ICP

1ST SEMESTER

ABSTRACT

ICP is very abstract level and helpful for computer science students. All basic programing rules and regulation are define and code in C++ language is use to explain the example I dedicate this book to myself because becoming an Engineer is not easy task. Special thanks to my parents and teacher.

Junaid Saturday, 09

INTRODUCTION TO COMPUTER PROGRAMMING

Copyright

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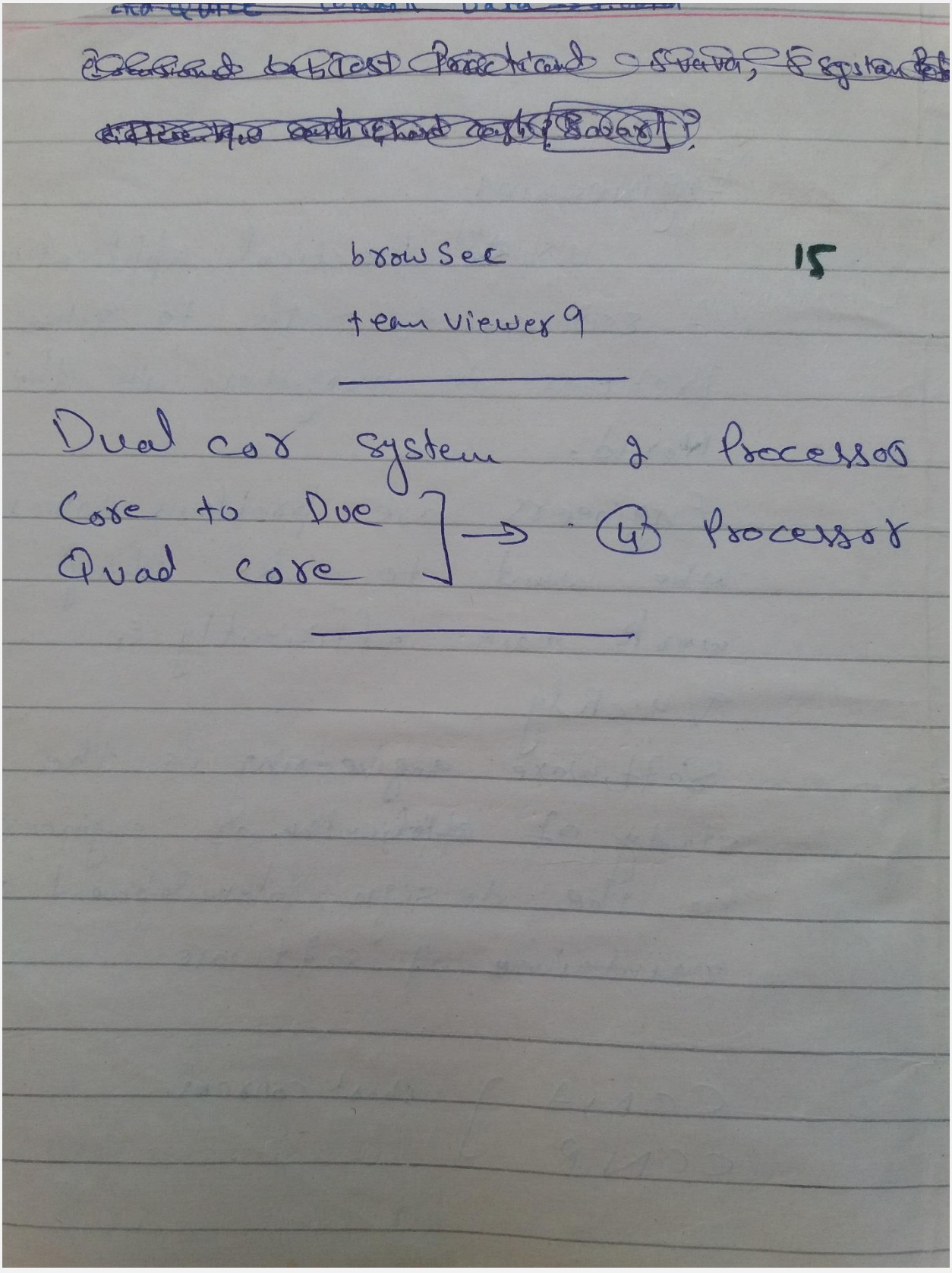
Comsats Sahiwal. 14

Engineering is a practical application of science & math to solve problems in everywhere in the world.

Engineers are problems solvers who want to make things work more efficiently & quickly.

Software engineering is the study of application of engineering to the design, development & maintaince of software.

CCNA
CCNP
} short courses.



browSec 15

team Viewer 9

Dual cor system → 2 Processor

Core to Duo

Quad core → 4 Processor

Collection of Program is Software. 16

Computer is an electronic device that process data into meaningful information

Data :- Raw fact & figures are called data.

Information is meaning ful form of data. is called information.

Integrated circuit (IC) :- An integrated circuit consists of thousands of transistors & other electronic components on a single crystal.

Input & output / input device & output device.

set Refers to a collection of related entries.

Programing :- A set of instructions that tells the computer what to do

Algorithm :- Step by step to solve a Problem.

$A = \pi r^2$ & $C = 2\pi r$

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1- Start.
2- input A] input / Data
3- Input B]
4- Sum = A+B] Processing
5- Display sum] output / information.
6- End.

Logic Design دماغ میں کوئی بھی ترکیب بنانا

Problem statement. means to find & explain them مسئلہ کو Problem بنانے کو کہا جاتا ہے Pro. stat ۔ ہے

1- System Unit. consist of different component that work together on data according to instructions. (RAM, CPU)
2- Mother Board or System Board.
3- RAM → Radom Access memory, Temp, voltial, Direct & Main Primary memory, R/W
4- ROM → Permanent memory, Hard disck.
non-voltial, Read only memory.

Types of RAM
SRAM → static RAM
DRAM → Dynamic RAM
Page # 40
→ D-RAM's are cheapies & lower

Types of ROM
PROM
EPROM
EEPROM (Electrically Erasable Programmable ROM)
Page # 41

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⇒ TFT (LCD) thin Film Transistor.

⇒ Five Phase to develop a Software.

① Logic Design ② Algorithm ③ cording ④ Testing ⑤ Final Documentation.

⇒ 1- Start	1- Start	1 - Start
2- Input r	2- Input r	2 - Input A
3- A = πr^2	3- C = $2\pi r$	3 - Input B
4- C = $2\pi r$	4- Display C	4 - Input C
5 - Display A	5- End.	5 - D = A * B
6 - Display C		6 - E = D/C
7 - End		7 - Disply D
		8 - Disply E
		9 - End

⇒ Pro. statement [illegible] Problem Statement [illegible] information [illegible]

⇒ C Language → class → objects.

C ++ Lasted virsion.

⇒ 1 bit Binary digit (0 and 1)

1 bit	Binary digit (0 and 1)
8 bits	1 Byte
1024 bites	1 Kb
1024 Kb	1 Mb
1024 Mb	1 Gb
1024 Gb	1 Tb
1024 Tb	1 Petab
1024 Pb	1 Exab
1024 Eb	1 Zettab
1024 Zb	1 Yotab
1024 Yb	1 Brontob

(Page #63)

PEZY | B

$a \propto b$ & $a \propto \frac{1}{a}$ 19

Problems Statements & No. of steps in Algorithm

=> Serial ports & Parallel Ports (Page # 46)

=> Main parts of CPU (or) unit.
ALU & C.U (Page #(35)

=> Register. (Page # 38)

=> cash Memory (Page # 42)

=> No. System & Types of Data.

Types of Data.

① Numeric Data :- consists of Numeric digits from 0 to 9 - it may be +ve or -ve digits. 10, -12, -32.5 etc
it may also contain decimal point.

② Alphabetic Data.
it consists of Alphabetic from A to Z in both cases uper case & Lower case. It also contain Blank space.
A -> Z & a -> z + M USMAN ↑ space.

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(3) Alphanumeric Data.
consits of special symbols & combination of Alphabetic & Numeric data.

(4) Image Data. → consits of chart, Graphs, Pics
(5) Audia Data. Sound is a representation of audio. Audio data consits of music, speech or any type of audia.
(6) Video:- Video is a set of full-motion images played at high speed. Video is used to display actions & movements. → 3D

Book #38

No. System.

(1) Binary No. Sys (0,1) Base 2
(2) Octal No. Sys (0,7) " 8
(3) Decimal No. Sys (0,9) " 10
(4) Hexadecimal No. Sys. (0-9, A, B, C, D, E, F) " 16

=> Frount End & Back End.

Coding Schemes which show the Binary Code.

Data Representation

Coding Scheem 21

① BCD code. (Binary coded Decimal) code

⇒ it is 4 bit binary code.

⇒ Each Decimals digits represents 4 bit binary code.

⇒ Use in early computers.

0000 → 0 0011 → 3 0110 → 6

0001 → 1 0100 → 4 0111 → 7

0010 → 2 0101 → 5 1000 → 8

1001 → 9.

8 bits = 1 byte (256 charaters.)

② ASCII code (American standard code for Information Interchange) code

→ Published by ANSI (American National Standard Institute). 1968

→ It is 7 bit binary code.

→ It is represents 128 characters.

→ Use in Personal Computers.

0 - 31 Blank space.

32 - Space bar

33 - 64 Blank space.

65 - 90 A → Z

91 - 96 Blank space

97 - 122 (a → z)
123 - 126 Bank Space
127 Delete.

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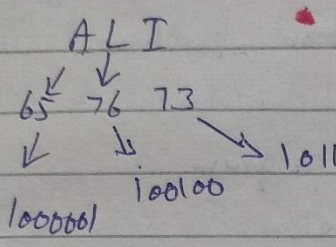

③ EBCDIC → (Extended Binary coded Decimal Interchange code)
(0 - 255)

→ Replace by ASCII
→ It is 8 bit binary code.
→ It is Represents 256 characters.
→ use in Mainframe computers.

④ Uni Code.
→ It is 16 bit binary code.
→ Represents (256 * 256) or 65536 characters.
→ use in All world Languages.

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Program Development Process. (PDP)

(1) Analyzing & Defining the problems.
(2) Designing an Algorithm.
(3) Coding (OR) writing the program.
(4) Testing
(5) Final Documentation.

=> Programming Languages.

A sets of words, symbols & codes use to write a programs is called programming Lanuage.
Two types of Lanuage.
(1) Low level Lanuage.
(2) Higher level Lanuage.

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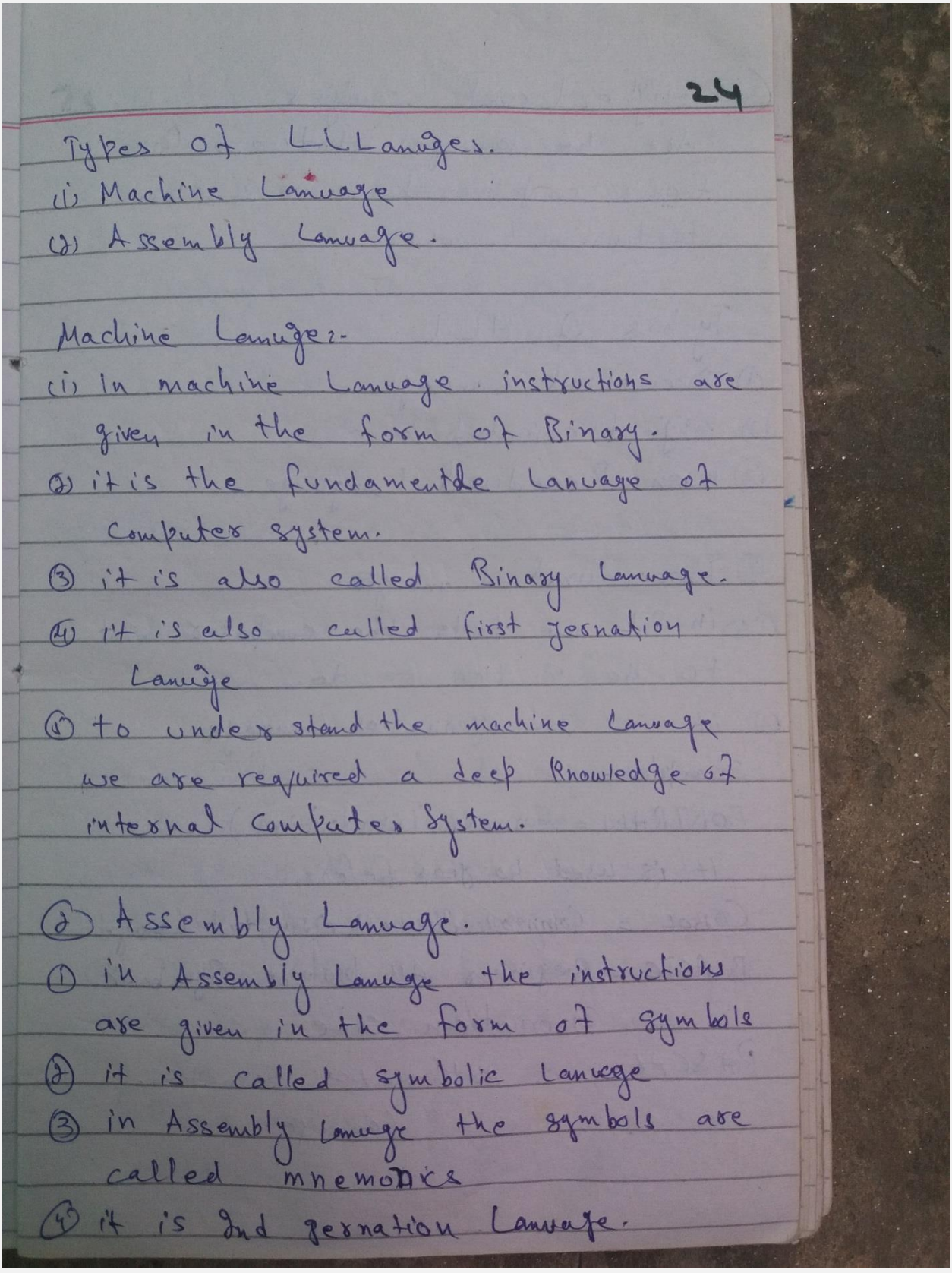
(1) Low Level Lanuge: LLL are the languages that are close to Computer hard ware & far from Human language.



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Types of LL Languages.

(1) Machine Language
(2) Assembly Language.

Machine Language:-

(1) In machine Language instructions are given in the form of Binary.
(2) it is the fundamentle Language of Computer system.
(3) it is also called Binary Language.
(4) it is also called first gernation Lanuge
(5) to understand the machine Language we are required a deep Knowledge of internal Computer System.

(2) Assembly Language.

(1) in Assembly Lanuge the instructions are given in the form of symbols
(2) it is called symbolic Lanuege
(3) in Assembly Lanuge the symbols are called mnemonics
(4) it is 2nd gernation Lanuage.

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(2) Higher Level Languages.

Are the languages that are far from computer hardware & close to Human Language.

Types of HLL.

1. Procedural Language.
2. object oriented "
3. Non-Procedural Language.

(1) Procedural Language.

(1) => in P.L we tells the computer what to do & How to do.

(2) it is 3rd gernation Language

Examples.

FORTRAN = Formula Translation)
it is used 40 year before.

COBOL = Common Business Oriented Lanuge

BASIC = Beginner All purpose Symbolic Intruction code.

PASCAL = is Mathematics Saiencetics. Lanuage.

(2) Object Oriented Lanuage.

in OOL we write Programs on the basic of object.

Object is a Entity that represents Person, Place, or any things.

class
↳ objects.
↳ Properties
→ funtions.

Example · C++, JAVA (GUI) Graphical user interfarance window.

Back End → C++

Frount End → JAVA.

(3) Non-Procedural. Lanuage.

in NPL we tells the compators what to do But Not How to do.

it is 4th geonation Lanuage.

Ex. SQL (Structured Query Lanuage) it is used in DBMS (Data Base management System)

RPG → Reboot Program Geonater used in Business Reports.

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Natural Programing Lanuage

① Used in Experimental Phases.
② it is 5th gernation Lanuge.
③ it is more complex Lanuge.
④ it is Artifical Intellgence AI

⇒ Types of codes.

(1) Source code.
(2) Object code.

(1) Source code (OR) Source Program:-

Source code is the code that is written in H.L.L, is called a source code. is also known as source Program. it is not under stand by computer.

(2) Object code:-

Object code A code that is written in low Level language is called object code or object Program.

Language Processor or Translater: 28

Translaters is the software that converts the instructions of the other languages into machine language Each computer language has its own translaters.

⇒ Types of Translater.

(i) Compiler
(ii) Assembler
(iii) Interpreter.

→ Page 98

(i) Compiler converts the instructions of H.L.L into machine language.

H.L.Ls → [compiler] → machine language.

(2) Assembler:- Converts the instruction of Assembly language into machine language.

Assembly Language [Assembler] → Machine language.

mnemonics are converted

(3) Interpreter:- Converts the instruction of H.L.L into machine language.

H.L.L [interpreter] → Machine Language.

The Advantage of interpreter over compilers is that errors is found immediately. So the programer can correct errors during Program development.

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=> Hard ware :- Physical components of Computer is Hard ware,

=> Soft ware :- Program is also called software.

=> Types of software → Page: 87

(1) System Software

- Operating System
- Utity Program
- Device Drivers.

System Software is the collection of programs that is used to manage & Control the actual operation of computer Hardware.

(i) Operating System :-
is the collection of Programs that is used to manage the computer components window, Dos, Unix Linux,
(C, D, E) drives
c is operating sys

Application Software.

=> it is include when an application is installed on our computer. also known Application Package.

Data base software :
- (oracle)
- (MS Access)

spread sheet software
- MS Excel

(2) Graphic software
- coreldraw & Adobe photoshop.

Utity Programs :- are use for specific task. it is also used to solve the common problems of Hardware & software.

antivirus is Utity Program

(3)

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Device Driver:- is used when a device is attach to computer system.

Ex- Printer, Scaner.

⇒ Flow chart.

Graphically representation of Algorithm is called flow chart.

Symbols.

1 oval — oval for start / End.

