no time may a piece be moved outside the 3x3 grid or lifted out of the plane.

Starting position:



Ending position:

Now write down the solution as a sequence of twenty letters, and shift the letters forwards in the alphabet by the following amounts, wrapping around from Z to A if necessary:

3, 1, 0, 15, 11, 22, 3, 19, 4, 2, 7, 7, 2, 4, 6, 0, 18, 20, 4, 2.

The answer to this puzzle is the longest English word that is embedded directly in the resulting string of twenty letters. For example, if the string of letters were **OSDIAMONDAYBTREAKTAN**, the answer would be **DIAMOND** (and not **DAYBREAK**, for example).

Achilles: Wake up, Mr. T. We need to get going again.

Tortoise: Is it Saturday morning already? I' m still kind of tired.

Achilles: It' s actually almost Saturday afternoon. We went to sleep pretty late. Anyway, take a look at this. What do you make of it?

Tortoise: ``Quartz glyph job vex' d cwm finks. '' What on earth does that mean?

Achilles: Well, a ``glyph'' is a symbol, and a ``cwm'' is a Welsh word for a valley or a basin, so I guess the picture is of some telltales who live in a valley puzzling over a bunch of symbols etched in a piece of quartz.

Tortoise: That' s about as plausible a scenario as a fox jumping over a dog.

If **QUARTZGLYPHJOBVEXDCWMFINKS**
6 13 7 5 4 2
8

is **PUZZLERS**, then what is

QUARTZGLYPHJOBVEXDCWMFINKS?
6 4 8 3 5 12
9 7

Tortoise: This was the part that clued us in to the importance of Hofstadter' s book.

Achilles: That' s right. We thought we had it figured out, too, but it didn' t seem to fit the pattern we' d found for the other parts of the manual.

Tortoise: We must have missed something.

Achilles: It wouldn' t be the first time.

Tortoise: And probably not the last, either.

Step 1: We have sandblasted a copy of an illustration from *GEB* into the granite pavers in Samuel Adams Park in front of Faneuil Hall. (No heavy-duty shoveling should be required– look for it on the pathways.) Determine which illustration it is.

Step 2: Find the page in *GEB* where the illustration appears. On that page, find the word which anagrams to the name of a monster. Call this word **A**.

Step 3: Go to word **A**'s listing in the index of *GEB*. Find the first acronym following **A** in the index, and let **a** be the last page number referenced for that acronym. Find the third initial of the second title on page **a**. Replace one of the letters of word **A** with this letter to form word **B**.

Step 4: Find the first word of the first title on page **a**. Let **b** equal the first page number referenced for this word in the index. Find the fifth letter before the first picture on page **b**. Replace one of the letters of word **B** with this letter to form word **C**.

Step 5: Let $\mathbf{c}_1$ equal the third numeral on page **b**, and let $\mathbf{c}_2$ equal the sixth numeral. Go to the **c**th main listing in the index, where $\mathbf{c}=\mathbf{c}_1+\mathbf{c}_2$. Let **d** equal the second page number in this index listing, and find the first letter on page **d**. Add this letter to word **C** to form word **D**.

Step 6: Find the letter which appears immediately before the word "would" on page **d**. Let α represent the last main entry in the index which begins with that letter. Let **e** be the last page referenced for α, and find the first letter in the last example of α on page **e**. Remove this letter from word **D** to form word **E**.

Step 7: Let β be the first name in the list on page **e**, and go to its entry in the index. Count back to the thirtieth main entry before β in the index, and let **f** equal the third page number referenced there. Let **n** equal the first two-digit number on page **f**. Replace one of the letters in the word **E** with the **n**th letter of the alphabet to form word **F**.

Step 8: Find the last letter of the last paragraph on page **f**. Let **g** be the first page referenced in the first index entry which starts with that letter. Exchange the first letter on this page with one of the letters in word **F** to form word **G**.

Step 9: Find the index entry for the fourth person mentioned on page **g**. Look through the page to find the entry on the opposite side, and let γ be the third index entry below that entry. Let **h** be the fourth page referenced for γ, and find the sentence on page **h** where the reference occurs. Take the letter preceding the subject of that sentence and substitute it into word **G** to form word **H**.

Step 10: Find the surname of the historical figure discussed on page **h**. Reverse the order of letters in that name, and find the location in the index where this string of letters occurs. Let δ be the 41st index entry after this location. Go to the first page listed for δ and find the first letter of the last instance of δ on that page. Let ε be the sixth letter of the word immediately above this letter. Exchange ε with one of the letters in word **H** to form word **I**.

Step 11: Let ϕ be the seventh index entry starting with ε, and let **i** be the last page reference for ϕ. Find the last letter of the first proper noun after the occurrence of ϕ on page **i**. Add this letter to word **I**, which will yield word **J**.

Step 12: Go to the index entry for the person discussed on page **i**. Find the entry which mirrors it on the opposite page, and let λ be the entry immediately preceding that entry. Go to the first location listed for λ, and find the consonant which occurs most frequently in the phrase which follows the colon. Insert this letter into word **J** to form word **K**.

Step 13: Let **j** be the last page listed for λ in the index. Let μ be the last phrase in quotes on page (**j**-10), and let **k** be the last page referenced in the index entry for μ. Find the letter immediately following the first instance of μ on page **k**. Substitute this letter into word **K** to form the final answer.

Tortoise: We did the first part of this already, didn' t we? Yes, here' s the decoded list.

Achilles: Why, look who' s over there! It' s our friend the Anteater!

Anteater: Hello, Achilles! Hello, Mr. T! How are you doing?

Achilles: We' re fine–a little tired, perhaps, but otherwise fine. What in the world are you doing here?

Tortoise: You' re the last person we expected to meet.

Anteater: Well, I' m actually on my way out of town, but my flight was delayed several hours because of bad weather, so I thought I' d drop by to see Mr. Crab since he lives nearby. Then he told me about the terrible accident, so I thought I' d pop in–or should I say push in?–to see if I could help.

Achilles: Well, I must say that was very nice of you. How long can you stay?

Anteater: Only an hour or so, I' m afraid.

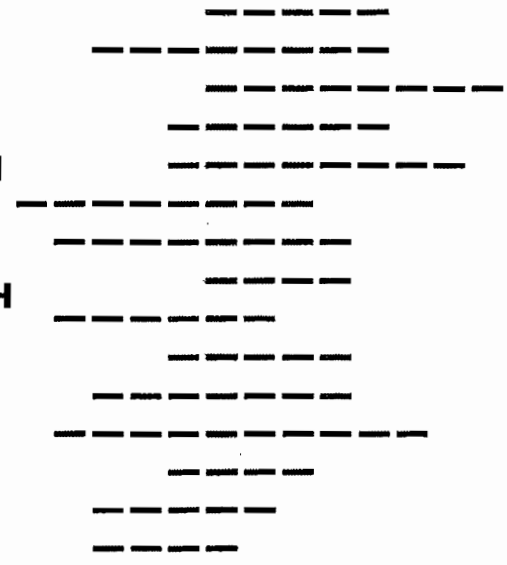
Tortoise: Well, every little bit helps. Do you know any of these inventors?

The first part is a list of three-part inventions. That is, we have taken a list of names of important inventions, removed all the spaces, and broken each invention into three parts, displayed in the three columns below. The rows in each column have been scrambled, and you must match them back together.

The second part is a cryptogram. All of the entries in the three columns below have been encoded with the same letter-substitution cipher.

The third part is a word grid. Identify each of the inventors of the fifteen inventions in the list, and fit their names into the grid. The answer to the puzzle will read down the center column. (Here's an example. Suppose that after decoding the cryptogram, you find VULCAN somewhere in the first column, IZEDRU somewhere in the second column, and BBER somewhere in the third column. Then you should piece them together as VULCANIZED RUBBER, and identify the inventor as GOODYEAR.)

MDKV	**KYKHAK**	**ZUU**
SZQ	**KFK**	**SZ**
SOKY	**KWD**	**KKL**
ZUZA	**FDEAPQF**	**XZYFEKY**
HFDKPZSO	**ZYM**	**ZD**
AKF	**YGFPGFF**	**SOAKLZH**
HO	**UZWDQ**	**FZD**
FODZZS	**FKYW**	**YZ**
EA	**QDFEY**	**UUZYHZH**
FZ	**ZSO**	**KYZ**
PQ	**UBUE**	**FZDB**
QHHZTP	**UN**	**WDQSOB**
PEMK	**AQ**	**UG**
KE	**DL**	**EY**
FZU	**DKTZ**	**QSO**



Tortoise: You know, this place actually appeals to me in some strange way. I could see myself moving here permanently to retire in my old age.

Achilles: Are you crazy? This manual is even more screwed up than Salvador Dali' s paintings! What can you possibly see in it?

Tortoise: You have to learn to read between the lines, Achilles.

Achilles: Oh come now. "Read between the lines"? That' s just a synonym for making up imaginary patterns out of thin air, if you ask me.

Tortoise: Whatever you say, Achilles, but I still like the scenery here.

Deduce the rules followed when the letter sequences were circled in the top grid, and then apply the same rules to the bottom grid to find the answer.

B	E	C	K	M	A	N	N	L	A	C	F	Y	Z	H
P	C	A	S	S	A	T	T	H	O	T	L	A	A	I
K	E	H	J	I	S	V	O	B	E	U	Y	S	R	T
Y	K	I	P	N	T	A	E	L	A	B	N	N	P	M
M	A	Y	A	L	I	N	Z	I	F	O	D	Z	V	L
R	L	I	R	B	X	E	T	C	G	S	B	M	A	R
D	U	H	R	A	D	Y	P	A	E	C	V	I	T	M
H	S	E	W	J	X	C	D	U	A	H	K	R	I	A
N	K	Z	B	G	K	K	O	D	X	I	S	O	E	V
N	O	S	L	E	V	E	N	I	F	Z	H	V	L	Z

D	A	V	I	N	C	I	L	A	Z	F	Z	E	T	K
T	V	X	M	K	O	L	L	W	I	T	Z	F	M	L
Y	Z	N	M	N	R	B	M	M	E	S	A	L	T	E
M	T	V	E	M	B	Y	B	A	Y	R	U	A	Z	E
C	A	L	D	E	R	W	V	T	Y	V	W	D	I	N
X	O	K	E	L	L	Y	N	A	F	A	H	E	A	K
N	T	D	N	A	R	B	R	Y	D	I	N	E	X	Y
W	H	A	Z	O	L	H	A	K	E	P	I	Y	R	A
K	P	K	L	L	T	I	E	P	M	I	N	F	V	R
E	H	L	E	Z	F	T	A	N	S	E	Y	A	F	H

Achilles: Here' s another part of the manual that' s unfamiliar. And it' s a chess problem–ugh. Really, I Can' t Endure Ridiculous Chess Analysis Riddles.

Tortoise: Come now, it' s not that bad. I can see right away how to arrive at this position with ten moves on each side–like this.

