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**FLORIDA HIGH SCHOOLS COMPUTING COMPETITION '92**

1.1 Write a program to display the following company name:

```

GGGGG   TTTTT   EEEEE
G        T        E
G GGG   T        EEEEE DATA SERVICES
G  G    T        E
GGGGG   T        EEEEE

```

1.2 GTE became a corporate entity in 1918 in Wisconsin and was named: RICHLAND CENTER TELEPHONE COMPANY. Over the years this company has taken on various names as a result of its mergers and to reflect its current focus:

```

1920   COMMONWEALTH TELEPHONE COMPANY
1926   ASSOCIATED TELEPHONE UTILITIES COMPANY
1935   GENERAL TELEPHONE CORPORATION
1959   GENERAL TELEPHONE & ELECTRONICS CORPORATION
1982   GTE CORPORATION

```

Write a program to print the name of the organization in a given year from 1918 to 1992. Examples:

```

INPUT: Enter year: 1950
OUTPUT: GENERAL TELEPHONE CORPORATION

```

```

INPUT: Enter year: 1982
OUTPUT: GTE CORPORATION

```

1.3 In 1990, GTE ranked 13th in the Forbes Super 50 1990 list of companies. The list ranks the biggest U.S. companies on a composite of revenue, net income, assets and market value. The following year GTE ranked 7th in the Forbes Super 50 1991 list of companies, rising up 6 places. Write a program to display a company's projected 1992 ranking after accepting a company's rank for 1991 and the number of places the company rises the following year. Examples:

```

INPUT: Enter 1991 rank: 40
      Enter number of places: 8

```

```

OUTPUT: 32

```

```

INPUT: Enter 1991 rank: 21
      Enter number of places: 13

```

```

OUTPUT: 8

```

1.4 GTE is the largest U.S.-based local-telephone company, with more than 20.2 million access lines, and the second largest cellular-mobile company. Its consolidated revenues and sales from continuing operations for 1991 totaled \$19.6 billion with a consolidated net income of \$1.8 billion. GTE's world headquarters is located in Stamford, Connecticut. The corporation employs approximately 160,000 people in various telephone and manufacturing operations in 48 states and 41 countries. GTE consists of the following operations:

GTE TELEPHONE OPERATIONS  
 GTE GOVERNMENT SYSTEMS  
 GTE MOBILE COMMUNICATIONS  
 GTE INFORMATION SERVICES  
 GTE SPACENET  
 GTE AIRPHONE

Write a program to indent each GTE operation a specified number of spaces more than the previously displayed operation. The first line displayed is not to be indented. Example:

INPUT: Enter number of spaces: 2

OUTPUT: **GTE TELEPHONE OPERATIONS**  
           **GTE GOVERNMENT SYSTEMS**  
               **GTE MOBILE COMMUNICATIONS**  
                   **GTE INFORMATION SERVICES**  
                       **GTE SPACENET**  
                           **GTE AIRPHONE**

1.5 GTE Data Services is a wholly owned subsidiary of GTE Corporation based in Stamford, Connecticut. GTEDS is one of the largest software development and information processing service companies in the United States, using 15 large mainframes to support approximately 125 major software systems. With corporate headquarters in Temple Terrace, Florida (next to Tampa), GTEDS is a part of GTE's Telephone Operations Group. More than 2,600 employees are located in the Tampa area, while approximately 5,000 are employed at four regional processing centers in the United States. The company was formed in October 1967 to provide information management and systems development services to customers nationwide. Since that time GTE Data Services has been providing low-cost, high-quality data processing, office automation and internal telecommunications product and services to GTE telephone operations in the United States, Canada and the Dominican Republic. Don A. Hayes was appointed president of GTE Data Services in July of 1988. Write a program to input a month and a year (of the form MM, YYYY) and display the number of WHOLE YEARS GTEDS has been operating. Examples:

INPUT: Enter M, Y: 5, 1992

INPUT: Enter M, Y: 10, 1987

OUTPUT: 24 YEARS

OUTPUT: 20 YEARS

**1.6** Write a program to center a person's title and last name within a box of asterisks with dimensions 24 by 5. Input will be given on two separate lines, but both the title and the name must appear centered on the same line separated by one space. If one side must have one extra space, it must appear on the right side. Examples:

```
INPUT: Enter title: COMMISSIONER
       Enter name: CASTOR
```

```
OUTPUT: *****
        *                               *
        * COMMISSIONER CASTOR          *
        *                               *
        *****
```

```
INPUT: Enter title: PRESIDENT
       Enter name: HAYES
```

```
OUTPUT: *****
        *                               *
        *  PRESIDENT HAYES             *
        *                               *
        *****
```

