LAB 12.5: IMPLEMENTATION OF SORTING AND SEARCHING ALGORITHMS USING AI ASSISTANCE

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B-04

TASK 1 - Merge Sort Implementation using AI Assistance

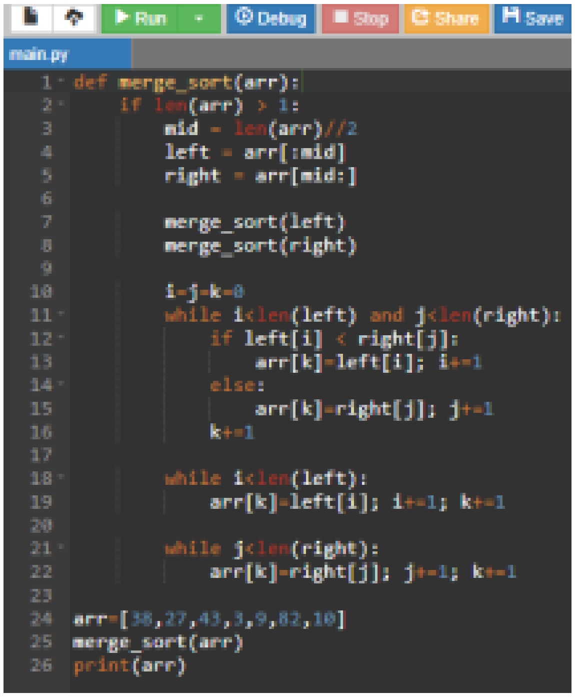
QUESTION

Generate a Python program that implements Merge Sort to sort a list in ascending order including time & space complexity.

PROMPT

Generate Python code for Merge Sort with function merge_sort(arr) including complexity.

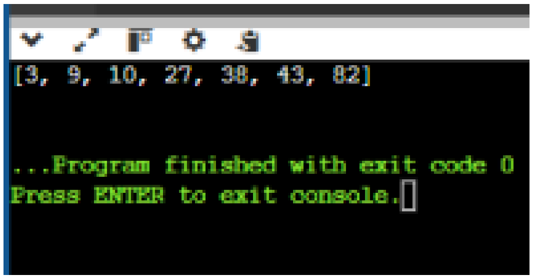
CODE



```python
def merge_sort(arr):
    if len(arr) > 1:
        mid = len(arr)//2
        left = arr[:mid]
        right = arr[mid:]

        merge_sort(left)
        merge_sort(right)

        i=j=k=0
        while i<len(left) and j<len(right):
            if left[i] < right[j]:
                arr[k]=left[i]; i+=1
            else:
                arr[k]=right[j]; j+=1
            k+=1

        while i<len(left):
            arr[k]=left[i]; i+=1; k+=1

        while j<len(right):
            arr[k]=right[j]; j+=1; k+=1

arr=[38,27,43,3,9,82,10]
merge_sort(arr)
print(arr)
```

```
def merge_sort(arr):
 if len(arr) > 1:
 mid = len(arr)//2
 left = arr[:mid]
 right = arr[mid:]
 merge_sort(left)
 merge_sort(right)
 i=j=k=0
 while i<len(left) and j<len(right):
 if left[i] < right[j]:
 arr[k]=left[i]; i+=1
 else:
 arr[k]=right[j]; j+=1
 k+=1
 while i<len(left):
 arr[k]=left[i]; i+=1; k+=1
 while j<len(right):
 arr[k]=right[j]; j+=1; k+=1

arr=[38,27,43,3,9,82,10]
merge_sort(arr)
print(arr)
```

OUTPUT



```
[3, 9, 10, 27, 38, 43, 82]


...Program finished with exit code 0
Press ENTER to exit console.
```

[3, 9, 10, 27, 38, 43, 82]

EXPLANATION

Merge Sort divides the list and merges sorted halves efficiently.