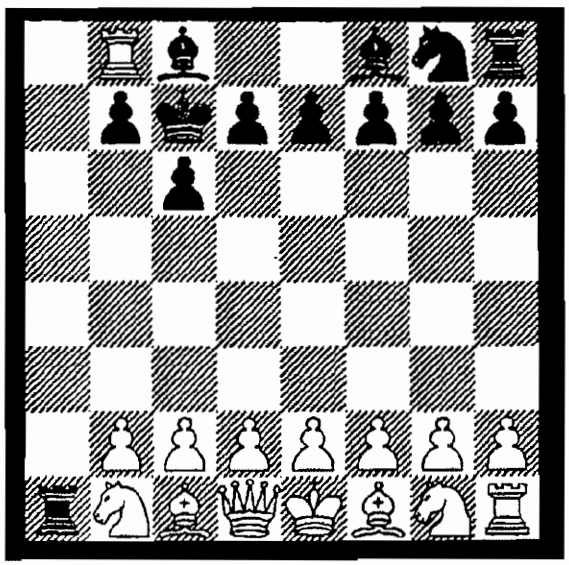
[The Tortoise moves the chess pieces on the board.]

Achilles: Yes, that works, but couldn' t you have transposed the order of those last two moves? It does say to find *the* shortest game, but what you' ve found is two sequences of the same length.

Tortoise: True. . . but maybe that' s just a mistake in the manual. Wait a minute. . . I see a quicker way of doing it. . .

Achilles: Why don' t we take a break and eat something? Did you bring any food?

Tortoise: Yes, I brought plenty. Let me put these pieces back where they were and we can eat.

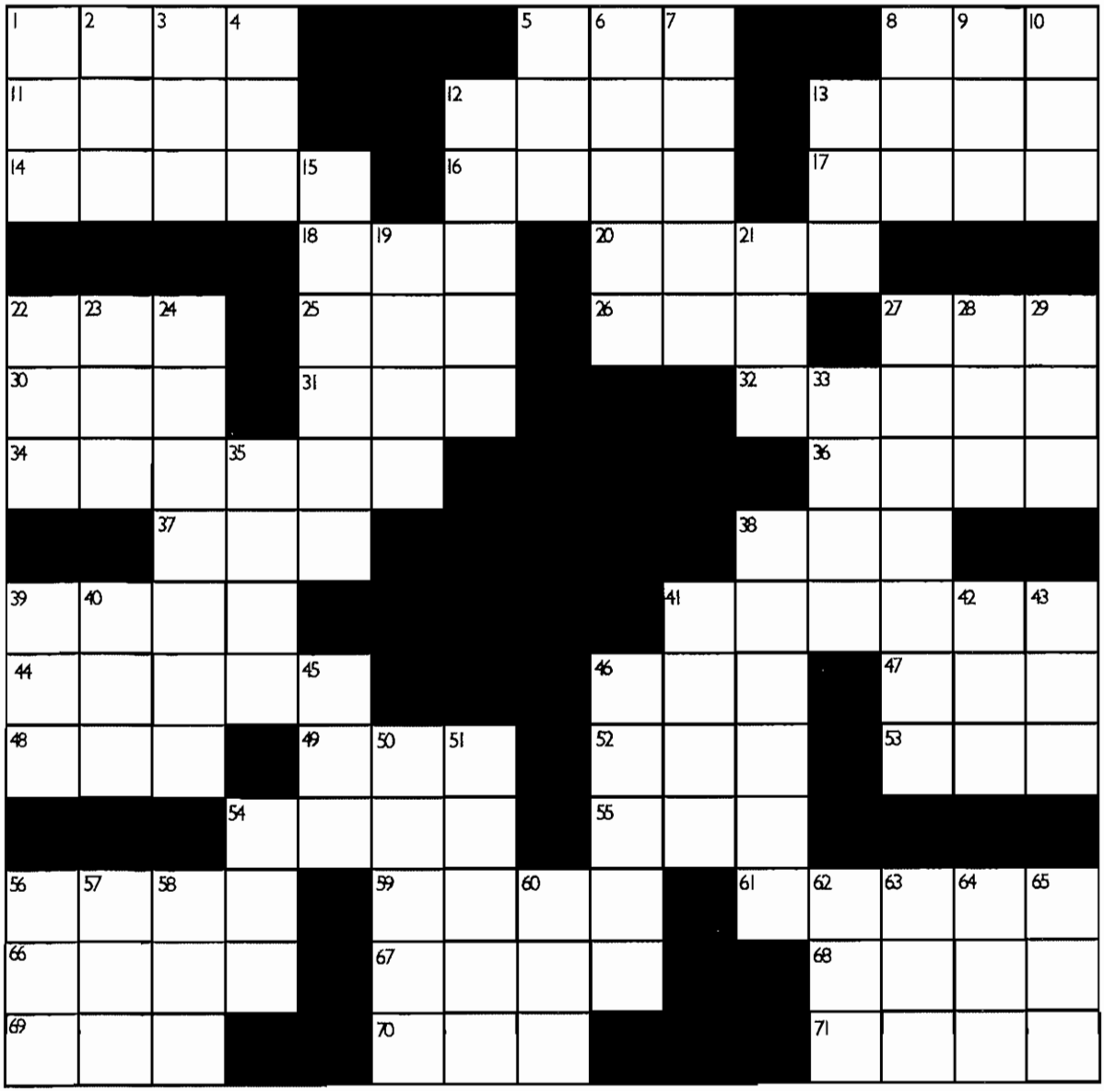


Find the shortest legal chess game that leads to the above position. The answer to the puzzle is a pair of numbers: the sum of the "from squares," and the sum of the "to squares," where the squares are numbered as shown below.

1	9	17	25	33	41	49	57
2	10	18	26	34	42	50	58
3	11	19	27	35	43	51	59
4	12	20	28	36	44	52	60
5	13	21	29	37	45	53	61
6	14	22	30	38	46	54	62
7	15	23	31	39	47	55	63
8	16	24	32	40	48	56	64

For example, suppose the game consisted of three moves: White moves his pawn from square 7 to square 5, Black moves his pawn from square 2 to square 4, and White moves his rook from square 8 to square 6. Then the sum of the "from squares" would be 7+2+8 = 17, and the sum of the "to squares" would be 5+4+6 = 15.

Achilles: I ate too much. I' m starting to get hiccoughs.
Tortoise: What did you say? Don' t walk so fast; I can' t catch up.
Achilles: Please, don' t talk about food.
Tortoise: Who' s talking about food? I just want to save my breath.



Across

1 ____ boy (assistant)
5 ____ down (simplify)
8 Positively charged quarks
11 Amneris, for instance
12 A roll of coins
13 Marketplace
14 Two ____ of raisins
16 Wear away
17 Sounded
18 From a given dam
20 Be suspended
22 Nostalgie de la boue: ___ craving
25 Turbaned mountie
26 ____ de cour (insincere one)
27 Twittering machine artist
30 Japanese herb
31 Clear of the bottom
32 Quiet
34 Tidal wave
36 Sax, for instance
37 Fluid drams in a cup (Imperial)
38 Contentious U.K. export
39 Ronald Reagan, for instance
41 PowerBook, for instance
44 Mocked, interrogated
46 The Great One (first name)
47 ____ light (Quaker guide)
48 ____buster (farmer)
49 Friend of Artemis
52 Put the helm alee
53 Tenebrae candelabrum
54 Alfred Hermann ____ : Austrian pacifist
55 Irish boat
56 Russian parliament
59 The ____ : Kafka
61 In a sumptuous manner
66 Screen graphic
67 Prepare
68 Test the trust of
69 Gist
70 Frigid
71 Lightning and Avalanche

Down

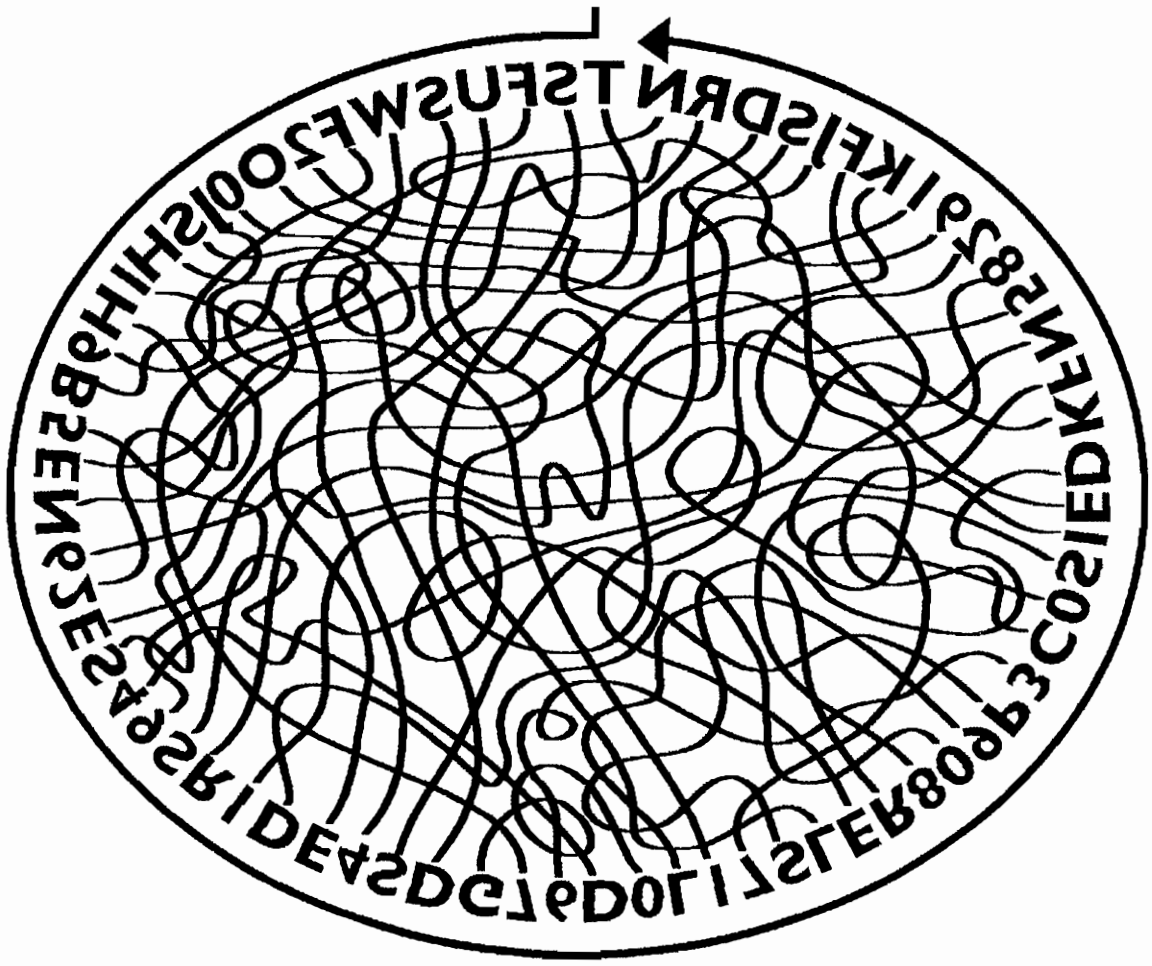
1 Spiny-finned fish
2 Old World 22dn
3 Mulligan ____
4 Drink to excess
5 One who acts
6 ____ shirt (tourist garb)
7 Communications device
8 Earlier
9 The ____ Fishers : Bizet
10 Vegetative matter in the Nile
12 Off-color
13 Fragrant oil
15 Til
19 New Zealander
21 Canadian rail company
22 New World 2dn
23 Farewell
24 Gifted
27 Bedspread material
28 Kent's partner
29 "____ man, a-sitting on a gate"
33 Burt in Mary Poppins
35 Mink relatives
38 Sacker of Rome (455)
39 Inquire (substandard)
40 In the capacity of
41 Leper
42 Blackman (Bond girl)
43 PGA prize fund
45 Shoji, for instance
46 Time is one
50 "Abort, ____, Cancel?"
51 Prepare to hit a golf ball
54 1994 Child-killer movie
56 Unit of work
57 Edible tuber
58 Mafia
60 Driver's Lic., for example
62 Advanced
63 Beauty, majesty (Sanskrit)
64 Appear in exaggerated form
65 Jane's alter egos (in a 1957 film)

Tortoise: Es brillig war. Die schlichten Toven wirten und wimmelten in Waben.