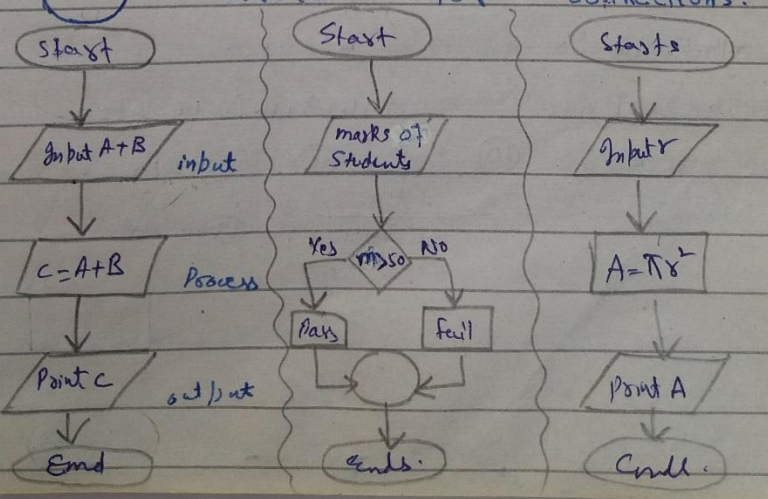
2 Parallelogram — Parallelogram for input / output.

3 Rectangle — Rectangle for Process.

4 Diamond — Diamond for selection / condition.

5 — flow lines for Direction.

6 — circle for connections.



Four Types of Data types.

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⇒ Data Types is for taking input

1 bytes = 8 bits. = 256 characters.

1- Integer data type:-

(a) int take 4 bytes → (+ve, -ve)

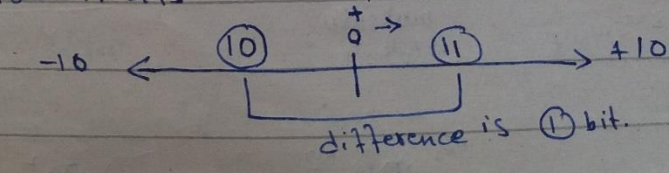
(b) Short // 2 // → (+ve, -ve)

(c) long // 4 // → (+ve, -ve)

(d) Unsigned int // 4 // → (only +ve)

(e) Unsigned long // 4 // → (only +ve)

Signed D. Type (+ve, -ve)	Un-Signed D-Type (only +ve)
1 byte $= 2^7 = 128$ bits	1 byte $= 2^8 = 256$ bits
2 byte $= 2^{15} = 32768$ bits	2 byte $= 2^{16} = 65536$ bits
3 byte $= 2^{23} = 8388608$ bits	3 byte $= 2^{24} = 16777216$ bits
4 byte $= 2^{31} = 2147483648$ bits	4 byte $= 2^{32} = 4294967296$ bits
Range	Range
+2147483648 to	0 to
-2147483647 bits.	+4294967296 bits



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(2) Real Data Type.

(a) Float → 4 bytes (+ve, -ve)
(b) double → 8 bytes (+ve, -ve)
(c) long // → 10 bytes (+ve, -ve)

value in points

Signed data type.

(3) Character data type.

1 byte → char

Use by ASCII coding scheem

follow char data type.

1 Byte → 2^7 → 128 (charters) → 0 – 127

(4) Booleam Data type.

1 bits → bool (0,1) use for comparision true / fasle

Bool is Signed Data Type.

Variable or Indentifier:-

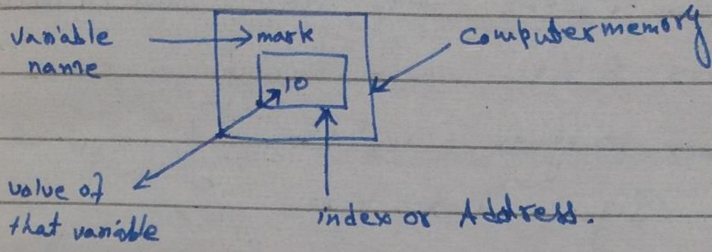
variable or Indentifier is the named memory location (or) cell.

For example → Input A

Input B

A & B are two variables or Identifier

& the purpose is to store the value.



=> Types of variables

(i) Standard variable

(۱) ان کا مقصد ہے جو بھی ہے تو

(±ve) integer ہے یہ مقصد کا int

Input A -> Cin -> for input

Input B -> cout -> for output

(2) User defined variables.

User defined variables are those variables which are defined by user. eg -> A, B, C, age etc.

e.g. Total No of key words is 32

auto, return, signed
break, short, unsigned
case, else, static
char, do, while
for, double, void
if, int, union, long

=> Key word (or) Reserve word.

(i) Predefined set of instruction

(2) Built in-Key words.

Bool, cout, cin شامل ہے define پہلے سے C++ نے

char اور یہ Built in ہے۔

Keywords is a word in C++ Lanuage that has a predefined meaning & Purpose. The purpose & meaning in define by the developer of Lanuge. it cannot be changed or refine by the user.

جب user سے ہم value لیتے ہیں

Declaring the variable. کسی چیز کو بیان کرنا 34

variable کو C++ میں کس طرح سے لکھتے ہیں۔

Syntax:-

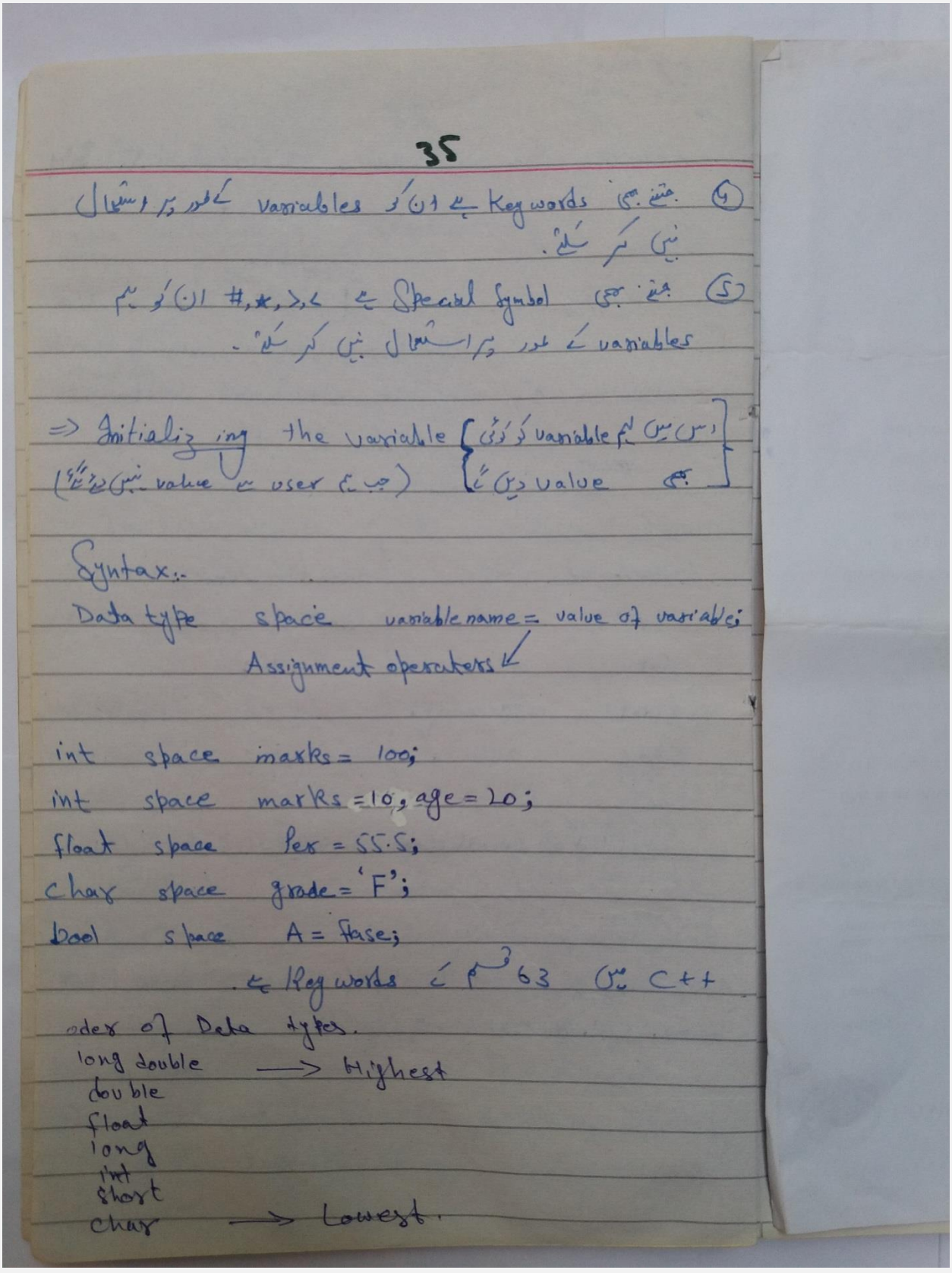
Syntax is the rule which help to understanding. These rules govern the way in which instruction of programs structured. Statements will not be executed if they are not correctly written/formulated.

Data type	space	variable name ;
int	space	marks;
int	space	marks, age;
Float	Percentag;	
Char	grade;	
bool	A;	

Data Type کو ہمیشہ small cap میں لکھا جاتا ہے۔

=> **Rule for writing variables.**

① variable جو بھی ہو اُس کا پہلا لفظ character (A→Z / a→z)
! system کی فارم میں ہو۔ 9mint X, 2KgX, Ⓐliv, #AX
② variable کے درمیان space نہیں ہونی چاہیے۔
③ variables کو دونوں small/capital/caps میں لکھ سکتے ہیں۔



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④ یعنی ہم Keywords کو variables کے طور پر استعمال نہیں کر سکتے۔

⑤ یعنی ہم Special Symbol جیسے #, *, >, < کو variables کے طور پر استعمال نہیں کر سکتے۔

=> Initializing the variable [variable کو value دینا] (جب user value نہیں دیتا)

Syntax:-

Data type space variable name = value of variable;

Assignment operaters

int space marks = 100;

int space marks = 10, age = 20;

float space per = 55.5;

char space grade = 'F';

bool space A = false;

Keywords کی تعداد C++ میں 63 ہے۔

order of Data types.

long double → Highest

double

float

long

int

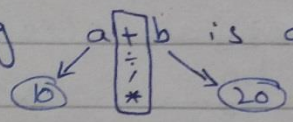
short

char → Lowest.

Expression:- Returns a single value. 36

→ Combination of operators & operands.

→ eg a + b is an expression.



+, -, /, * are operaters.

a & b are operands.

10 + 20 = 30 it return a single value.

Operands are also called variables.

Operators

There are two types of operators.

1- Uniary operators (one operand)

2- Binary operators (two Operand)

Examples:-

Uniary operators.

a++, b--, ++b, a+, a-

Binary operantors

a+b, a-b, a*, a/b

1- Arithmatic operators.

+ for addition

- for sobtration

/ for division

* for Multiplication

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% for Reminder, Modolas opertors.

10 % 5 N % D

$$5 \overline{)10}\ ^{2}_{10}\ \underline{10}\ 0$$ ✓

→ Reminder = 0

5 % 10

$$10 \overline{)5}\ ^{0}_{0}\ \underline{0}\ 5$$

→ Reminder = 5

if a = 10, b = 5

Arthmatic	operators	N / D
a + b	15	
a - b	5	
a x b	50	
a / b	2	
a % b	0	

2 - Conditional operators. OR ← CRCS

Relational operators OR

Selection operators OR

Comparision operators

in C++	Mathematics.
>	>
<	<
>=	≥
<=	≤
==	=

in C++	Mathematics
!=	≠

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It may be uniary & Binary

Uniary	Binary
a > 50	b > N
b < 100	b < P
C >= 200	C >= Q
D <= 20	D <= R
2 == 2	Z == S
M != 10	M != T

10 > 10 Not Uniary & Not Binary.

3- Increment operators. Symbol (++) اضافہ کرتا

Increment operators are used to increase the value of variables by (1)

جب ہم initializated کرتے ہیں تو ان میں اضافہ ہوتا ہے۔

Syntax

VariableName ++; oR ++ Variable Name;

eg a++; Post Fix ++a; Post fix

4- Decrement Operators. Symbol (--) کم کرتا ہے۔

Decrement operators are used to decrease the value of variable by (1)

Syntax

VariableName --; a--; Post

--Variable Name; Prefix 39

--a;

a = 0 then a = -1

Two forms of increment & decrement operators.

1. Prefix ++Variable Name; ⇒ ++a;
2. Post Fix Variable Name++; ⇒ a++;

if int a = 20; Then

++a; a = 21 → No difference

a++; a = 21

But if int a = 20;

a++; a = 21

++a; a = 22

a++; a = 23

++a; a = 24

operand.

int a = 10;

a = = 10;

a = ++b;

operand ↓ increment operators

Assignment operators

Two steps to solve the expression

if a=? & b=3 (in Prefix)

a=++b;

① ++b; b=4

② a=b; a=4

if a=? & b=3 (in Post fix)

① a=b; a=3 a=b++;

b++; b=4

5- Compound Assignment operators.

is the combination of Arithmatic operators + Assignment operators.

Syntax

Variable Name	Arithmatic operators	Assignment operators	Value;
a	+	=	20;

if int a=40;

First Method.

a+=20; → a=60

a-=20; → a=20

a*=20; → a=800

a/=20; → a=2

a%=20; → a=0

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2nd Method. if int a = 40;

a = a + 20; (40 + 20) a = 60

a = a - 20; (40 - 20) a = 20

a = a * 20; (40 * 20) a = 800

a = a % 20; a = 0

6- Operators Precedence. → پیش روی

(1) ( ) Rule

(2) / & * (P)(E)(M D)(A S)

(3) + & -

جب ہم پروگرام لکھتے ہیں تو اس کی تین Terms ہے۔

Terms.

Compiling (Source code → object code)

Linking (object code + Liabary file / Header files)

Executing (object code + Liabary file → Load in RAM)

Cint, Cout are Liabary files

رابطہ قائم کرنا / Communicate / دوران — ترقی اپنانا — ماحول

⇒ IDE → Integrated Development Environment

eg MicroSoft visual studio 2010 Express Edition is IDE

سرین کو IDE کہتے ہیں جس جگہ MSVS2010EE نظر آتا ہے ۔

=> Out Put Using [cout] -> Keyword 42

Robert Lafore is best book ↵

Cout << "Robert Lafore is best book";
→ console out put → String constant

(Console window) C++ میں out put پر جو سکرین یا window نظر آتی ہے وہ
یا سکرین کہتے ہیں۔

<< Insertion operators (OR) "Put to" operators

String is the combination of Multipuls charaters

Constant => quatity which cannot change.

eg
```
cout << "Dateof birth # is 05-09-1990";
cout << 2000;
cout << "a 2000";
```

Program output Every Lanuage has its own age

Head file, Liabary file, Built in file.

```
#include <iostream>
Using name space std;
Voild main ( )
{
```

#include <iostream> → Preprocessor Directive.

Keywords.

Body of Function → {

Preprocessor directive is an instruction given to compiler before the exectution of actual Program.

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```
cout << "Every Lanuage has its own age";
Cin.get( );
}
```

↙ Body of function.

⇒ #include <math.h> & #include <graphic.h>

⇒ main (name of function) is Keyword. or build in Funtion.

سب سے Compiler ← main function کو

جائے گا اور پہلی دو لائنز کو چھوڑ دے گا۔ بریکٹ کے ذریعے اگلے سٹیپ میں داخل ہو گا۔

پھر cout کو دیکھے گا اور پھر cout << "Every Lanuage has its own age";

کو show کرے گا اور cin.get(); ← output کو سکرین پر show

دکھے گی۔

Compiler ← White space کو ignore کر دے گا۔

iostream ⟶ flow of data.
↳ output
↳ input

White space is the blank space.

iostream اور using namespace std; یہ دونوں Compiler سے Request

کرنے کے لیے استعمال ہوتے ہیں کہ ہمیں ہدایت کرنا

instructs the preprocessor to include a section of standard C++ code, know as a header iostream, that allows to perform standard input & output operations.

The extension of Header file is (.h)

Header files are the collection of standard liabrary function to perform different tasks.

There are many header file for dif purposes

Comment => Two types of comments. 44

(1) Single line Comment. جب Comment ایک لائن کا ہو۔

(2) Muti-line comment. جب Comment ایک سے زیادہ لائن کا ہو۔

(i) Single line Comment.

use two Forward slash //

e.g. ≡ {A=3.14*r*r; // This is formula for Aeara= $A=\pi r^2$

Compiler always ignore the comment & didnot store it

(ii) Muti-line comment. use as /* ≡ */

e.g. ≡ {A=3.14*r*r; /* This is formula for Aear i.e. $A=\pi r^2$ of a circle*/

Program

```
#include<iostream>
using namespace std;
void main()
{int a,b,c;   2nd way int a=10, b=5, c;
cout<<"Enter the 1st value";
cin>>a;
cout<<"Enter the 2nd value";
cin>>b;
c=a*b;
cout<<"Result of multiplication"<<c;
cinget();}
```

Put to operater insertion

Extraction/ Get from operaters

45

2nd way.