**1.7** GTE Data Services selects qualified candidates to participate in the Information Systems Orientation Program (ISOP). Selection is made from all individuals whose current position is at least a Salary Grade Level 5 and who have the potential and desire to occupy at least the positions of Systems Supervisor and Systems Manager. Write a program to accept the NAME of a selected candidate, their TITLE, and the GROUP that they represent, and then display the information in the form of a four-line statement as illustrated below. Examples:

```
INPUT: Enter name: SCOTT
       Enter title: PROJECT LEADER
       Enter group: SERVICE ORDER DEVELOPMENT
```

```
OUTPUT: SCOTT IS A PROJECT LEADER WITHIN THE
        SERVICE ORDER DEVELOPMENT GROUP AND
        HAS BEEN SELECTED TO PARTICIPATE IN
        THE ISOP.
```

```
INPUT: Enter name: RICK
       Enter title: PROJECT LEADER
       Enter group: CONVERSION
```

```
OUTPUT: RICK IS A PROJECT LEADER WITHIN THE
        CONVERSION GROUP AND
        HAS BEEN SELECTED TO PARTICIPATE IN
        THE ISOP.
```

**1.8** One of the many benefits of working at GTEDS is the Personal Computer Purchase Program which allows employees to buy a personal computer through interest-free payroll deductions. At most \$2000.00 may be borrowed. Write a program to display the dollar amount to be borrowed (preceded by a "\$"), given the cost of the computer in dollars (without the dollar sign). Examples:

INPUT: Enter amount: **1255.70**      INPUT: Enter amount: **2543.23**  
OUTPUT: **\$1255.70**                      OUTPUT: **\$2000.00**

**1.9** Debra, Lori, Sherry, Sue, and Tom all occupy the position of BIA (Business Information Analyst) in the SERVICE ORDER/TREATMENT Sub-application groups within CBSS at GTEDS. BIAs are knowledgeable in both the Telephone Operations business functions and the support of Data Processing systems. Write a program for the BIAs to display an acronym for a given set of business words separated by a space. The acronym is formed by concatenating the first letter of each word entered. Examples:

INPUT: Enter words: **BUSINESS INFORMATION ANALYST**  
OUTPUT: **BIA**

INPUT: Enter words: **CUSTOMER BILLING SERVICES SYSTEM**  
OUTPUT: **CBSS**

**1.10** "Quality begins with U" is Scott's slogan for the SERVICE ORDER/TREATMENT SUPPORT group that he is supervising. His vision is to establish easy procedures for the technicians to follow enabling them to fit "quality" into their busy work schedule at GTEDS. One way in which Scott is implementing "quality" is by allowing all the technicians to meet together on a daily basis to enlighten one another about their critical day-to-day maintenance activities and how they responded to achieve a solution. These meetings help new technicians learn quicker and standardizes the way work is done by hearing how some of the more experienced programmers solve problems. Write a program to determine how many HOURS and MINUTES are devoted to implementing "quality" after 1 year (50 weeks) if N technicians meet 5 days a week for M minutes, given that N and M are input as positive integers. Examples:

INPUT: Enter number of technicians, N: **10**  
          Enter number of minutes, M: **15**  
  
OUTPUT: **625 HOURS 0 MINUTES**

INPUT: Enter number of technicians, N: **7**  
          Enter number of minutes, M: **5**  
  
OUTPUT: **145 HOURS 50 MINUTES**

**2.1** Write a program to display several input lines of a speech in an indented outline format. The last line entered will be followed by a blank line. Each line that begins with a Roman numeral (I, II, III, IV) is displayed without any indentation. Each line that begins with a letter (A through H) is indented 4 spaces. Each line that begins with a number (1 through 9) is indented 8 spaces. Example:

```
INPUT: Enter line: I. THE CROSS
      Enter line: A. HISTORY
      Enter line: 1. THE PERSIANS
      Enter line: 2. THE CARTHEAGANS
      Enter line: 3. THE ROMANS
      Enter line: B. MEDICAL PERSPECTIVE
      Enter line: C. HIS PERSONAL SUFFERING
      Enter line: II. THE LAST 7 STATEMENTS
      Enter line: III. 3 DAYS LATER
      Enter line: (press the return key)
```

```
OUTPUT: I. THE CROSS
        A. HISTORICAL PERSPECTIVE
          1. THE PERSIANS
          2. THE CARTHEAGANS
          3. THE ROMANS
        B. MEDICAL PERSPECTIVE
        C. HIS PERSONAL SUFFERING
II. THE LAST 7 STATEMENTS
III. 3 DAYS LATER
```

**2.2** Bob is the project leader for the REPORTS SUPPORT group within CBSS. The Customer Billing Services System utilizes a utility called the REPORT FORMATTER GENERATOR (RFG) to create its reports. The RFG is a table driven utility which processes one to an infinite number of reports from a single job-step. Write a program to display in words, the number of reports that the CBSS Director, Mick, is requesting. Input will be any integer between 1 and 99, inclusive. Examples:

```
INPUT: Enter number: 25
OUTPUT: TWENTY-FIVE
```

```
INPUT: Enter number: 91
OUTPUT: NINETY-ONE
```

```
INPUT: Enter number: 16
OUTPUT: SIXTEEN
```

```
INPUT: Enter number: 3
OUTPUT: THREE
```

