

QUESTION BANK –

Operating System

1. What is the relationship between operating systems and computer hardware?
2. What are the primary differences between Network Operating System and Distributed Operating System?

Operating Systems Process

1. What is the Difference between a Job and a Process?
2. What are the advantages of multiprogramming?
3. What are the advantages of Multiprocessing or Parallel System?
4. Draw and explain various process state transitions.

Operating Systems Types

1. What are the differences between Batch processing system and Real Time Processing System?
2. What are the differences between Real Time System and Timesharing System?
3. What are the differences etween multiprocessing and multiprogramming?

Operating Systems Process Scheduling

1. What is a process scheduler? State the characteristics of a good process scheduler?
OR
What is scheduling? What criteria affects the schedulers performance?
2. Explain time slicing. How its duration affects the overall working of the system.
3. What is Shortest Remaining Time, SRT scheduling?
4. What is Highest Response Ratio Next (HRN) Scheduling?
5. What are the different principles which must be considered while selection of a scheduling algorithm?
6. Find out which algorithm among FCFS, SJF And Round Robin with quantum 10, would give the minimum average time for a given workload.
7. Explain pseudo parallelism? Describe the process model that makes parallelism easier to deal with.

Operating Systems Memory Allocation

1. What are the differences between paging and segmentation?
2. Explain various allocation algorithms.
3. When does a page fault occur? Explain various page replacement strategies/algorithms.
4. What are the differences between paging and segmentation?

Concurrency control and Dead Lock:

1. What is Starvation? Explain with example
2. Explain different methods of recovering from a Deadlock .
3. Explain Dining Philosophers Problem.

Operating Systems Semaphores

1. Explain semaphores and write a short note on it.

Calculation

1. Five processes A,B,C,D and E are having burst time of 10,2,13,1 and 5 respectively (in seconds). Their arrival times are 0, 1, 2, 3 and 4 respectively. Their Priorities are 4,2,3,1, and 5 respectively. Calculate turnaround time of each process for 1) SJN 2) SRT 3) Priority scheduling
2. Four processes A,B,C,D are having burst time of 11,7,5 and 3seconds respectively. Their arrival times are 0, 2, 3 and 5 seconds respectively. Draw a timeline and calculate the average Turn around time and average waiting time using 1) FCFS 2) Round Robin Scheduling (Time Quantum = 4 msec)

DEFINE
1. Operating System
2. Thread
3. Virtual memory
4. Page
5. Disk cache

1. Explain Mutual Exclusion.
2. What is a Deadlock.
3. Explain the process of Segmentation.
4. Differentiate between a Job and a Process.
5. How is uni-processor scheduling different from multi-processor scheduling?
6. Explain Elevator (SCAN) disk scheduling algorithm.
1. Draw and explain the process state diagram.
2. What is RAID? Explain first two levels of RAID.
3. Four processes P1,P2 and P3 are having burst time of 24,3, 3 milliseconds respectively. Their arrival times are 0, 1 and 2 milliseconds respectively. Draw a timeline and calculate the average waiting time using FCFS and Round Robin Scheduling (consider Time Quantum = 5 msec).
4. What is Virtual Memory? Explain the concept of Demand Paging.

What is Deadlock? Explain Bankers Algorithm to avoid deadlocks.

Explain features of Linux Operating system. Explain the syntax and working of following commands

with example.

- 1) **cal**
- 2) **pwd**
- 3) **chmod**
- 4) **mv**

Explain Dining Philosophers problem of starvation giving example. How Starvation could be resolved? Explain any one method of resolving starvation.

1. What is Operating System? Give the functions of Operating System.

2. What do you mean by virtual memory and physical memory? Explain.

3. What are the advantages of multiprogramming?

4. Difference between Multitasking and Multiprocessing

5. What is thread? Explain thread structure.

6. Give the functions of following UNIX commands: grep, cat.

1. What is deadlock? Explain the Banker's algorithm for deadlock avoidance.

2. What are the differences between Real Time System and Timesharing System?

3. What is Virtual Memory? Explain Demand Paging.

4. What is RAID? Explain Different RAID levels.

When does a page fault occur? Explain various page replacement strategies/algorithms.

