CHAPTER

05

DATA REPRESENTATION

Data representation refers those methods which are used internally to represent information stored in a computer. Computer store lots of different types of information as numbers, text, graphics, sounds, etc.

Number System

It is a technique to represent numbers in the computer system architecture, every value that you are saving into/from computer memory has a defined number system.

Types of Number System

Binary Number System

This system is very efficient for computers, but not for humans. It contains only two unique digits 0's and 1's.

It is also known as Base 2 system. A string, which has any combination of these two digits (0 and 1 are called bit) is called a binary number. The computer always calculates the input in binary form and digital computers internally use the binary number system to represent data and perform arithmetic calculations.

For example, $(10101)_2$

Here, 2 represents the base of binary number.

Decimal Number System

The number system that we use in our day-to-day life is decimal number system.

It consists of 10 digits from 0 to 9. These digits can be used to represent any numeric value. It is also known as Base 10 system or positional number system. *For example,* $(1275)_{10}$

Here, 10 represents the base of decimal number.

Octal Number System

It consists of 8 digits from 0 to 7. It is also known as Base 8 system. Each position of the octal number represents a successive power of eight.

For example, $(234)_8$

Here, 8 represents the base of octal number.

Hexadecimal Number System

It provides us with a shorthand method of working with binary numbers. There are 16 unique digits available in this system.

These are 0 to 9 and A to F, where A denotes 10, B denotes 11, ..., F denotes 15.

It is also known as Base 16 system or simply Hex.

So, each position of the hexadecimal number represents a successive power of 16.

For example, $(\text{F9D})_{16}$

Here, 16 represents the base of hexadecimal number.

Decimal, Binary, Octal and Hexadecimal Equivalents

Decimal	Binary	Octal	Hexadecimal
0	0000	0	0
1	0001	1	1
2	0010	2	2
3	0011	3	3
4	0100	4	4
5	0101	5	5
6	0110	6	6
7	0111	7	7
8	1000	—	8
9	1001	—	9
10	1010	—	A
11	1011	—	B
12	1100	—	C
13	1101	—	D
14	1110	—	E
15	1111	—	F

Conversion between the Number Systems

Decimal to Binary

To convert decimal to binary, following steps are involved

***Step* 1** Divide the given number by 2.

***Step* 2** Note the quotient and remainder. Remainder should be 0 or 1.

***Step* 3** If quotient $\neq 0$, then again divide the quotient by 2 and back to step 2.
If quotient $= 0$, then stop the process.

***Step* 4** First remainder is called as **Least Significant Bit** (LSB) and last remainder is called as **Most Significant Bit** (MSB).

***Step* 5** Arrange all remainders from MSB to LSB.

Example $(43)_{10} \rightarrow (?)_2$

		Remainder
2	43	$1 \rightarrow$ LSB
2	21	1
2	10	0
2	5	1
2	2	0
2	1	$1 \rightarrow$ MSB
	0	

Then, $\boxed{(43)_{10} \rightarrow (101011)_2}$

Binary to Decimal

To convert binary to decimal, following steps are involved

***Step* 1** Multiply the all binary digits by powers of 2.

***Step* 2** The power for integral part will be positive and for fractional part will be negative.

***Step* 3** Add all the multiplying digits.

Example $(1101.10)_2 \rightarrow (?)_{10}$

$$(1101.10)_2 = 1\times 2^3 + 1\times 2^2 + 0\times 2^1 + 1\times 2^0 + 1\times 2^{-1} + 0\times 2^{-2}$$
$$= 8 + 4 + 0 + 1 + 0.5 + 0 = 13.5$$

Then, $\boxed{(1101.10)_2 \rightarrow (13.5)_{10}}$

Binary to Octal

To convert binary to octal, following steps are involved

***Step* 1** Make the group of 3 bits from right to left. If the left most group has less than 3 bits, put in the necessary number of leading zeroes on the left.

***Step* 2** Now, convert each group to decimal number.

Example $(110110100)_2 \rightarrow (?)_8$

$$\underbrace{110}\ \underbrace{110}\ \underbrace{100}$$
$$\downarrow \quad \downarrow \quad \downarrow$$
$$6 \quad 6 \quad 4$$

Then, $\boxed{(110110100)_2 \rightarrow (664)_8}$

Octal to Binary

Convert every digit of the number from octal to binary in the group of 3 bits.