Achilles: Reading from the book again?

Tortoise: That' s right. It' s Lewis Carroll' s poem "Jabberwocky" from *Through the Looking Glass*, only translated into German.

Achilles: Now that' s a coincidence. Here' s something that might be more intelligible if viewed through a looking glass.



Tortoise: Did you bring the string with you?

Achilles: Yes, I tied it on my finger so that I wouldn' t forget it. Any ideas what to do with it? We didn' t check the book on this one, did we?

Tortoise: No, we didn' t. I remember he has a dialogue entitled "Air on G' s String," and there' s another dialogue that talks about the Art of Zen Strings, but I don' t see how those are relevant.

Achilles: Neither do I. Did you bring anything to drink? I' m getting kind of thirsty.

Tortoise: I brought several kinds of drinks, actually. Take your pick.

Decode the string.

***Achilles*: Oh, no! Look at all these mangled envelopes!**

Tortoise: Why are you so upset?

***Achilles*: This is the very stationery I used when I wrote to that long list of mathematicians to ask for help with the mathematics of repair manuals. In fact, it looks like these are some of the very letters I sent!**

Tortoise: I don' t remember your writing any letters.

***Achilles*: What do you mean? You were right there with me.**

***Tortoise*: No, *I* was.**

Tortoise (stunned): Who are you?

***Tortoise*: More to the point, who are *you*?**

***Achilles*: According to the red ink, these letters have all been returned because of insufficient addresses. But I remember addressing them all very carefully! Oh, I see... the postal machinery has mangled the envelopes so badly that the addresses are obliterated. I can't read them myself, and I'm the one who wrote them! Now what am I going to do?**

Achilles: Hi, Mr. T. I' m back. I couldn' t get anywhere on that cryptogram either. Hey, who' s that guy with the envelopes?

***Tortoise*: He's Achilles. Who are you?**

Achilles: What? Is this all some kind of joke?

***Achilles*: That's just what I was going to ask.**

***Tortoise*: Never mind them. I can still make out the postal barcodes at the bottom of each envelope. Do you suppose we can use these to figure out to whom each envelope was addressed?**

Tortoise: I think I understand what' s going on now. These two gentlemen are denizens of the repair manual.

***Achilles*: That's a bit of a stretch, don't you think? All I remember is that each mathematician on my list was on the faculty of a different college or university.**

Tortoise: Well, then, let' s start by figuring out the institution to which each envelope was addressed.

Achilles: In the future we probably shouldn' t talk to the natives lest we go mad. . .

For each of the valid postal barcodes below, find the name of the university to which it was addressed. Take the resulting list of schools and subtract one from the diagonal (see *Gödel, Escher, Bach*, p.404) to find the first part of the answer to this puzzle.
To find the second part of the answer, find the three schools in the list that were founded in the same year. Take this year, and subtract from it the square of the age of the youngest school on the list. Divide the result by 2. To this quotient, add the square root of twice the age of the oldest school on this list. Add also six times the number of schools founded before 1800. The result is the second part of the answer to this puzzle.

1


2


3


4

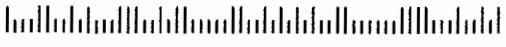

5


6


7


8


9


10


11


12


13


14


15


16


17


18


19


20


Achilles: Well, this is an unexpected surprise.
Tortoise: What do you mean?
Achilles: When we entered the manual, I wasn' t sure that when we got to this part that we' d actually be able to enter cyberspace and access all the Web-like interconnections directly, without having to keep clicking to get from one page to another. But look, over there' s an entrance into cyberspace that lets us do just that.
Tortoise: You' re right. . . and we can re-emerge into the manual over there, at that other opening. This sure beats trying to keep track of all those links on paper. Are you ready to go in?
Achilles: Ready when you are.

This puzzle can be found at:
http://www.mit.edu:8001/activities/puzzle/puzzle/start.html

Achilles: I don' t understand this grid. When you play dominoes, aren' t adjacent dominoes supposed to match each other? But most of this grid doesn' t seem to be matched properly.

Tortoise: I don' t think that the tiling has anything to do with the game of dominoes; it does say, after all, that the tiling is random.

Achilles: Oh, I see what you' re saying. But I see three double zeroes in the grid–that would seem to suggest that there' s more than one tiling that could produce this grid. This is more confusing than an Escher tiling!

A 7x8 grid has been randomly tiled with dominoes. Each of the 28 distinct dominoes from 0 0 to 6 6 appears *exactly once* in the tiling. (You might think at first that there are 49 dominoes rather than 28, but for example 1 3 is considered to be the same domino as 3 1.) The tiling is shown below on the first grid, except that the boundaries between dominoes have been erased.

1	0	0	6	5	6	4	5
1	2	2	1	3	3	4	2
3	0	3	1	4	5	6	6
3	1	6	0	0	2	4	6
2	2	5	5	6	2	4	1
4	5	0	1	3	3	0	2
4	3	0	5	5	4	1	6

	T		R	A		I	
	E	N	D				R
			O		N	T	
	P	I		H			O
	E		L	E	S		
	W		M	A		F	
		A			L	L	S

Reconstruct the domino boundaries, and then superimpose the pattern onto the second grid. The letters that lie underneath the horizontally oriented dominoes will spell out the answer to this puzzle.

Achilles: Let' s see. . . the cryptogram. . . that' s provably it. Yes, that' s right. We' ve now revisited every section of the manual that we looked at before drinking the potion.

Tortoise: Yes, we took off in the muddle of figuring this out. Ugh. I spent a long time on this and am rather sick of it. I' d prefer to move on to the next section.

Achilles: I' d like to spend some more time on it. Why don' t you go on ahead, and I' ll look for you when I' m done. But don' t wander too far off or I won' t be able to spit you.

Tortoise: All right. Good luck.

This puzzle is described on page 565 of the book.

"U qsa taljumg tge prhwt say," aais Qolkosn Tifwra yo yjw ptgre billshrra fsyhetrf stiibf yhw ubb forw, "to s febrkwnan sniit rjat olsvw cskkes Loicsin---qhay thw Hwtnsbd havw birmt fpqn. Gw saof gr lmiwrd uy ewkk---uses tp vosur a Nekfiab frowbs thrrr. Jr asuf rje jiise og hoa drownf was on s kimf arrrey, bynbwtwf im jia disw inr, tqi, rhrew anf di pb, snf rgar skk rgw nynvrea im pnw aufr of jom sdfed io wzacrku rje asnw sd skl tgr bynveed im tge pther aufe id gom. Dybbt tgong rjat! Hw ssid hr lnrq tgree esa noee rhab fufyt giidwa ib rgay aidr og the syrwwr, nit npr do msbu ad govr jibfref. O nsdw mwnyupm if yhw narywe to oyt psesob anf je ropk s prncik abf qotjrf pir yje ninnee of tjw joyae wjwte thw Vekgoam kocwd. U fpm'r knpw goq he sibw ot." Peehapd yge twasee nsu kilr yp duscivre rgw mymnre pg yhst hiyaw.

Tortoise: I' m still not sure I understand what a cryptic clue is.

Achilles: Each clue consists of two parts. One half is a regular definition, and the other half constructs the word via wordplay. For example, "Lack of dissonance marred thy performance" is PERFECT HARMONY. The two parts of the clue are "lack of dissonance" and "marred thy performance"; "lack of dissonance" is an ordinary or "straight" definition of PERFECT HARMONY, and the word "marred" clues the fact that PERFECT HARMONY is an anagram of "thy performance. "

Tortoise: I see. . . devilishly clever! I' ll have to check out that reference.

Except for the thematic clues, all the clues below are regular cryptic crossword clues. The thematic clues are all quotations from nineties' songs; the answer is the title of the song from which the quotation was taken. Help for solving cryptic crosswords may be found at the web site http://www.cis.ohio-state.edu/hypertext/faq/usenet/crossword-faq/top.html