TASK-02

Binary Search Implementation

QUESTION

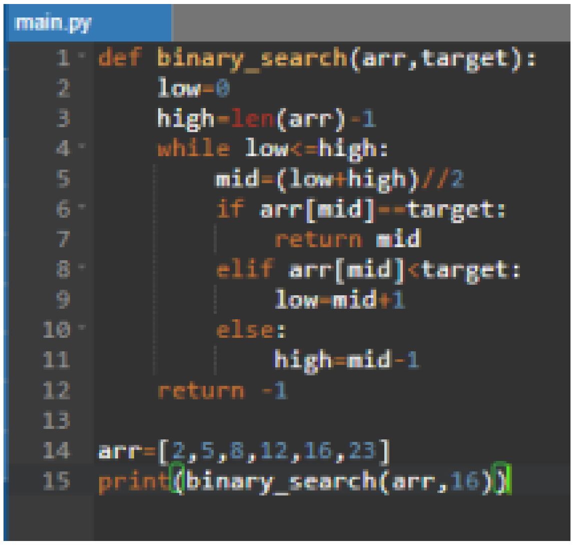
Create a binary search function returning index or -1.

PROMPT

Generate Python function

binary_search(arr,target).

CODE



```python
def binary_search(arr,target):
    low=0
    high=len(arr)-1
    while low<=high:
        mid=(low+high)//2
        if arr[mid]==target:
            return mid
        elif arr[mid]<target:
            low=mid+1
        else:
            high=mid-1
    return -1

arr=[2,5,8,12,16,23]
print(binary_search(arr,16))
```

```
def binary_search(arr,target):
 low=0
 high=len(arr)-1
 while low<=high:
 mid=(low+high)//2
 if arr[mid]==target:
 return mid
 elif arr[mid]<target:
 low=mid+1
 else:
 high=mid-1
 return -1
arr=[2,5,8,12,16,23]
print(binary_search(arr,16))
```

OUTPUT

```
4
```

4

EXPLANATION

Binary search works on sorted lists and halves searches space.

TASK 3 – HEALTHCARE APPOINTMNET SYSTEM

Healthcare Appointment System

QUESTION

Search using ID and sort by fee/time.

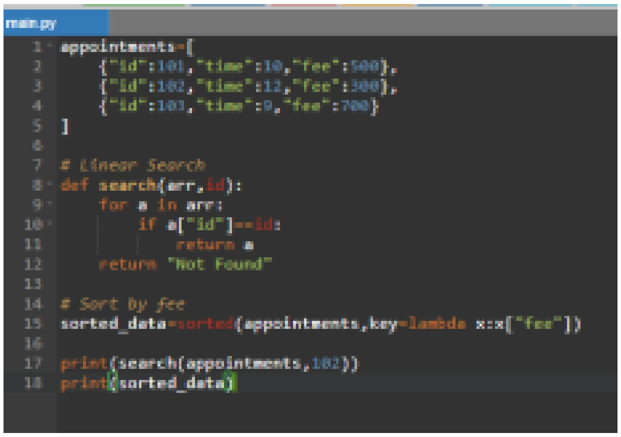
PROMPT

Suggest searching and sorting algorithms.

CODE

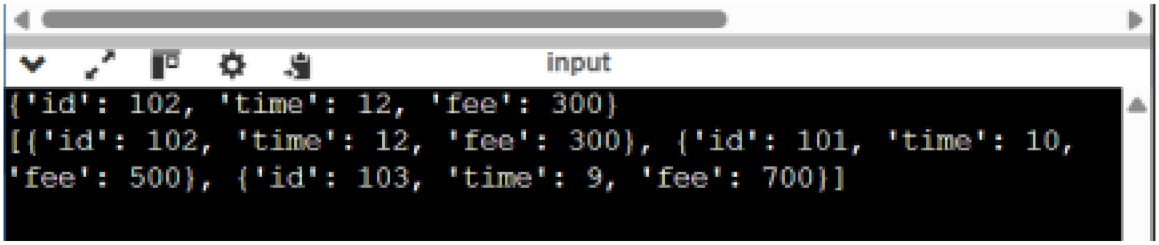
```
appointments=[
 {"id":101,"time":10,"fee":500},
 {"id":102,"time":12,"fee":300},
 {"id":103,"time":9,"fee":700}
]

def search(arr,id):
 for a in arr:
 if a["id"]==id:
 return a
sorted_data=sorted(appointments,key=lambda x:x["fee"])
```

print(search(appointments,102))
print(sorted_data)



```python
appointments=[
    {"id":101,"time":10,"fee":500},
    {"id":102,"time":12,"fee":300},
    {"id":103,"time":9,"fee":700}
]

# Linear Search
def search(arr,id):
    for a in arr:
        if a["id"]==id:
            return a
    return "Not Found"

# Sort by fee
sorted_data=sorted(appointments,key=lambda x:x["fee"])

print(search(appointments,102))
print(sorted_data)
```

