Q1: Suppose the time to service a page fault is on the average 10 milliseconds, while a memory access takes 1 microsecond. Then a 99.99% hit ratio results in average memory access time of

(a) 1.9999 milliseconds

(b) 1 millisecond

(c) 9.999 microseconds

(d) 1.9999 microseconds

Q2: Which of the following scheduling algorithms is non-preemptive?

(a) Round Robin

(b) First-In First-Out

(c) Multilevel Queue Scheduling

(d) Multilevel Queue Scheduling with Feedback

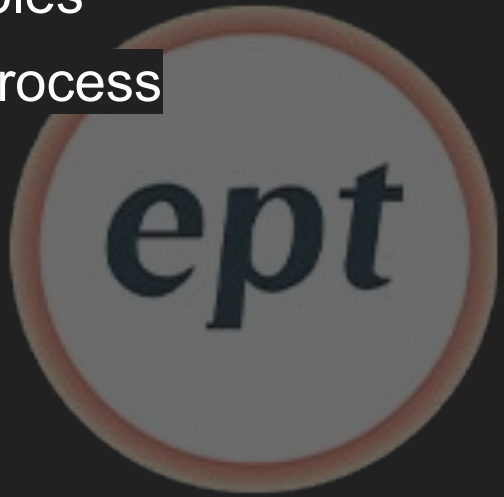
Q3: In a system with 32 bit virtual addresses and 1 KB page size, use of one-level page tables for virtual to physical address translation is not practical because of

(a) the large amount of internal fragmentation

(b) the large amount of external fragmentation

(c) the large memory overhead in maintaining page tables

(d) the large computation overhead in the translation process



Q4: When a thread terminates some target thread immediately, it is known as?

1) Immediate Termination
2) Asynchronous termination
3) Synchronous termination
4) Deferred cancellation

Q5: When are the register context and stack of thread deallocated?

1) when the thread terminates
2) when the thread blocks
3) when the thread unblocks
4) when the thread spawns

Q6: UNIX is written in which language?

1) C#

2) C++

3) C

4) .NET

Q7: Consider 4 tasks T1, T2, T3 and T4 and each of them consist an infinite sequence of instances. A new instance of all processes arrive every 16ms. Each instance of T1,T2,T3 and T4 takes 6ms, 5ms, 2ms and 3ms time for execution on CPU. No any task and instance has any IO requirement. The OS uses Non-preemptive SJF policy to run the processes on CPU. The first instance of all process arrive at time 0. The throughput of the CPU for this execution is_____instances/ second?

Q8: Consider a paged virtual memory environment with 4 page-frames in main memory (all initially empty). The system uses FIFO page replacement policy. The system stores dirty bit for each page in main memory to keep a track of modified pages in main memory; and only the page which has dirty bit set, is actually written back to secondary storage if replaced otherwise not. The CPU executes a process in which 70% of total page references have a hit in main memory, 15% of total memory references having page fault with no page replacement needed, 10% of total memory references having page fault with page replacement needed of a non-dirty page and remaining references having page fault with page replacement needed of a dirty page. The memory access time for a reference when the page is available in memory is 200ns. The memory access time is 2000ns when there is a page fault without page replacement. The memory access time is 2500ns when there is a page fault with page replacement of a non-dirty page. The memory access time is 5000ns when there is a page fault with page replacement of a dirty page. The effective memory access time for the process is __ ns?

Q9: A system has 6 identical resources and N processes competing for them. Each process can request atmost 2 resources. Which one of the following values of N could lead to a deadlock?

(A) 1

(B) 2

(C) 3

(D) 4

Q10: When the result of a computation depends on the speed of the processes involved, there is said to be

(A) cycle stealing

(B) race condition

(C) a time lock

(D) a deadlock

Q11: Which of the following actions is/are typically not performed by the operating system when switching context from process A to process B?

(A) Saving current register values and restoring saved register values for process B.

(B) Changing address translation tables.

(C) Swapping out the memory image of process A to the disk.

(D) Invalidating the translation look-aside buffer.

Q12: Four jobs to be executed on a single processor system arrive at time 0 in the order A, B, C, D. Their burst CPU time requirements are 4, 1, 8, 1 time units respectively. The completion time of A under round robin scheduling with time slice of one time unit is

(A) 10

(B) 4

(C) 8

(D) 9

Q13: Consider three processes, all arriving at time zero, with total execution time of 10, 20 and 30 units, respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time doing I/O again. The operating system uses a shortest remaining compute time first scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Assume that all I/O operations can be overlapped as much as possible. For what percentage of time does the CPU remain idle?