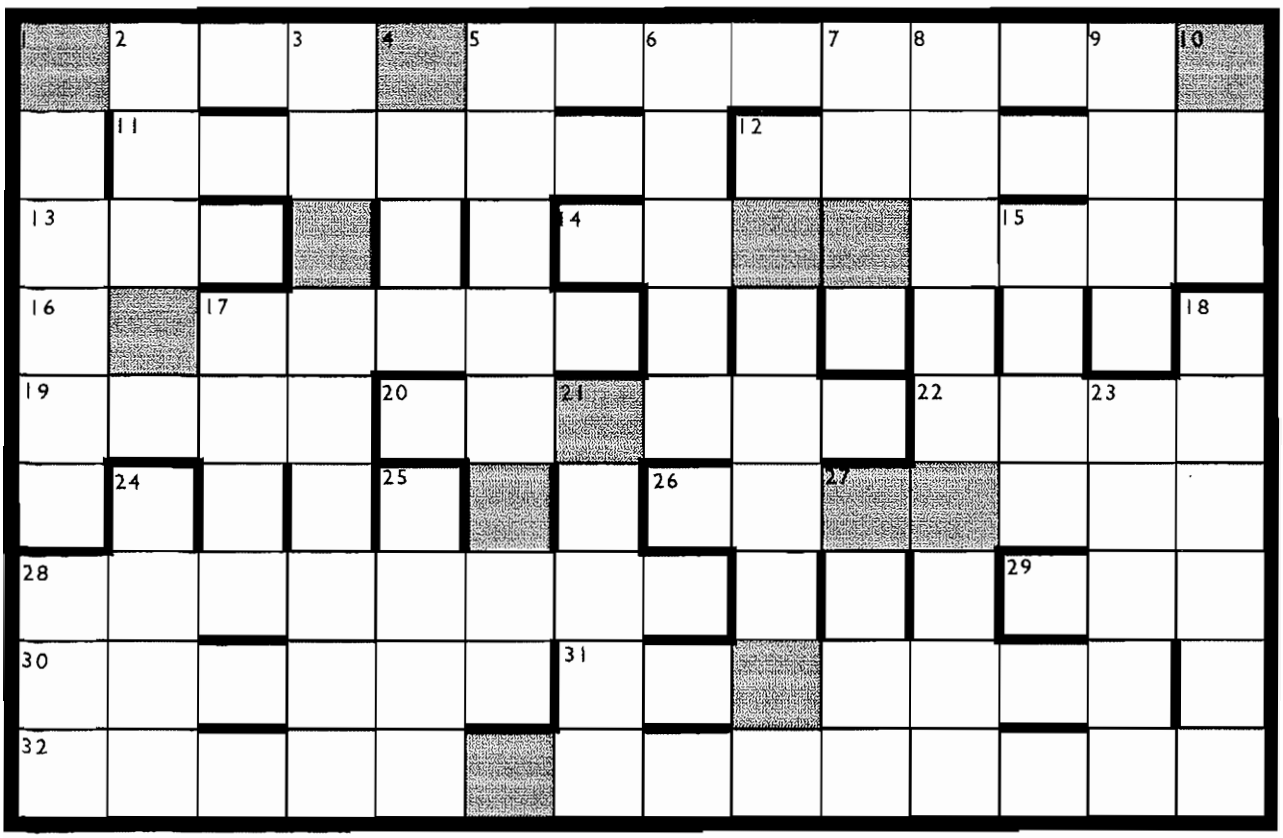
ACROSS

1 Not too strict but rather free, yet as right as right can be (14)
11 She might destroy your image, embarrassed about bistro retreat (7)
12 A lovely moon beneath the trees (6)
13 A language known around the world, it is thus we express our vows (3)
14 Editor is slinging rocks (8)
16 A flower from Killarney with a Tipperary smile (7)
19 A month abroad, a romantic embraces (4)
20 Ruin my creases, at least free of mud (6)
22 So sailors used to cry; a sloop turning round (4)
26 Engages in wild financial risks, and the poor beg alms (7)
28 A wild sort of devil but dead on (8)
29 Megamegamega- -- Texan, at heart (3)
30 Easter is crazy in the Alps, you find these (6)
31 To smother, see a lover going head over heels, that is (7)
32 Drummers sat at dinner in a grand hotel one day (14)

DOWN

1 Belonging to a class of folk, the test involves a class of blood (6)
2 Embellished daddy's heart with little boy (5)
3 Hamfatter suffers the consequences (9)
4 A guy prone to fibbing, given pick-up lines (4)
5 An uncomfortable feeling as inches melt away (8)
6 She's a little doe from a southern clime; O, I will go after what some call a wife (5)
7 Short for midday, and the earlier time (4)
8 You'll take the lead in each trip we take (9)
9 The first letter, and husbands get the final word (4)
10 An agreeable voice, which in eight would make vision (3)
12 The savage foeman crept around us (8)
15 Work design upon a store of money stacked up (4)
17 Darn front of dress with fine wool -- not half (4)
18 Each pearl a prayer to still a heart (6)
21 I'm up with a cry, making the sound of a small animal (5)
23 The cross held in regard, bewitched (5)
24 Hasty Romeo embracing a debutante (4)
25 Bungle every secret song in parts (4)
27 A kind of memory back up for a bit of verse (4)
28 A fond word for mother, the morning after the last of them (3)

IIA CONT.



Achilles: Aha! Another Achilles and Tortoise! Let' s keep a safe distance.

Achilles and the Tortoise were playing with Mr. Crab's computer (or "smart-stupid," as the Crab called it). They started up a Minesweeper game and were prompted for the dimensions of the board and the number of mines they wanted. After typing in this information, they were presented with a blank 5x5 board as they had requested, with the rows and columns labelled as shown:

	A	B	C	D	E
1					
2					
3					
4					
5					

"I'm feeling crazy today; I'm going to try clicking on the squares **A1**, **C1**, **E1**, **A3**, **C3**, **E3**, **A5**, **C5** and **E5** in succession, no matter what happens," said Achilles. "I think it'll be interesting to see what we get."

"That's a silly way to play Minesweeper," said the Tortoise, and wandered off to study Mr. Crab's other electronic gadgets. Achilles ignored him and carried out his plan. "Wow!" he exclaimed. "All nine squares turned out to be safe! Too bad they all have at least one mine next to them, though."

Just then Mr. Crab walked in. "Playing Minesweeper again, eh?" he chuckled. He looked at the board. "That's a pretty pattern! I see that no number has shown up in more than two of the nine squares you have uncovered." He studied the pattern some more, and frowned. "It seems to me that you don't have enough information yet to deduce where all the mines are, though," he said. "I can see at least three different mine distributions that are consistent with the information you have now."

"Ah, but that's because you didn't see the beginning of the game, when we typed in the total number of mines," interrupted the Tortoise, who in spite of himself had been listening closely to Achilles and the Crab. After a bit of thought, the Tortoise continued, "In fact, Achilles can deduce the mine locations now."

"But that's outrageous, Mr. T!" exclaimed Achilles. "How can you possibly know that? You haven't even looked at the computer screen after I clicked on those nine squares!"

But as usual, the Tortoise's logic was impeccable. Given that square **B1** did not have a mine, deduce the numbers in the nine squares that Achilles uncovered. Concatenate these nine numbers to form a single nine-digit number, subtract 22052836, multiply by 5576, and convert to base thirty-six (with A = ten, B = eleven, etc.).

Achilles: "ESCHAR"–isn' t an "eschar" a kind of scab?

Tortoise: I don' t know. Too bad the Anteater couldn' t stay–he might have been able to help, since he has a good vocabulary.

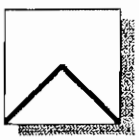
Achilles: Well, it might be unimportant, like the Greek in the division calculation we saw yesterday.

Tortoise: That' s true. By the way, are you ready to take another rest?

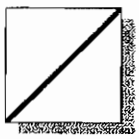
Achilles: Already? We just got up a few hours ago!

Place a copy of one of the tiles in each of the squares labelled "1" in the grid below, place a copy of one of the other tiles in each of the squares labelled "2" below, and so on, in such a way that the line segments in the resulting picture forms a single continuous line that starts and ends at the edge of the grid and does not cross itself. (The line may touch the edge of the grid many times, but the line may not touch itself.) Note: the copies of the tiles must be placed in the grid with exactly the same orientation as they have above; they may not be rotated or reflected in any way. Squares labelled with the same number must be covered with copies of the same tile, and squares labelled with distinct numbers must be covered with distinct tiles.

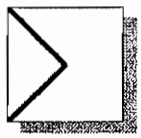
Tile E



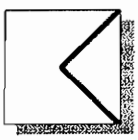
Tile S



Tile C

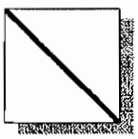


Tile H



Tile A

Tile R



1	2	3	4
5	5	1	2
4	4	4	6
3	2	1	5

Now trace out the line, starting from the end further from the top right-hand corner of the grid. The fourth, fifth, seventh, eighth, ninth, and fifteenth tiles visited will spell out the answer to this puzzle.

Tortoise: What time is it?

Achilles: About 6 a. m. Why?

Tortoise: Oh, I was just wondering. It seems like we' ve been here for ages.

Achilles: We *have* been here a while. We drank the pushing potion on Friday, so this is our third day of hunting. I feel dead.

Tortoise: We' ve got to find Mr. Crab' s coin, though. You know how much it means to him.

Achilles: Yes, I know. But I don' t see any pattern in these numbers. They could be anything–room numbers, weights in grams, telephone exchanges–anything at all!

Tortoise: We shouldn' t have stayed up all night; we' re starting to get cross.

Find the next two numbers in this sequence.

407, 330, 412, 404, 423, 415, 331, 420, 411, 327, 416, 408, 323, 412, 404, 424, 408, 331, 420, 405, 327, 416, 401, 421, 412, 404, 417, 409, 331, 420, 405, 328, 416, 401, 421, 413, 328, 417, 409, ___, ___.

Achilles: We' re at the trivia quiz now. Where are the answers that we obtained before we pushed into the manual?

Tortoise: Here they are. You know, I' m beginning to wonder whether it was such a good idea to push into this manual. It doesn' t give us any advantage in many cases, and here it' s even a disadvantage, because there' s no library here for us to use.

Achilles: That' s true. Maybe we should move on to the next part of the manual and come back to this part later.

This a trivia quiz. Alphabetize your answers, and then place them in the blanks provided. Leave out spaces and initial "The"s.

1 Trains, a trial, and a spaceship are recurring images in an opera whose name mentions an important 20th century historical figure. Name the opera.

2 Who added music to "Green Grow the Lilacs" by Lynn Riggs and to "Liliom" by Ferenc Molnar?

3 The `Bard of Armagh' relocated to the streets of what town?

4 Which composer dedicated a symphony to Napoleon, then later tore up the dedication?

5 Aaron Copland composed the piece "Canticle of Freedom" for the dedication of what building?

6 In October 1995, the MIT Symphony performed the world premiere of a piece of music. Who was the composer of that work?

7 Who composed the opera in which Sting starred on Broadway?

8 What MIT musical ensemble was cofounded by Susan Jackson '91?

9 Who played Mrs. Claypool in the "A Night at the Opera"?

10 Name the tune whistled by Peter Lorre before his committing the murders in "M".

11 Name the band which performed a hit song whose title was a Lewis Carroll character.

12 The world premiere of whose cello concerto was performed by Yo-Yo Ma in April 1995?

13 What opera contains the coloratura soprano aria "Glitter and be Gay"?

14 Give the name of the dog in the RCA Victor logo.

15 What is the name of the percussion ensemble at Wellesley College?

16 Give all but the first word of the first line of the poem which contains the lines "Could I revive within me her sympathy and song/ To such a deep delight 'twould win me, that with music loud and long/ I would build that dome in air".

17 Name the song featured in the Hitchcock film "The Man who Knew too Much" as well as in the opening titles of "Heathers."