Explain various file attributes and file operations in brief

Explain the different types of operating system

What are the advantages of Multiprocessing or Parallel System?

Explain various Disk Scheduling Algorithms with illustration.

3. What is Preemptive scheduling?

Answer: A scheduling strategy that interrupts the processing of a job and transfers the CPU to another job is called Preemptive Scheduling policy, it is widely used in time sharing environment.

4. List out features of OS.

Answer: Features of OS: Multi-Tasking, Multi Programming, Parallel Processing, Buffering.

5. Define Mutual Exclusion.

Answer: If one process is executing in its critical section, then no other processes can be executing in their critical sections.

6. Write down Characteristics of RAID.

Answer: RAID is a set of physical disk drives viewed by the operating system as a single logical drive. Data are distributed across the physical drives of an array in a scheme known as striping. Redundant disk capacity is used to store parity information, which guarantees data recoverability in case of a disk failure.

7. Write a full form of: FCFS, SJF.

Answer: FCFS = First Come First Serve, SJF = Shortest Job First.

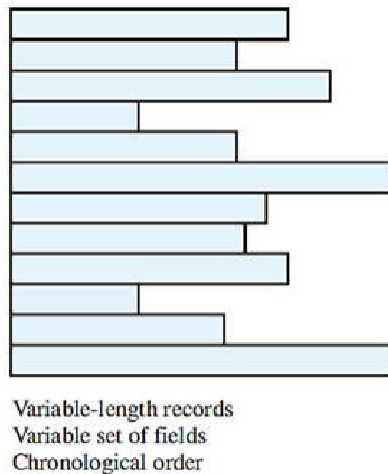
8. List out different types of file organization. Explain any one in detail.

Answer:

There are five different File organizations used.

1. The pile
2. The sequential file
3. The indexed sequential file
4. The indexed file
5. The direct, or hashed, file

1. **The Pile:** The pile is the least-complicated form of file organization. Data are collected in the order in which they arrive. Each record consists of one burst of data. The purpose of the pile is simply to accumulate the mass of data and save it. Records may have different fields, or similar fields in different orders. Thus, each field should be self-describing, including a field name as well as a value. The length of each field must be implicitly indicated by delimiters, explicitly included as a subfield, or known as default for that field type.



2. Write a short note on Time Sharing Operating System.

Answer:

Time Sharing Operating System: A time sharing system is allowing many users to share the computer resources. A time sharing system operating system is that in which each tasks are given some time to execute and all tasks are given time so that all processes run seamlessly without any problem.

Advantages:

- Giving a time limit for each job
- Users can access a terminal simultaneously
- Multiprogramming

Disadvantages:

- Lack of protection against file
- Problem in data communication

3. Write down difference between User Level Thread & Kernel Level Thread.

Answer:

S.N.	User-Level Threads	Kernel-Level Thread
1	User-level threads are faster to create and manage.	Kernel-level threads are slower to create and manage.
2	Implementation is by a thread library at the user level.	Operating system supports creation of Kernel threads.
3	User-level thread is generic and can run on any operating system.	Kernel-level thread is specific to the operating system.
4	Multi-threaded applications cannot take advantage of multiprocessing.	Kernel routines themselves can be multithreaded.

4. List out different types of partitioning. Explain fixed size partition in detail.

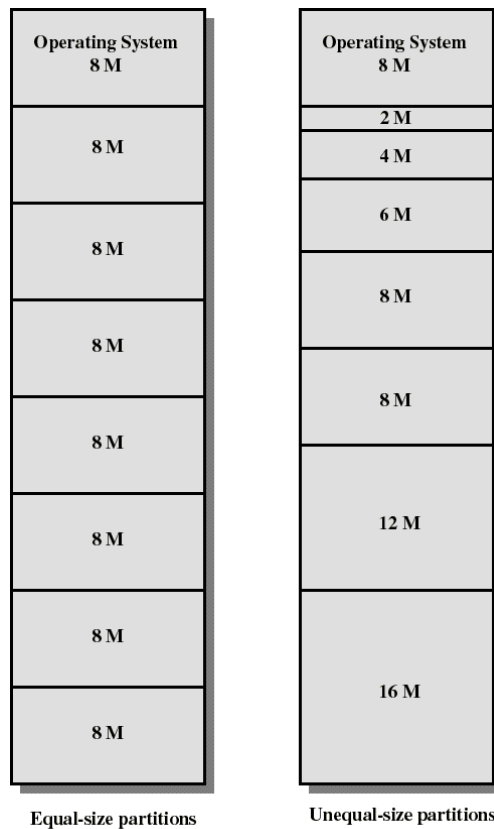
Answer:

Types of Partitioning:

- Fixed Size Partitioning
- Dynamic Partitioning
- Simple Paging
- Segmentation

Fixed Size Partitioning:

- Partition main memory into a set of non-overlapping regions called partitions
- Partitions can be of equal or unequal sizes
- any process whose size is less than or equal to a partition size can be loaded into the partition.
- if all partitions are occupied, the operating system can swap a process out of a partition.
- a program may be too large to fit in a partition. The programmer must then design the program with overlays.



5. Write a shell script to check whether given number is prime or not.

Answer:

```
echo "Enter a number: "
read num
i=2
f=0
while [ $i -le `expr $num / 2` ]
do
if [ `expr $num % $i` -eq 0 ]
then
f=1
fi
i=`expr $i + 1`
done
if [ $f -eq 1 ]
then
echo "The number is composite"
else
echo "The number is Prime"
fi
```

6. What is Real Time Scheduling? Explain Soft & Hard Real Time System.

Answer:

Real Time Scheduling: Real time system means that the system is subjected to real time, i.e., response should be guaranteed within a specified timing constraint or system should meet the specified deadline. For example: flight control system, real time monitors etc.

Soft real time system: This type of system can miss its deadline occasionally with some acceptably low probability. The usefulness of result produced by a soft real time system decreases gradually with increase in tardiness. Example: Telephone switches.

Hard real time system: This type of system can never miss its deadline. Missing the deadline may have disastrous consequences. Tardiness means how late a real time system completes its task with respect to its deadline. Example: Flight controller system.

7 . What is RAID? Explain ant two types of RAID in detail.

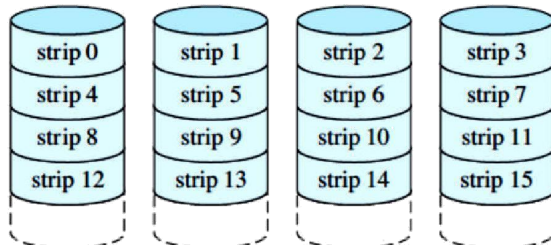
Answer:

RAID (Redundant Array of Independent Disk):

RAID stands for Redundant Array of Independent Disk. The RAID scheme consists of seven levels, zero through six.

RAID 0

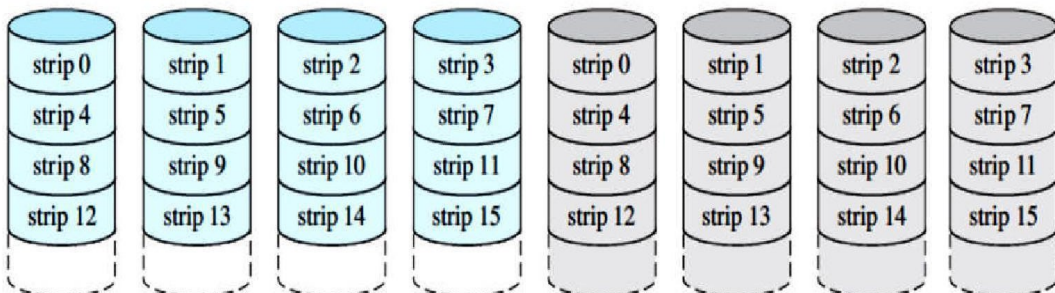
For RAID 0, the user and system data are distributed across all of the disks in the array. This has a notable advantage over the use of a single large disk: If two different I/O requests are pending for two different blocks of data, then there is a good chance that the requested blocks are on different disks. Thus, the two requests can be issued in parallel, reducing the I/O queuing time.



(a) RAID 0 (nonredundant)

RAID 1

In RAID 1, redundancy is achieved by the simple expedient of duplicating all the data. Figure shows data striping being used, as in RAID 0. But in this case, each logical strip is mapped to two separate physical disks so that every disk in the array has a mirror disk that contains the same data. RAID 1 can also be implemented without data striping, though this is less common.