OUTPUT



```
{'id': 102, 'time': 12, 'fee': 300}
[{'id': 102, 'time': 12, 'fee': 300}, {'id': 101, 'time': 10,
'fee': 500}, {'id': 103, 'time': 9, 'fee': 700}]
```

{'id': 102, 'time': 12, 'fee': 300}

EXPLANATION

Linear Search for ID, Sorting by fee using built-in-sort.

TASK 4 – RAILWAY RESERVATION SYSTEM

Search tickets and sort bookings

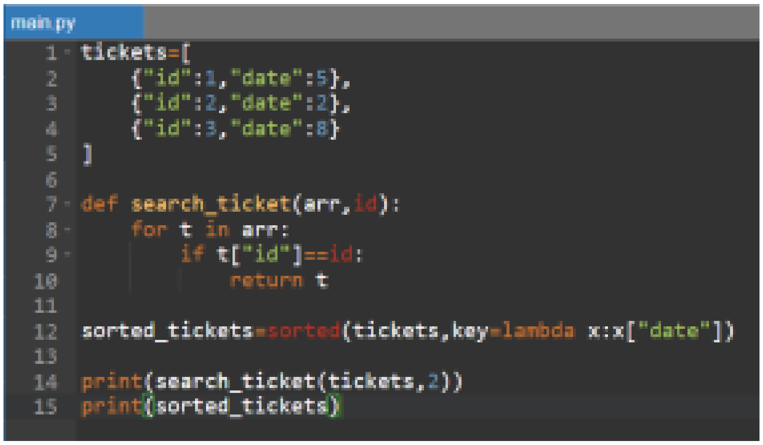
QUESTION

Search using Ticket ID and sort by date.

PROMPT

Recommend efficient algorithms.

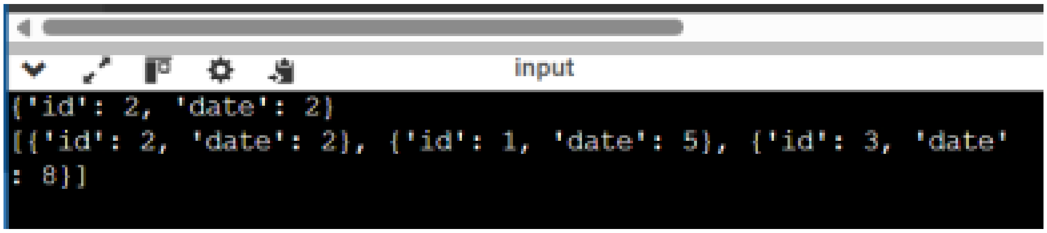
CODE



```
tickets=[
    {"id":1,"date":5},
    {"id":2,"date":2},
    {"id":3,"date":8}
]

def search_ticket(arr,id):
    for t in arr:
        if t["id"]==id:
            return t

sorted_tickets=sorted(tickets,key=lambda x:x["date"])

print(search_ticket(tickets,2))
print(sorted_tickets)
```

```
tickets=[
 {"id":1,"date":5},
 {"id":2,"date":2},
 {"id":3,"date":8}
]

def search_ticket(arr,id):
 for t in arr:
 if t["id"]==id:
 return t

sorted_tickets=sorted(tickets,key=lambda x:x["date"])

print(search_ticket(tickets,2))
print(sorted_tickets)
```

OUTPUT



```
{'id': 2, 'date': 2}
[{'id': 2, 'date': 2}, {'id': 1, 'date': 5}, {'id': 3, 'date'
: 8}]
```