18 What was the 1988 fall show performed by the MIT Musical Theater Guild?

19 What city is home to the only remaining radio orchestra in North America?

20 In what state is the largest city in the U.S.A. which is not the largest city of its name in the U.S.A.?

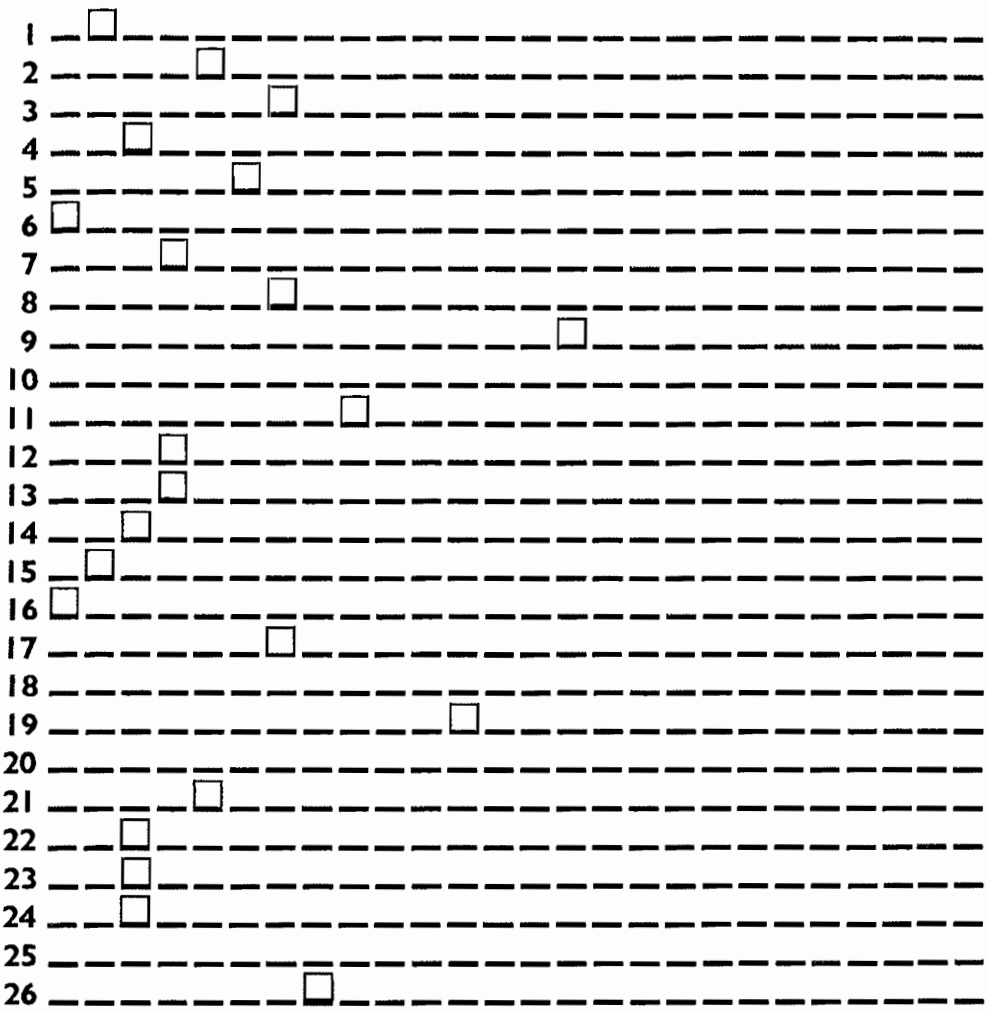
21 What was the name of Walt Disney's first cartoon character?

22 Who is the world's foremost player of the synthaxe drumitar?

23 Which MIT faculty member appeared as a soloist with the Philadelphia Orchestra in 1995?

24 Which city is the odd one out in the following list? Alexandria, Egypt; Athens, Greece; Houston, TX; Ladysmith, South Africa; Vancouver, Canada; Washington, DC; Ho Chi Minh City, Vietnam.

25/26 Only two countries have ever declared unilateral independence from the U.K. What are their current names?



Achilles: Ah! Finally, a part of the manual where it really helps that we' re right here instead of out in the real world. From here, we can fully observe this living colony of *Escherichia coli* bacteria.

Tortoise: What beautiful patterns! And they' re constantly changing, as the bacteria reproduce. It reminds me of one of the Crab' s screen savers.

Achilles: Which one?

Tortoise: I think it' s called " Life. " It' s based on John Conway' s model of " cellular automata. "

Achilles: It reminds me of Aunt Hillary. You remember, the colony of ants with whom the Anteater has frequent conversations?

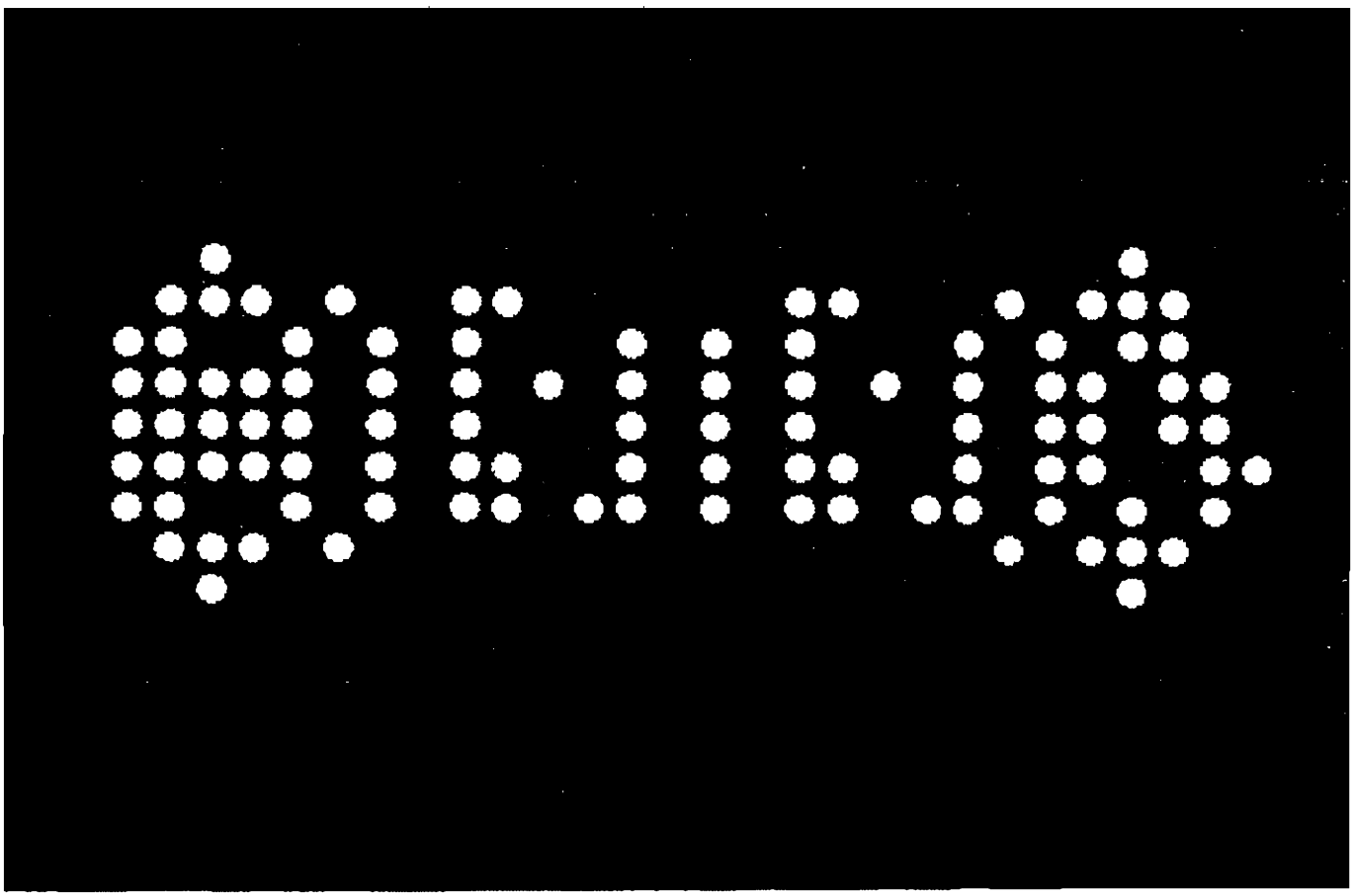
Tortoise: Ah, yes. The Anteater says that Aunt Hillary converses quite intelligently, despite the fact that her component ants are completely unintelligent beings, performing tasks by rote. . .

Achilles: Hey, do you see that? The colony of bacteria is communicating with us!

Tortoise: Where?

Achilles: You were too slow. The message just disappeared!

Tortoise: If the message occurred exactly one generation ago, I ought to be able to deduce what it was. . .



Each block of text below is an alphanumeric Augustus cipher. An *ordinary* Augustus cipher is a text that has been encoded by shifting each letter of the original text forwards in the alphabet by a certain amount (wrapping around the end of the alphabet if necessary), where the amount that the nth letter is shifted is given by the nth letter of a certain password or "key" text. For example, suppose we wish to encode the message IHAVETWOFINEPUPILS using the key text ITHURTSTOFOLDPAPER. We would shift "I" forwards by "I" (i.e., by nine places), "H" forwards by "T" (i.e., by twenty places), "A" forwards by H" (i.e., by eight places), and so on, obtaining the cipher text RBIQWNPIUOCQTKQYQK. An *alphanumeric* Augustus cipher differs from an ordinary Augustus cipher only in that the "alphabet" used is the thirty-six character alphabet 0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ. Shifting an alphanumeric character by 0 leaves it unchanged, shifting by 7 moves it forward seven places, shifting by A moves it forward ten places, and so on.

Each block of text below was encoded using a different key text. Each key text was obtained by taking every third alphanumeric character from some block of text from the book *Gödel Escher Bach: An Eternal Golden Braid* by Douglas Hofstadter.

The final answer is given by the formula

$26n_1 - 24n_2 + 48n_3 - 25n_4 - 26n_5 + 6n_6 + 27n_7 + 28n_8 - 29n_9 - 28n_{10}$.

k6bnmer3vqkejw67gc3e2xmr5uuhb5bmj6998zfcowilkr61336gf15o
5qxxwsvo45g2wjk5ba9wga3b8353cp3by0656d2zao513vbb5vseb99d
wf1wjy9z1j5o611v2kovdf3va2qxhkkwybixf1a2hhmb2qkt5j264kx2
pas57d59b115bxy7fhf7r2sf1tmi4tsjk3x4os6m2t5obsrabe44412s
1yvyr249sod4bhfohg17r4yzu6hzbglgz8za6s94v4pi1rzfxe6gv0j5
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8yov1tng2b7a9h5qqmk17f76w8e391gj2s2a7828e3zsha8zis2vbtub
31m204gbd460r5fa451535zsa5q9or20x6c35bdz2x92sr1nw06baszn
94510kpj0e7o1axsk66gpsei2

CUEOHINAMGVPREOADSTISUSILCBAOLTVEIETORRNEISDBYTAOH

n1fwppm8skn1qn5oa90eou97gwvco7y1n378w6kic9getu

66kns2fp5a874w0a1bkfyf6pzy4a7e1ee23pqx6823ja9qbg5813mc0w
dpg1a4feju7k7whab3j8yb51vo67yzkc5yf6

u33syv1m06fyt7w5ds9br3jq16cenuy5syu39c52g4snjcxe6hfbyino
fpa6cpsecy9g1cog15gm4o02gg35szf0f4vntmhtflo7ci90

u6bh9i99jhjw90q4b2i2hb4o2dk7u9441g54yb0ws1

50fn47gi76467eicdhim9f9t70km2czb795j022bersw

65s368far64wbhr8voq111sfgj7ezrgin6suja9fk7rzyob845gux4w7
6i57941f7q7157w0b63z1w2v696kwyxq3sn55ss

ko85habnt8x89wx4s2s7osrx9su2tdm849wsmgskb5uc8iuxmkric135
bdrok2gv72wpn68rz12gby0bea0a81fr1au525dzcb57hrw967dt74u1
0zot5yq5yah5fayd72qr9h9

82c15yc6z72r21ybzfeztcoqkzktx8s4wtqy3i04k4yre645f6xhu1

2rm9pqgkhbe95s0a6qez0p459q8bp311og2t8400956wmafd3kb15c37
1cjoqpfdzf5icar1f1e3z3tsxpisiff0aqi

5bf91492fhtvy1w5jzf6b1hjpy4ke2ef0mska3evvqb9d21ws3q6c577
hfv

1r7286lz3zo3f24mg61z9t8b6v0ayffa4sdrcep29gaa41n3w546pr73
1z5y2g8igbn0q97a83muvynd54f3g05gse5cf06knkpyhkz6zmt1d0ss
1c1tgfo8h493k56mwle2pwol96abkzbb1r2qg4vs4d1bux7v51tgls67
g439cdkv1na5vopn35ov1628qz4s5b5o

RUATMGHBEEEWSRAMIYANOLTFLHOEENS3ETRORDFOPTOAHMSENS

The original text for this trail was split into thirteen chunks by taking every thirteenth character (i.e., characters 1, 14, 27, 40, etc., make up one chunk, characters 2, 15, 28, 41, etc., make up a second chunk, and so on), and then each chunk was anagrammed using a password or pass phrase (this will be explained in a moment) to obtain the thirteen blocks of text below. Notice that case distinctions, punctuation, and spaces (represented by underscores) have been preserved.