(A) 0%

(B) 10.6%

(C) 30.0%

(D) 89.4%

Q14: Consider the 3 processes, P1, P2 and P3 shown in the table.

Process	Arrival time	Time Units Required
P1	0	5
P2	1	7
P3	3	4

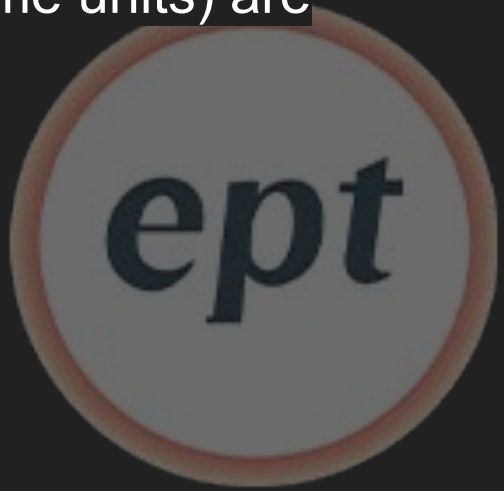
The completion order of the 3 processes under the policies FCFS and RR2 (round robin scheduling with CPU quantum of 2 time units) are

(A)FCFS: P1, P2, P3 RR2: P1, P2, P3

(B)FCFS: P1, P3, P2 RR2: P1, P3, P2

(C)FCFS: P1, P2, P3 RR2: P1, P3, P2

(D)FCFS: P1, P3, P2 RR2: P1, P2, P3



Q15: Consider a uniprocessor system executing three tasks T1, T2 and T3, each of which is composed of an infinite sequence of jobs (or instances) which arrive periodically at intervals of 3, 7 and 20 milliseconds, respectively. The priority of each task is the inverse of its period and the available tasks are scheduled in order of priority, with the highest priority task scheduled first. Each instance of T1, T2 and T3 requires an execution time of 1, 2 and 4 milliseconds, respectively. Given that all tasks initially arrive at the beginning of the 1st milliseconds and task preemptions are allowed, the first instance of T3 completes its execution at the end of _____ milliseconds.

(A) 5

(B) 10

(C) 12

(D) 15

Q16: Consider a set of n tasks with known runtimes r1, r2, …. rn to be run on a uniprocessor machine. Which of the following processor scheduling algorithms will result in the maximum throughput?

(A)Round-Robin

(B)Shortest-Job-First

(C)Highest-Response-Ratio-Next

(D)First-Come-First-Served

Q17: Consider a process scenario with 4 processes A,B,C and D with their respective arrival times and burst times in milliseconds. Processes A,B,C and D arriving at times 0,1,2 and 3 respectively. Processes A,B,C and having their CPU burst time 6,4,3 and 1 respectively. Consider preemptive shortest remaining time first algorithm for scheduling. Use arrival time to break tie if 2 processes have some remaining time. The scheduling happens only on arrival of a new process or on completion of a running process. Each scheduling overhead takes 0.1ms. Further note that scheduling is required only when at least one process is there in ready queue. The total time required to run given 4 processes on single CPU is ____ milliseconds.

Q18: Which of the following commands in UNIX is used to send a signal?

1) send

2) kill

3) sigsend

4) none

Q19: Which of the following disk strategies is likely to give the best throughput?

(A) Farthest cylinder next

(B) Nearest cylinder next

(C) First come first served

(D) Elevator algorithm

Q20: Normally user programs are prevented from handling I/O directly by I/O instructions in them. For CPUs having explicit I/O instructions, such I/O protection is ensured by having the I/O instructions privileged. In a CPU with memory mapped I/O, there is no explicit I/O instruction. Which one of the following is true for a CPU with memory mapped I/O?