**2.3** GTE Data Services hires talented college graduates into their New Recruit Development Program. This is an intensive, innovative 14 week training program designed to develop individuals in the state-of-the-art technologies of GTE Data Services. Trainees will enter into the program as Programmers - New Recruit Associates and take part in lectures, lab session, and on-line training exercises in the areas of: COBOL, CICS, JCL, MVS/XA, VSAM Files, TSO/ISPF, C, Case Tools, DB2/SQL, Telecommunications, and Database Concepts. Recruiters generally hire those individuals with a BA/BS or higher degree in Computer Science, Math, Business, Engineering, Management Information Systems or Computer Information Systems. Other considerations are also reviewed as shown below. Write a program to accept as input the name of a potential recruit and his/her degree, and then display a menu of 7 other considerations as shown below. The computer then prompts the user to select up to 7 of the items listed (as a "string" in any order). Next, the computer is to clear the screen and display the name of the recruit followed by his/her degree followed by all the other considerations selected. Considerations are to be separated by a blank line and renumbered consecutively in the order they appear within the menu. Example:

INPUT: Enter name: **DOUG**  
Enter degree: **BS IN COMPUTER SCIENCE**

OUTPUT: 1. **DEMONSTRATED INTEREST IN INFORMATION MANAGEMENT.**  
2. **DEMONSTRATED LEADERSHIP SKILLS.**  
3. **STRONG GPA/PERFORMANCE HISTORY.**  
4. **AT LEAST TWO COURSES IN ANY PROGRAMMING LANGUAGE.**  
5. **INTERNSHIP OR WORK EXPERIENCE.**  
6. **EFFECTIVE ORAL AND WRITTEN COMMUNICATION SKILLS.**  
7. **CAREER DEVELOPMENT POTENTIAL.**

INPUT: Select up to 7 items: **17265**

OUTPUT: (screen is cleared)  
**DOUG**  
**BS IN COMPUTER SCIENCE**  
  
1. **DEMONSTRATED INTEREST IN INFORMATION MANAGEMENT.**  
  
2. **DEMONSTRATED LEADERSHIP SKILLS.**  
  
3. **INTERNSHIP OR WORK EXPERIENCE.**  
  
4. **EFFECTIVE ORAL AND WRITTEN COMMUNICATION SKILLS.**  
  
5. **CAREER DEVELOPMENT POTENTIAL.**

**2.4** Shelley has served as president of the Toastmasters Club at GTE Data Services. Each week the club meets to provide its members with a friendly atmosphere in which they can present effective speeches that inform, persuade, inspire, and entertain. Each meeting includes open evaluation, in which the speaker learns the audience's reaction to his or her presentation. One person is assigned the task of formally evaluating another person's speech. The speech is judged in regards to seven categories: speech value (interesting, meaningful), preparation (research, rehearsal), manner (direct, confident, sincere), organization (purposeful, clear), opening (attention-getting, led into topic), body of speech (logical flow; ideas supported by facts), and conclusion (effective, climatic). Write a program to accept an evaluator's verbal rating for the seven categories and to output the numerical value of each category, the average numerical rating (rounded to the nearest tenth), and the overall verbal rating, given the following rating scale:

- 1 = EXCELLENT
- 2 = ABOVE AVERAGE
- 3 = SATISFACTORY
- 4 = SHOULD IMPROVE
- 5 = MUST IMPROVE

The program then must display the equivalent overall verbal rating after rounding the displayed average numerical rating to the nearest whole number. Examples:

INPUT: Enter rating for speech value: **ABOVE AVERAGE**  
 Enter rating for preparation: **ABOVE AVERAGE**  
 Enter rating for manner: **SHOULD IMPROVE**  
 Enter rating for organization: **SATISFACTORY**  
 Enter rating for opening: **MUST IMPROVE**  
 Enter rating for body of speech: **ABOVE AVERAGE**  
 Enter rating for conclusion: **EXCELLENT**

OUTPUT: **SPEECH VALUE: 2**  
**PREPARATION: 2**  
**MANNER: 4**  
**ORGANIZATION: 3**  
**OPENING: 5**  
**BODY OF SPEECH: 2**  
**CONCLUSION: 1**

**AVERAGE NUMERICAL RATING = 2.7**  
**SPEECH RATING = SATISFACTORY**

**2.5** Write a program to display GTEDS MISSION statement formatted with at most N characters per line, where N is input as a number between 20 and 40 inclusive. Words in the following statement end with a space, dash, or period: "Be the customer-oriented leader and provider-of-choice of quality information products and services in the telecommunications marketplace and selected other related markets in support of GTE'S TELOPS goals." The last word displayed on a line may end with a dash. Example:

INPUT: Enter N: 28

OUTPUT: **BE THE CUSTOMER-ORIENTED  
LEADER AND PROVIDER-OF-  
CHOICE OF QUALITY  
INFORMATION PRODUCTS AND  
SERVICES IN THE  
TELECOMMUNICATIONS  
MARKETPLACE AND SELECTED  
OTHER RELATED MARKETS IN  
SUPPORT OF GTE'S TELOPS  
GOALS.**

**2.6** Write a program to enter a paragraph with no commas, and change all periods to question marks if the sentence begins with WHAT, WHY, HOW, WHO, or WHERE. All sentences end with one of three characters: period (.), question mark (?), or exclamation point (!). Note: Input will be at most 125 characters; Output does not need to be formatted and may wrap around the end of the screen to the next line. Example:

INPUT: Enter paragraph: **WHAT IS TODAY'S DATE. MAY 2ND.  
WHERE ARE WE. IN TAMPA. WHY ARE WE HERE! WHOM ARE YOU. IS THIS  
FUN OR WHAT.**