The way the anagramming was done will now be illustrated by example; actually, we will explain how to recover the original text from the anagrammed text below (instead of explaining how to generate the anagrammed text from the original). Suppose that the block of text, after anagramming, says "tsaetemxpl" and that the password is "bad." To recover the original text, we move forwards 2, 1, 4, 2, 1, 4, etc., spaces respectively in the anagrammed text (because b = 2, a = 1, d = 4), wrapping around the end of the text if necessary, and ignoring any letters that were already used on previous passes through the text. Thus, we move forward 2 and get the letter s. We move forward another
1 and get a. We move forward another 4 and get m. We move forward 2 and get p. We move forward 1 and get l. We move forward 4, wrapping around the front and skipping over the s and a since they've already been used, and get (the second) e. We move forward 2, wrapping around and skipping over the m, p and l to get t. Continuing, we get "sampletext" as the answer.

Each block of text below was anagrammed using a different password or pass phrase. Warning: it is not necessarily the case that the first block of text below corresponds to the chunk of text with characters 1, 14, 27, 40, etc. After restoring the anagrams to their original state, you may need to rearrange the order of the thirteen blocks of text to obtain the full original text.

_altrgoca_og._eh_nh_Kn_o_knedlstpi_uoolt__g._, n_i__d_loa
on, einnnel_a__o_aterdlho__0e5Tsndamt4erT_bdhpt_th. 1e2. n1
ixr__d_aigit_t__s_ue_s__pnn__erspo7k_troiFwo_n4___lo_yud
._irlh_ec._erdt_ou__le_ty_esh_ueesh_. ootltth0. to__

rtMg1laofDatIdd. ioghf_d_myei_E. bnsm_hspet_o_snt1_oeeal_
bGh__d_oigy_6hettsdi_9_noieo_rd_iea_1tia_m_g1nFdy_hetn_
go. oitt_rleetrfhrokpr. rpa_loPPoo_e_tttbr. tvha_en1_. o1n_
e. ftehdxnao_1_2___t_io._Enrtn_ilioyeed_thtwhe_ow_ilro

TLHRUEAERISTLFRSOAIRISOLONSNEOEONOFTFTHTHIHESEOLCT

ehg_gi_Re_odtragoit_nt_tp___t_cn, l__rirsva_rolodkt_, onMi dhfnronte3__T0_teftwamirt. nSh_o_sptel_leeS__wrieg__l_ulr l. Es__7t. aoteh__ttoroasdp. obpceeh_sn. _ke0_teuaehtekeiueE _utool E_ah_egdlhghthnterhtm_daoOF__n__ot_riYi7aowh

rd. osnpa_p_erFlgre_sn_ted_o_eeoie. _eoety_hGbnkt. ned_n_or s_te__s___n_osfly_gEl_e_io_tt8_te_on_ohtGcuo_ee__lno0t5o s5o_elhkip. _dyin_h_toetgscfie_t_. doj_htrtgc. xtg7. jutnofn weayi_ro_rg. _iaid. e_l_nkrtae_e_22shtxbstet_gofhe_r

Ttaei_yrslerttna__ysegaym_Aetit_o_gttw_n_a__h__o_woreoeo o____alro_o__ni_oio_y_e_t_h, , y. gmgmoa_Soei_trty_yoo_3ha_ ecIs1nhpv_nclgnle_h_. pt3_o_4a_Btoi_lnotr9n__hP_iklese_oa _rirtmgwc. wl_iydbuttehsddkt_nyIE. a__t_o_tonncrG_t4

1B_oon1hSoEre3exereoeet__eotw__bn-kopwePeerF. tglddvb_itw _ftlxi7_1___bdesuhlttegK_nGrd. tnr_n__x4t_esrtptoiag_rf. _ _arfto__ia, i_orn_atshfG__ha_rhrr2_Wtr2_bfp_a_la_etaihaed o_rrh_ewtoPo_nu_Cop1f_f_a_r_huWhor_gngou_ueadru. la

G_r_te_. t_po9Wh1x1xt_chrur_t_u__xhif_eba_nah21__oo__hhmk _on117uee. gni. Wuc_. cui_rtt_ohyneo_xaoohr__ni_oo_up_trtfr BGrhn_b__ntgewtl, a. _t_peuie_. _dsg_tt_tcote_hroo__ots. t__ r_, e_p_de___aaio_th. n__1#h_e_i_co2. fui_ttidpWxucxr

lie. uykgeCG_drei_tnrtE'. ia_anic2ieGh_____rhthhed_on_rp_ t_re__tercsat_ouol2neu_e__n__adoylasp_htoS. 8neBoaGrfa_ay a_w_teeoetpoge_t_rhcod6r__D_eke0iptdaee9rt5_dt__ied_fl_t onooei__l. _soxntoimmdkyeynt_agt_o__nsk_iw_bys___y_

ALLTDNTTUEAMRKBTEERTRAHDIEIL I VYSIOTDUSESEIHRTOIBUA

g_teI__fe__omep_T_0uwet_G_r_F_e_1b2, tahbiK, tnietrAwruuee uodi__ui_fSht_ov4_. _eo_anuoh_oeecd_od_asofl_tklotil. __s; 'bifbtil_uniosl_unc_tantoidan__nsiiprs_a18Wlast03n_to__n hoo_wha_trAgtr. tntwWa_go_h__taehkbg_e_eo8o_stlaxnh

uoWr_ntau_oxrig_s_xah_dvebannndsEts__nahtitrto_23woee: on ghimnsxtee_itwi_ilKust___DoeLlgibk_e_purlkpfu_nttckis_h_ pelew_n____rnhs__dzo_t6lsca_uooktP_seaeror__yroiulut. ho. _t. oo__geny__. aAdsiuyea_cte_eG7n3k__a_Gu_m. fbohBr5

e_dketuslr. _enwgcoso6esiin2_tloteuXtdnstbhot__r_h_ilseda geslas_rdera_h_gTceiut__tG_so__poh_a, t_w_teaahhig. P16. p_ ssodth_otto__li__e_eFfxop_l_l_wie__teao3. rooo, e____cte_t as_hulatvhly_6_t_Tehioio. rlirrlee_rhthet_eeF'gigr_

. u_iadhsrperhoetrnau2sZg_ene__seoa_8t_hs__gK__srfe__T_eE _mefarru__ghthxkke_e5n5_ee__a_llroro_re_ti_dmapnlne0n__e 9xda_e_hrsoudeeso__nanr_nhc. tericsiEno_vklde6_G_s_r. _. ep oehochrorpntd__t__fNdhdne_lggttofpoohndetmc. rrt_i_

va__n3hte_. t_ttwnh_tAr. _7oB_o. t. oyd. u__bahvirWotarKto3dc de_Gh__otoogr4i__Ksekod_. iiuts4il__bng_wrlodOw_8__oet_. u wmeaph__t_. n_yoatd4a_eta. _rhao_Geffh_eo. oA_Bth__weeiraot _eitletft_o_A_i_iioo_at_rl_ewullNee_ne_Hte_tig__6b

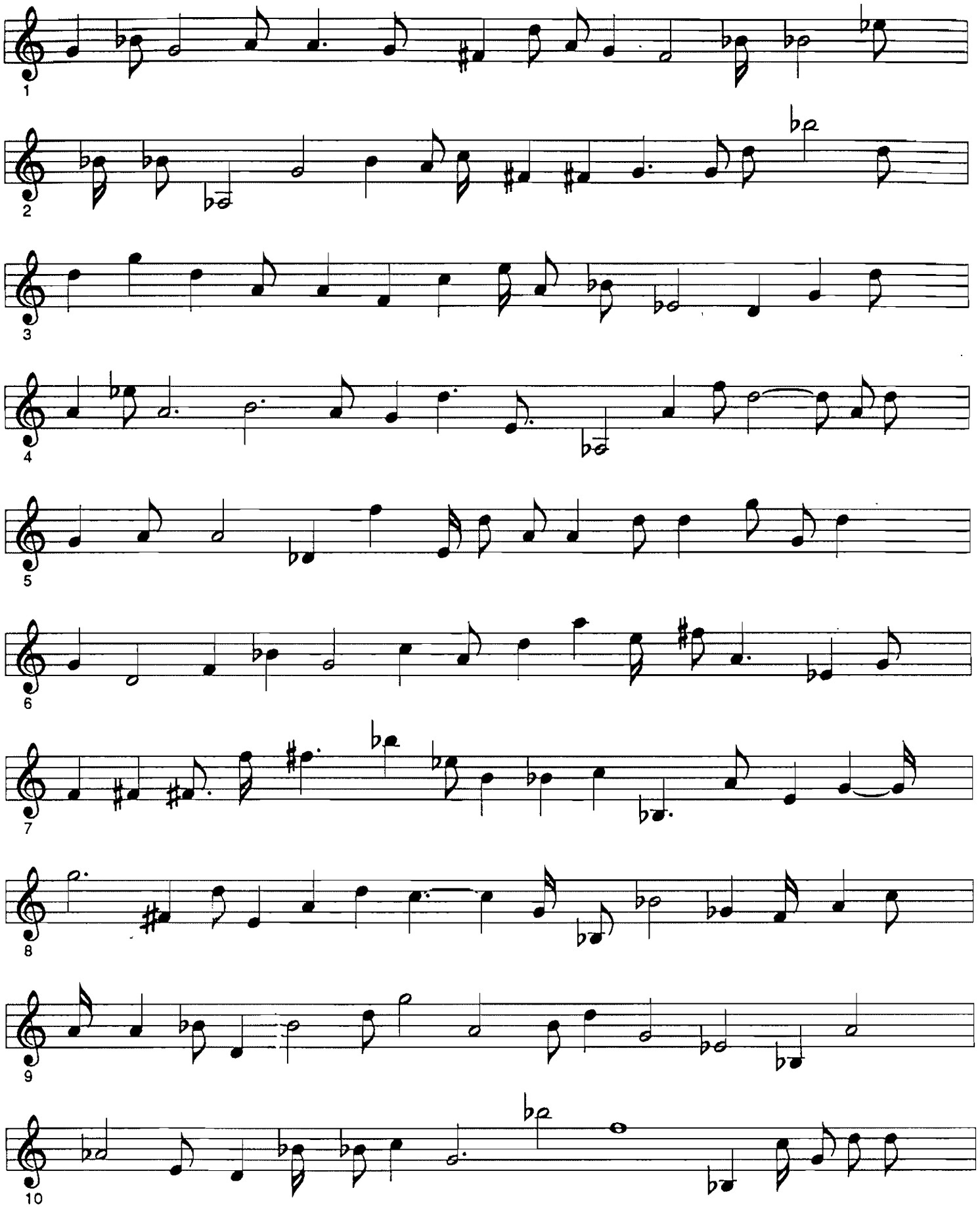
YIH4NT9DHAEENR2DDNTODATSKHEEERTSIHAAEMLRENEWUMIMAT

For each melody, find the first note of the melody in the first line of the sheet music on the following pages and cross it off, find the second note of the melody in the second line of the sheet music and cross it off, and so on until you have crossed off one note from each of the thirty-eight lines of music." One note from each bar will remain when you are all done. Follow this remaining melody around the MIT little harmonic labyrinth that is diagrammed on the maps. In the nth passageway on this trail (by a passageway we mean either a corridor or a stairwell connecting two floors), find all doors with at least one instance of the nth letter in the "key sequence" painted on the window pane. The "key sequence" is