Example $(1034.5)_8 \rightarrow (?)_2$

$$1 \quad 0 \quad 3 \quad 4 \quad 5$$
$$\downarrow \quad \downarrow \quad \downarrow \quad \downarrow \quad \downarrow$$
$$\underbrace{001}\ \underbrace{000}\ \underbrace{011}\ \underbrace{100}\ \underbrace{101}$$

Then, $\boxed{(1034.5)_8 \rightarrow (001000011100.101)_2}$

Binary to Hexadecimal

To convert a binary number to its hexadecimal equivalent, follow these steps

***Step* 1** Start making the group of 4 bits each from right to left from the given binary number. If the left most group has less than 4 bits, put in the necessary number of leading 0's on the left.

***Step* 2** Now, each group will be converted to decimal number.

Example $(11110101111011)_2 \rightarrow (?)_{16}$

$$
\begin{array}{cccc}
0011 & 1101 & 0111 & 1011 \\
\downarrow & \downarrow & \downarrow & \downarrow \\
3 & 13 & 7 & 11 \\
 & D & & B
\end{array}
$$

Then, $\boxed{(11110101111011)_2 \rightarrow (3D7B)_{16}}$

Hexadecimal to Binary

For this type of conversion, convert each hexadecimal digit to 4 bits binary equivalent.

Example $(BA81)_{16} \rightarrow (?)_2$

$$
\begin{array}{cccc}
B = 11 & A = 10 & 8 & 1 \\
\downarrow & \downarrow & \downarrow & \downarrow \\
1011 & 1010 & 1000 & 0001
\end{array}
$$

Then, $\boxed{(BA81)_{16} \rightarrow (1011101010000001)_2}$

Decimal to Octal

To convert decimal to octal, following steps are involved

***Step* 1** Divide the given number by 8.

***Step* 2** Note the quotient and remainder. Digits of remainder will be from 0 to 7.

***Step* 3** If quotient ≠ 0, then again divide the quotient by 8 and go back to step 2.

***Step* 4** If quotient = 0 or less than 8 then stop the process.

***Step* 5** Write each remainder from left to right starting from MSD (Most Significant Digit) to LSD (Least Significant Digit).

Example $(97647)_{10} \rightarrow (?)_8$

8	97647	7 LSD
8	12205	5
8	1525	5
8	190	6
8	23	7
8	2	2 MSD
	0	

Then, $\boxed{(97647)_{10} \rightarrow (276557)_8}$

Octal to Decimal

To convert octal to decimal, following steps are involved

***Step* 1** Multiply each digit of octal number with powers of 8.

***Step* 2** These powers should be positive for integral part and negative for fractional part.

***Step* 3** Add the all multiplying digits.

Example $(327.4)_8 \rightarrow (?)_{10}$

$$
\begin{aligned}
(327.4)_8 &= 3 \times 8^2 + 2 \times 8^1 + 7 \times 8^0 + 4 \times 8^{-1} \\
&= 3 \times 64 + 2 \times 8 + 7 \times 1 + \frac{4}{8} \\
&= 192 + 16 + 7 + 0.5 \\
&= 215.5
\end{aligned}
$$

Then, $\boxed{(327.4)_8 \rightarrow (215.5)_{10}}$

Decimal to Hexadecimal

To convert decimal to hexadecimal, following steps are involved

***Step* 1** Divide the given number by 16.

***Step* 2** Note the quotient and remainder. Digits of remainder will be 0 to 9 or A to F.

***Step* 3** If quotient ≠ 0, then again divide the quotient by 16 and go back to step 2.

***Step* 4** If quotient = 0 or less than 16, then stop the process.

***Step* 5** Write each remainder from left to right starting from MSD (Most Singnificaut Digit) to LSD (Least Singnificaut Digit).