OUTPUT: **WHAT IS TODAY'S DATE? MAY 2ND. WHERE ARE WE? IN  
TAMPA. WHY ARE WE HERE! WHOM ARE YOU. IS THIS FUN OR WHAT.**



**2.7** Employees at GTEDS usually spend their time either in development work or in support work. Development builds a new system or adds new features to an existing system. Support, or maintenance, fixes functionality that currently is producing undesired results. Dan is the project leader for the SERVICE ORDER/TREATMENT SUPPORT sub-application group within CBSS at GTEDS. In order to respond promptly to the customers' needs, a beeper is carried by one person in the support group at all times. The primary beeper person is responsible for providing support to the customer and is the customer's primary contact for emergency situations. Write a program to display an alphabetical listing of all the employees that are in the office at a given time when the beeper "goes off". If no one is in the office at the given time, then display: NONE. Since the employees are on "flex time", their schedules may differ among themselves but will be consistent on a day to day basis. The following is a list of support personnel and their core hours (24-hour clock time), Monday through Friday unless otherwise indicated by a day off:

David	0700 - 1600	
Don	0800 - 1700	
Doug	0730 - 1630	
Grandville	1230 - 2100	
James	1130 - 2200	off on Monday
Jim	0900 - 1800	
John	0700 - 1600	
Linda	1230 - 2300	off on Friday
Marie	0700 - 1600	
Matt	1230 - 2300	off on Monday
Paula	0700 - 1600	
Robert	0800 - 1700	
Shelley	0630 - 1530	
Tom	1100 - 1930	

Examples:

INPUT: Enter time: **0730**  
Enter day: **FRIDAY**

OUTPUT: **DAVID, DOUG, JOHN, MARIE, PAULA, SHELLEY**

INPUT: Enter time: **1930**  
Enter day: **MONDAY**

OUTPUT: **GRANDVILLE, LINDA, TOM**

INPUT: Enter time: **1230**  
Enter day: **SUNDAY**

OUTPUT: **NONE**

INPUT: Enter time: **0650**  
Enter day: **THURSDAY**

OUTPUT: **SHELLEY**

**2.8** Anita is the Supervisor of the TREATMENT DEVELOPMENT sub-application within the Customer Billing Services System (CBSS) at GTEDS. To insure the development of a high-quality product, Anita asks her project leader, Val, to conduct a formal inspection of their work, in accordance with company procedures. A formal inspection is a "rigorous structured review of a product to find defects." Val has designated that five of her co-workers will function as inspectors. Each inspector is assigned one of five titles and performs its function accordingly: moderator, reader, recorder, author, and inspector. The MODERATOR leads and guides the inspection. The READER sets the pace and paraphrases the material. The RECORDER lists the defects as they are detected. The AUTHOR provides clarification and explanation of the material when requested. Although everyone participates as an inspector, one person has the title of INSPECTOR. The seven co-workers that Val can choose from are Darlene, Jeff, Liz, Lori, Mary, Ping, and Will. Only Darlene and Will may function as a moderator. If Darlene or Will is the author, then the other person serves as the moderator; otherwise, there is a 50% chance that Val will select either person to serve as the moderator. The positions of reader, recorder, and inspector are chosen randomly (with equal probability) from among the remaining five co-workers. Write a program to simulate Val's selections for her inspection team given that one of the seven co-workers is input as the author. The following are POSSIBLE examples:

INPUT: Enter author's name: **WILL**

OUTPUT: **AUTHOR - WILL**  
**MODERATOR - DARLENE**  
**READER - LIZ**  
**RECORDER - JEFF**  
**INSPECTOR - LORI**

INPUT: Enter author's name: **WILL**

OUTPUT: **AUTHOR - WILL**  
**MODERATOR - DARLENE**  
**READER - JEFF**  
**RECORDER - LIZ**  
**INSPECTOR - PING**

INPUT: Enter author's name: **MARY**

OUTPUT: **AUTHOR - MARY**  
**MODERATOR - WILL**  
**READER - JEFF**  
**RECORDER - DARLENE**  
**INSPECTOR - PING**

**2.9** The Customer Billing Services System (CBSS) was developed at GTE Data Services during a five year period from 1986 to 1990. With the help and commitment of GTE Telephone Operations, this tremendously complex billing system, consisting of approximately 5 million lines of code, was first installed in the summer of 1990 in Bethel, Pennsylvania. GTE was the first company in the telephony industry to introduce a new billing system that provides the extensive bill format and pricing flexibility. GTEDS is in the process of converting from the previous billing system, CRB, and the TOLL message system. These two large systems are converted to CBSS by the CONVERSION SYSTEM group under Bonnie's supervision. This group supports the conversion process to ensure the quality of data movement from the old systems to the new CBSS.