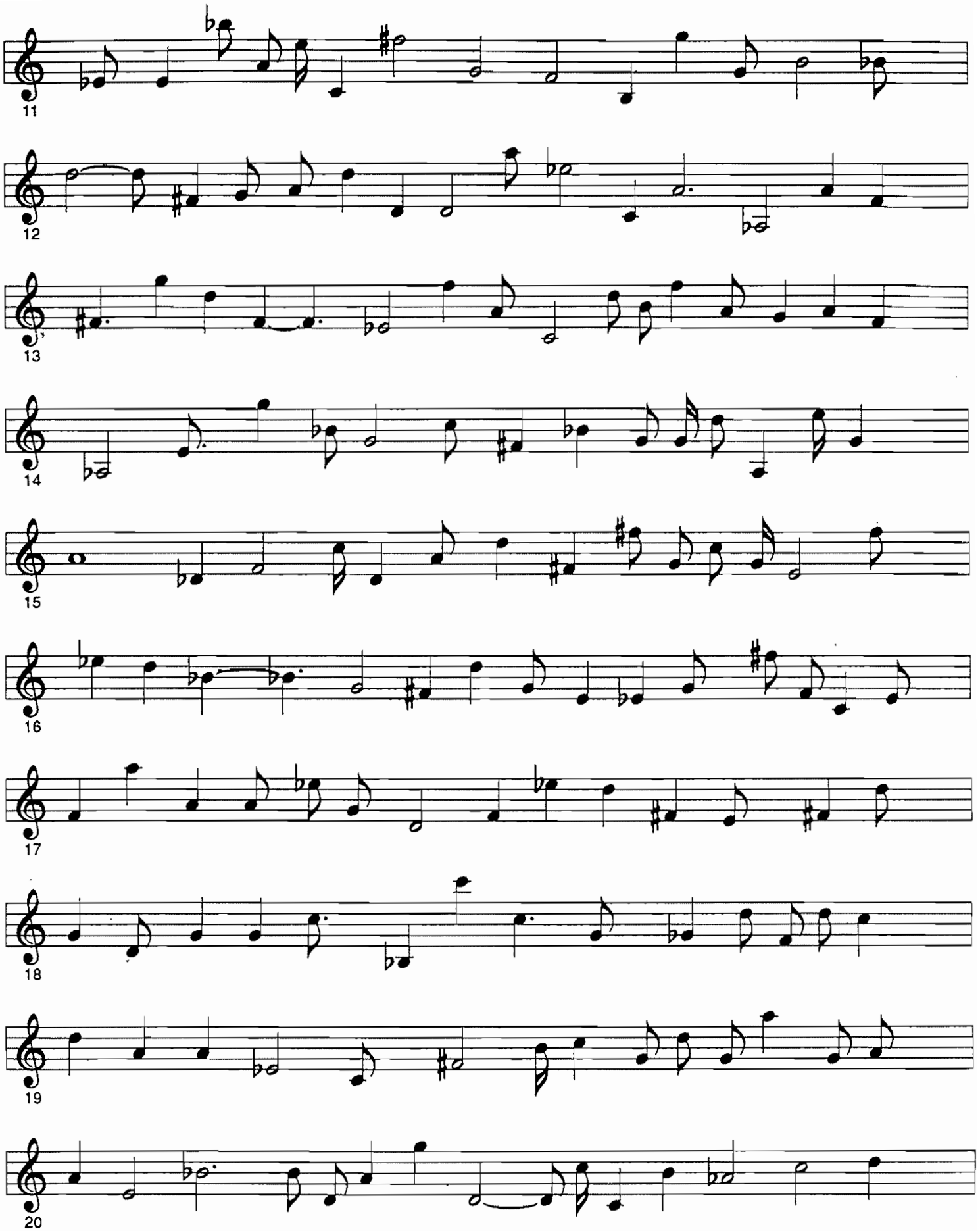
BABACHBCAHABCHJSBACHBACJBABHHBACJSJSBA

(Double doors count as a single unit.)
In each passageway, order these doors in ascending order of room number. Next, in each passageway, look for room numbers that appear more than once in this list of doors. Eliminate all occurrences of such doors from the sequence of doors. (Doors in different passageways have no effect on each other for the purposes of this elimination.) Finally, for each door, take the first letter after the first occurrence of the key letter on the window pane. (If the first occurrence of the key letter is the last letter on the window pane, wrap around, i.e., take the first letter on the door.) Warning: do not expect this sequence of letters to form intelligible text.