Example $(929987)_{10} \rightarrow (?)_{16}$

16	929987	3 LSD
16	58124	12 → C
16	3632	0
16	227	3
16	14	14 → E MSD
	0	

Then, $\boxed{(929987)_{10} \rightarrow (E\,30\,C\,3)_{16}}$

Hexadecimal to Decimal

To convert hexadecimal to decimal, following steps are involved

***Step* 1** Multiply each digit of hexadecimal number with powers of 16.

***Step* 2** These powers should be positive for integral part and negative for fractional part.

***Step* 3** Add the all multiplying digits.

Example $(BC\,9.8)_{16} \rightarrow (?)_{10}$

$$\begin{aligned}(BC\ 9.\ 8)_{16} &= B\times16^2 + C\times16^1 + 9\times 16^0 + 8\times 16^{-1}\\ &= 11\times 256 + 12\times 16 + 9\times 1 + \frac{8}{16}\\ &= 2816 + 192 + 9 + 0.\ 5 = 3017.5\end{aligned}$$

Then, $\boxed{(BC\,9.8)_{16} \rightarrow (3017.\ 5)_{10}}$

Octal to Hexadecimal

To convert octal to hexadecimal, following steps are involved

***Step* 1** Convert each digit of octal number to binary number.

***Step* 2** Again, convert each binary digit to hexadecimal number.

Example $(7632)_8 \rightarrow (?)_{16}$

$$\text{Now,}\quad \begin{array}{cccc} 7 & 6 & 3 & 2\\ \downarrow & \downarrow & \downarrow & \downarrow\\ 111 & 110 & 011 & 010 \end{array}$$

$$(7632)_8 \rightarrow (111\,110\,011\,010)_2$$

$$\begin{array}{ccc} 1111 & 1001 & 1010\\ \downarrow & \downarrow & \downarrow\\ 15 & 9 & 10\\ F & & A \end{array}$$

Then, $\boxed{(7632)_8 \rightarrow (F9A)_{16}}$

Hexadecimal to Octal

To convert hexadecimal to octal, following steps are involved

***Step* 1** Convert each digit of the hexadecimal number to binary number.

***Step* 2** Again, convert each binary digit to octal number.

Example $(AC2D)_{16} \rightarrow (?)_8$

$$\begin{array}{cccc} A & C & 2 & D\\ \downarrow & \downarrow & \downarrow & \downarrow\\ 1010 & 1100 & 0010 & 1101 \end{array}$$

Now, $(AC2D)_{16} \rightarrow (1010\,1100\,0010\,1101)_2$

$$\begin{array}{cccccc} 001 & 010 & 110 & 000 & 101 & 101\\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow\\ 1 & 2 & 6 & 0 & 5 & 5 \end{array}$$

Then, $\boxed{(AC2D)_{16} \rightarrow (126055)_8}$

Computer Codes

In computer, any character like alphabet, digit or special character is represented by collection of 1's and 0's in a unique coded pattern.

In computers, the code is made up of fixed size groups of binary positions.

The binary coding schemes that are most commonly used are as follows

Binary Coded Decimal (BCD)

This system was developed by IBM. It is a number system where four bits are used to represent each decimal digits.

BCD is a method of using binary digits to represent the decimal digits (0-9). In BCD system, there is no limit on size of a number.

American Standard Code for Information Interchange (ASCII)

These are standard character codes used to store data so that it may be used by other software programs.

Basically, ASCII codes are of two types, which are as follows

(i) **ASCII-7** It is a 7-bit standard ASCII code. It allows $2^7 = 128$ (from 0 to 127) unique symbols or characters.

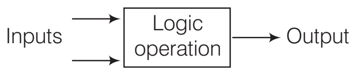
(ii) **ASCII-8** It is an extended version of ASCII-7. It is an 8-bit code, allows $2^8 = 256$ (0 to 255) unique symbols or characters.

Extended Binary Coded Decimal Interchange (EBCDIC)

In EBCDIC, characters are represented by eight bits. These codes store information which is readable by other computers. It allows $2^8 = 256$ combination of bits.

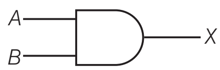
Logic Gate

It is a basic building block of a digital circuit that has two inputs and one output. The relationship between the input and the output is based on a certain logic. These gates are implemented using electronic switches like transistors, diodes.



There are various types of logic gate as follows

1. **AND Gate** This gate is also represented by (·), i.e. $(A \cdot B)$. It returns True only if both the conditions or inputs are True otherwise it returns False.