```
cout << "Result of Multiplication";
cout << c;
cin.get();
}
```

=> Errors in Programs / Types of Errors in Program.

Three types of error maybe in a Program.

① Syntax ② Logical ③ run time error / Bug

Bug یعنی (An error in a Program)

run time error وہ ہوتا ہے جس میں data type کے مطابق data نہ ہو۔

=> Logical error is the most difficult to find.

=> Finding & removing errors is called Debugging.

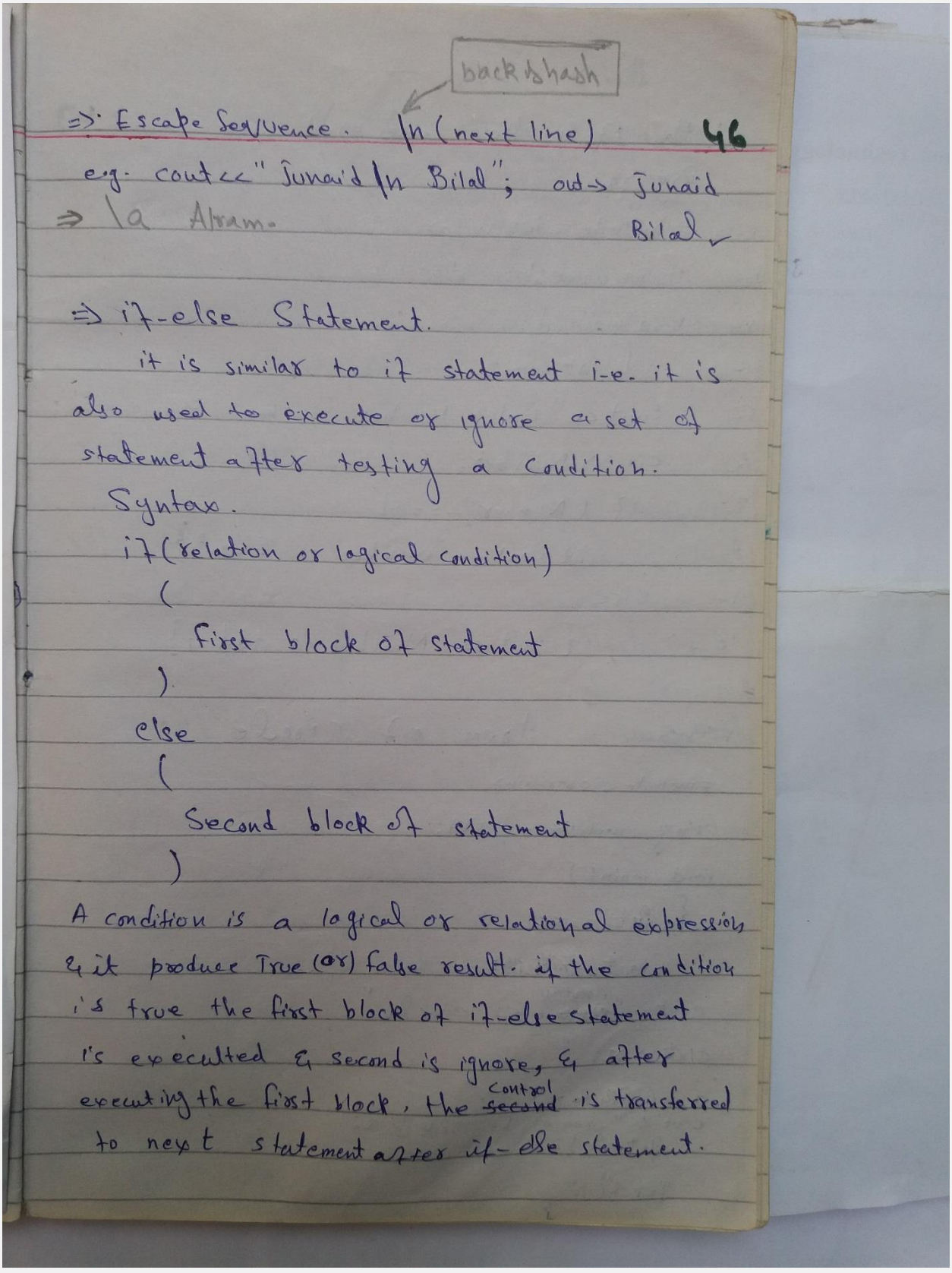
=> Manipulators (خوش اسلوبی سے استعمال کرنا) in C++

endl -> is a keyword. & used for ending the line. & meaning is End of Line.

an othe manipulator is setw

```
cout << "Junaid Bilal";        out -> Junaid Bilal
cout << "Junaid" << endl << "Bilal";   out -> Junaid
                                          Bilal
```

endl کو cout اور cin میں استعمال کرتے ہیں۔



backslash

=> Escape Sequence. \n (next line) 46

e.g. cout<<" Junaid \n Bilal"; out-> Junaid
Bilal

=> \a Alram.

=> if-else Statement.

it is similar to if statement i-e. it is also used to execute or ignore a set of statement after testing a condition.

Syntax.

```
if(relation or logical condition)
  (
    first block of statement
  )
else
  (
    Second block of statement
  )
```

A condition is a logical or relational expression & it produce True (or) false result. if the condition is true the first block of if-else statement is executed & second is ignore, & after executing the first block, the ~~second~~ control is transferred to next statement after if-else statement.

both if & else are used for result. 47

Program.

```
1-  #include <iostream>
2-  using namespace std;
3-  Void main()
4-      { int num;
5-  cout<<" Enter Number to check Even or odd";
6-  cin >> Number;
7-      if (Number%2==0)
8-          {cout << "Number is Even";}
9-  else
10-         {cout<<" Number is odd";}
11-     }
```

Program Area of circle.

```
#include<iostream>
Using namespace std;
Void main()
  { float a, r;
    float Pi=3.14;
cout<<"Enter the radius of circle"
cint>>r;
a=(Pi * r * r);
cout<<" area of the circle"<<a;
   getch();
   getch();  }
```

=> Control Statements.

→ The flow of control jumps from one part of the program to another, depending on calculation performed in the program. The program / statements that causes such jumps are called control statements.

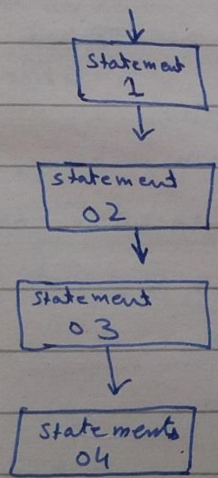
[illegible] statements ہے

There are 4 types of Control Statements.

① Sequence Statement
② Selection Statements
③ Iteration Statements.
④ Funtion Call.

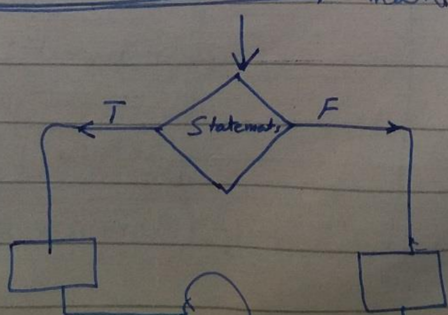
① Sequence Statement:-

In Sequence Statements instructions / Statements are executed on the basic of Sequence / oder.



② Selection Statements.

In Selection Statements Instruction / Statements are executed on the basic of dision / Selection OR Condition.
It is also know dision making statement.



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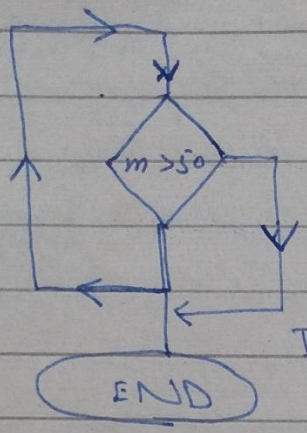
(3) Interation / Loop / Repeated.



out Put
C++
C++
C++
C++
C++

In Interation or Loop or Repeated Statement instration / statements are executed on the basic of repetition. Repetition is continues while a condition is true. Three types of loop (1) For loop (2) The while loop (3) The do loop

(4) Funtion - Call.

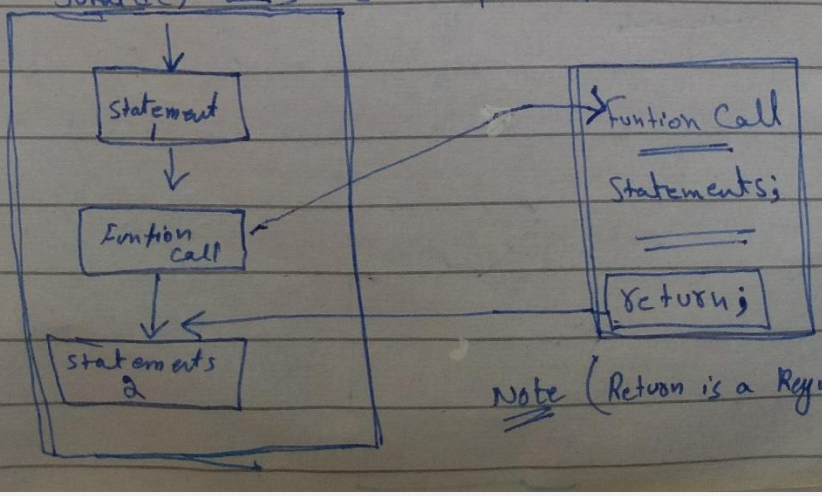
There are two types of funtion Call.

① Stantard funtion ② user define Funtion.

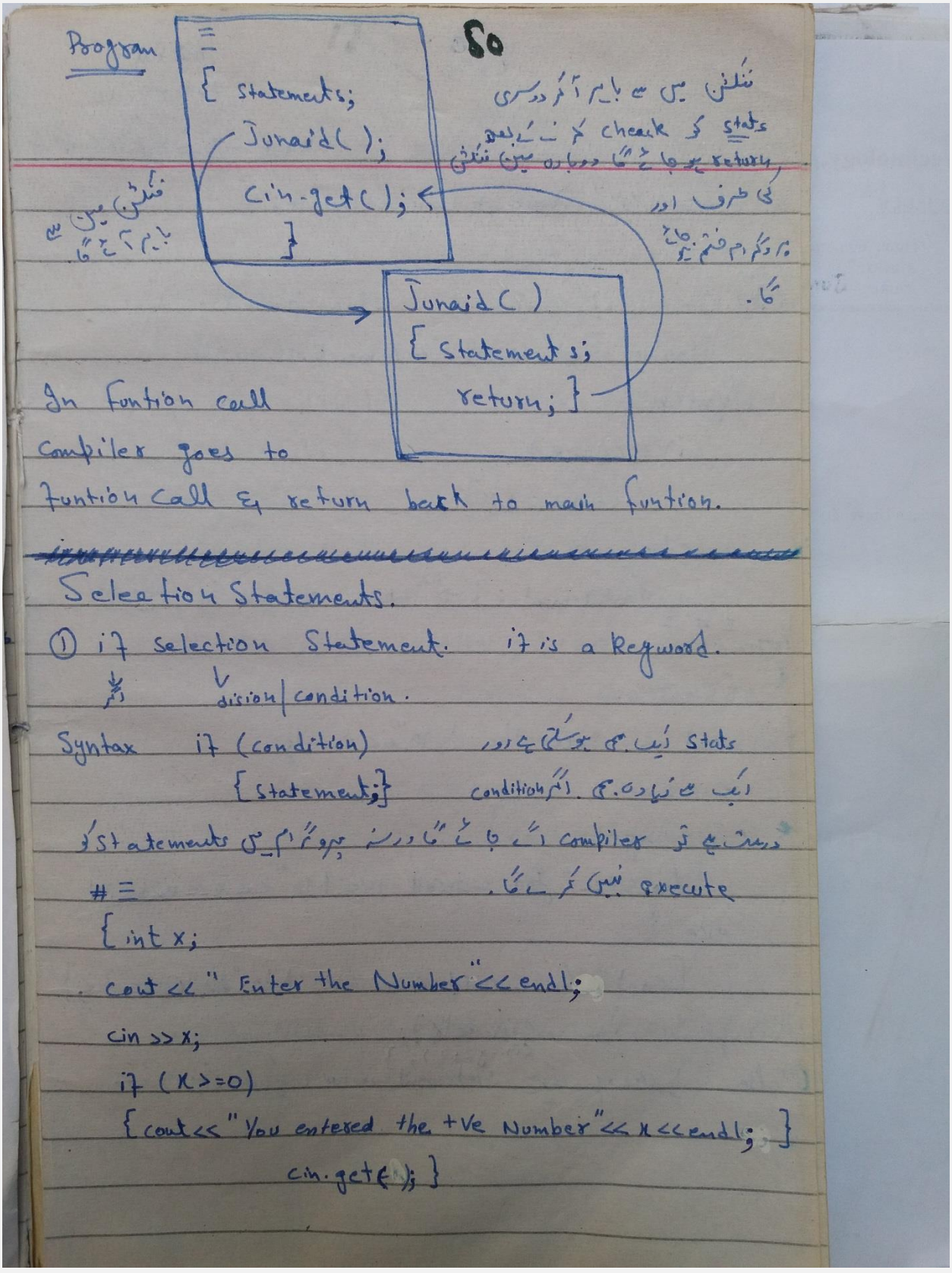
Bulit in ہے جو کہ Compiler / C++ کے ساتھ آتے ہیں

Junaid ⟶ is a variable.

Junaid() ⟶ is a funtion.



Note (Return is a Keyword)



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In funtion call compiler goes to funtion call & return back to main funtion.

Selection Statements.

① if selection Statement. it is a Keyword.

Syntax if (condition)
{Statement;}

#=
{int x;
cout << " Enter the Number" << endl;
cin >> x;
if (x>=0)
{cout << "You entered the +Ve Number" << x << endl; }
cin.get( ); }

12

10 >= 0 .
x >= 0 ✓

out Put
Enter 10

اب compiler آگے جا رہا ہو اور statements کو execute کرے گا.

cout<<" Pleasent Day"<< endle;

(2) if- else statement also called Double Selection Statement.

Syntax.

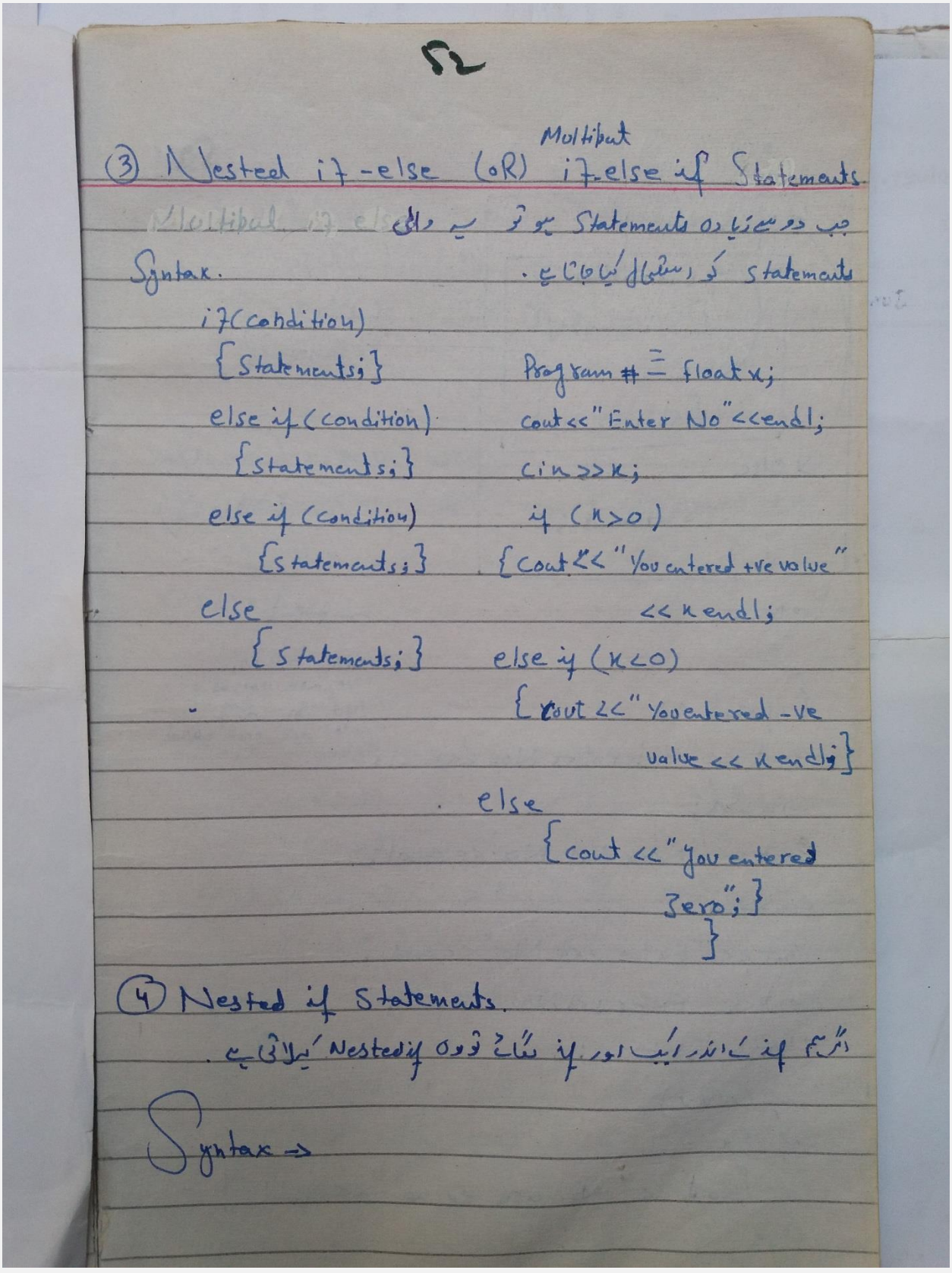
```
if(condion)
   {statements;}
else
   {Statements;} -> 
```

اس میں if کے opposite statements ہوگی

Program: ≡ # ≡

```
{float x;
cout <<" Enter the No"<< endl;
cin >> x;
if (x>=0)
   {cout << " You entered +Ve No" << x<< endle;}
else
   {cout". You entered the -ve No."<< x<<endle;
      cin.get();
      cin.get(); }
```

دونوں میں سے ایک statement execute ہوگی if والی یا else والی



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③ Nested if-else (OR) if-else if Statements
Multiput

جب دو سے زیادہ Statements ہو تو یہ والی Syntax. statements کو استعمال کیا جاتا ہے۔

```
if(condition)
{Statements;}
else if(condition)
 {statements;}
else if (condition)
  {statements;}
else
  {statements;}
```