The CONVERSION SYSTEM group, has been responsible for converting customer telephone numbers when an area code splits due to various reasons, such as an increase in population. Some telephone numbers remain the same while other telephone numbers take on a new area code. Write a program to enter two 3-digit area code numbers from a split, the number of names to be entered, and a list of names in the CONVERSION SYSTEM group that will be assigned to one of these two areas. After sorting the list of names alphabetically, the program will fictitiously assign the first half of the names to the smaller area code number and the last half to the larger area code number. If there is an odd number of people in the list, then the person in the middle of the list is assigned the smaller area code number. Examples:

```
INPUT: Enter two area codes: 813, 811
      Enter number of names: 4
      Enter name: JENNIFER
      Enter name: JACKIE
      Enter name: BYRON
      Enter name: ESTHER
```

```
OUTPUT: 811 - BYRON
        811 - ESTHER
        813 - JACKIE
        813 - JENNIFER
```

```
INPUT: Enter two area codes: 305, 307
      Enter number of names: 5
      Enter name: MARCELLE
      Enter name: MIKE
      Enter name: THERESA
      Enter name: CHARLOTTE
      Enter name: RICK
```

```
OUTPUT: 305 - CHARLOTTE
        305 - MARCELLE
        305 - MIKE
        307 - RICK
        307 - THERESA
```

**2.10** Approximately 250 employees play in the GTE Data Services Golf League. Each week two teams of two golfers plays nine-holes against each other on one of four courses in the Tampa area. Tom, a supervisor for the REPORTS DEVELOPMENT sub-application in CBSS, is on the Rules Committee. The committee has determined that each player's handicap shall be calculated using USGA rules. A player's gross score is adjusted for handicap purposes by not counting any score over a triple bogey, (3 strokes over par). A player's current handicap determines the number of double or triple bogeys allowed: If the handicap is 9 or less, then the handicap indicates the number of scores that are limited to a double bogey (2 strokes over par), while the rest of the scores are limited to a bogey (1 stroke over par); otherwise, the scores are limited to a triple bogey for every handicap score over 9, and double bogeys for the rest of the scores. A handicap of 4 allows four double bogeys and 5 single bogeys. A handicap of 16 allows 7 triple bogeys and 2 double bogeys. The higher bogey limits are used up as they are needed from hole to hole. The handicap for the round is calculated by subtracting the course rating (par total in this case) from the adjusted total score. Write a program to display the adjusted score, the round handicap, and other statistics as shown below, given a golfer's current handicap (1 through 18) and gross scores for nine-holes of golf. Use the following pars for the nine holes:

Hole #:	1	2	3	4	5	6	7	8	9
Par:	5	4	4	4	3	4	4	3	5

Examples:

INPUT: Enter handicap: 11  
Enter gross scores: 6,7,4,10,4,5,7,6,4

OUTPUT:	HOLE #:	1	2	3	4	5	6	7	8	9
	PAR:	5	4	4	4	3	4	4	3	5
	GROSS:	6	7	4	10	4	5	7	6	4
	ADJUST:	6	7	4	7	4	5	6	5	4

PAR TOTAL: 36  
GROSS TOTAL: 53  
ADJUST TOTAL: 48  
ROUND HANDICAP: 12

INPUT: Enter handicap: 5  
Enter gross scores: 7,4,7,6,7,8,7,6,7

OUTPUT:	HOLE #:	1	2	3	4	5	6	7	8	9
	PAR:	5	4	4	4	3	4	4	3	5
	GROSS:	7	4	7	6	7	8	7	6	7
	ADJUST:	7	4	6	6	5	6	5	4	6

PAR TOTAL: 36  
GROSS TOTAL: 59  
ADJUST TOTAL: 49  
ROUND HANDICAP: 13

**3.1** Write a program to move a triangle, made up of the acronym GTEDS, around the screen using the keys I, J, K, and M to move the triangle up, left, right, and down respectively. The triangle must initially appear in the approximate center of the screen. Once a valid directional key is pressed the triangle continuously shifts one column (or row) in the designated direction until either: 1) another valid directional key is pressed, causing the triangle to shift in another direction, or 2) the triangle's edge is about to go past the perimeter of the screen, in which case the triangle is to remain stationary until another directional key is pressed to send it away from (or along) the perimeter. The following triangle is to be displayed:

```

      G
     T T
    E   E
   D     D
  SDETGTEDS

```

**3.2** Patricia is a wonderful manager over 5 sub-groups at CBSS. Each year she coordinates a Christmas party for her department that livens up the season. This past year each person bought and wrapped a small gift to play in the "Chinese gift exchange". After Derril picked a gift, his desirable Far-Side calendar gift was taken from him. Having been a biologist, he is knowledgeable of animal behavior and human behavior and able to enjoy the humor in interchanging animals with human roles. Fortunately, Santa Claus had placed another 1992 Far-Side calendar in his stocking. His calendar contains 314 pages of hilarious animal illustrations, 1 weekday of the year on each page with Saturdays and Sundays being combined on one page. If Derril has read X hilarious pages and torn them from his calendar, write a program to determine what day(s) of the year now appear(s) on his desk calendar. January 1, 1992 was a Wednesday. The program must display the day of the week, the month, and the day. Examples:

INPUT: Enter X: 5

INPUT: Enter X: 100

OUTPUT: **TUESDAY JANUARY 7**

OUTPUT: **MONDAY APRIL 27**

INPUT: Enter X: 309

INPUT: Enter X: 51

OUTPUT: **SATURDAY DECEMBER 26**  
**SUNDAY DECEMBER 27**

OUTPUT: **SATURDAY FEBRUARY 29**  
**SUNDAY MARCH 1**

**3.3** Russ is the Supervisor of the SERVICE ORDER DEVELOPMENT sub-application within CBSS at GTEDS. His team uses the Programmer Work Station (PWS) to manage and coordinate enhancements made to their programs. PWS allows team members to communicate among themselves about their changes to the code for a particular module. After enhancements have been made in the TEST library environment of PWS, a request is made to release the changes to the BASE library environment, which will eventually be used in production. Write a program to accept the name of a person on the Service Order Development team, the program being enhanced, a flag (Y/N) indicating that changes are complete, and a flag (Y/N) to request release. If release is requested (Y), the computer will automatically mark the person's program as "completed", even if "N" was entered for this field. Release to base can only occur if everyone thus far has finished their enhancements on that program and at least one person has requested release. When a module is properly released, display the message MODULE XXXX HAS BEEN RELEASED, where XXXX is the four character program name. The program ends when all modules input have been released. Each module will be RELEASED only once. Examples:

```
INPUT: Enter name, program: MIKE,TU03
      Enter completed, release: N,N
```

```
INPUT: Enter name, program: PATRICK,TU03
      Enter completed, release: Y,Y
```

```
INPUT: Enter name, program: MIKE,TU03
      Enter completed, release: Y,N
```

```
OUTPUT: MODULE TU03 HAS BEEN RELEASED
```

```
-----
INPUT: Enter name, program: LARRY,TU01
      Enter completed, release: Y,N
```

```
INPUT: Enter name, program: DERRIL,TT00
      Enter completed, release: Y,N
```

```
INPUT: Enter name, program: DERRIL,TU01
      Enter completed, release: Y,Y
```

```
OUTPUT: MODULE TU01 HAS BEEN RELEASED
```

```
INPUT: Enter name, program: DOUG,TT00
      Enter completed, release: N,N
```

```
INPUT: Enter name, program: LARRY,TT00
      Enter completed, release: Y,Y
```

```
INPUT: Enter name, program: DOUG,TT00
      Enter completed, release: Y,N
```

```
OUTPUT: MODULE TT00 HAS BEEN RELEASED
```

**3.4** A company would like to use an acronym as a phone number that is easy for the public to remember. They would like a word that can be used for the last several digits of their number, where each letter corresponds to a particular digit. Each possible word will be 4 or 5 letters long. Write a program to display all possible acronym phone numbers (alphabetically by the acronyms used) for an input number of the format XXX-XXXX. Assume that at least one word will satisfy the requirements given the following word list options:

AGENT SOAP MONEY JEWEL BALL LOANS CARE SAVE CALL  
PAVE KEEP KINGS KNIFE KNOCK JOINT JUICE LOBBY RATE

Use the following letters to correspond to the digits 2 to 9:

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

Examples:

INPUT: Enter phone #: **555-3935**

OUTPUT: **55J-EWEL**

INPUT: Enter phone #: **555-2255**

OUTPUT: **555-BALL**  
**555-CALL**

**3.5** Write a program to display seven 7-digit squares which contain no duplicate digits in the octonary (base 8) system. One such number is 1567204 because it is  $1242 * 1242$  in base 8. Output each 7-digit number followed by 2 spaces and its square root. Display each successive entry on a separate line in ascending order. The following example illustrates the format of the output, but it only gives the first solution. Example:

OUTPUT: **1567204 1242**  
 #####  
 #####  
 #####  
 #####  
 #####  
 #####  
 #####

**3.6** GTE Data Services has a highly talented group of classroom instructors that equip qualified New Recruits with a wide range of skill sets necessary to succeed in the GTEDS environment. The trainers in the program impart to their students not only technical skills, but personal insights into corporate life and the needed people-skills to succeed in the company. In addition to teaching the Recruits a "right" way to solve programming problems, the instructors also lead them on a journey to discover a solution that is highly "efficient." Write a program that is "efficient", given the following information:

Every integer,  $N$ , greater than 17 can be written as the sum of three distinct integers, each greater than 1, such as:

$$X + Y + Z = N$$

where  $X$ ,  $Y$ , and  $Z$  are pairwise relatively prime with respect to each other. When  $N$  is equal to 20, there are six sets of integers that satisfy the equation:

$$2+5+13, \quad 2+7+11, \quad 3+4+13, \quad 3+7+10, \quad 4+5+11, \quad 4+7+9.$$

Notice that although  $3+6+11$  equals 20, the set does not satisfy the conditions since the numbers 3 and 6 have a common factor: 3.