(A) I/O protection is ensured by operating system routine (s)

(B) I/O protection is ensured by a hardware trap

(C) I/O protection is ensured during system configuration

(D) I/O protection is not possible

Q21: Consider a disk pack with 16 surfaces, 128 tracks per surface and 256 sectors per track. 512 bytes of data are stored in a bit serial manner in a sector. The capacity of the disk pack and the number of bits required to specify a particular sector in the disk are respectively:

(A) 256 Mbyte, 19 bits

(B) 256 Mbyte, 28 bits

(C) 512 Mbyte, 20 bits

(D) 64 Gbyte, 28 bit

Q22: A graphics card has on board memory of 1 MB. Which of the following modes can the card not support?

(a) 1600 x 400 resolution with 256 colours on a 17 inch monitor.

(b) 1600 x 400 resolution with 16 million colours on a 14 inch monitor.

(c) 800 x 400 resolution with 16 million colours on a 17 inch monitor.

(d) 800 x 800 resolution with 256 colours on a 14 inch monitor.

Q23: Many to One model is at an advantage in which of the following conditions?

1) When the program needs to be multi-threaded

2) When there is a single processor present

3) When the program does not need multithreading

4) None

Q24: What are the two types of operating modes of AT?

1) Virtual mode, dedicated mode
2) Private mode, public mode
3) Real mode, protected mode
4) Direct mode, indirect mode

Q25: FIFO scheduling is a type of:

1. Pre-emptive scheduling
2. Non Pre-Emptive scheduling
3. Deadline scheduling
4. None of the above

Q26: A process which is copied from main memory to secondary memory on the basis of requirement is known as

1. Demand Paging
2. Paging
3. Threads
4. Segmentation

Q27:In which one of the following page replacement policies, Belady's anomaly may occur?

(A) FIFO

(B) Optimal

(C) LRU

(D) MRU

Q28:A system uses FIFO policy for page replacement. It has 4 page frames with no pages loaded to begin with. The system first accesses 100 distinct pages in some order and then accesses the same 100 pages but now in the reverse order. How many page faults will occur?

(A) 196

(B) 192

(C) 197

(D) 195

Q29: Consider a demand paging system with four-page frames (initially empty) and an LRU page replacement policy. For the following page reference string 7, 2,7,3, 2,5,3, 4,6,7,7,1,5,6,1 the page fault rate, defined as the ratio of number of page faults to the number of memory accesses (rounded off to one decimal place) is_____.

(A)1.5

(B)0.5

(C)0.6

(D)0.8

Q30: Which of the following is NOT a valid deadlock prevention scheme?

(A) Release all resources before requesting a new resource

(B) Number the resources uniquely and never request a lower numbered resource than the last one requested.

(C) Never request a resource after releasing any resource

(D) Request and all required resources be allocated before execution.

Q31: Consider a system with 3 processes that share 4 instances of the same resource type. Each process can request a maximum of K instances. Resource instances can be requested and released only one at a time. The largest value of K that will always avoid deadlock is ___ .

(A) 1

(B) 2

(C) 3

(D) 4

Q32: A process in the context of computing is?

(A)A set of instructions to be executed on a computer

(B)A program in execution

(C)A piece of hardware that executes a set of instructions

(D)The main procedure of a program

Q33: Consider the following table of arrival time and burst time for three processes P0, P1 and P2.

Process	Arrival time	Burst Time
P0	0 ms	9 ms
P1	1 ms	4 ms
P2	2 ms	9 ms

The pre-emptive shortest job first scheduling algorithm is used. Scheduling is carried out only at arrival or completion of processes. What is the average waiting time for the three processes?

(A) 5.0 ms

(B) 4.33 ms

(C) 6.33

(D) 7.33

Q34: Which of the following is an example of a spooled device?

(A) The terminal used to enter the input data for the C program being executed.

(B) An output device used to print the output of a number of jobs.

(C) The secondary memory device in a virtual storage system.

(D) The swapping area on a disk used by the sapper.

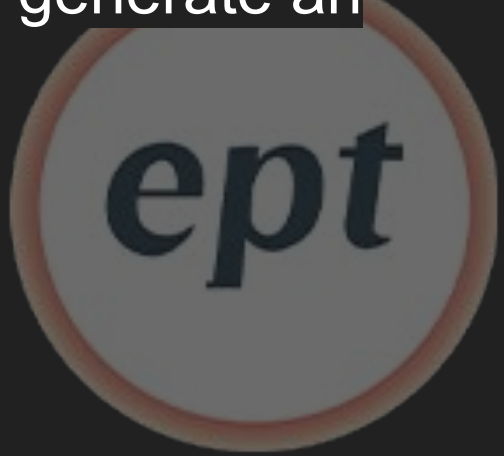
Q35: A CPU has two modes-privileged and non-privileged. In order to change the mode from privileged to non-privileged

(A) a hardware interrupt is needed

(B) a software interrupt is needed

(C) a privileged instruction (which does not generate an interrupt) is needed

(D) a non-privileged instruction (which does not generate an interrupt is needed



Q36: Which of the following does not interrupt a running process?