```
Program # = float x;
cout<<"Enter No"<<endl;
cin>>x;
if (x>0)
{cout<<"You entered +ve value"
<<x endl;
else if (x<0)
{cout<<"You entered -ve
value<<x endl;}
else
{cout<<"you entered
zero";}
}
```

④ Nested if Statements.

اگر ہم if کے اندر ایک اور if بنائے تو وہ Nested if کہلاتی ہے۔

Syntax ->

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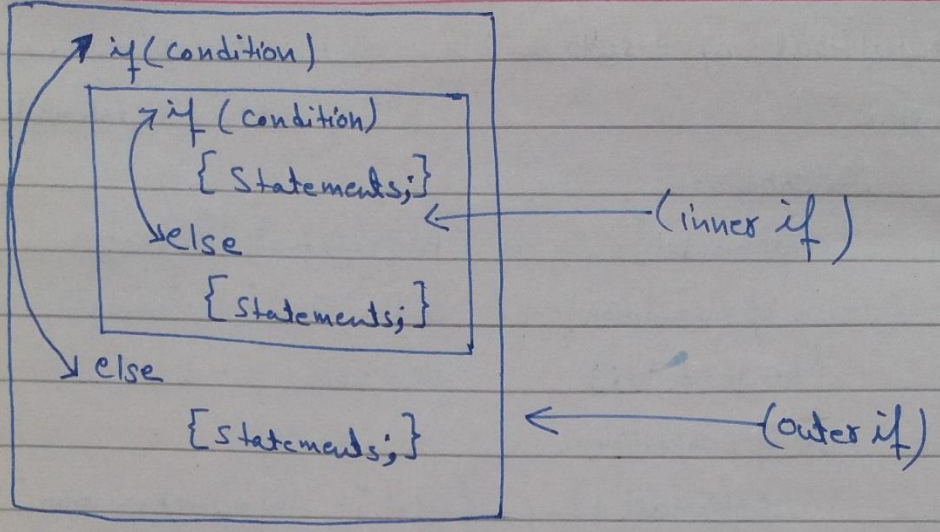

Program:

```
{ if a, b, c;
cout << "Enter 1st No." << endl;
cin >> a;
cout << "Enter 2nd No." << endl;
cin >> b;
cout << "Enter 3rd No." << endl;
cout << "Enter 3rd No." << endl;
cin >> a >> b >> c;
if (a == b)
if (a == c)
   {cout << " No. are equal" << endl; }
else
   {cout << " No. are Different " << endl; }
```

(OR)

output

```
Enter 3 No.
No are equal
No are dif
No are Not equal
```

54

```
else
    { cout << " No are Different " << endl; }
      cin.get();   OR   getchar();
      cin.get();   OR   getchar();
    }
```

Increment operators.

++ increment اور decrement کو ظاہر کرتا ہے جو variable (a) کے ساتھ
لگتے ہیں۔ e.g a++; OR ++a;

Program

```
Voidmain()
{ int count = 10;
cout << count << endl;
    count++;
    ++count;
cout << count << endl;
    cin.getch();
    cin.getch();
  }
```

output
10
12

Note: پروگرام میں جتنے cout ہوں گے اتنے ہی Result شو ہوں گے۔
اوپر والے میں ② cout ہے اس لیے output رزلٹ میں بھی دو
cout آتے ہیں

نوٹ

Program. 55

```
{int count=20;                          output
cout << count << endl;                  20
cout << ++count << endl;                21
cout << count << endl;                  21
cout << count++ << endl;                21
cout << count << endl;                  22
                getchar();
                getchar(); }
```

Logical operator?

There are three logical operators in c++

1. AND — &&
2. OR — ||
3. NOT — !

→ No space b/w them.

Syntax. AND & OR

((Condition 1) && (condition 2))

(condition 1 && condition 2)

space space

Note → Compiler Read کرتا ہے space کے بعد condition

Syntax NOT operater ! 56

(!(condition))

Note

NOT operater !

not equal to !=

AND &&

OR ||

Table.

condition No. 1	condition No. 2	AND &&	OR ||
True	True	output	output
True	False	X	output
False	True	X	output
False	False	X	X

Program. =

```
void main()
{int x,y,z;
cout << "Enter 3 No" <<endl;
cin >> x y>>z;
if((x>y) &&(x>z))
{cout<< "Maximun No." <<x<<endl;}
else if
     ((y>x) &&(y>z))
{cout << "Maximun No" <<y <<endl;}
else
  {cout << "Max No" <<z endl;}
```

out Put.

10, 20, 30

max No is 30

```
cin.get();
        }
```

57

Program. ≡ Not Program.

```
void main()
{int m;
cout<<"enter marks"<<endl;
cin>>m;
  if (!(m>50))
   { cout << "False"; }
 else
     {cout << "Pas"; }
                cin.get(); }
```

Assignment Program.

output is

Press 1 for Addition.
" 2 " Subtration.
" 3 " Multiplication
" 4 for Division.

Press Enter 1st value
Enter 2nd value.

Press (5) show invalid No.

Hind Choice → variable.

swith, Nested if, Nested ifelse.

ہوگا Shore کی value میں Choice

Program. 58

```
#include<iostream>
Using namespace std;
Void main( )
{ int a, b, choice, sum, sub, multi, div;
cout << " Enter the 1st number " << endl;
cin >> a;
cout << " Enter the 2nd number " << endl;
cin >> b;
cout << " Enter your choice " << endl;
cin >> choice;
    { if (choice == 1)
        { sum = (a+b);
        cout << "sum is " << sum << endl; }
      else if ( choice == 2)
        { sub = (a-b);
        cout << " sub is " << sub << endl; }
      else if (choice == 3)
        { div = (a/b);
        cout << " div is " << div << endl; }
      else if (choice == 4)
        { Multi=(a*b);
        cout << " multi is " << multi << endl; }
      else
    { cout << " You enter the invalid No " << endl; } }
```

getchar();
getchar();

Cout Put
Assignment

59

}

Program.

Sessional-I
Question

```
#include<iostream>
Using namespace std;
Void main()
{ int count = 99;
  cout << count << endl;
Cout << ++count << endl << count++ << endl;
cout << count << endl;
Cout << -- count << endl << count-- << endl;
cout << count << endl;
      cin.get();
      cin.get();
}
```

99 ++ = 100
101
101 -- = 100

Dry run

99
99+1 = 100
1+ 100 = 101
101 - 1 = 100
1 - 100 = 99

output 99, 101, 99, 101, 99, 101, 99

⇒ Operater Precedance.

++ Prefix ، Postfix ++ Precedance
Compiler C++

Program given as example above.

Program. Sessional -1

≡ Question 6

```
int p=1, q=9;
if((p>=3) || (q<11 && p+q<15))
  {cout << "Best of Luck" <<endl;}
else
  {cout << " Good Luck " <<endl;}
   getchar();   | cin.get();
   get char();  | cin.get();
}
```

(E) (T) (T) (T) (OR) F || T = out put ✓

Program Coding Increment & decrement.

≡ According to Precedance.

```
{ int bilal=7;
  cout << bilal <<endl;
  cout<< bilal++ <<endl<< ++bilal <<endl;
  cout << bilal <<endl;
  cout << bilal <<endl<< bilal-- <<endl;
  cout << bilal <<endl;
  cout << ++bilal <<endl<< bilal-- <<endl;
  cout << bilal <<endl;
  cout << --bilal <<endl<< bilal++ << endl;
  cout << bilal <<endl;
   getchar();
   get char(); }
```

out Put

7, 8, 9, 9, 7, 7, 7, 7, 7, 7, 7

7

61

Switch Multiple Selectio Statement

Program.

```
#include<iostream>
Using name space std;
Void main()
{
 char bilal;
 float a,b,c;
 cout<<"+ and j for addition"<<endl<<"- for subtration"<<
      endl<<"* for multiplication"<<endl<<"/ and k
      for division"<<endl;
 cout<<"enter the operater +,-,*,/,j,k"<<endl<<endl;
 cin>>bilal;
 cout<<"enter the operands "<<endl;
 cin>>a;
 cout<<"enter the 2nd operands "<<endl;
 cin>>b;
 Switch(bilal)
 {Case '+':
  case 'j':
  c=a+b;
  cout<<"result of addition"<<c<<endl;
  break;
```

Switch اور Case دونوں کا

Data Type ← Same ہونا چاہیے

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Switch Multiple Selection Statement (OR)

* Switch Statement in C++ Programming.

* Switch statement compares the result of a single expression with multiple cases. Switch is also a control structure & it is used to select one option from a set of options.

* Consider a situation in which, only one block of code needs to be executed among many blocks. This type of situation can be handled using nested if-else statement but, the better way of handling this type of problems is using switch... case statement.

* It compares the value of an expression or a variable against a list of cases.

* The case labels & value of expression or variable must be an integer or a character.

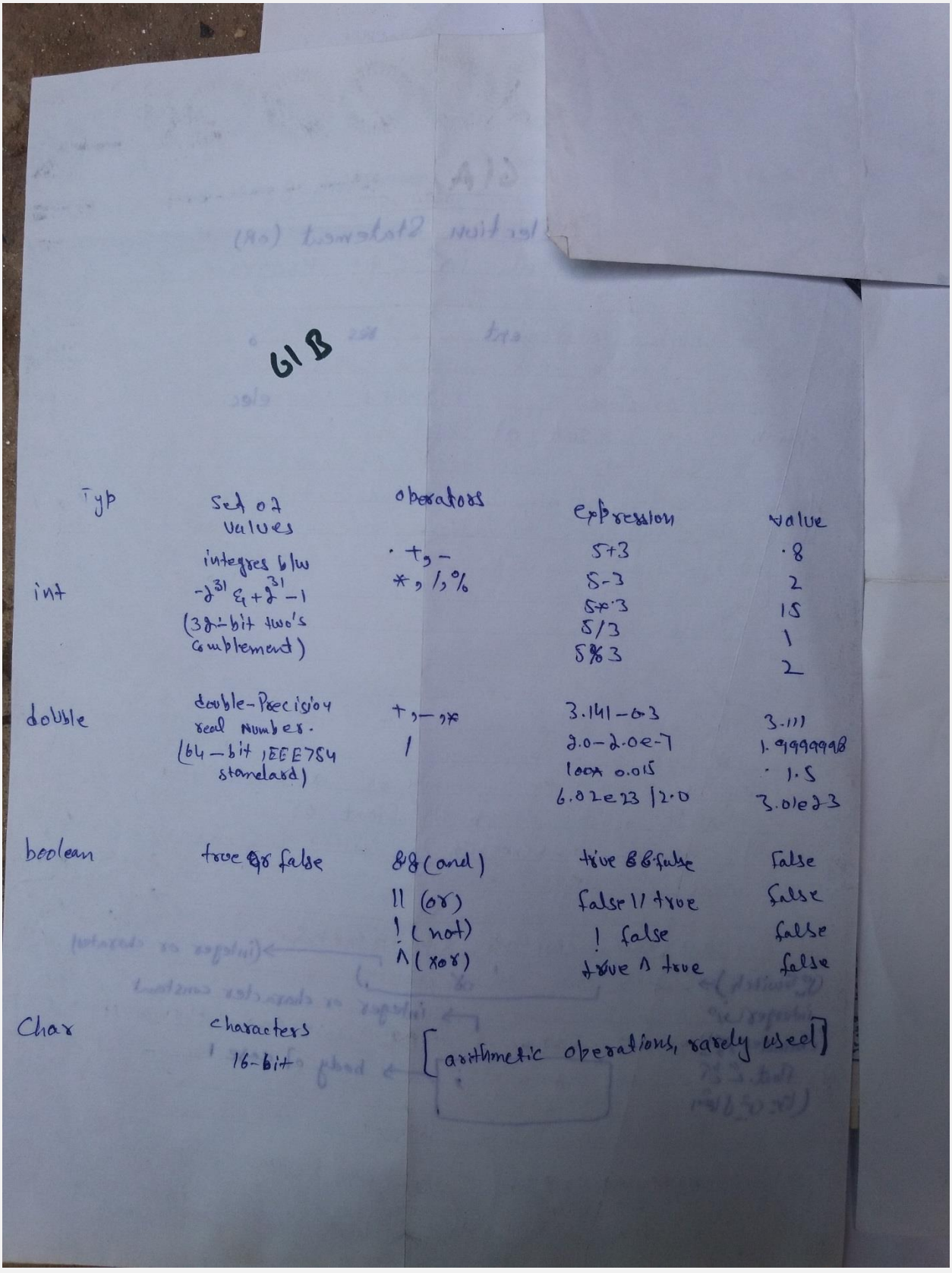
* It must not be a float or double value, if the value of expression in switch is float or double type then the compiler will generate error message.

* Syntax of Switch Statement.

(integer or character)

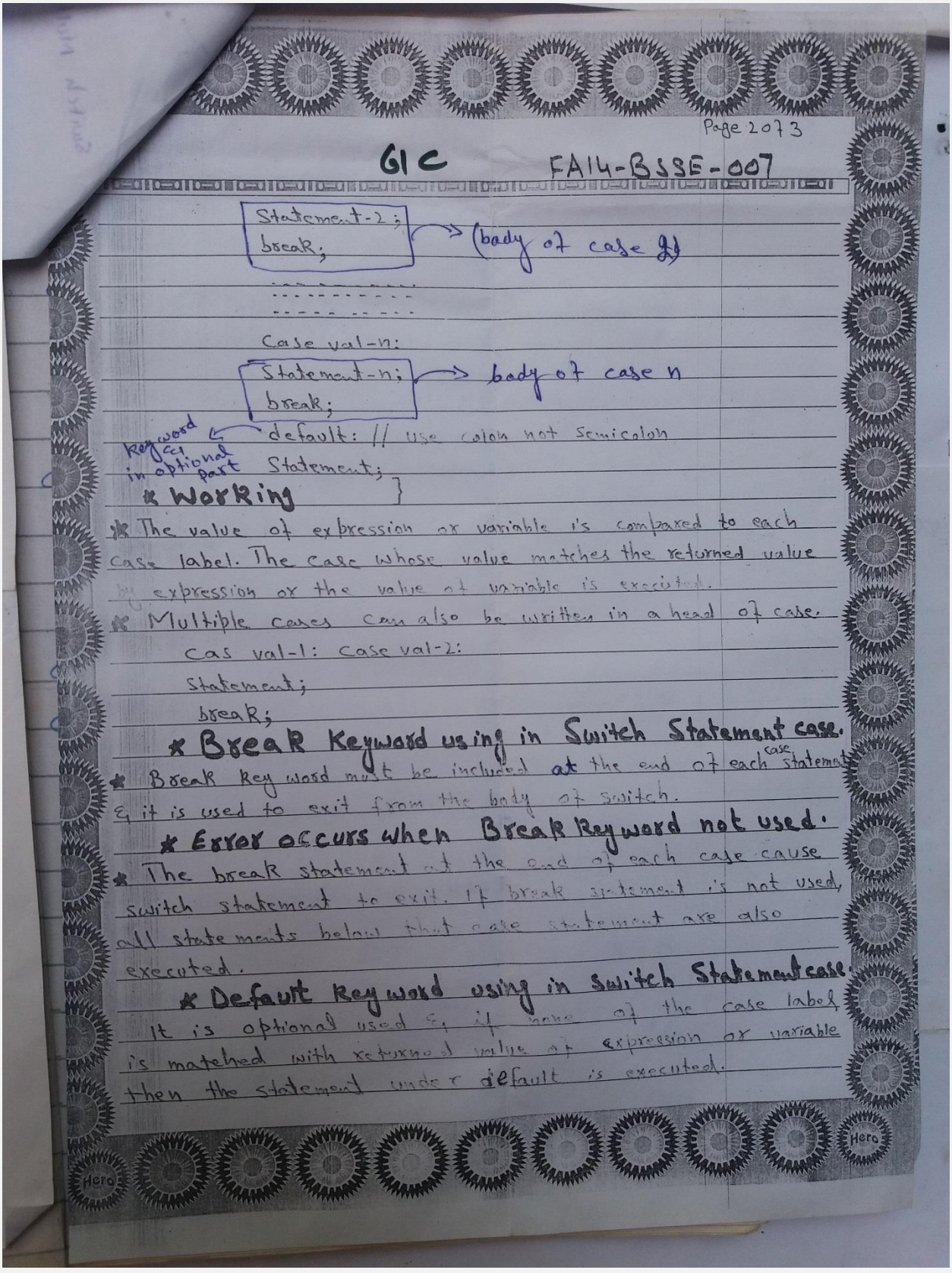
switch(expression or variable)
{
case val-1 : // use colon not semi colon
Statement-1; → body of case 1
break;
case val-2 : // use colon not semi colon

integer ✓
character ✓
float ✗



GIB

Typ	Set of Values	operators	Expression	value
int	integres b/w -2^{31} & $+2^{31}-1$ (32-bit two's complement)	. +, -	5+3	8
		*, /, %	5-3	2
			5*3	15
			5/3	1
			5%3	2
double	double-Precision real Numbers. (64-bit IEEE754 standard)	+, -, *	3.141-03	3.111
		/	2.0-2.0e-7	1.9999998
			100* 0.015	1.5
			6.02e23 /2.0	3.01e23
boolean	true or false	&& (and)	true && false	false
		|| (or)	false || true	false
		! (not)	! false	false
		^ (xor)	true ^ true	false
Char	characters 16-bit	[arithmetic operations, rarely used]		



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Statement-2;
break;
→ body of case 2

.....

Case val-n:
Statement-n;
break;
→ body of case n

default: // use colon not semicolon
Statement;

Keyword is optional part

* Working

* The value of expression or variable is compared to each case label. The case whose value matches the returned value by expression or the value of variable is executed.
* Multible cases can also be written in a head of case.

Cas val-1: case val-2:
Statement;
break;

* Break Keyword using in Switch Statement case.

* Break Key word must be included at the end of each case statement it is used to exit from the body of switch.

* Error occurs when Break Keyword not used.

* The break statement at the end of each case cause switch statement to exit. If break statement is not used, all statements below that case statement are also executed.

* Default Keyword using in Switch Statement case.

It is optional used e, if none of the case label is matched with returned value of expression or variable then the statement under default is executed.

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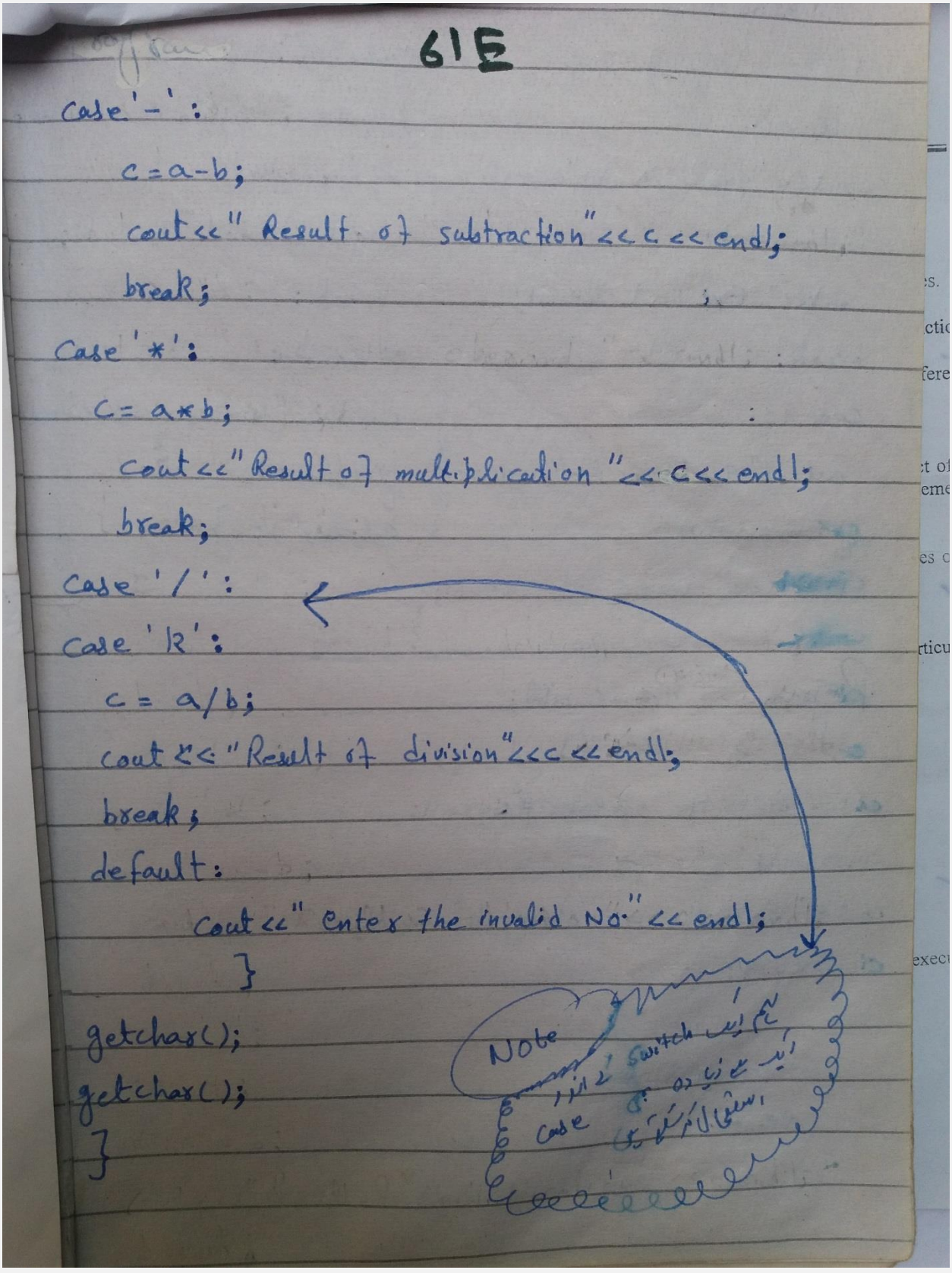
* The default Keyword is not fixed. It may be placed before the first case or after the last case.

* Switch Statement Program in C++

