1. what is c language?

c is a general-purpose, procedural programming language that was created in the early 1970s by Dennis Ritchie at Bell labs.

Key features of c:-

* fast and effecient - great for system-level programming.
* low-level access to memory - allows working directely with hardware.
* simple and powerful - easy to learn the basic but capable of building complex systems.

Common uses of c:-

* operating system (eg. major parts of windows, Linux, unix.
* Embedded system (microcontrollers, IOT devices)
* compilers and interpreters.

2. Applications of c programming.

* operating systems: used to write kernels, OS utilities and low system components.
* Embedded systems: perfect for microcontrollers, IOT low memory footprint and hardware access.
* system software: creation of devices drivers, firmware, and system utilities.
* compilers & interpreters: many compilers (like GCC) and interpreters are written in c.
* High performance databases such as mysql are implemented in c.

3. what is a variable?

* A variable is a symbol used to store or represent a value that can change.

e.g.:-

* in math:-

  $x+2=5$ - here x is a variable.

* in programming:-

  python.

  age = 25 - (Here Age is a variable that stores the number 25)

→ short notation for a variable.

sometimes variables are written in short form like letters, especially in math or formulas.

* x, y, t - general unknown values.
* T - time.
* v - velocity.
* n - count
* i, j, k - counters in loops (programming)

4 what are different data types in programming.

1. primary (basic) Data types:-

int

* used for whole numbers (integers)
* e.g. int age = 20;

float

* stores single-precision decimal numbers
* e.g. float price = 10.5;

double:-

* stores double-precision decimal numbers (more accurate than float)
* e.g. double Pi = 3.141592;

char:-

* stores a single character.
* e.g. char grade = 'A';

2. Derived Data types:-

array

* collection of same-type elements stored in sequences.
* e.g. int a[5];

Pointer

* stores memory address of another variable.
* e.g. int *p;

function.

* Block of code that performance a task.
* e.g. int sum (int a, int b);

structure:-

* combines of different data types into one unit.

e.g. c

```
struct student { int id; char name[20]; };
```

union:-

* similar to structure but shares the same memory for

e.g.

```
union data { int x; float y; };
```

3. void type:-

void.

* means "no value" or "empty type"
* used for functions that return nothing.
* example: void display();

5. what is format specifiers?

A format specifiers in C is a symbol used inside printf() or scanf() functions to tell the compilers what type of data being printed or read.

common format specifiers in C.

Data type	format specifier	example.
int	%d or %i	printf("%d", a);
float	%f	printf("%f", b);
double	%lf	printf("%lf", c);
char	%c	printf("%c", ch);
string (char array)	%s	printf("%s", name);
unsigned int	%u	printf("%u", x);
hex value	%x or %X	printf("%x", num);
octal value	%o	printf("%o", num);
address (pointer)	%p	printf("%p", ptr);

example:-

```
int a = 10;
float b = 5.5;
char c = 'A';
printf("a = %d, b = %f, c = %c", a, b, c);
```