(A) A device

(B) Timer

(C) Scheduler process

(D) Power failure

Q37: An application loads 100 libraries at start-up. Loading each library requires exactly one disk access. The seek time of the disk to a random location is given as 10 ms. Rotational speed of disk is 6000 rpm. If all 100 libraries are loaded from random locations on the disk, how long does it take to load all libraries? (The time to transfer data from the disk block once the head has been positioned at the start of the block may be neglected)

(A) 0.50 s

(B) 1.50 s

(C) 1.25 s

(D) 1.00 s

Q38: A hard disk system has the following parameters :

Number of tracks = 500

Number of sectors/track = 100

Number of bytes /sector = 500

Time taken by the head to move from one track to adjacent track = 1 ms

Rotation speed = 600 rpm.

What is the average time taken for transferring 250 bytes from the disk ?

(A) 300.5 ms

(B) 255.5 ms

(C) 255.0 ms

(D) 300.0 ms

Q39: Consider a disk pack with a seek time of 4 milliseconds and rotational speed of 10000 rotations per minute (RPM). It has 600 sectors per track and each sector can store 512 bytes of data. Consider a file stored in the disk. The file contains 2000 sectors. Assume that every sector access necessitates a seek, and the average rotational latency for accessing each sector is half of the time for one complete rotation. The total time (in milliseconds) needed to read the entire file is ___.

(A) 14020

(B) 14000

(C) 25030

(D) 15000

Q40: Consider a non-negative counting semaphore S. The operation P(S) decrements S, and V(S) increments S. During an execution, 20 P(S) operations and 12 V(S) operations are issued in some order. The largest initial value of S for which at least one P(S) operation will remain blocked is ____.

(A) 7

(B) 8

(C) 9

(D) 10

Q41: At a particular time of computation the value of a counting semaphore is 7. Then 20 P operations and 15 V operations were completed on this semaphore. The resulting value of the semaphore is :

(A) 42

(B) 2

(C) 7

(D) 12

Q42: Which technique was introduced because a single job could not keep both CPU and IO devices busy?

(A) Real time

(B)Spooling

(C)Preemptive scheduling

(D)Multiprogramming

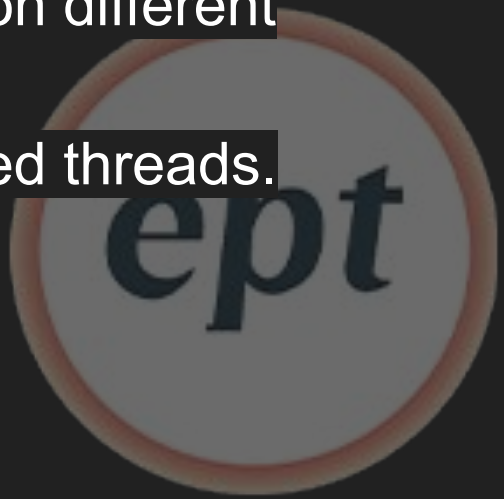
Q43:Consider the following statements about user level threads and kernel level threads. Which one of the following statement is FALSE?

(A) Context switch time is longer for kernel level threads than for user level threads.

(B) User level threads do not need any hardware support.

(C) Related kernel level threads can be scheduled on different processors in a multiprocessor system.

(D) Blocking one kernel level thread blocks all related threads.



Q44:Which one of the following is FALSE?

A) User level threads are not scheduled by the kernel.

B) When a user level thread is blocked, all other threads of its process are blocked.

C) Context switching between user level threads is faster than context switching between kernel level threads.

D) Kernel level threads cannot share the code segment.