```
#include<iostream>
Using namespace std;
Void main()
{ char ch;
 cout<< "Enter a charactor to cheak it is Vowel or not"
 cin>>ch;
   Switch(ch)
       {
       case 'a': case 'A':
       cout<<ch<<" is a vowel";
       break;
       case 'e': case 'E':
       cout<<ch<<" is a vowel";
       break;
       case 'i': case 'I':
       cout<<ch<<" is a vowel";
       break;
       case 'o': case 'O':
       Cout<<ch<<" is a vowel";
       break;
       Case 'u': case 'U':
       cout<<ch<<" is a vowel";
       break;
 default:
 cout<<ch<< "is a consonant character not a vowel";}
}
```

جو int یا char کا variable ہوگا وہی switch کا ہوگا ورنہ error آئے گا۔

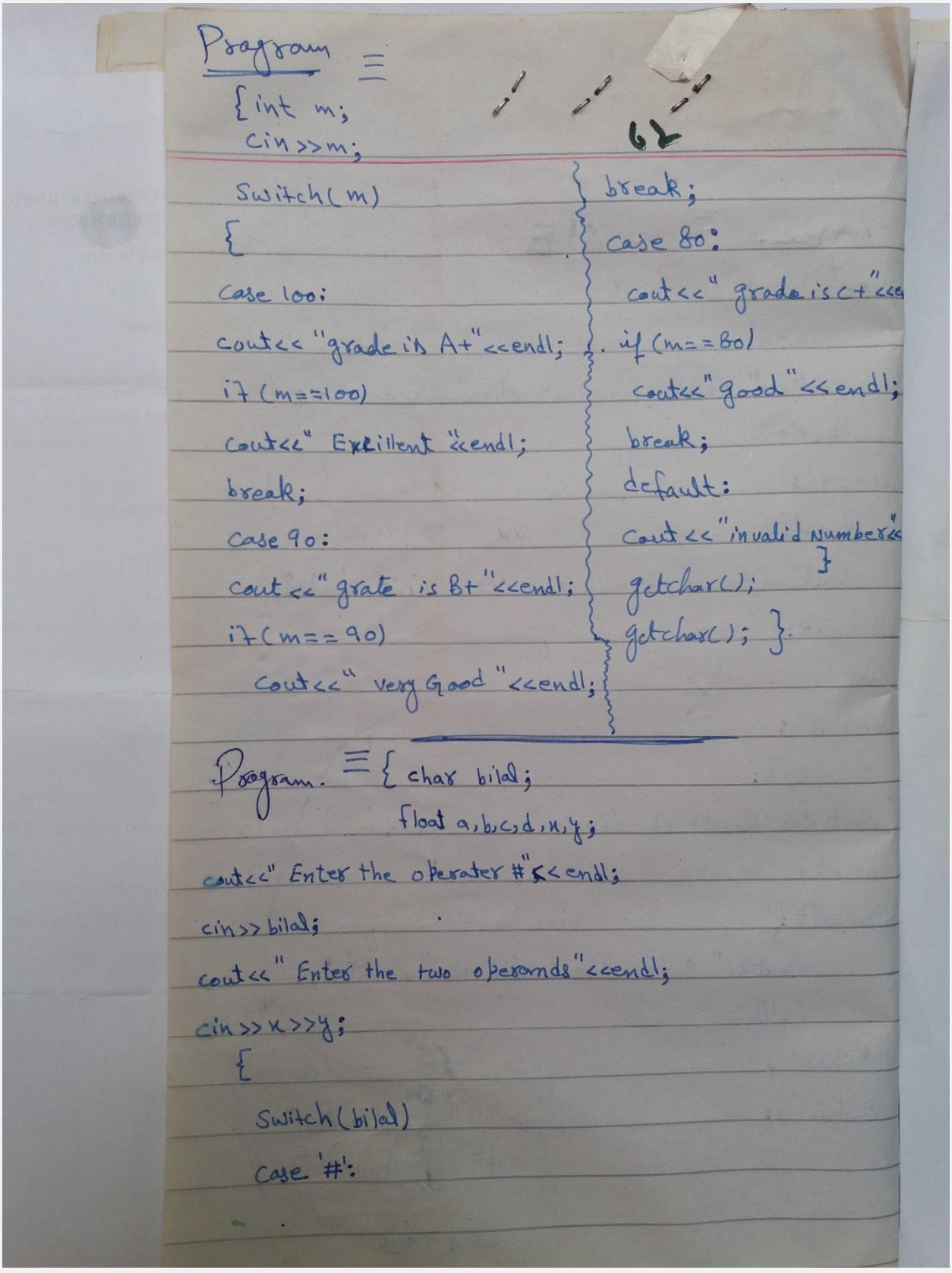
switch کے پیرامیٹر۔



61E

```
case '-':
    c=a-b;
    cout<<" Result of subtraction"<<c<<endl;
    break;
case '*':
    c= a*b;
    cout<<" Result of multiplication "<<c<<endl;
    break;
case '/':
case 'k':
    c = a/b;
    cout<<" Result of division"<<c<<endl;
    break;
default:
    cout<<" enter the invalid No."<<endl;
    }
getchar();
getchar();
}
```

Note

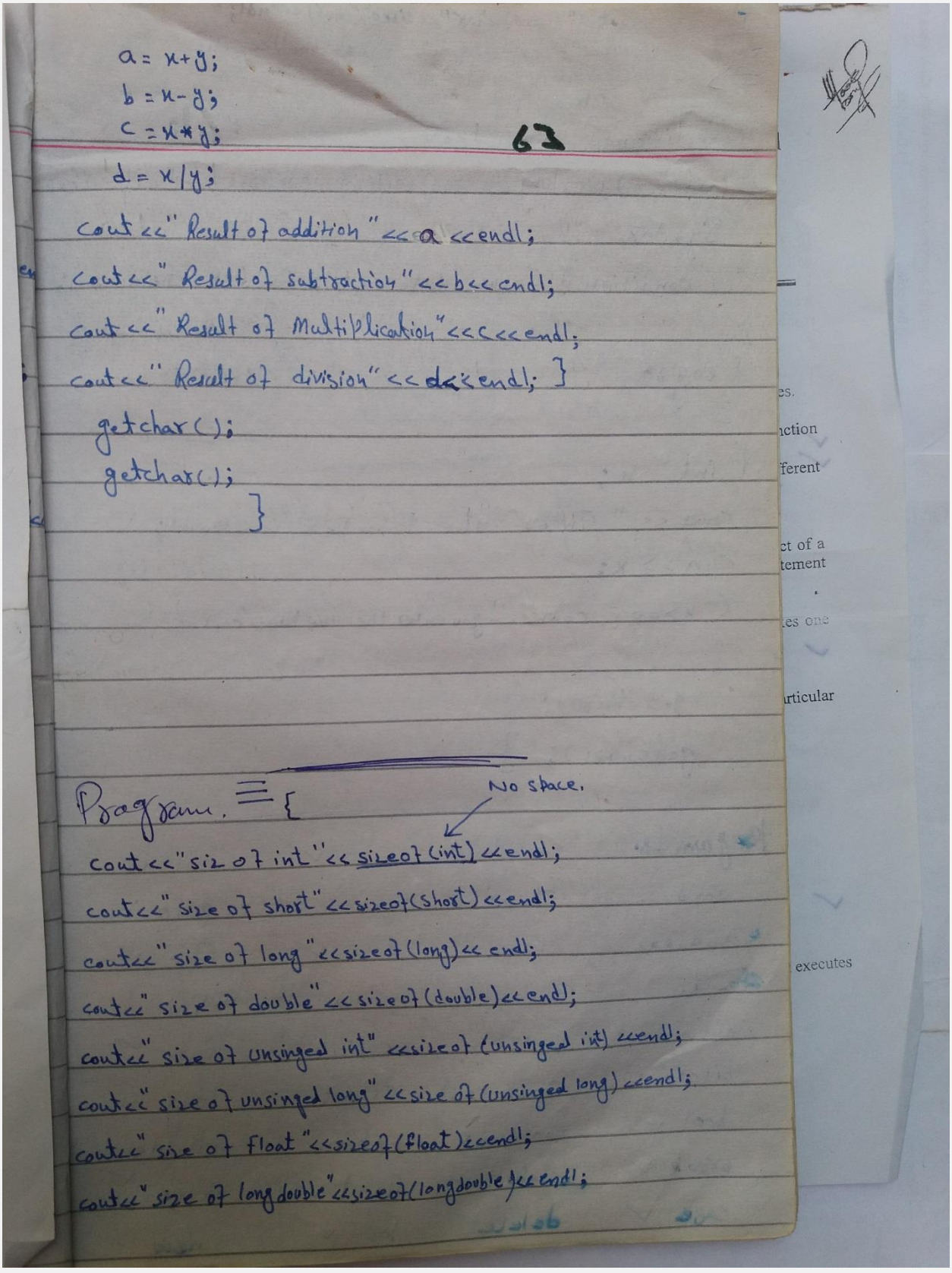


Program =

```
{int m;
 cin>>m;
 Switch(m)
 {
case 100:
cout<< "grade is A+"<<endl;
if (m==100)
cout<<" Excillent "<<endl;
break;
case 90:
cout<<" grate is B+"<<endl;
if(m==90)
  cout<<" very Good "<<endl;
break;
case 80:
 cout<<" grade is C+"<<
. if (m==80)
 cout<<"good"<<endl;
 break;
 default:
 cout<<"invalid number"<<
 }
 getchar();
 getchar(); }.
```

Program. = { char bilal;
float a,b,c,d,x,y;

```
cout<<" Enter the operater #"<<endl;
cin>>bilal;
cout<<" Enter the two operands"<<endl;
cin>>x>>y;
  {
   Switch(bilal)
   case '#':
```



```
a = x+y;
b = x-y;
c = x*y;                                    63
d = x/y;
cout<<" Result of addition "<<a<<endl;
cout<<" Result of subtraction"<<b<<endl;
cout<<" Result of Multiplication"<<c<<endl;
cout<<" Result of division"<<d<<endl; }
getchar();
getchar();
}
```

Program. = {

No space.

```
cout<<"size of int"<<sizeof(int)<<endl;
cout<<" size of short"<<sizeof(short)<<endl;
cout<<" size of long "<<sizeof(long)<<endl;
cout<<" size of double"<<sizeof(double)<<endl;
cout<<" size of unsinged int"<<sizeof(unsinged int)<<endl;
cout<<" size of unsinged long"<<size of(unsinged long)<<endl;
cout<<" size of float "<<sizeof(float)<<endl;
cout<<" size of long double"<<sizeof(long double)<<endl;
```

```
cout<<" size of char "<<sizeof(char)<<endl;
cout<<" size of boolean "<<sizeof(bool)<<endl;
getchar();
getchar(); }
```

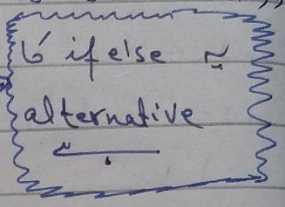
⇒

Conditional operaters 64

≈ (Same) working of Condition operaters as if-else

Syntax.

(condition ? True Statement : False Statement);



Note

Program.

```
{ int x;
cout << " Enter the Number" <<endl;
cin >> x;
( x>=0 ? cout<< " you enter the +ve No": cout<< " you enter the -ve No.");
getchar();
getchar(); }
```

Keywords.			
and	catch	do ✓	friend
and_eq	char ✓	dynamic_cast	goto ✓
auto	class ✓	else ✓	if ✓
bitand	compl	enum ✓	inline
bitor	const ✓	explicit	int ✓
bool ✓	const_cast	export	long ✓
break ✓	continue ✓	extern	mutable ✓
case ✓	default ✓	float ✓	namespace
	delete ✓	for ✓	new ✓

not	reinterpret_cast	switch	typename	65
operator	return	temlate	union	
or	short	this	unsigned	while
or_eq	signed	throw	using	xor
Private	size of	true	virtual	xor_eq
Protected	Static	try	Void	
Public	Static_cast	typedef	Volatile	
register	Struct	typeid	Wchar_t	

Iteration (or) loop. (OR) repeatation.

Repeatation of loop is called Iteration.

There are three types of loop.

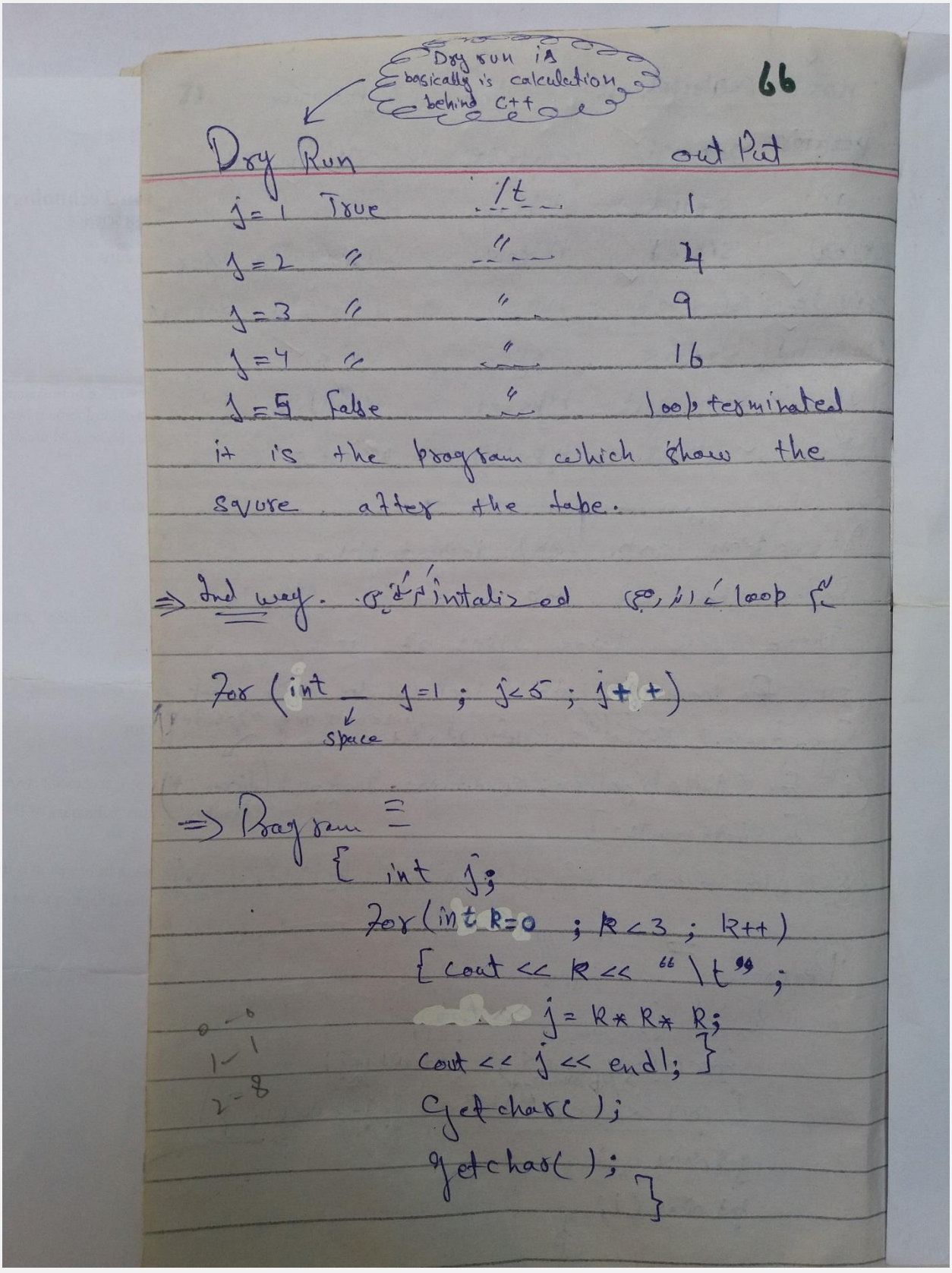
(1) for loop (2) while loop. (3) do while loop

Syntax. (use only one operater at a time.)

(1) for (Initalization; Condition; Increment/decrement operater)
{ Statements; }

Program