(b) RAID 1 (mirrored)

8 . Explain Least Recently Used Page Replacement Algorithm with example.

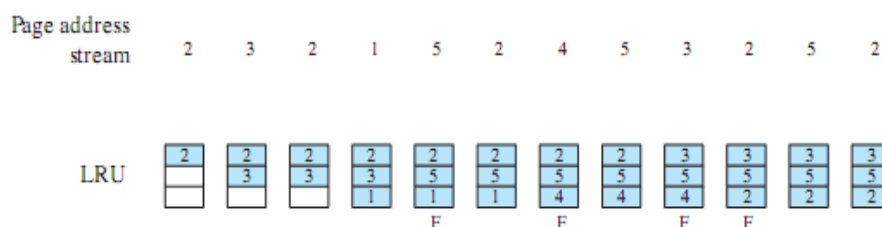
Answer:

Least Recently Used:

- Replaces the page that has not been referenced for the longest time
- By the principle of locality, this should be the page least likely to be referenced in the near future
- Difficult to implement
- One approach is to tag each page with the time of last reference.
- This requires a great deal of overhead.

Example:

Consider page reference string 2, 3, 2, 1, 5, 2, 4, 5, 3, 2, 5, 2 with 3-page frame.



F = page fault occurring after the frame allocation is initially filled

Figure 8.15 Behavior of Four Page Replacement Algorithms

In this example, there are 4 page faults.

9 . What is Deadlock? Explain various conditions for deadlock.

Answer:

Deadlock: A deadlock is a situation in which two computer programs sharing the same resource are effectively preventing each other from accessing the resource, resulting in both programs ceasing to function. The earliest computer operating systems ran only one program at a time.

Conditions for Deadlock:

Three conditions of policy must be present for a deadlock to be possible:

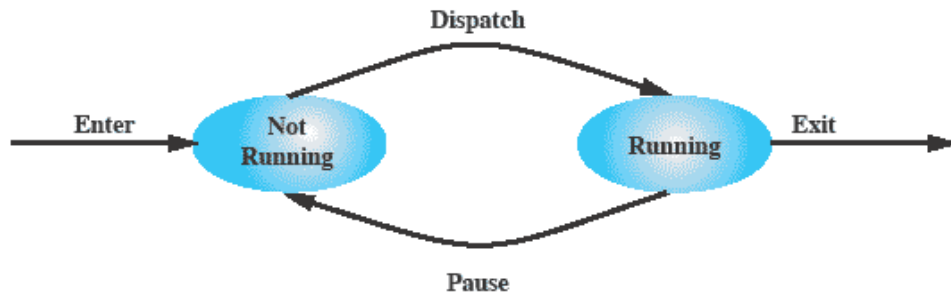
- **Mutual exclusion:** Only one process may use a resource at a time. No process may access a resource unit that has been allocated to another process.
- **Hold & wait:** A process may hold allocated resources while awaiting assignment of other resources.
- **No preemption:** No resource can be forcibly removed from a process holding it.

Circular wait: A closed chain of processes exists, such that each process holds at least one resource needed by the next process in the chain.

10. Explain two state process model with diagram.

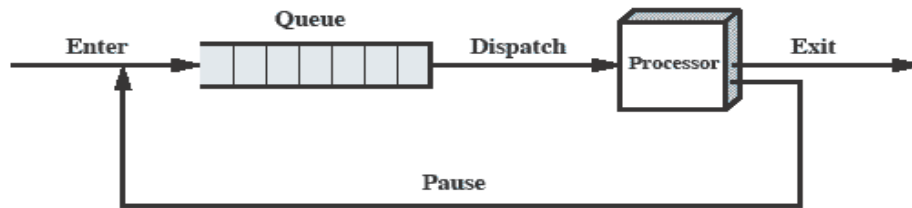
Answer:

- Process may be in one of two states
 - Running
 - Not-running
- In the simplest model, a process is either running, or it is not.



(a) State transition diagram

Queuing Diagram: Processes moved by the dispatcher of the OS to the CPU then back to the queue until the task is completed.



(b) Queuing diagram

Explain following with Bankers Algorithm.