{'id': 2, 'date': 2}

EXPLANATION

Efficient for small datasets using linear search

TASK 5

Hostel Allocation System

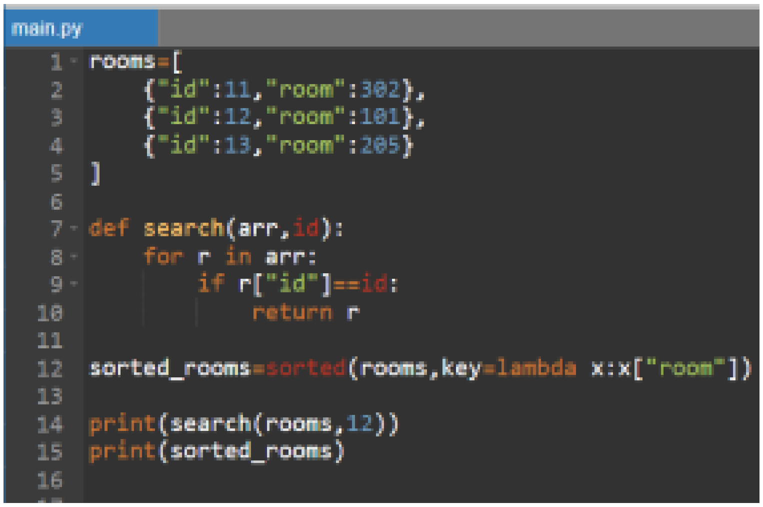
QUESTION

Search by student ID and sort by room.

PROMPT

Suggest optimized algorithms.

CODE

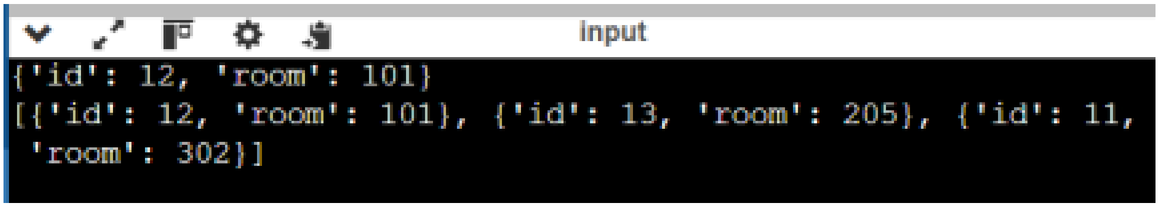


```python
rooms=[
    {"id":11,"room":302},
    {"id":12,"room":101},
    {"id":13,"room":205}
]

def search(arr,id):
    for r in arr:
        if r["id"]==id:
            return r

sorted_rooms=sorted(rooms,key=lambda x:x["room"])

print(search(rooms,12))
print(sorted_rooms)
```

```
rooms=[
 {"id":11,"room":302},
 {"id":12,"room":101},
 {"id":13,"room":205}
]

def search(arr,id):
 for r in arr:
 if r["id"]==id:
```

```
 return r

sorted_rooms=sorted(rooms,key=lambda x:x["room"])

print(search(rooms,12))
print(sorted_rooms)
```

OUTPUT



```
{'id': 12, 'room': 101}
[{'id': 12, 'room': 101}, {'id': 13, 'room': 205}, {'id': 11,
 'room': 302}]
```

{'id': 12, 'room': 101}

EXPLANATION

Simple search and sorting improves allocation visibility.

TASK 6 – MOVIE STREAMING PLATFORM

QUESTION

Search by movie ID and sort by rating.

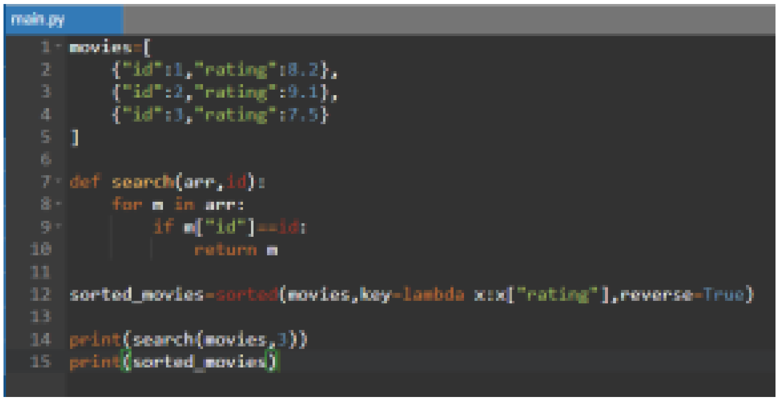
PROMPT

Recommend algorithms.