```
{ int j;
for(j=1; j<5; j++(OR)++j)
{ cout << j << "\t" << j*j<<endl; }
getchar();
getchar();
}
```



Dry run is basically is calculation behind C++

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Dry Run

			out Put
j=1	True	/t	1
j=2	"	"	4
j=3	"	"	9
j=4	"	"	16
j=5	False	"	loop terminated

it is the program which show the squre after the tabe.

⇒ 2nd way. جو پہلے initalized کیا ہوا loop میں

for (int _ j=1 ; j<5 ; j++)
space

⇒ Program =

```
{ int j;
for(int R=0 ; R<3 ; R++)
{cout << R << "\t";
j = R * R * R;
cout << j << endl; }
Getchar();
getchar(); }
```

0-0
1-1
2-8

Q: write a Program that input a No. for table from the user & also input length for table. & show the table according to its length → Hint (use for loop)

No. 1

Program for any type of table.

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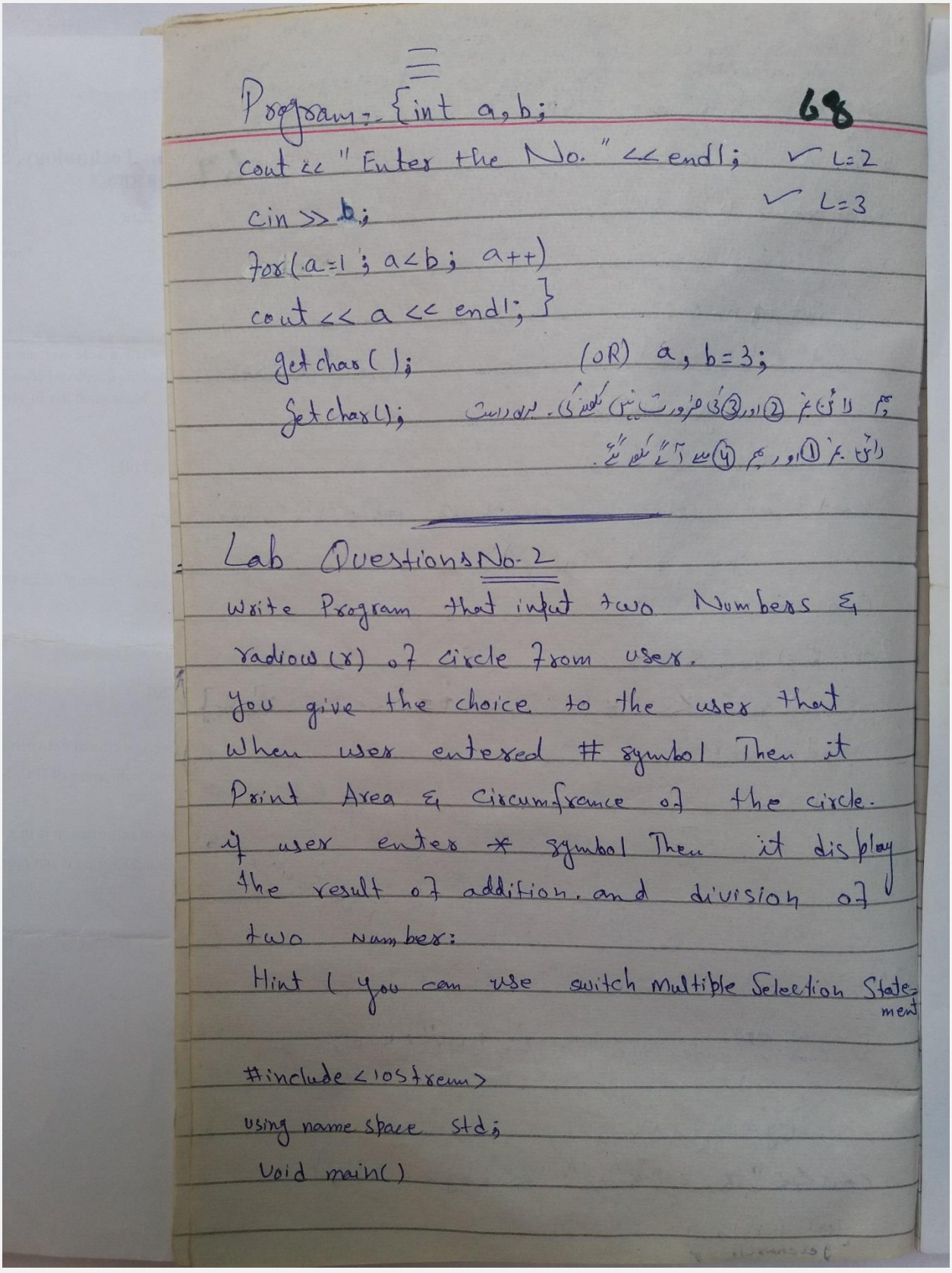
```
# include <iostream>
using namespace std;
Void main()
  { int t, n, c;
  Cout << " Enter the number of table !t (which
                you want)";
  cin >> t;
  Cout << " Enter the length of table !t (where
                you want to go)";
  Cin >> n;
 For( c=1; c<=n; c++)
   {cout << t<< "*" << c << "=" << t*c<<endl;}
   getchar();
   getchar();
          }
```

OW ← اگر endl استعمال نہ کریں تو Table ساری ایک ہی لائن میں شو ہوگی

e.g 2*1=2 2*2=4 2*3=6

2nd way for Table.

```
{ int x,y;
  cout << " Enter the No. for table"<< endl;
  cin >> x
  for(y=1; y<5; y++)
cout << " x << "*"<<"="<< x*y <<endl;}
  getchar();
  getchar(); }
```



Program :- {int a, b;
cout << " Enter the No. " << endl;
cin >> b;
for (a=1; a<b; a++)
cout << a << endl; }
getchar ();
Getchar ();

(OR) a, b=3;

L=2
L=3

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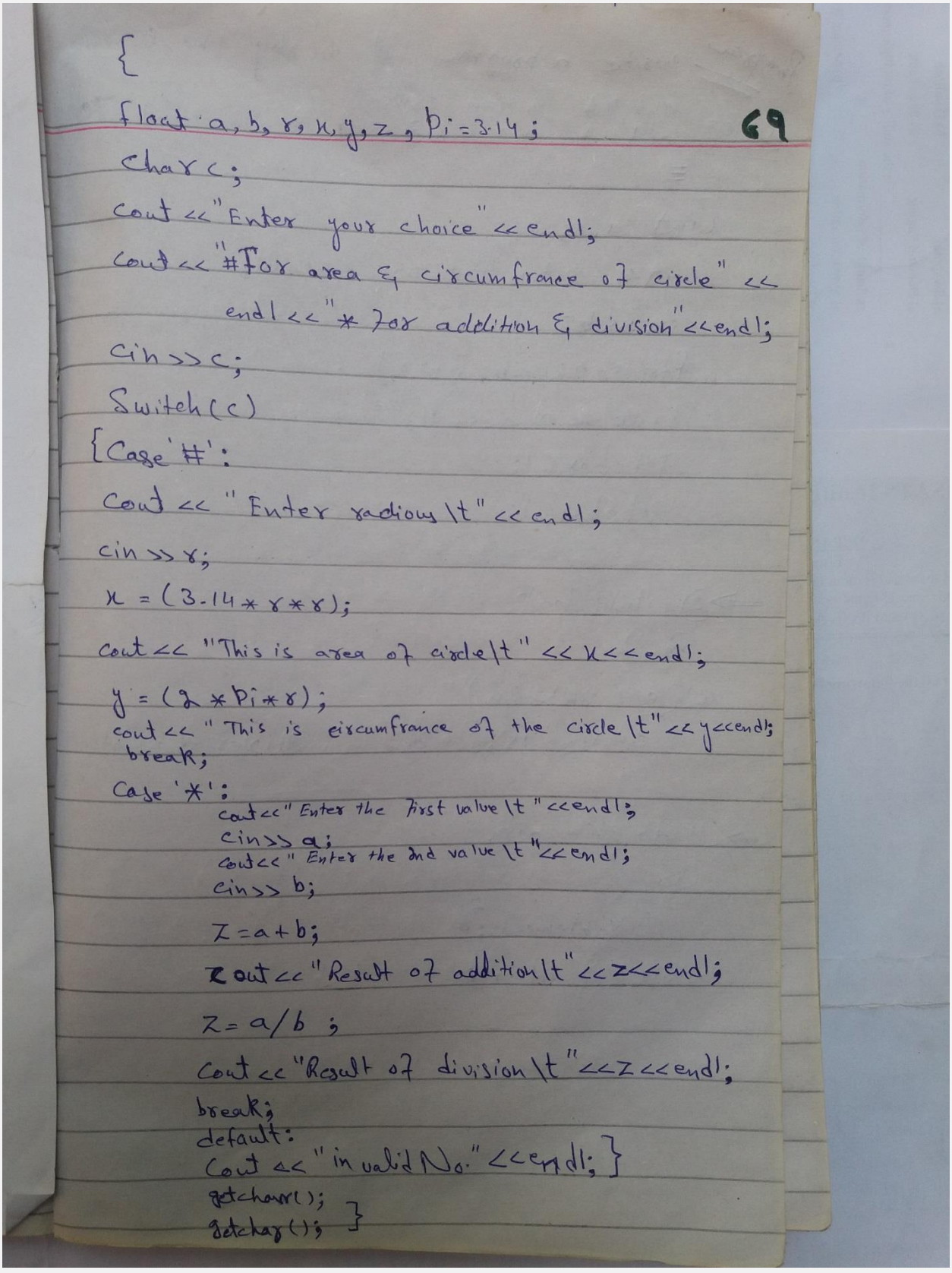
Lab Questions No. 2

Write Program that input two Numbers & radious (r) of circle from user.
you give the choice to the user that when user entered # symbol Then it Print Area & Circumfrance of the circle.
if user enter * symbol Then it display the result of addition, and division of two Number:
Hint (you can use switch Multible Selection Statement

```
#include <iostream>
using name space std;
Void main()
```



```
{
float a, b, r, x, y, z, Pi = 3.14;                    69
char c;
cout << "Enter your choice" << endl;
cout << "#For area & circumfrance of circle" <<
        endl << "* for addition & division" << endl;
cin >> c;
Switch(c)
{Case '#':
cout << " Enter radious \t" << endl;
cin >> r;
x = (3.14 * r * r);
cout << "This is area of circle \t" << x << endl;
y = (2 * Pi * r);
cout << " This is circumfrance of the circle \t" << y << endl;
break;
Case '*':
        cout << " Enter the first value \t " << endl;
        cin >> a;
        cout << " Enter the 2nd value \t" << endl;
        cin >> b;
        z = a + b;
        cout << " Result of addition \t" << z << endl;
        z = a / b ;
        Cout << "Result of division \t" << z << endl;
        break;
        default:
        Cout << "invalid No." << endl; }
        getchar();
        getchar(); }
```

Program write a program that display the following out put on the consoul.

① NO3 out put 0, 2, 4, 6, 8 Hint (use for loop) 70

≡

```
{int a,b;
cout<< "Enter the no." <<endl;
cin >>b;
for(a=0; a<b; a+=2)
 cout << a <<endl;
 getchar();
 getchar();
```

→ ② while loop

Syntax.

```
while (condition)
  {statements;}
```

one or multibles statements

→ ③ do while loop.

```
do
  {statements;}
while (condition);
```

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① For loop	output	② while loop	output	③ dowhile loop
≡	1	≡	1	≡
{ int R;	2	{ int R=1	2	{ int R=1
for(R=1; R<6; K++)	3	while(R<6)	3	do
{ cout << R << endl;}	4	{cout<<R<<endl;	4	{cout<<R<<endl;
system("Pause");	5	R++; }	5	R++; }
}		system("Pause"); }		While(R<6);
				system("Pause");
				}

output (③ dowhile loop): 1 2 3 4 5

"مگر جب ہم K کی value (-ve) رکھیں گے تو یہ ساری کام نہیں کریں گا سوائے (3) loop کے وہ صرف ایک output ضرور شو کروائے گا۔

یعنی اس میں ایک بار statement ضروری execute ہوگی خواہ Statements کی false ہی کیوں نہ ہو۔

---

① Continue Statement جاری رہنا
② Break Statement.
③ go to Statement.

Program.

① Continue Statement. ② & break Statement.

```
≡
{ for (int R=1 ; R<6 ; R++)
{ cout << " C++ " << endl;
continue; (OR) break;
Cout << "JAVA" << endl; }
Cout << " Good thinking" << endl;
system ("Pause"); }
```

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Note:

break اور continue صرف body of loop میں استعمال کرتے ہیں۔
کسی اور جگہ پر continue اور break نہیں آتے جس میں استعمال
کر سکیں۔

goto کو کہیں بھی لے جا سکتے ہیں۔ اس کو loop کے اندر
بھی استعمال کر سکتے ہیں۔

Program

```
{ label:
  cout << " Good Class" << endl;
  Cout << " Bad class" << endl;
  cout << " Hot day" << endl;
  goto label;
  System ("Pause"); }
```

⇒ Nested loop. Syntax.

```
for (initialization; condition; inc/dec)
    { for (initialization; condition; inc/dec)
        {statements;}
    }
```

Similarly Nested while loop & Nested do while loop

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outer loop ← Row کے لیے
iner loop ← colom کے لیے۔
جب outer کی condition ← True ہوتی ہے تو
compiler iner loop کی طرف جائے گا اور جب
iner کی condition غلط false ہوتی ہے تو compiler
outer کی طرف جائے گا۔

Program =

```
{ for (int x=1 ; x<5 ; x++)
     { for (int y=2; y<5; y++)
          { cout << " * "; }
          cout << endl; }
     system("Pause");
}
```

Dry Run

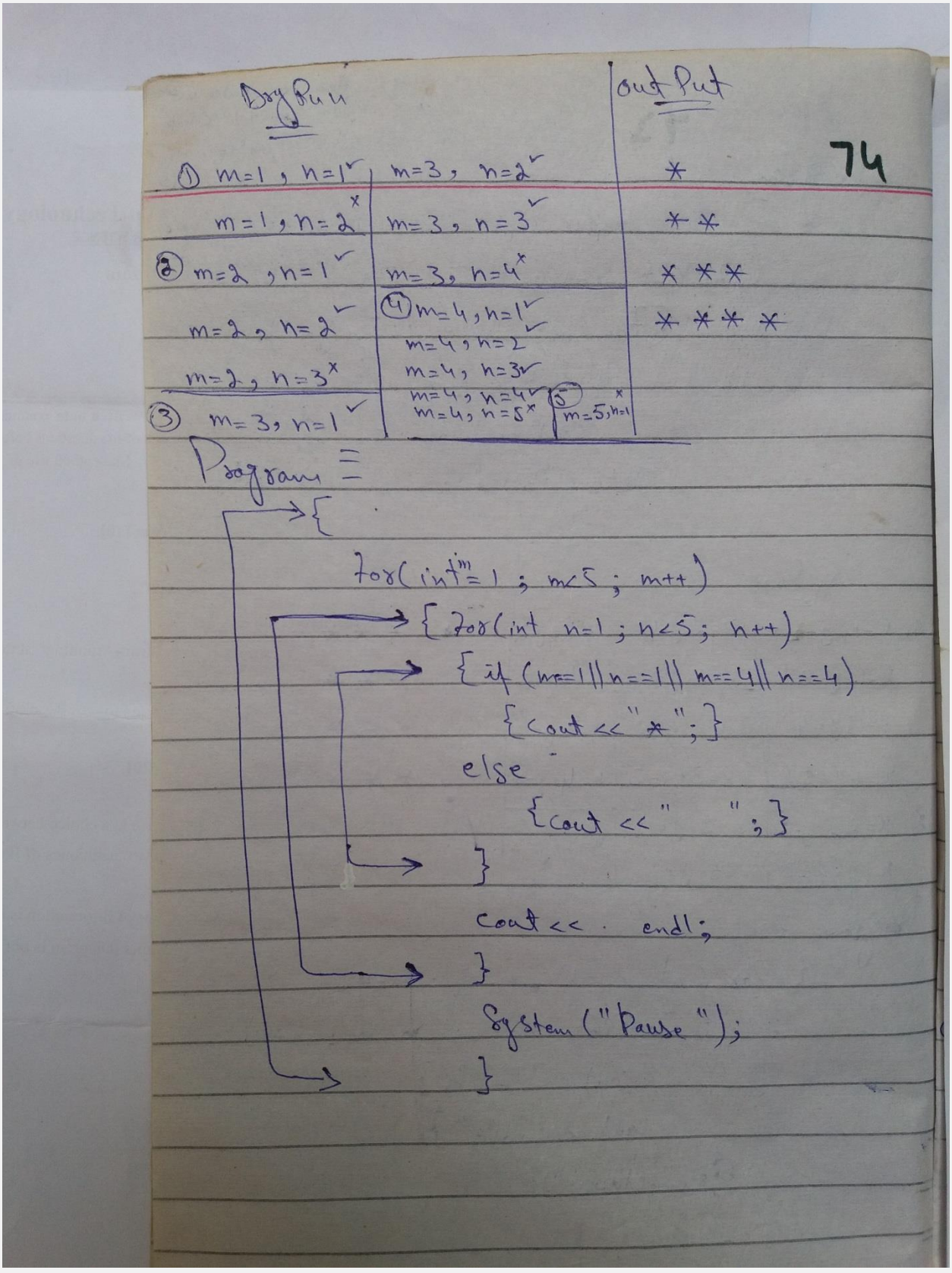
① x=1, y=2 ✓	x=2, y=4 ✓	x=4, y=2 ✓
x=1, y=3 ✓	x=2, y=5 ✗	x=4, y=3 ✓
x=1, y=4 ✓	③ x=3, y=2 ✓	x=4, y=4 ✓
x=1, y=5 ✗	x=3, y=3 ✓	x=4, y=5 ✗
② x=2, y=2 ✓	x=3, y=4 ✓	x=5, y=5 ✗
x=2, y=3 ✓	x=3, y=5 ✗	

out put