Write an "efficient" program to generate the smallest combination of  $X$ ,  $Y$ , and  $Z$  (with  $X$  as small as possible, then  $Y$ , then  $Z$ ) that satisfies the equation for an input number,  $N$ , between 18 and 32700. Display the solution in the following format:

$$X + Y + Z = N$$

with  $X < Y < Z$ . Examples:

INPUT: Enter N: **20**  
OUTPUT: **2 + 5 + 13 = 20**

INPUT: Enter N: **184**  
OUTPUT: **2 + 3 + 179 = 184**

INPUT: Enter N: **185**  
OUTPUT: **3 + 19 + 163 = 185**

INPUT: Enter N: **32693**  
OUTPUT: **3 + 13 + 32677 = 32693**

INPUT: Enter N: **32694**  
OUTPUT: **2 + 3 + 32689 = 32694**



**3.7** Doug and Dan have each served as the captain of the New Recruits indoor soccer team. Four other GTEDS New Recruit employees have consistently play on the team: Andy, Jack, Mike, and Yehia. No more than six players may play on the field at any time. Substitutions may be made for any player at any time. Write a program to accept, as input, 1 to 3 extra players that come for the game, and then display all possible combinations of six players (listed alphabetically) that can play together. Display each list numbered and ordered alphabetically among the lists, assuming that the names are concatenated within the list. If the number of lines of lists exceeds the number of lines on the screen, then pause each screen of output, allowing a key to be pressed to display then next screen of output. Examples:

```
INPUT: Enter number of substitutes: 1
      Enter name: TONY
```

```
OUTPUT: 1 ANDY,DAN,DOUG,JACK,MIKE,TONY
        2 ANDY,DAN,DOUG,JACK,MIKE,YEHIA
        3 ANDY,DAN,DOUG,JACK,TONY,YEHIA
        4 ANDY,DAN,DOUG,MIKE,TONY,YEHIA
        5 ANDY,DAN,JACK,MIKE,TONY,YEHIA
        6 ANDY,DOUG,JACK,MIKE,TONY,YEHIA
        7 DAN,DOUG,JACK,MIKE,TONY,YEHIA
```

```
INPUT: Enter number of substitutes: 3
      Enter name: PAUL
      Enter name: DEAN
      Enter name: ROB
```

```
OUTPUT: 1 ANDY,DAN,DEAN,DOUG,JACK,MIKE
        2 ANDY,DAN,DEAN,DOUG,JACK,PAUL
        3 ANDY,DAN,DEAN,DOUG,JACK,ROB
        4 ANDY,DAN,DEAN,DOUG,JACK,YEHIA
        5 ANDY,DAN,DEAN,DOUG,MIKE,PAUL
        6 ANDY,DAN,DEAN,DOUG,MIKE,ROB
        :
        :
        63 DAN,DEAN,DOUG,JACK,ROB,YEHIA
        64 DAN,DEAN,DOUG,MIKE,PAUL,ROB
        :
        :
        81 DEAN,DOUG,JACK,PAUL,ROB,YEHIA
        82 DEAN,DOUG,MIKE,PAUL,ROB,YEHIA
        83 DEAN,JACK,MIKE,PAUL,ROB,YEHIA
        84 DOUG,JACK,MIKE,PAUL,ROB,YEHIA
```

Note: lines 7 through 62 and lines 65 through 80 are not displayed in the example, but must appear within the actual output, allowing a key to be pressed after a screen full of lines has been displayed.

**3.8** The Customer Billing Services System (CBSS) at GTEDS prints its customers' phone bills at different times to suit the customers' needs. Bills are produced on one of 10 cycles, starting on the first of the month and occurring every 3 days afterwards: 1, 4, 7, 10, 13, 16, 19, 22, 25, 28. The Bill Due Date is assigned to an account by adding a specified number of days to the account's Bill Date (the day the bill was produced). In many cases, if the due date falls on a Saturday, Sunday, or holiday, the system moves the due date to the next weekday that is not a holiday. Write a program to display the BILL DATE and the DUE DATE given the following as input: the month of the bill in 1992, the cycle number, the number of days (less than 25) to add to the Bill Date, and a set of holidays in the form MM, DD (terminated by 0, 0). January 1, 1992 was a Wednesday. Examples:

```
INPUT: Enter month of bill: 1
       Enter cycle number: 6
       Enter number of days: 15
       Enter holiday MM, DD: 1, 1
       Enter holiday MM, DD: 1, 31
       Enter holiday MM, DD: 0, 0
```

```
OUTPUT: BILL DATE: THURSDAY JANUARY 16
        DUE DATE: MONDAY FEBRUARY 3
```

```
INPUT: Enter month of bill: 5
       Enter cycle number: 1
       Enter number of days: 24
       Enter holiday MM, DD: 5, 25
       Enter holiday MM, DD: 0, 0
```

```
OUTPUT: BILL DATE: FRIDAY MAY 1
        DUE DATE: TUESDAY MAY 26
```

**3.9** GTE Data Services is located in four large information processing centers in Temple Terrace, Florida; San Angelo, Texas; Sacramento, California; and Fort Wayne, Indiana. GTEDS employs over 5,000 data processing, software, and network professionals within the buildings located in the four areas. The buildings have many different rooms and cubicles. Write a program to calculate the area of a room in the shape of a polygon with perpendicular corners, given a series of movements describing its shape. After the program accepts the number of vertical and horizontal sides in the room, it then accepts a list of successive direction-distance pairs, starting from an arbitrary corner. Directions will be U, D, R, and L to indicate Up, Down, Right, and Left respectively. Each direction will be followed by a distance in feet, less than 25. Each room described will have at most 10 corners and will have both a length and a width less than 25 feet. The first example uses a polygon room with the shape and dimensions of:

```

                24
          *****
          *                                           *
4 *                                           *
          ***** * 7
            8 *                                           *
              3 *                                           *
                *****
                16