CODE

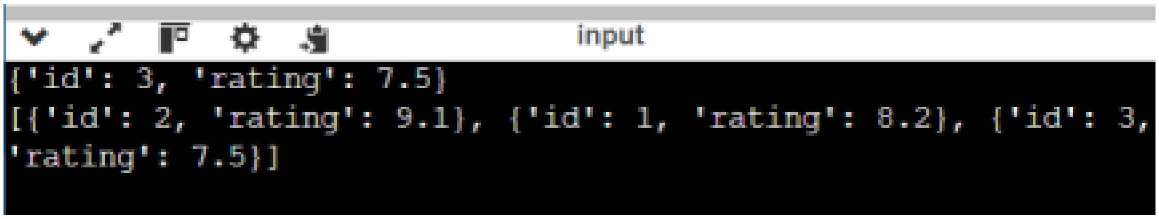
```
movies=[
 {"id":1,"rating":8.2},
 {"id":2,"rating":9.1},
 {"id":3,"rating":7.5}
]
def search(arr,id):
 for m in arr:
```

```
 if m["id"]==id:
 return m

sorted_movies=sorted(movies,key=lambda x:x["rating"],reverse=True)

print(search(movies,3))
print(sorted_movies)
```



```
movies=[
    {"id":1,"rating":8.2},
    {"id":2,"rating":9.1},
    {"id":3,"rating":7.5}
]

def search(arr,id):
    for m in arr:
        if m["id"]==id:
            return m

sorted_movies=sorted(movies,key=lambda x:x["rating"],reverse=True)

print(search(movies,3))
print(sorted_movies)
```

OUTPUT



```
{'id': 3, 'rating': 7.5}
[{'id': 2, 'rating': 9.1}, {'id': 1, 'rating': 8.2}, {'id': 3,
'rating': 7.5}]
```

{'id': 3, 'rating': 7.5}

Explanation

Sorting by rating helps recommendation engines

TASK 7 – AGRICULTURE MONITORING SYSTEM

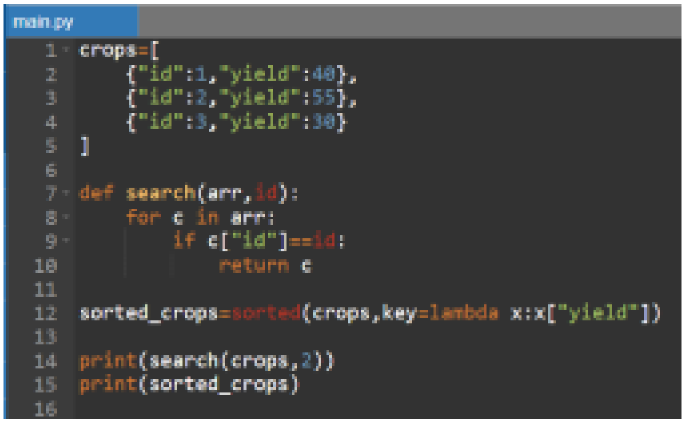
QUESTION

Search by crop ID and sort by yield.

PROMPT

Use AI reasoning.

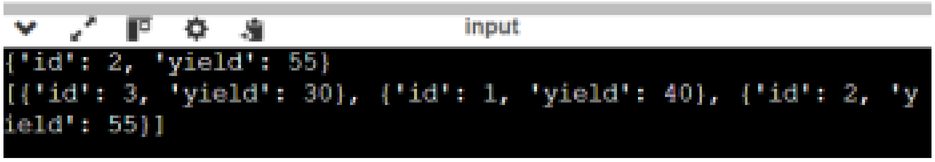
CODE



```
crops=[
    {"id":1,"yield":40},
    {"id":2,"yield":55},
    {"id":3,"yield":30}
]

def search(arr,id):
    for c in arr:
        if c["id"]==id:
            return c

sorted_crops=sorted(crops,key=lambda x:x["yield"])

print(search(crops,2))
print(sorted_crops)
```

```
crops=[
 {"id":1,"yield":40},
 {"id":2,"yield":55},
 {"id":3,"yield":30}
]

def search(arr,id):
 for c in arr:
 if c["id"]==id:
 return c

sorted_crops=sorted(crops,key=lambda x:x["yield"])

print(search(crops,2))
print(sorted_crops)
```

OUTPUT



```
{'id': 2, 'yield': 55}
[{'id': 3, 'yield': 30}, {'id': 1, 'yield': 40}, {'id': 2, 'y
ield': 55}]
```

{'id': 2, 'yield': 55}

EXPLANATION

Helps farming prioritize crop monitoring.