Q45: A systematic procedure for moving the CPU to new process is known as-

1. Synchronization
2. Deadlock
3. Starvation
4. Context Switching

Q46: Consider a paging system that uses 1-level page table residing in main memory and a TLB for address translation. Each main memory access takes 100 ns and TLB lookup takes 20 ns. Each page transfer to/from the disk takes 5000 ns. Assume that the TLB hit ratio is 95%, page fault rate is 10%. Assume that for 20% of the total page faults, a dirty page has to be written back to disk before the required page is read from disk. TLB update time is negligible.

The average memory access time in ns (round off to 1 decimal places) is _____ .

(A) 154.5

(B) 155

(C) 755

(D) 725

Q47: Which page replacement policy sometimes leads to more page faults when size of memory is increased?

A] Optimal

B] LRU

C] FIFO

D] None of these.

Q48: Suppose n processes, P1, …. Pn share m identical resource units, which can be reserved and released one at a time. The maximum resource requirement of process Pi is Si, where Si > 0. Which one of the following is a sufficient condition for ensuring that deadlock does not occur?

(a) $\forall i, s_i < m$

(b) $\forall i, s_i < n$

(c) $\sum_{i=1}^{n} s_i < (m+n)$

(d) $\sum_{i=1}^{n} s_i < (m * n)$

(A) A

(B) B

(C) C

(D) D

Q49: Consider the procedure below for the Producer-Consumer problem which uses semaphores:

```
semaphore n = 0;
semaphore s = 1;
void producer()
{
      while(true)
      {
       produce();
       semWait(s);
       addToBuffer();
       semSignal(s);
       semSignal(n);
      }
}
```

```
void consumer()
{
      while(true)
      {
       semWait(s);
       semWait(n);
       removeFromBuffer();
       semSignal(s);
       consume();
      }
}
```

Which one of the following is TRUE?

(A) The producer will be able to add an item to the buffer, but the consumer can never consume it.

(B) The consumer will remove no more than one item from the buffer.

(C) Deadlock occurs if the consumer succeeds in acquiring semaphores when the buffer is empty.

(D) The starting value for the semaphore n must be 1 and not 0 for deadlock-free operation.

Q50: A computer has six tape drives, with n processes competing for them. Each process may need two drives. What is the maximum value of n for the system to be deadlock free?

(A) 6

(B) 5

(C) 4

(D) 3

Q51: Consider the methods used by processes P1 and P2 for accessing their critical sections whenever needed, as given below. The initial values of shared boolean variables S1 and S2 are randomly assigned.

Method Used by P1

while (S1 == S2) ;

Critical Section

S1 = S2;

Method Used by P2

while (S1 != S2) ;

Critical Section

S2 = not (S1);

Which one of the following statements describes the properties achieved?

(A) Mutual exclusion but not progress

(B) Progress but not mutual exclusion

(C) Neither mutual exclusion nor progress

(D) Both mutual exclusion and progress

Q52: A file is organized so that the ordering of data records is the same as or close to the ordering of data entries in some index. Then that index is called

(A) Dense

(B) Sparse

(C) Clustered

(D) Unclustered

Q53: A Computer system implements 8 kilobyte pages and a 32-bit physical address space. Each page table entry contains a valid bit, a dirty bit three permission bits, and the translation. If the maximum size of the page table of a process is 24 megabytes, the length of the virtual address supported by the system is _____ bits

(A)36

(B)32

(C)28

(D)40

Q54: Consider a computer system with ten physical page frames. The system is provided with an access sequence a1, a2, …, a20, a1, a2, …, a20), where each ai number. The difference in the number of page faults between the last-in-first-out page replacement policy and the optimal page replacement policy is _____

(A) 0

(B) 1

(C) 2

(D) 3

Q55: Consider a process executing on an operating system that uses demand paging. The average time for a memory access in the system is M units if the corresponding memory page is available in memory, and D units if the memory access causes a page fault. It has been experimental measured that the average time taken for a memory access in the process is X units.

Which one of the following is the correct expression for the page fault rate experienced by the process?

(A) (D – M) / (X – M)

(B) (X – M) / (D – M)

(C) (D – X) / (D – M)

(D) (X – M) / (D – X)

Q56: Consider the following set of processes, with the arrival times and the CPU-burst times given in milliseconds

Process	Arrival Time	Burst Time
P1	0	5
P2	1	3
P3	2	3
P4	4	1

What is the average turnaround time for these processes with the preemptive shortest remaining processing time first (SRPT) algorithm ?