The total amount of resources R1, R2, and R3 are 9, 3, and 6 units.

Answer:

	R1	R2	R3		R1	R2	R3		R1	R2	R3
P1	3	2	2	P1	1	0	0	P1	2	2	2
P2	0	0	0	P2	0	0	0	P2	0	0	0
P3	3	1	4	P3	2	1	1	P3	1	0	3
P4	4	2	2	P4	0	0	2	P4	4	2	0
Claim matrix C				Allocation matrix A				C - A			
	R1	R2	R3		R1	R2	R3		R1	R2	R3
	9	3	6		6	2	3				
Resource vector R				Available vector V							

(b) P2 runs to completion

	R1	R2	R3		R1	R2	R3		R1	R2	R3
P1	0	0	0	P1	0	0	0	P1	0	0	0
P2	0	0	0	P2	0	0	0	P2	0	0	0
P3	3	1	4	P3	2	1	1	P3	1	0	3
P4	4	2	2	P4	0	0	2	P4	4	2	0
Claim matrix C				Allocation matrix A				C - A			
	R1	R2	R3		R1	R2	R3		R1	R2	R3
	9	3	6		7	2	3				
Resource vector R				Available vector V							

(c) P1 runs to completion

	R1	R2	R3
P1	3	2	2
P2	6	1	3
P3	3	1	4
P4	4	2	2

Claim matrix C

	R1	R2	R3
P1	1	0	0
P2	6	1	2
P3	2	1	1
P4	0	0	2

Allocation matrix A

	R1	R2	R3
P1	2	2	2
P2	0	0	1
P3	1	0	3
P4	4	2	0

C - A

	R1	R2	R3
Resource vector R	9	3	6

	R1	R2	R3
Available vector V	0	1	1

(a) Initial state

	R1	R2	R3
P1	0	0	0
P2	0	0	0
P3	0	0	0
P4	4	2	2

Claim matrix C

	R1	R2	R3
P1	0	0	0
P2	0	0	0
P3	0	0	0
P4	0	0	2

Allocation matrix A

	R1	R2	R3
P1	0	0	0
P2	0	0	0
P3	0	0	0
P4	4	2	0

C - A

	R1	R2	R3
Resource vector R	9	3	6

	R1	R2	R3
Available vector V	9	3	4

(d) P3 runs to completion

	R1	R2	R3
P1	3	2	2
P2	6	1	3
P3	3	1	4
P4	4	2	2

Claim matrix C

	R1	R2	R3
P1	1	0	0
P2	6	1	2
P3	2	1	1
P4	0	0	2

Allocation matrix A

	R1	R2	R3
Resource vector R	9	3	6

Explain various elements of Process Control Block.

Answer:

- **Identifier:** A unique identifier associated with this process, to distinguish it from all other processes.
- **State:** If the process is currently executing, it is in the running state.
- **Priority:** Priority level relative to other processes.
- **Program counter:** The address of the next instruction in the program to be executed.
- **Memory pointers:** Includes pointers to the program code and data associated with this process, plus any memory blocks shared with other processes.
- **Context data:** These are data that are present in registers in the processor while the process is executing.
- **I/O status information:** Includes outstanding I/O requests, I/O devices (e.g., disk drives) assigned to this process, a list of files in use by the process, and so on.
- **Accounting information:** May include the amount of processor time and clock time used, time limits, account numbers, and so on.

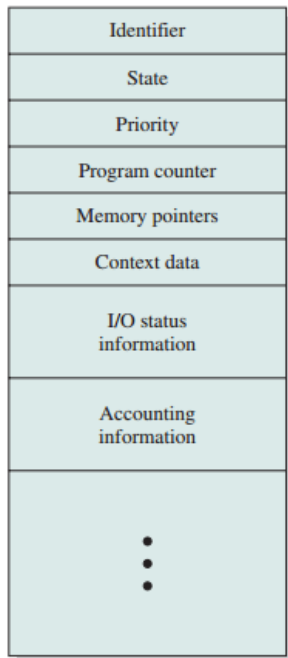


Figure 3.1 Simplified Process Control Block

11. List out essential managers of Operating System. Explain any one in detail.

Answer:

Managers of OS:

- Memory Management
- Processor Management
- Device Management
- File Management

Memory Management: Memory management refers to management of Primary Memory or Main Memory. Main memory provides a fast storage that can be access directly by the CPU. So for a program to be executed, it must in the main memory.