TASK 8 – AIRPORT FLIGHT MANAGEMENT

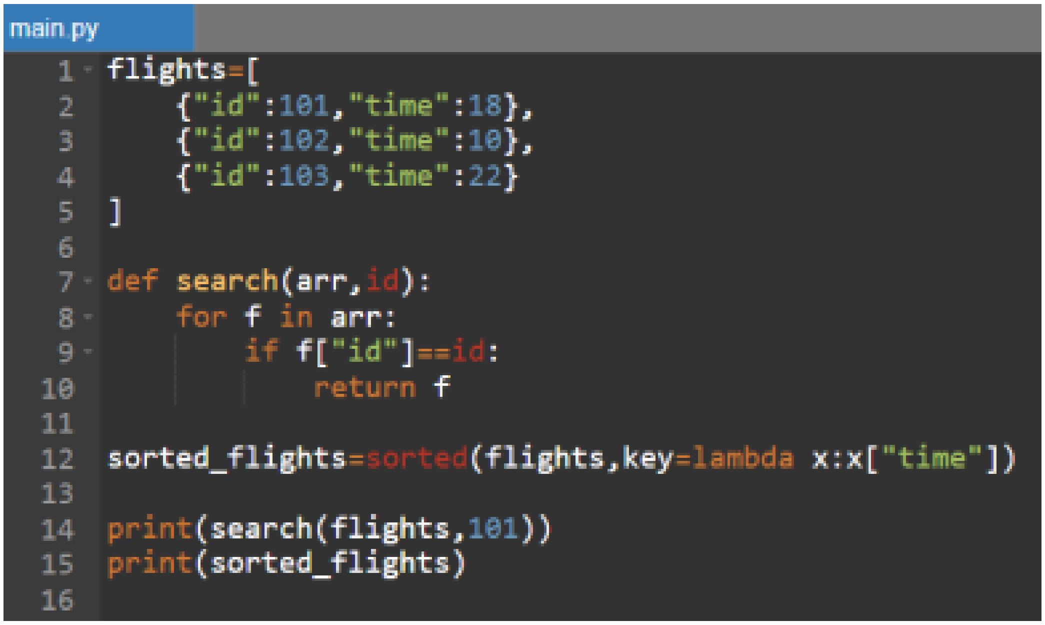
QUESTION

Search by Flight ID and sort by time.

PROMPT

Recommend algorithms.

CODE



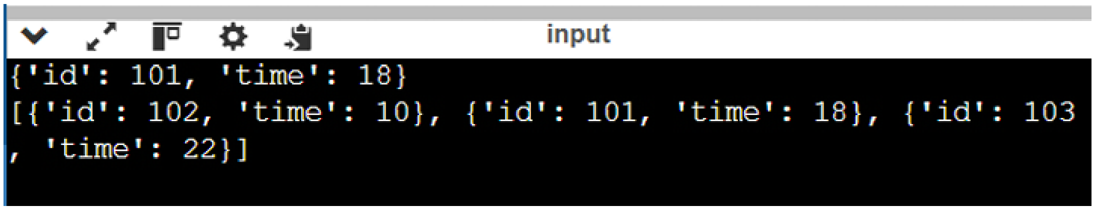
main.py

```
flights=[
    {"id":101,"time":18},
    {"id":102,"time":10},
    {"id":103,"time":22}
]

def search(arr,id):
    for f in arr:
        if f["id"]==id:
            return f

sorted_flights=sorted(flights,key=lambda x:x["time"])

print(search(flights,101))
print(sorted_flights)
```

```
flights=[
 {"id":101,"time":18},
 {"id":102,"time":10},
 {"id":103,"time":22}
]

def search(arr,id):
 for f in arr:
 if f["id"]==id:
 return f
```

```
sorted_flights=sorted(flights,key=lambda x:x["time"])

print(search(flights,101))
print(sorted_flights)
```

OUTPUT



```
{'id': 101, 'time': 18}
[{'id': 102, 'time': 10}, {'id': 101, 'time': 18}, {'id': 103
, 'time': 22}]
```

{'id': 101, 'time': 18}

EXPLANATION

Sorting improves schedule management