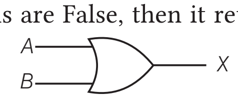


Truth Table of AND Gate

A	**B**	**X**
0	0	0
0	1	0
1	0	0
1	1	1

$\therefore \quad X = A \cdot B$

2. **OR Gate** This is represented by (+), i.e. $(A + B)$. It returns True if any one of the conditions or inputs is True and if both conditions are False, then it returns False.

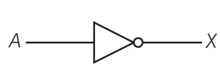


Truth Table of OR Gate

A	**B**	**X**
0	0	0
0	1	1
1	0	1
1	1	1

$\therefore \quad X = A + B$

3. **Inverter or NOT Gate** This gate is also represented by (′), i.e. A'. It returns True if the input is false and *vice-versa*.

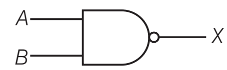


Truth Table of NOT Gate

A	$X = A'$
0	1
1	0

4. **NAND Gate** It is basically the inverse of the AND gate. This gate is designed by combining the AND and NOT gates.

   It returns False only if the both conditions or inputs are True otherwise it returns True.

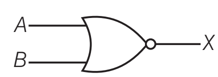


Truth Table of NAND Gate

A	B	X
0	0	1
0	1	1
1	0	1
1	1	0

$$X = (\overline{A \cdot B}) = \overline{A} + \overline{B}$$

5. **NOR Gate** It is inverse of the OR gate. This gate is designed by combining the OR and NOT gates. It returns True only if both the conditions or inputs are False otherwise it returns False.



Truth Table of NOR Gate

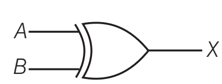
A	**B**	**X**
0	0	1
0	1	0
1	0	0
1	1	0

$$X = (\overline{A + B}) = \overline{A} \cdot \overline{B}$$

Note *NAND and NOR gates are also called universal gates.*

6. **Exclusive-OR or XOR Gate** It performs based on the operation of OR gate.

   It returns True only if one condition is true from both the conditions otherwise it returns False.



Truth Table of XOR Gate

A	*B*	*X*
0	0	0
0	1	1
1	0	1
1	1	0

$$X = A \oplus B$$

$$X = \overline{A}B + A\overline{B}$$

Tit-Bits

- **UNICODE** uses 16-bits to represent a symbol in the data. It represents any non-english character, scientific symbol in any language like Chinese, Japanese.
- One's complement of binary number is defined as the value obtained by inverting all the bits
  For example, 110100
  One's complement is
  001011

QUESTION BANK

1. There are how many types of number system?
(1) One (2) Two (3) Three (4) Four

2. Modern computers represent characters and numbers internally using one of the following number systems.
(1) Penta (2) Octal
(3) Hexa (4) Septa
(5) Binary

3. In the binary language, each letter of the alphabet, each number and each special character is made up of a unique combination of
(1) 8 bytes (2) 8 KB
(3) 8 characters (4) 8 bits

4. To perform calculation on stored data computer, uses .... number system.
(1) decimal (2) hexadecimal
(3) octal (4) binary

5. Which of the following is not a binary number?
(1) 001 (2) 101
(3) 202 (4) 110

6. The number system based on '0' and '1' only, is known as
(1) binary system (2) barter system
(3) number system (4) hexadecimal system

7. Binary system is also called
(1) base one system (2) base two system
(3) base system (4) binary system

8. Which of the following is an example of binary number?
(1) 6AH1 (2) 100101
(3) 005 (4) ABCD

9. Numbers that are written with base 10 are classified as
(1) decimal number
(2) whole number
(3) hexadecimal number
(4) exponential integers
(5) mantissa

10. Decimal number system is the group of .... numbers.
(1) 0 or 1 (2) 0 to 9
(3) 0 to 7 (4) 0 to 9 and A to F

11. The octal system
(1) needs less digits to represent a number than in the binary system
(2) needs more digits to represent a number than in the binary system
(3) needs the same number of digits to represent a number as in the binary system
(4) needs the same number of digits to represent a number as in the decimal system

12. A hexadecimal number is represented by
(1) three digits (2) four binary digits
(3) four digits (4) All of these

13. Hexadecimal number system has .... base.
(1) 2 (2) 8 (3) 10 (4) 16

14. Hexadecimal number system consists of
(1) 0 to 9 (2) A to F
(3) Both (1) and (2) (4) Either (1) or (2)

15. A hexadigit can be represented by **[IBPS Clerk 2012]**
(1) three binary (consecutive) bits
(2) four binary (consecutive) bits
(3) eight binary (consecutive) bits
(4) sixteen binary (consecutive) bits
(5) None of the above