(A) 5.50

(B) 5.75

(C) 6.00

(D) 6.25

Q57: Which of the following is an example of spooled device?

I> A line printer used to print the output of a number of jobs

II>A terminal used to enter input data to a running program

III>A secondary storage device in a virtual memory system

IV>A graphic display device

Q58: System calls are usually invoked by using:

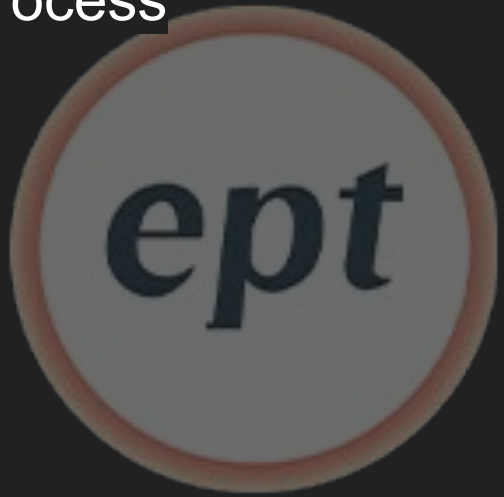
(A) A software interrupt
(B) Polling
(C) An indirect jump
(D) A privileged instruction

Q59: Consider a paged memory system with logical address space of 256Mbytes and physical address space of 8Gbytes. The page size is 4Kbytes. The total page table size is 256Kbytes. The number of protection bits stored in each page table entry apart from translation is ___ bits?

Q60: A particular disk unit uses a bit string to record the occupancy or vacancy of its disk blocks with ‘1’ denoting vacant block and ‘0’ denoting occupied block. A 1024-bits string contains one time C, three times A, 6 times E, 7 times B and remaining all 0 in hexadecimal representation. The percentage of occupied blocks on the disk for this part (to closest integer) is_____%?

Q61: Which of the following can help in reducing amount of internal fragmentation in paging?

1. Increasing the page size
2. Increasing the allocated number of frames to a process
3. Decreasing the page size
4. Decreasing the allocated number of frames to a process



Q62: OS classifies the threads as

1) Mainframe and motherboard level
2) Kernel and User level
3) Security and Memory level
4) OS and CPU level

Q63: For which of the following is resource sharing used?

1) an application having several threads of activity all within the same address space.

2) share the memory and resources of the process to which the threads belong

3) Compress the address space a process can use

4) all of the above

Q64: What of the following defines Thread cancellation?

1) The process of terminating a thread process before its execution

2) The process of removing a thread after its work is executed

3) The process of destroying the thread after its work is executed

4) none

Q65: Consider a virtual memory system with FIFO page replacement policy. For an arbitrary page access pattern, increasing the number of page frames in main memory will

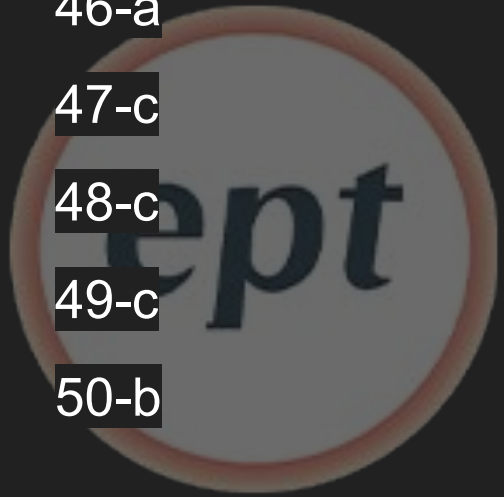
(a) Always decrease the number of page faults

(b) Always increase the number of page faults

(c) Sometimes increase the number of page faults

(d) Never affect the number of page faults

1-d	11-c	21-a	31-b	41-b
2-b	12-d	22-b	32-b	42-d
3-c	13-b	23-c	33-a	43-d
4-b	14-c	24-c	34-b	44-d
5-a	15-c	25-b	35-d	45-d
6-c	16-b	26-a	36-c	46-a
7-250	17-14.7	27-a	37-b	47-c
8-940	18-b	28-a	38-d	48-c
9-d	19-b	29-c	39-a	49-c
10-b	20-a	30-c	40-a	50-b



51-a

52-c

53-a

54-b

55-b

56-a

57-a

58-a

59-11

60-95

61-c

62-b

63-d

64-a

65-c