```
* * *
* * *
* * *
* * *
```

Program =

```
{ for (int m=1 ; m<5 ; m++)
     { for(int n=1 ; n<=m ; n++)
          {cout << " * ";}
          cout << endl; }
     System("Pause");
}
```



Dry Run

		Out Put
① m=1, n=1 ✓	m=3, n=2 ✓	*
m=1, n=2 ✗	m=3, n=3 ✓	* *
② m=2, n=1 ✓	m=3, n=4 ✗	* * *
m=2, n=2 ✓	④ m=4, n=1 ✓	* * * *
m=2, n=3 ✗	m=4, n=2 ✓	
③ m=3, n=1 ✓	m=4, n=3 ✓	
	m=4, n=4 ✓	
	m=4, n=5 ✗	⑤ m=5, n=1 ✗

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Program =

```
{
for(int m=1; m<5; m++)
{ for(int n=1; n<5; n++)
{ if (m==1||n==1|| m==4|| n==4)
{cout << "*";}
else
{cout << " ";}
}
cout << endl;
}
System("Pause");
}
```

Dry Run

			Out Put
m=1, n=1 ✓	m=2, n=2 ✗	m=3, n=4 ✓	* * * *
m=1, n=2 ✓	m=2, n=3 ✗	m=4, n=1 ✓	* . . *
m=1, n=3 ✓	m=2, n=4 ✓	m=4, n=2 ✓	* . . *
m=1, n=4 ✓	m=3, n=1 ✓	m=4, n=3 ✓	* * * *
m=1, n=5 ✗	m=3, n=2 ✗	m=4, n=4	
m=2, n=1 ✓	m=3, n=3 ✗	m=5, n=1 ✗	
		-	

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Funtion ch#5

Funtions are two types.

① user define funtion. eg ① add() ② show() ③ disply()

② Built in funtion. eg ① sin() ② cos()

Three tooms are used in funtion.

① Defining the funtion.

② Declaring the funtion

③ calling the funtion.

① Defining the funtion.

Syntax

Return type _ funtion Name (Parameters)

↙ space

{ Statements ; }

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جب ہم کسی variable کو اس کی Data type کے ساتھ لکھتے ہیں تو وہ Parametter کہلاتے ہیں۔ مثال

Funtion Name

add (int a, int b, int c)
add (int a)
add (int a, float b, char c)

Parametter

فنکشن کی final رزلٹ کا جو جواب ہوگا وہ ہی اس کی Datatype ہوگی اور Returntype بھی ہوگی۔ eg.

int (int a , int b) ✓

c = 10 + 20

30 is a Returntype.

جب ہم void (Keyword) لگا دیتے ہیں تو اس کی کوئی datatype نہ ہو تو اس کی Returntype بھی void ہوگی

void show( ) oR void show(void)

No Datatype → No return type.

No Parametter

eg int factorial (int n)
{ ≡ }

٦٧

② Declaring the funtion.

Syntax

Return type FuntionName(Paramettes);

(arrow under the gap: space)

③ Calling the funtion.

Syntax

funtion Name (Aregumments);

اگر ہم simple a, b, c کو دیتے ہیں تو وہ Aregumments کہلاتے ہیں
یعنی جن کی Datatype کے بغیر لکھتے ہیں تو وہ Aregumments کہلاتے ہیں
وہ ایک دو یا تین بھی ہو سکتے ہیں۔

eg add (x, y);

Parmetter اور Aregumments کے variables ایک جیسے same
نہیں ہونے چاہیئے۔

show ( );

flctorial(x);

⇒ Two way of defining the funtion.

① Befor the main() funtion.

② After the main() funtion.

جب ہم

(Note)

when we define the funtion Before the main() funtion. There is no need of declartion of funtion. But when we

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define the funtion after the main funtion, funtion declartion must be written.

Returntype funtionName (Parameter)
{ Statement; }

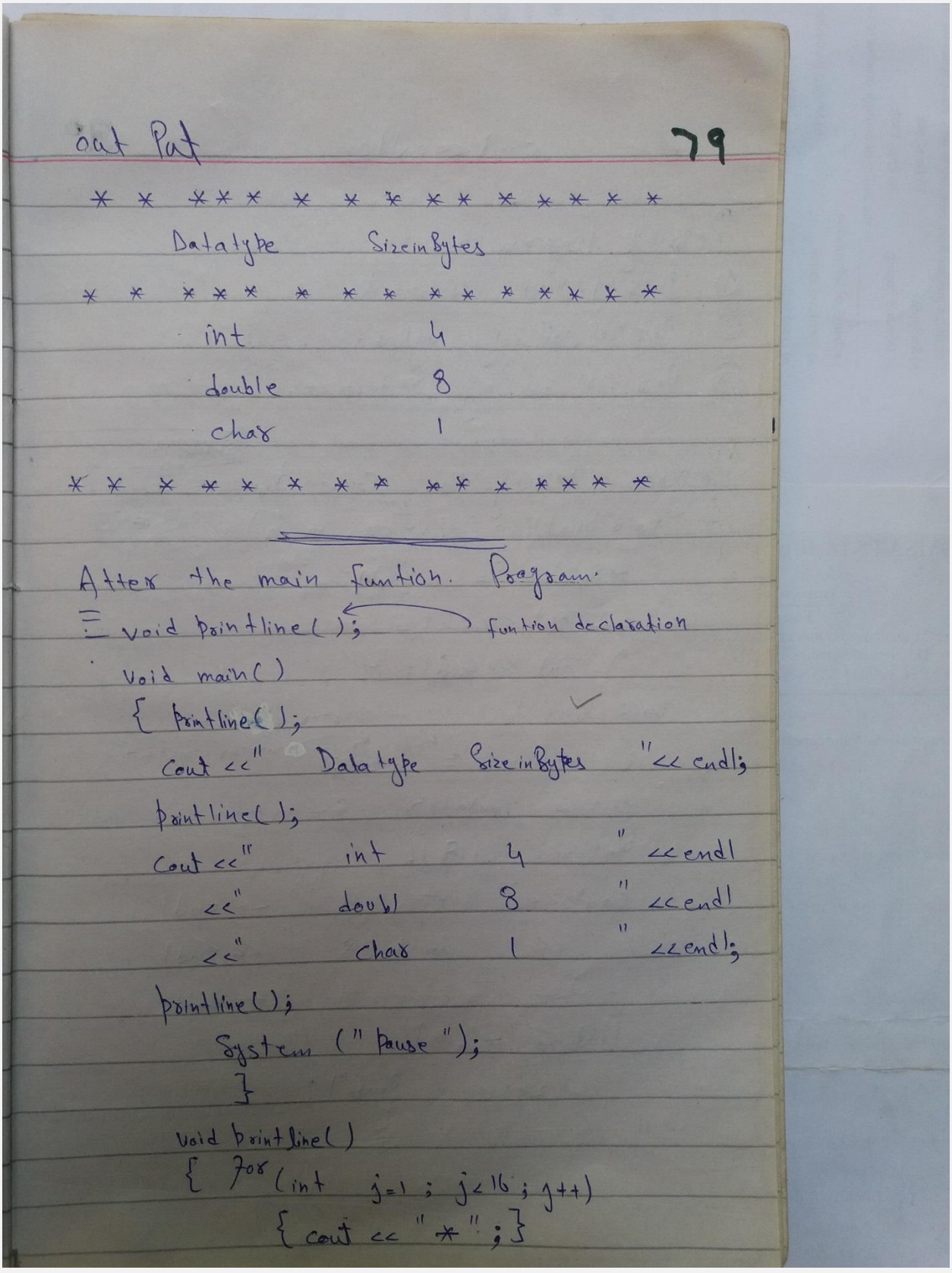
Funtion Header

Body of funtion

Program. (Befor the main funtion)

```
Void Printline()
  { for(int j=1; j<=16; j++)
      { cout << "*"; }
      cout << endl; }

Void main()
 { Print line();
   cout << "    Datatype    Size in Bytes  " << endl;
 Print line();
 cout << "    int         4              " << endl
      << "    double      8              " << endl
      << "    Char        1              " << endl;
 Printline();
        System ("Pause");
    }
```



out Put 79

* * *** * * * * * * * * * *

Datatype Size in Bytes

* * *** * * * * * * * * * *

int 4

double 8

char 1

* * * * * * * * ** * *** *

After the main funtion. Program.

= void printline( ); funtion declaration

void main( )

{ printline( );

cout << " Datatype Size in Bytes " << endl;

printline( );

cout << " int 4 " << endl

<< " doubl 8 " << endl

<< " char 1 " << endl;

printline( );

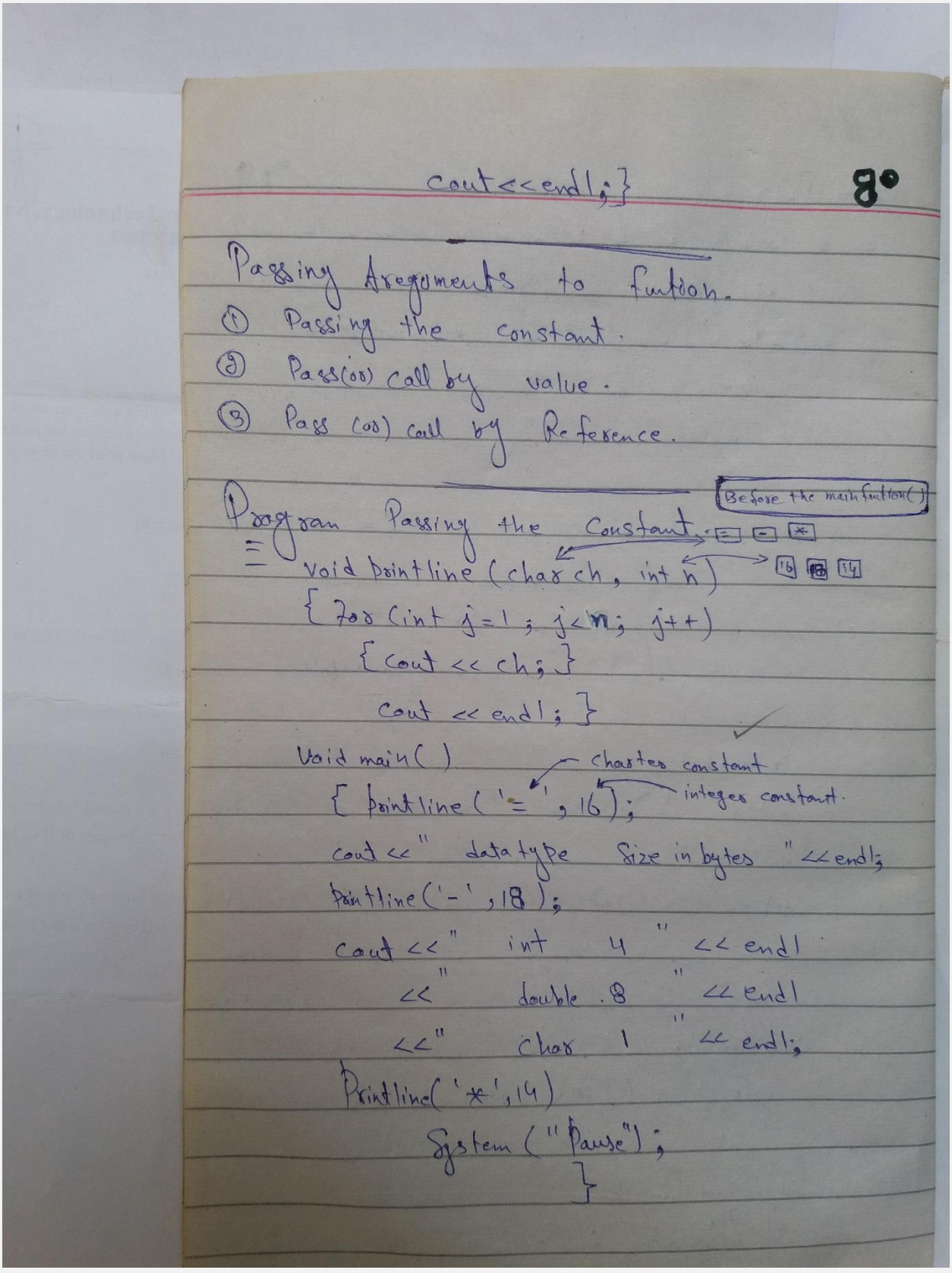
System (" pause ");

}

void printline( )

{ for (int j=1 ; j<16 ; j++)

{ cout << " * " ; }



cout<<endl;}

Passing Aregements to futions.

① Passing the constant.

② Pass(oo) call by value.

③ Pass (oo) call by Reference.

Before the main function()

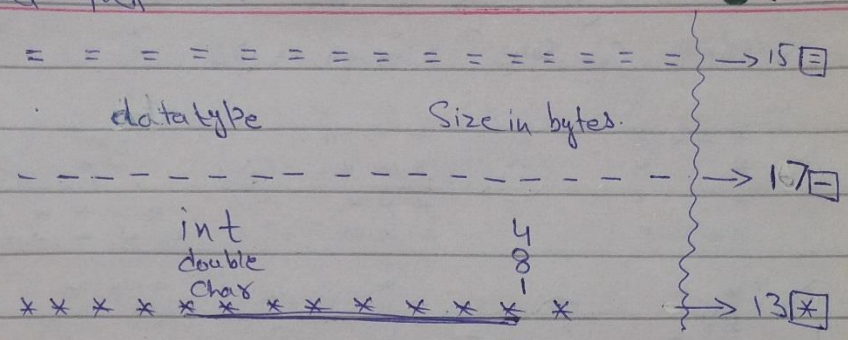
① Program Passing the Constant.

```
void printline (char ch, int n)
{ for (int j=1 ; j<n; j++)
  {cout << ch;}
   cout << endl; }
Void main( )
{ printline ('=', 16);
cout << "  datatype   Size in bytes " <<endl;
printline('-',18);
cout <<"   int     4   " << endl
     <<"   double  8   " <<endl
     <<"   char    1   " << endl;
Printline('*',14)
    System ("Pause");
        }
```

charter constant

integer constant.

out put 81



No1 write a program that print three lines of stars using for loop in the user defined funtion named as printline(). You also call call printline() funtion from the main() funtion according to your need & also shows size of data types using simple cout objed in main funtion.

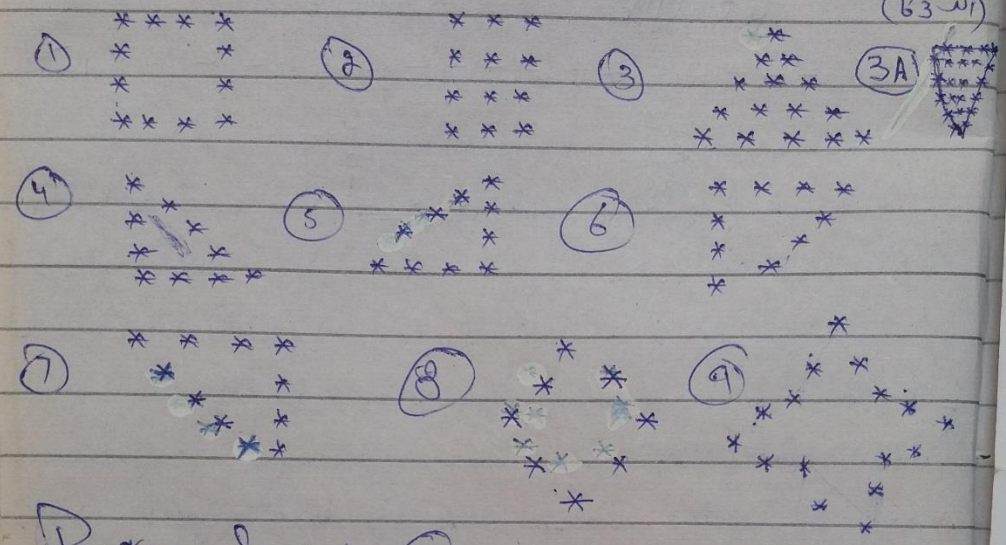
Program.