16. Which of the following is invalid hexadecimal number?
(1) A0XB (2) A0F6
(3) 4568 (4) ACDB

17. What type of information system would be recognised by digital circuits?
(1) Hexadecimal system
(2) Binary system
(3) Both (1) and (2)
(4) Only roman system

18. The binary equivalent of decimal number 98 is **[IBPS Clerk 2012]**
(1) 1110001 (2) 1110100
(3) 1100010 (4) 1111001
(5) None of these

19. Conversion of decimal number $(71)_{10}$ to its binary number equivalent is **[IBPS Clerk 2012]**
(1) $(110011)_2$ (2) $(1110011)_2$
(3) $(0110011)_2$ (4) $(1000111)_2$
(5) None of these

20. What is the value of the binary number 101?
(1) 3 (2) 5 (3) 6 (4) 101

21. Decimal equivalent of $(1111)_2$ is **[IBPS Clerk 2012]**
(1) 11 (2) 10 (3) 1 (4) 15
(5) 13

22. The decimal equivalent of binary number $(1010)_2$ is
(1) 8 (2) 9 (3) 10 (4) 11

23. The binary number 10101 is equivalent to decimal number ....
(1) 19 (2) 12 (3) 27 (4) 21

24. Which of the following is octal number equivalent to binary number $(110101)_2$?
(1) 12 (2) 65
(3) 56 (4) 1111

25. Which of the following is a binary number equivalent to octal number $(.431)_8$?
(1) $(100011001)_2$ (2) $(.100011001)_2$
(3) $(100110100)_2$ (4) $(.100110001)_2$

26. To convert binary number to decimal, multiply the all binary digits by power of
(1) 0 (2) 2
(3) 4 (4) 6

27. Which of the following is hexadecimal number equivalent to binary number $(1111\ 1001)_2$?
(1) 9F (2) FF
(3) 99 (4) F9

28. Conversion of binary number $(1001001)_2$ to hexadecimal is
(1) $(40)_{16}$ (2) $(39)_{16}$
(3) $(49)_{16}$ (4) $(42)_{16}$

29. Which of the following is the correct binary form of $(4A2.8D)_{16}$? **[IBPS PO Mains 2017]**
(1) $(010010100010.10001101)_2$
(2) $(010110100010.11101101)_2$
(3) $(011110100010.10001101)_2$
(4) $(010010111110.10001101)_2$
(5) None of the above

30. Which of the following is an octal number equal to decimal number $(896)_{10}$?
(1) 0061 (2) 6001
(3) 1006 (4) 1600

31. Conversion of decimal number $(42)_{10}$ to its octal number equivalent is
(1) $(57)_8$ (2) $(42)_8$
(3) $(47)_8$ (4) $(52)_8$

32. Determine the octal equivalent of $(432267)_{10}$

(1) $(432267)_8$ (2) $(346731)_8$
(3) $(2164432)_8$ (4) None of these

33. Determine the decimal equivalent of $(456)_8$

(1) $(203)_{10}$ (2) $(302)_{10}$
(3) $(400)_{10}$ (4) $(402)_{10}$

34. Conversion of octal number $(3137)_8$ to its decimal equivalent is

(1) $(1631)_{10}$ (2) $(1632)_{10}$
(3) $(1531)_{10}$ (4) $(1931)_{10}$

35. Conversion of decimal number $(15)_{10}$ to hexadecimal number is

(1) $(14)_{16}$ (2) $(13)_{16}$ (3) $(F)_{16}$ (4) $(7F)_{16}$

36. Which of the following is a hexadecimal number equal to 3431 octal number?

(1) 197 (2) 917 (3) 791 (4) 971
(5) 719

37. The method used for the conversion of octal to decimal fraction is

(1) digit is divided by 8
(2) digit is multiplied by the corresponding power of 8
(3) digit is added with 8
(4) digit is subtracted with 8

38. MSD refers as

(1) Most Significant Digit
(2) Many Significant Digit
(3) Multiple Significant Digit
(4) Most Significant Decimal