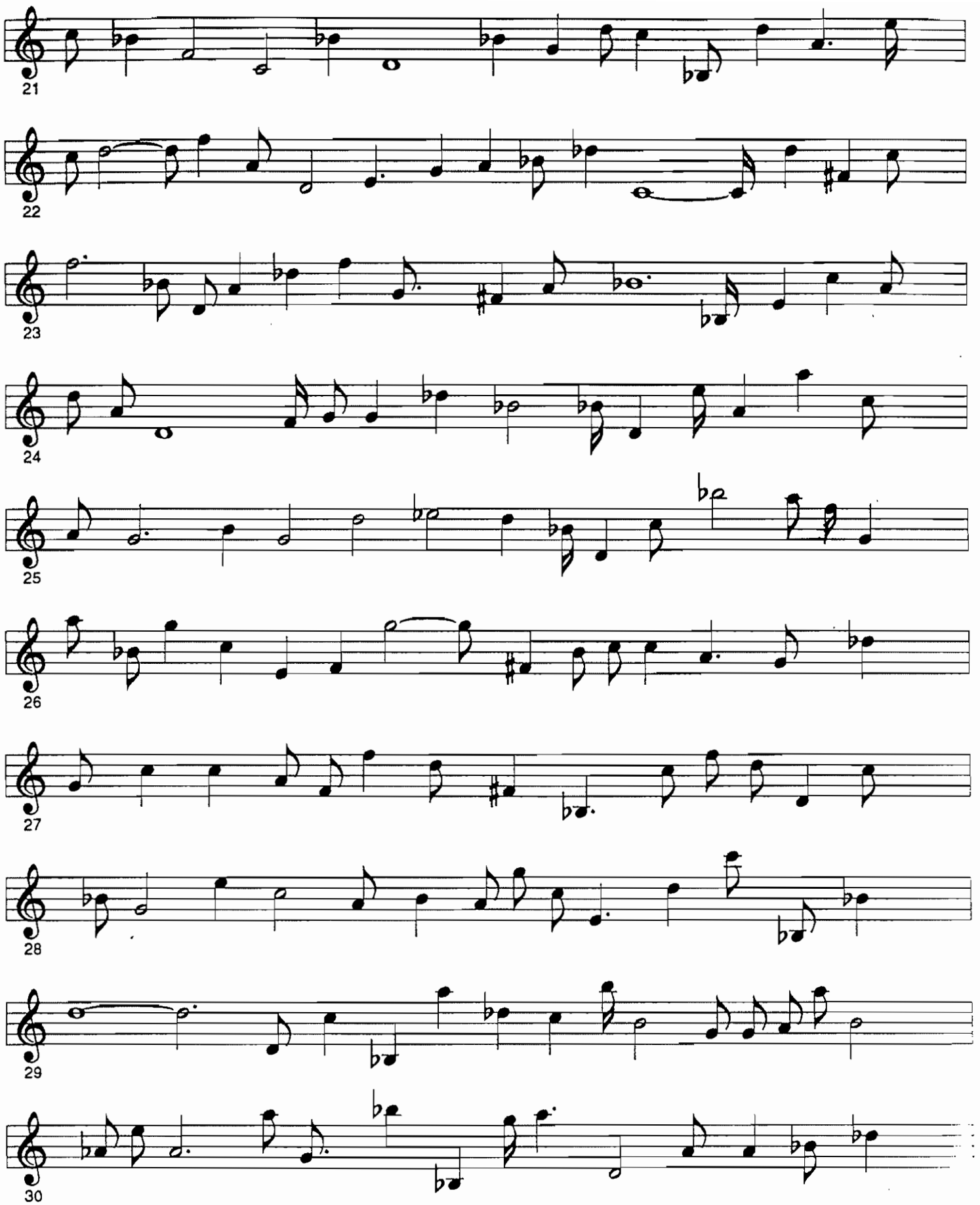
BSEETWREIEATXDHCOTEFHP4ET93WDRIODTTNHHU6EM1SBIAENM



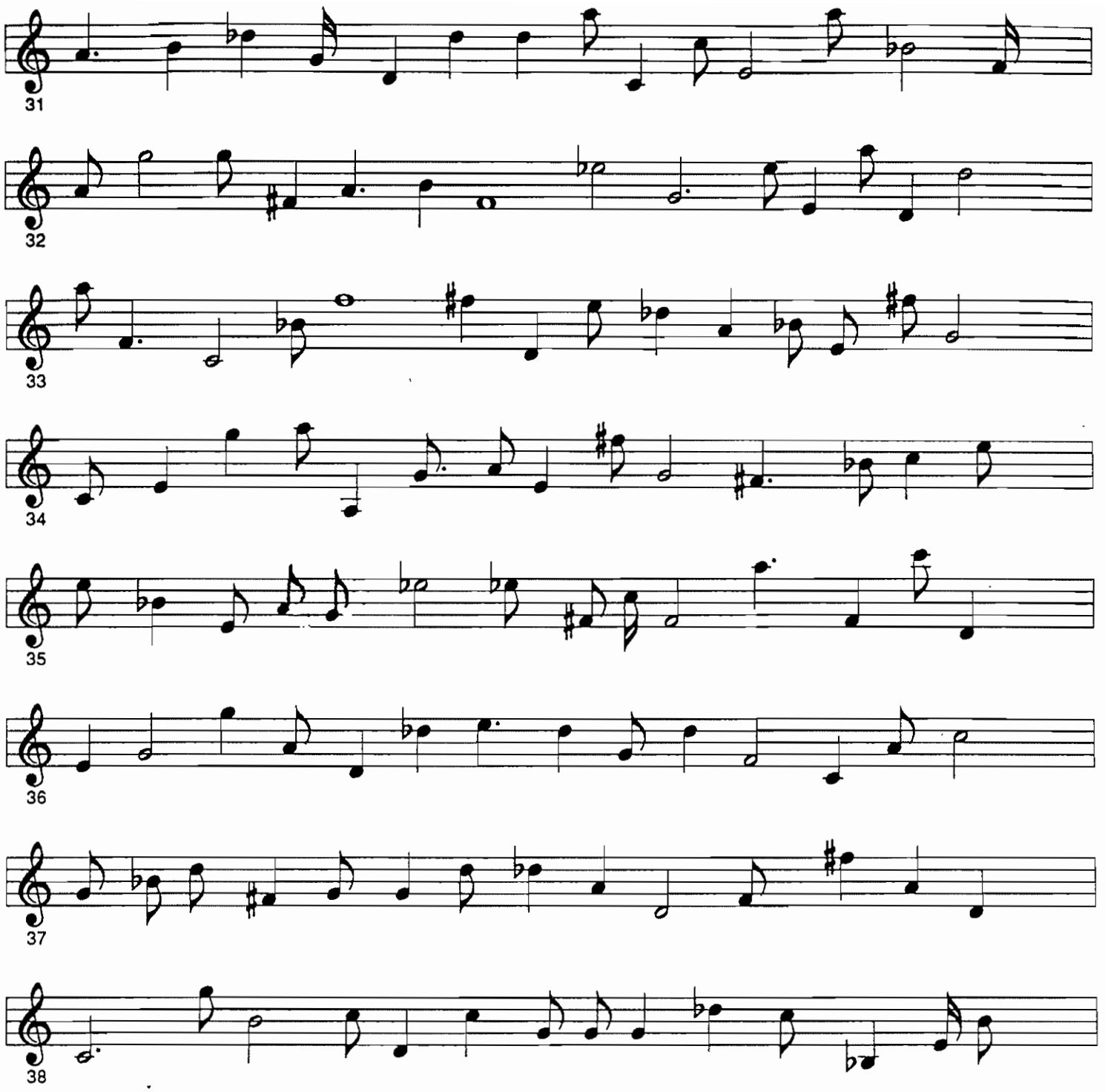
RTTEHWXEIC4TETHPH5TN3WUWIMITBTHEH8RT9EHWXEIC5TETHP



H9MN I BUAEMNRBDEEWXRICETEXHPCTTEHWPEIT6TWTHIH6TN4HU

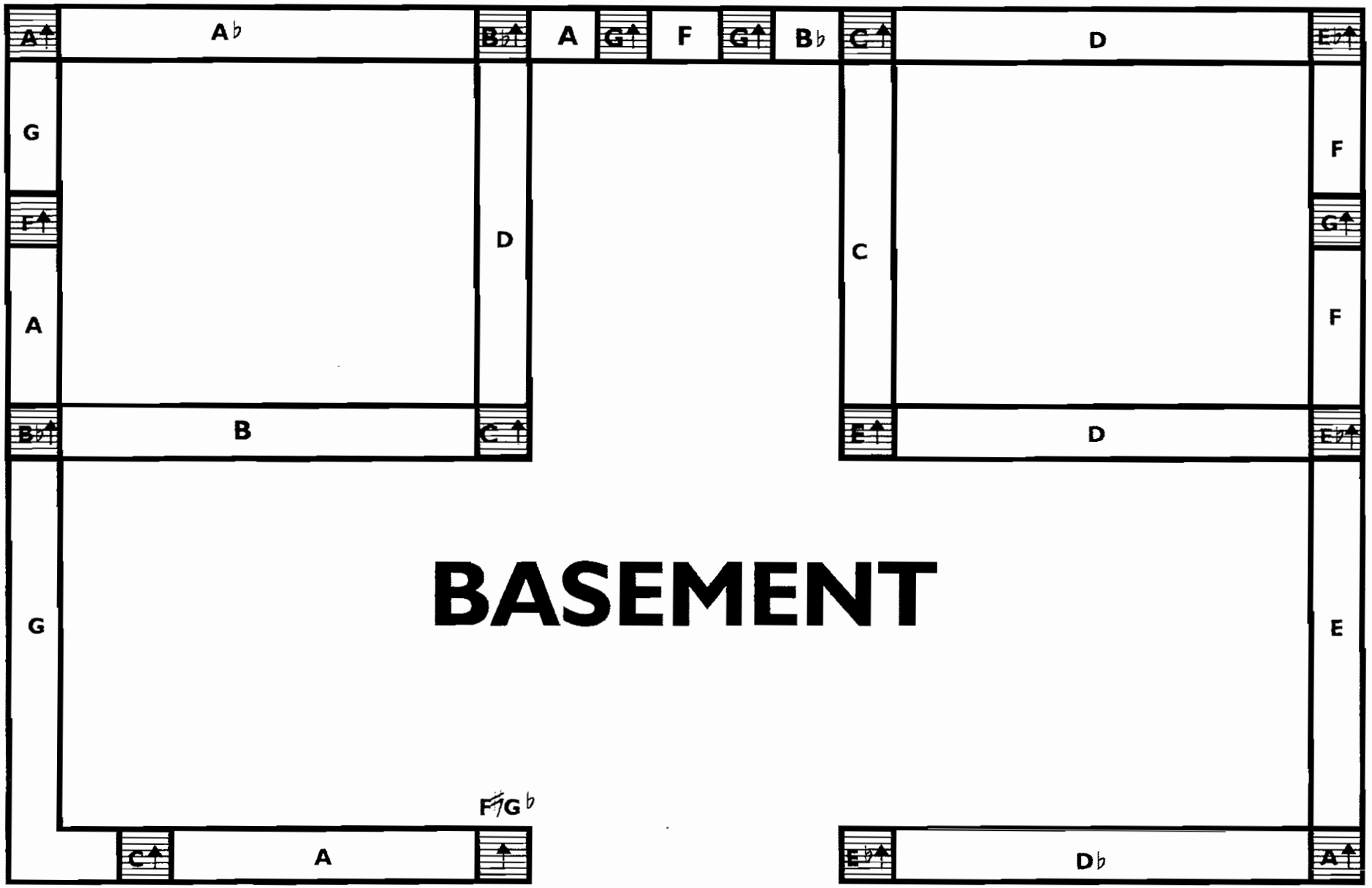


TULHMDIBCSEOWRNISVLTELHRGATITTVYOEOLYUEOSTUHT6OENU



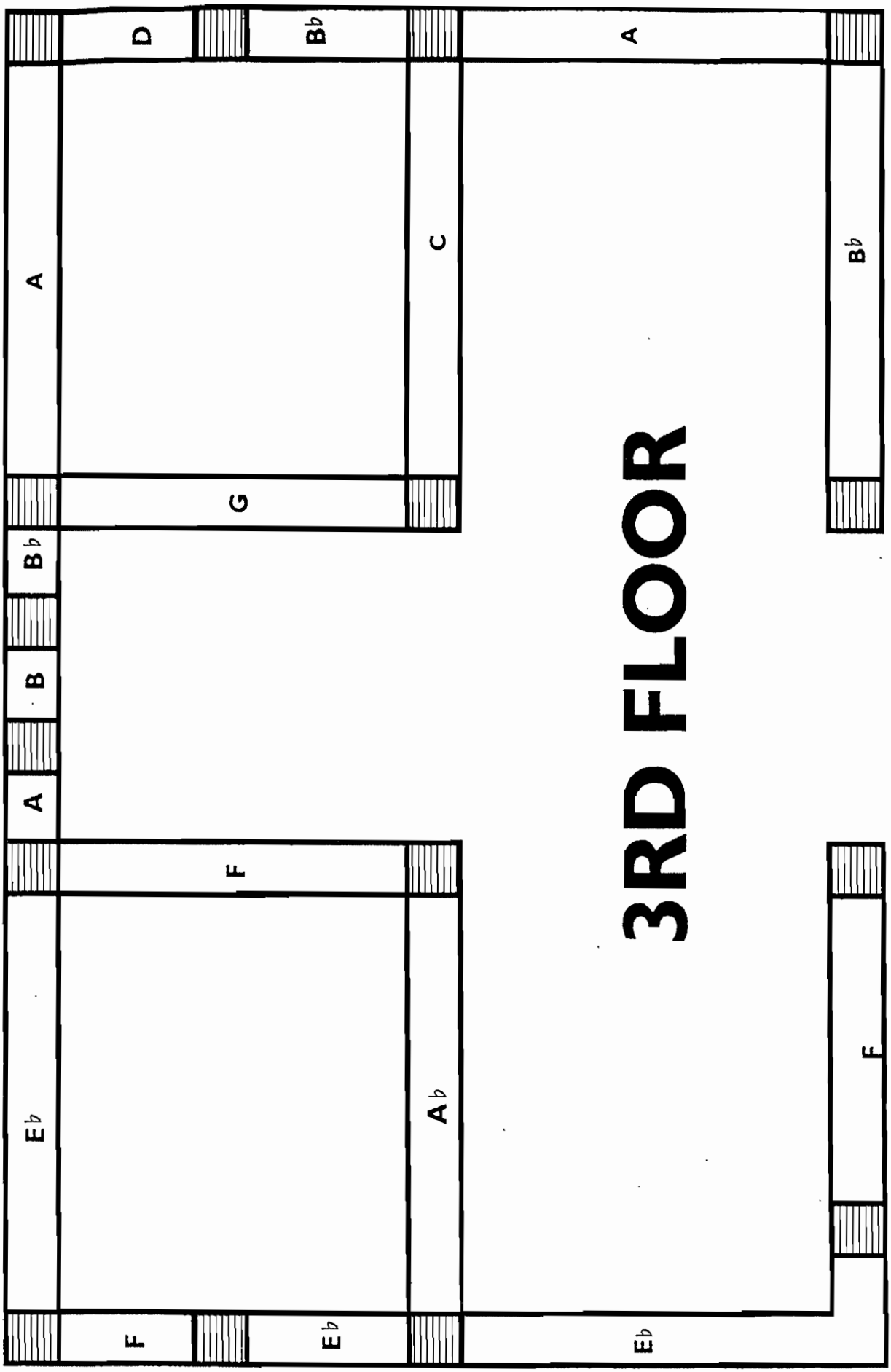
RFASOITRLOTOSHNPETERHLEILMSOAFUIITNNAIACNLLGTUTRER

AOIIROLTNOHEBEDT I AASBITONTVTREHABEIYCLULMSUEIENNFT



GMBTNOHWSEHTREOINNGYEHODTUIHRSAEONANDCCCHOOTMLHPUE

2ND FLOOR
A5LNREYOTTWTA I EKLREE3RTROTOWEW3R4L2LE6ETRTTOTEWER2



RL17E3RTAOTNWED5RRL1OERWTO5TWLE6ERLT8ETRTEOTRWE27R