```

Examples:

```

INPUT: Enter number of sides: 6
      Enter movement: U3
      Enter movement: L8
      Enter movement: U4
      Enter movement: R24
      Enter movement: D7
      Enter movement: L16

```

OUTPUT: **AREA = 144 SQUARE FEET**

```

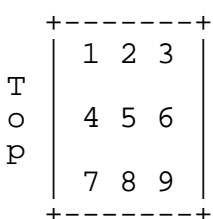
INPUT: Enter number of sides: 10
      Enter movement: R8
      Enter movement: U2
      Enter movement: R6
      Enter movement: D10
      Enter movement: L10
      Enter movement: U3
      Enter movement: L9
      Enter movement: U7
      Enter movement: R5
      Enter movement: D2

```

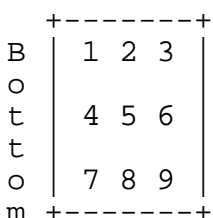
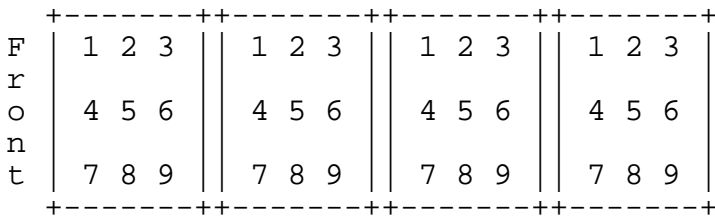
OUTPUT: **AREA = 147 SQUARE FEET**

**3.10** The Rubik's Cube, invented by the Hungarian Erno Rubik in 1975, is a three by three by three inch cube. A cube has six sides or faces which contain a different color. Each face is divided up into nine squares--a total of 54 squares on the cube. A brilliant inner mechanism of a spring loaded spindle allows sides of the cube to be rotated either vertically or horizontally and independent of the other sides. In the cube's pristine condition it has a solid color on each face, but is scrambled by just a few random moves. The cube comes in six different colors, of which, the original Rubik's Cube contains: white, yellow, orange, red, green, and blue. The object is to get the cube back to its original positions so that all six sides have nine identical squares with respect to their colors. If the cube is taken apart and randomly reassembled, then there is only a 1 in 12 chance that the puzzle can be solved. An almost sure way to make the cube impossible to solve is to remove the 54 square colors and randomly place them back on the squares of the cube.

Write a program to accept as input, 6 sides of 9 square color symbols for the Rubik's Cube, and to then determine the reasons for judging the cube as insolvable, as given on the next page. One letter color symbols (W, Y, O, R, G, B) will be entered from left to right, top to bottom, for the following sides (in order): top, front, right, back, left, bottom. The order of input is illustrated below by numbers for each side of the cube:



The sides of this cube are connected as shown. The TOP side "1 2 3" is joined to the BACK side "1 2 3". The LEFT side "3 6 9" is joined to the FRONT side "1 4 7". The BOTTOM side "7 8 9" is joined to the BACK side "7 8 9".



Right      Back      Left

The cube has 12 edge pieces made up of 2 adjacent squares in positions 2,4,6,8. There are 8 corner pieces made up of 3 adjacent squares in positions 1,3,7,9. There are 6 middle pieces in position 5.

After the program accepts the color symbols on the six sides, then display one or two of the following statements (in order), with the first statement displayed conditionally:

If two of the middle squares have the same color, display:

**COLORS ON MIDDLE SQUARES ARE NOT UNIQUE**

Display the following message on the next (or first) line:

**NUMBER OF EDGE PIECES HAVING SAME COLOR: ##**

where ## is a number between 0 and 12.

Examples:

INPUT: Enter colors on top: **R,G,R,O,W,B,W,B,Y**  
 Enter colors on front: **G,O,O,R,Y,G,B,W,B**  
 Enter colors on right: **W,G,Y,W,O,B,Y,O,R**  
 Enter colors on back: **W,G,B,Y,R,Y,G,R,G**  
 Enter colors on left: **Y,O,G,W,R,B,B,O,R**  
 Enter colors on bottom: **G,W,O,Y,B,R,O,Y,W**

OUTPUT: **COLORS ON MIDDLE SQUARES ARE NOT UNIQUE**  
**NUMBER OF EDGE PIECES HAVING SAME COLOR: 3**

Note: Edge "Back 2" and Edge "Top 2" have same color: G  
 Edge "Front 4" and Edge "Left 2" have same color: O  
 Edge "Front 8" and Edge "Bottom 2" have same color: W

INPUT: Enter colors on top: **B,R,G,B,W,G,Y,B,R**  
 Enter colors on front: **W,G,B,W,O,Y,G,R,R**  
 Enter colors on right: **W,R,W,Y,G,O,Y,W,B**  
 Enter colors on back: **O,B,R,G,R,O,O,W,B**  
 Enter colors on left: **G,O,O,Y,Y,G,Y,O,R**  
 Enter colors on bottom: **W,Y,B,R,B,Y,O,W,G**

OUTPUT: **NUMBER OF EDGE PIECES HAVING SAME COLOR: 2**

Note: Edge "Front 6" and Edge "Right 4" have same color: Y  
 Edge "Bottom 8" and Edge "Back 8" have same color: W