39. LSD stands for

(1) Long Significant Digit
(2) Least Significant Digit
(3) Large Significant Digit
(4) Longer Significant Decimal

Directions (40 and 41) *Triangle represents Δ (1) and circle represents o (0). If triangle appears in unit's place then its value is 1. If it appears in 10's place its value is doubled to 2 like that it continues. Using the given terminology answer the following questions.*
For example,

$$\Delta = 1$$
$$\Delta o \Delta = 4, 0, 1 = 4 + 0 + 1$$
$$\Delta o = 2$$

[IBPS PO Mains 2017]

40. How will you represent '87' in this code language?

(1) oΔΔΔoΔΔ (2) ΔoΔoΔΔΔ
(3) ΔΔoΔΔΔΔ (4) ΔooΔooΔ
(5) ΔΔoΔΔΔo

41. What will be the code for ΔΔoooΔo?

(1) 98 (2) 95 (3) 96 (4) 94
(5) 99

42. How many values can be represented by a single byte?

(1) 4 (2) 16
(3) 64 (4) 256

43. Which of the following is not a computer code?

(1) EBCDIC (2) ASCII
(3) CISC (4) UNICODE

44. ASCII stands for **[IBPS Clerk 2014, 2018]**

(1) American Special Computer for Information Interaction
(2) American Standard Computer for Information Interchange
(3) American Special Code for Information Interchange
(4) American Special Computer for Information Interchange
(5) American Standard Code for Information Interchange

45. The most widely used code that represents each character as a unique 8-bit code is **[UPSSSC 2017]**

(1) ASCII (2) UNICODE
(3) BCD (4) EBCDIC

46. Today's mostly used coding system is/are

(1) ASCII (2) EBCDIC
(3) BCD (4) Both (1) and (2)

47. In EBCDIC code, maximum possible characters set size is

(1) 356 (2) 756
(3) 556 (4) 256

48. Code 'EBCDIC' that is used in computing stands for

(1) Extension BCD Information Code
(2) Extended BCD Information Code
(3) Extension BCD Interchange Conduct
(4) Extended BCD Interchange Conduct

49. Most commonly used codes for representing bits are
(1) ASCII (2) BCD
(3) EBCDIC (4) All of these

50. The coding system allows non-english characters and special characters to be represented
(1) ASCII (2) UNICODE
(3) EBCDIC (4) All of these

51. Which of the following character set supports Japanese and Chinese fonts? **[IBPS Clerk Mains 2017]**
(1) EBCDIC (2) ASCII
(3) BC (4) ECBI
(5) UNICODE

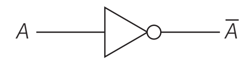
52. Two inputs A and B of NAND gate have 0 output, if
(1) A is 0 (2) B is 0
(3) Both are zero (4) Both are 1

53. Gate having output 1 only when one of its input is 1 is called
(1) AND (2) NOT
(3) OR (4) NOR

54. ....gate is also known as inverter.
(1) OR (2) NOT
(3) XOR (4) NAND

55. The only function of NOT gate is to ....
(1) stop signal
(2) invert input signal
(3) act as a universal gate
(4) double input signal

56. Following diagram depicts which logic gate? **[IBPS PO Mains 2017]**



(1) NOR gate (2) NOT gate
(3) OR gate (4) NAND gate
(5) None of these

57. The NAND gate is AND gate followed by ......
(1) NOT gate (2) OR gate
(3) AND gate (4) NOR gate

58. The NOR gate is OR gate followed by ....
(1) AND gate (2) NAND gate
(3) NOT gate (4) OR gate

59. The NOR gate output will be high if the two inputs are
(1) 00 (2) 01 (3) 10 (4) 11

60. Which of following are known as universal gates?
(1) NAND and NOR (2) AND and OR
(3) XOR and OR (4) AND

61. Gate whose output is 0 only when inputs are different is called
(1) XOR (2) XNOR (3) NOR (4) NAND

62. If Δ represents '1' and o represents '0'. What will be the one's complement of o$\Delta\Delta$ooΔ? **[IBPS PO Mains 2017]**
(1) 011001 (2) 100110
(3) 101010 (4) 000000
(5) 111111

ANSWERS

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