1 What is the role of static keyword in the context of memory management.

→

- The static keyword makes a member (method, variable) belong to the class rather than an instance.
- Static members are stored in a common memory area and shared across all instances of the class, reducing memory usage for that member.

2 Can static methods be overloaded and overridden in Java? How static variables shared across multiple instances of a class?

→

- Overloading: Static methods can be overloaded (multiple methods with the same name but different parameters)
- Overriding: Static methods cannot be overridden because they are bound at compile time (class-level, not instance-level)

Static variables are stored in class memory, meaning all instances of the class share the same copy of the static variable

3 What is the significances of the final keyword in java?

→

final variable: value cannot be changed after initialization.

final method: cannot be overridden by subclasses.

final class: cannot be subclassed

4 What are narrowing and widening conversion in java?

→

- Widening: Implicit conversion from a smaller data type to a larger one (eg int to double)
- Narrowing: Explicit conversion from a larger data type to a smaller one, potentially causing data loss (eg double to int)

5 Provide examples of narrowing and widening conversions between primitive data types.

→

- Widening:

```
int x = 5;
double y = x;
```

- Narrowing:

```
double d = 9.8;
int i = (int) d;
```

6 How does Java handle potential loss of precision during narrowing conversions?

→

- Java requires explicit casting for narrowing conversions to make the programmer aware of the potential loss of precision.
- The extra fractional part is truncated (not rounded)

7 Explain the concept of automatic widening conversion in Java.

→

Java requires explicit casting for narrowing conversions to make the programmer aware of the potential loss of precision. The extra fractional part is truncated

- Widening conversions happen automatically when assigning a smaller data type to a larger one (e.g int to long, float to double).
- Java handle this without explicit casting.

8 What are the implications of narrowing and widening conversions on type compatibility and data loss?

→

- Widening : Safe and compatible, no data loss.
- Narrow : May lead to data loss and requires explicit casting due to potential loss of information