Operating System does the following activities for memory management.

1. Keeps tracks of primary memory i.e. what part of it are in use by whom, what part are not in use.
2. In multiprogramming, OS decides which process will get memory when and how much.
3. Allocates the memory when the process requests.
4. De-allocates the memory when the process no longer needs.

12. Explain the syntax and working of following commands with example.

1. **who**
2. **cal** (display current year calendar)
3. **ls**
4. **cp**
5. **mkdir**

Answer:

1. who: The who command is used to get information about currently logged in user on to system.

Example: who

```
hduser@mahesh-Inspiron-3543:~$ who
hduser    tty7          2018-03-18 19:08 (:0)
```

2. cal: It is used to display calendar.

Example: cal 2018

```
dharam@dharam-H110MHC:~$ cal 2018
      2018
    January      February      March
Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
 1  2  3  4  5  6      4  5  6  7  8  9 10      4  5  6  7  8  9 10
 7  8  9 10 11 12 13    11 12 13 14 15 16 17    11 12 13 14 15 16 17
14 15 16 17 18 19 20    18 19 20 21 22 23 24    18 19 20 21 22 23 24
21 22 23 24 25 26 27    25 26 27 28              25 26 27 28 29 30 31
28 29 30 31             

    April        May          June
Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
 1  2  3  4  5  6  7      1  2  3  4  5          3  4  5  6  7  8  9
 8  9 10 11 12 13 14      6  7  8  9 10 11 12    10 11 12 13 14 15 16
15 16 17 18 19 20 21    13 14 15 16 17 18 19    17 18 19 20 21 22 23
22 23 24 25 26 27 28    20 21 22 23 24 25 26    24 25 26 27 28 29 30
29 30                  27 28 29 30 31

    July         August       September
Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
 1  2  3  4  5  6  7      1  2  3  4          2  3  4  5  6  7  8
 8  9 10 11 12 13 14      5  6  7  8  9 10 11    9 10 11 12 13 14 15
15 16 17 18 19 20 21    12 13 14 15 16 17 18    16 17 18 19 20 21 22
22 23 24 25 26 27 28    19 20 21 22 23 24 25    23 24 25 26 27 28 29
29 30 31                26 27 28 29 30 31        30

    October      November     December
Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa Su Mo Tu We Th Fr Sa
 1  2  3  4  5  6      1  2  3          2  3  4  5  6  7  8
 7  8  9 10 11 12 13    4  5  6  7  8  9 10      9 10 11 12 13 14 15
14 15 16 17 18 19 20    11 12 13 14 15 16 17    16 17 18 19 20 21 22
21 22 23 24 25 26 27    18 19 20 21 22 23 24    23 24 25 26 27 28 29
28 29 30 31            25 26 27 28 29 30        30 31
```

3. ls: ls is a Linux shell command that lists directory contents of files and directories.

Example:

```
$ ls
a.txt b.txt c.txt d.txt
```

4. cp: cp stands for copy. This command is used to copy files or group of files or directory. It creates an exact image of a file on a disk with different file name. cp command require at least two filenames in its arguments.

Example:

```
$ cp a.txt b.txt

$ ls
a.txt b.txt
```

5. mkdir: It is use to make directory.

Example:

```
mkdir Dir1
```

Consider the set of 5 processes whose arrival time and burst time are given below.

Process Id	Arrival time	Burst time
P1	3	1
P2	1	4
P3	4	2
P4	0	6
P5	2	3

If the CPU scheduling policy is SJF non-preemptive, calculate the average waiting time and average turnaround time.

Answer:

Process Id	A.T	B.T	W.T	T.R
P1	3	1	3	4
P2	1	4	11	15
P3	4	2	3	5
P4	0	6	0	6
P5	2	3	7	10
			24	40

CRANTTI chart:

P4	P1	P3	P5	P2
0	6	7	9	12

Average waiting time = $\frac{3+11+3+0+7}{5}$
 $= \frac{24}{5} = 4.8$

Average turnaround time = $\frac{4+15+5+6+10}{5}$
 $= \frac{40}{5} = 8$

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