```
#include<iostream>
using name space std;
Void printline();
{for(int j=1; j<16; j++)
  {cout<<"*";};
  cout<<endl;}

Void main()
{ printline();
  cout<<"  Datatype  size in bytes  "<<endl;
printline();
  cout<<"  double    8              "<<endl
  <<"      int       4              "<<endl
  <<"      char      1              "<<endl;
printline();
        getchar();
        getchar();}
```

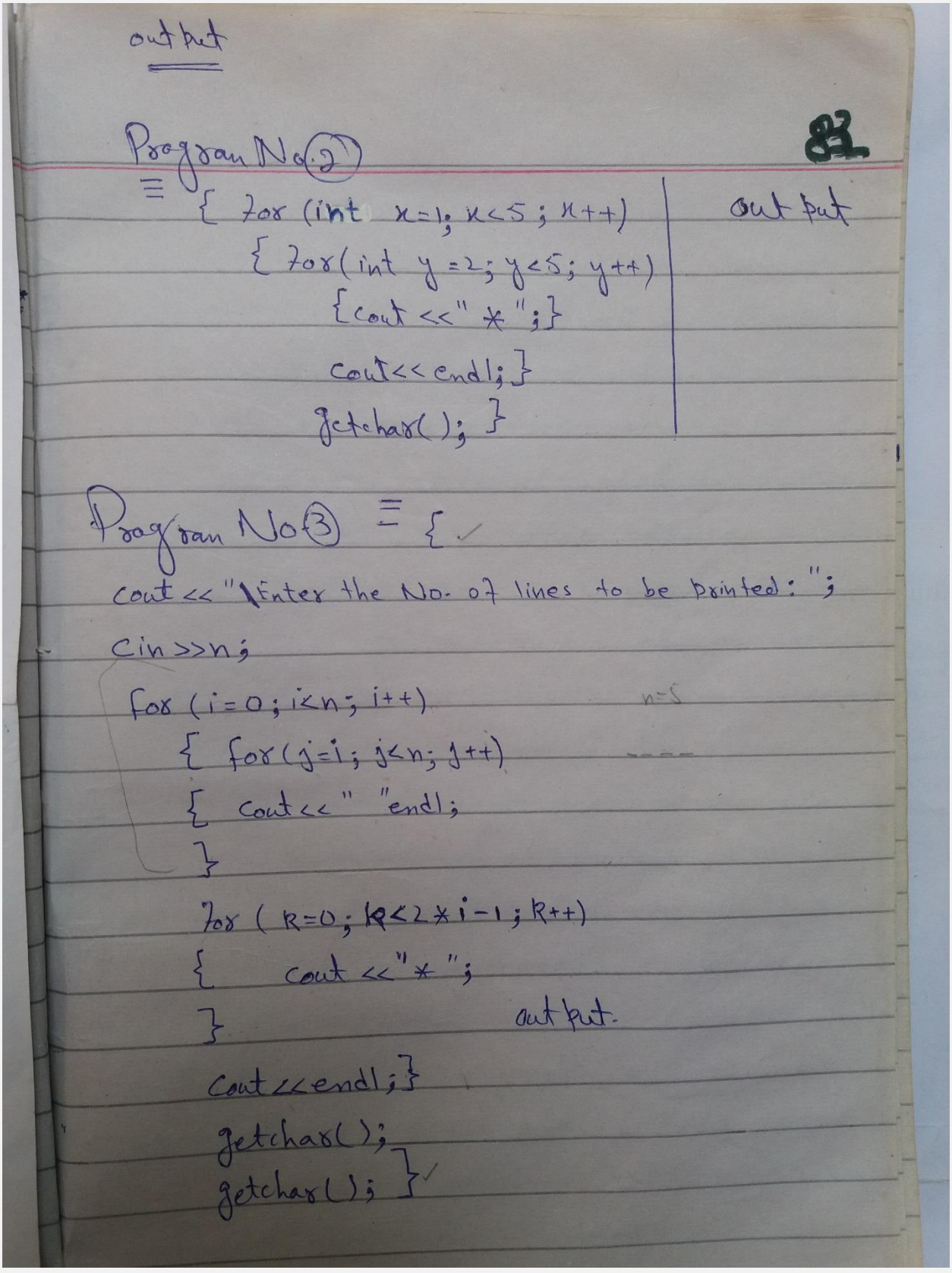
Program.

Write a Program display the following output 82
on the Console (Nested loop)



Program No. 1

```
{ for(int m=1; m<5; m++)
  { for(int n=1; n<5; n++)
    {if (m==1||n==1||m==4||n==4)
      { cout<<"*";}
    else
      { cout<<" ";}
    }
  cout << endl;
  }
    getch();
}
```



output

Program No (2)

```
{ for (int x=1; x<5; x++)
    { for(int y=2; y<5; y++)
        {cout << " * ";}
      cout<<endl;}
    getchar(); }
```

output

Program No (3) = {

```
cout << "Enter the No. of lines to be printed: ";
cin >>n;
for (i=0; i<n; i++)                    n=5
   { for(j=i; j<n; j++)
   { cout<<" "endl;
   }
   for ( k=0; k<2*i-1; k++)
   {    cout << "* ";
   }                                   output.
   cout<<endl;}
   getchar();
   getchar(); }
```

Passing Arguments to Functions. 84

(2) Pass/call by value.] defination on
(3) Pass/call by Reference.] Next Page.

=> Reference operater. (or) Address operter (&)

کسی ۔ جو Memory location یا cell کو show کروانا ہو تو ہم (یعنی ویری ایبل کا address یا)

Program — Reference opr/Add op استعمال کرتے ہیں۔

```
≡ { int z=10;
    cout << "The value of z" << z endl;
    cout << "The address of z" << &z << endl;
    getchar();
    getchar(); }
```

(2) Pass/call by value. Program.

```
# ≡
void duplicate(int a, int b)      ← formal Parameter
   ↓ called function.         → scope.
  { a*=2;  /  a=a*2;
    b*=4;  /  b=b*4;
cout << a << endl << b << endl; }
void main()
 {  int x, y;
 cout << "Enter the value for x" << endl;
 cin >> x;
```

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cout << " Enter the value for y " << endl;
cin >> y;
duplicate (x, y); ← Actual Parameters (OR) actual Arguments.
* Calling function
cout << x << endl << y << endl;
getchar();
getchar();

Definition:

A procedure (طریقہ) in which we copy the values of actual parameters to the formal parameter is called call/Pass by value.

A procedure in which the address of actual parameter goes to formal parameter is called call/Pass by Reference.

Program.

Same Program as above but little difference

=> void duplicate (int &a, int &b)

(out Put)

Pass by value

Enter the value for x 2

Enter the value for y 3

4
12
2
3

Pass by Reference

-> 2
-> 3

4
12
4
12

⇒ Types of variables according to function. 06

There are (04) Variable.

(1) Local variable (scope + Life time)
(2) Global variable (scope + Life time)
(3) Static variable (scope + Life time)
(4) Register variable (X + X)

(1) Local variable.

⇒ A variable declared inside a function is known as local variable (or) variable that is return inside the user define function is called Local variable.

⇒ The area / place where the variable can be accessed or written is called scope of variable.

⇒ The time period by which the variable remain in computer memory.

So,

The Scope of Local variable inside the user define function. (a, b)

& Life time is also inside the User define function. یہ values (a, b) جب تک delete

(2) Global variable

Global variable is the variable that is written out side of any funtion.
Scope remain untill end of the program
Life time is also untill end of the program.
یہ پروگرام کے آخر تک Memory میں رہتا ہے Globaly ہے

```
# =
int z;  ——> z is Global variable   access ہے۔
void show()
{ z = z+3; }
void main()
{ cout << "Enter the value";
  cin >> z;
  Show();
  Cout << z << endl;
     getchar();
     getchar(); }
```

(3) Static variable.

A local variable that is return inside user define function with static key word is called static variable.

```
void duplicate (static int a, static int b)
```

Scope is Similarly to the scope of Local variable & Life time is same as Global variable. 68

(4) Register variable

A variable that is return with register Key variable (or) in register variable the values of variables are stored in Register instead of RAM, Because register are faster than RAM & slow than cash memory.

void duplicate (register int a; register int b)

Program.

Funtion overloading function Name Same But signatures are different.

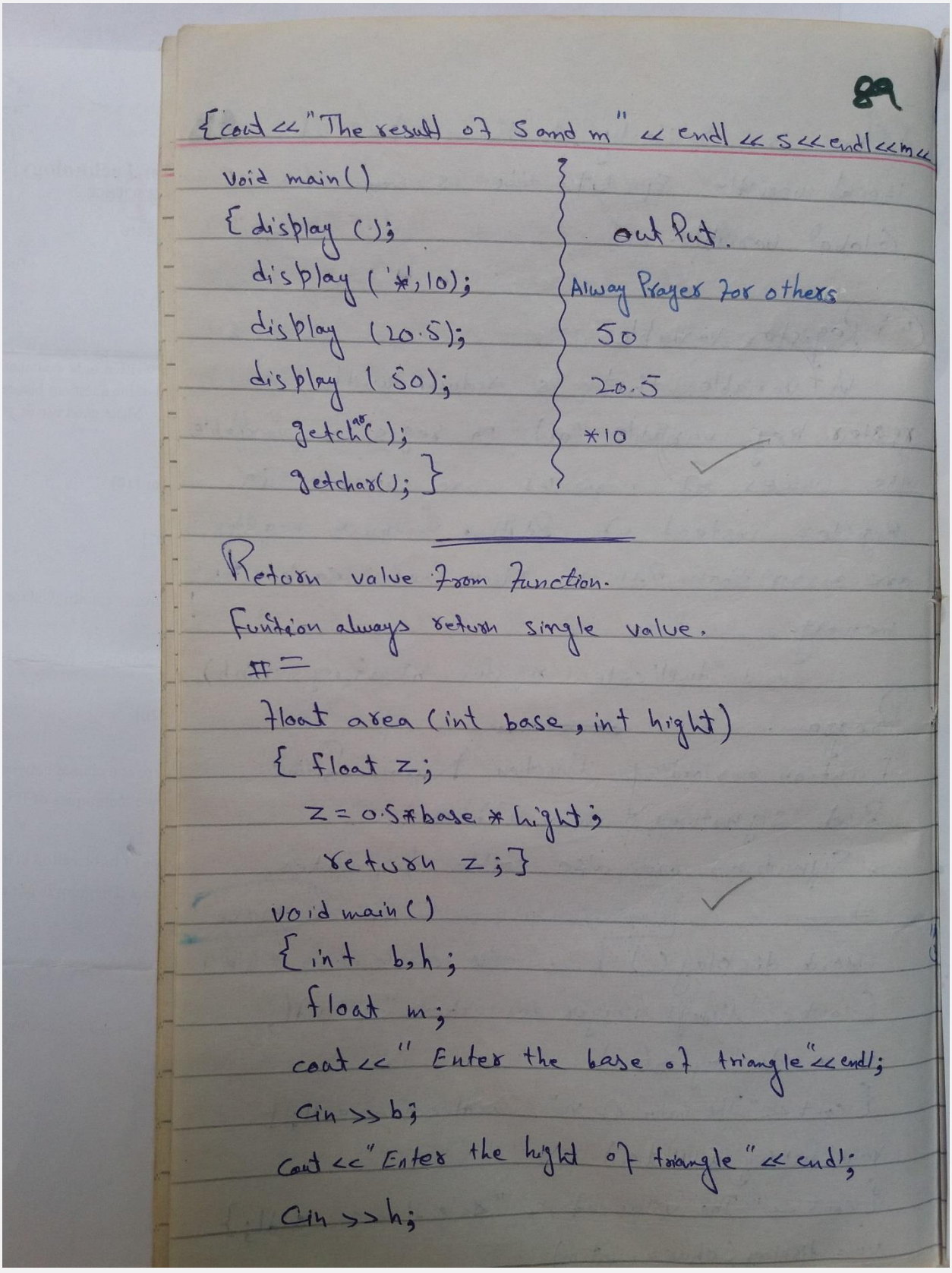
=> Signatures are also called parameter.

#

Note

Float استعمال نہیں کرنا چاہیے double استعمال کرنا چاہیے

```
void display ( )
{cout<<" Always Prayer for others "<< endl;
void display(int n)
{ cout<<" The value of n "<<endl<<n<<endl;}
void display (double c)
{ cout<<" The value of c "<<endl<<c<<endl;}
void display (char s, int m)
```



89

{cout << "The result of 5 and m" << endl << 5 << endl << m <<

```
void main()
{ display ();
  display ('*',10);
  display (20.5);
  display ( 50);
    getch();
    getchar(); }
```

Output.

Always Prayer for others
50
20.5
*10

Return value from function.

Function always return single value.

#=

```
float area (int base, int hight)
 { float z;
   z = 0.5*base * hight;
    return z;}
void main()
{ int b,h;
  float m;
 cout << " Enter the base of triangle" << endl;
 Cin >> b;
 Cout << " Enter the hight of triangle " << endl;
 Cin >> h;
```

endl;}

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```
m = area(b,h);
cout <<" The area of triangle"<<m<<endl;
        getchar();
        getchar(); }
```

Area = $\frac{1}{2}$ * base * hight.

Return value میں value فنکشن سے مین میں آئے گی۔

value/char میں Return ہو سکتی ہے۔ مگر فنکشن صرف ایک value کو

return کر رہے گا۔

return 10; (OR) return A;

Program.

```
# include <iostream>
using namespace std;
int main()
{cout<<" Best of Luck!"<<endl;
return 0;
}
```

Cout put result.

Best of Luck!

Arrays ترتیب - سنوارنا attached 91

It is an arrged set of locations. any of which can be accessed from some common starting address.

(OR)

Consecutive (↑) memory location with same name & same data type.
(one after other)

3 terms in array.
- memory
- consective location
- same data type

Gernaric = عمومی ← MS word
Specific = خاص طور پر ← IDE

4 things in arrays.

(1) name of Arrays
(2) Elements of array
(3) Lenghth of array.
(4) index of Array.

① اصل میں user define variable ہوتے ہیں جو Name of Arrays ہوتے ہیں۔

marks

0			3
10	-2	10	50

② Array میں جتنی values پڑی ہوں elements of Array ہیں۔ جیسے اوپر 4 element ہیں یا 5 یا 6 بھی ہو سکتے ہیں۔

③

Total Number of elements in Array is called its length. eg (4) length of above example

④

Index is basically memory location / Address. In the array index is always start from zero.

It refess to the number that identifies a specific element in an array.

92

First index = 0

Find last index = Length − 1
= 4 − 1 = 3

Syntax Declaration.

Data type Name of Array [length of Array];

(sequire Brackt)

```
int marks [4];
marks [0] = 10;
marks [1] = -2;
marks [2] = 10;
marks [3] = 50;
```

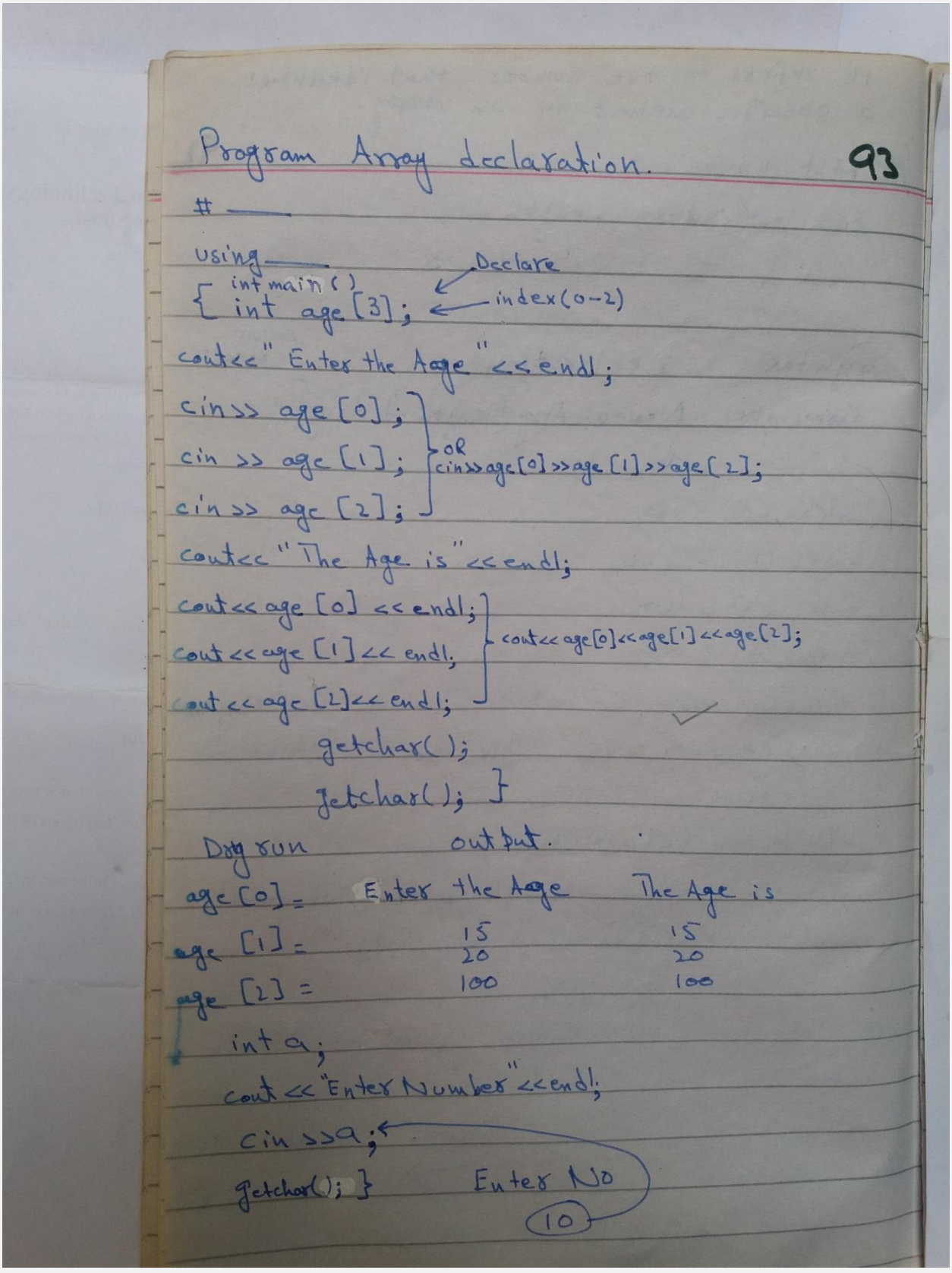
Array کا مقصد values کو serch کرنا Assending یا decsending ترتیب
کو معلوم کرنا. Maximum یا Minimum کو معلوم کرنا.

Syntax. Intialization

Datatype Name of Array [length] = {List of values};

```
int marks [4] = {10, -2, 10, 50};
```

⇒ Note: cin کے ساتھ ہم endl; کو استعمال
نہیں کر سکتے۔ صرف cout کے ساتھ
ہم استعمال کر سکتے ہیں



Program Array declaration. 93

#

using

```
int main()
{ int age[3];
```

Declare index(0-2)

```
cout<<" Enter the Age "<<endl;
cin>> age[0];
cin >> age[1];
cin >> age[2];
```

or `cin>>age[0]>>age[1]>>age[2];`

```
cout<<" The Age is "<<endl;
cout<<age[0]<<endl;
cout<<age[1]<<endl;
cout<<age[2]<<endl;
```

`cout<<age[0]<<age[1]<<age[2];`

```
getchar();
getchar(); }
```

Dry run

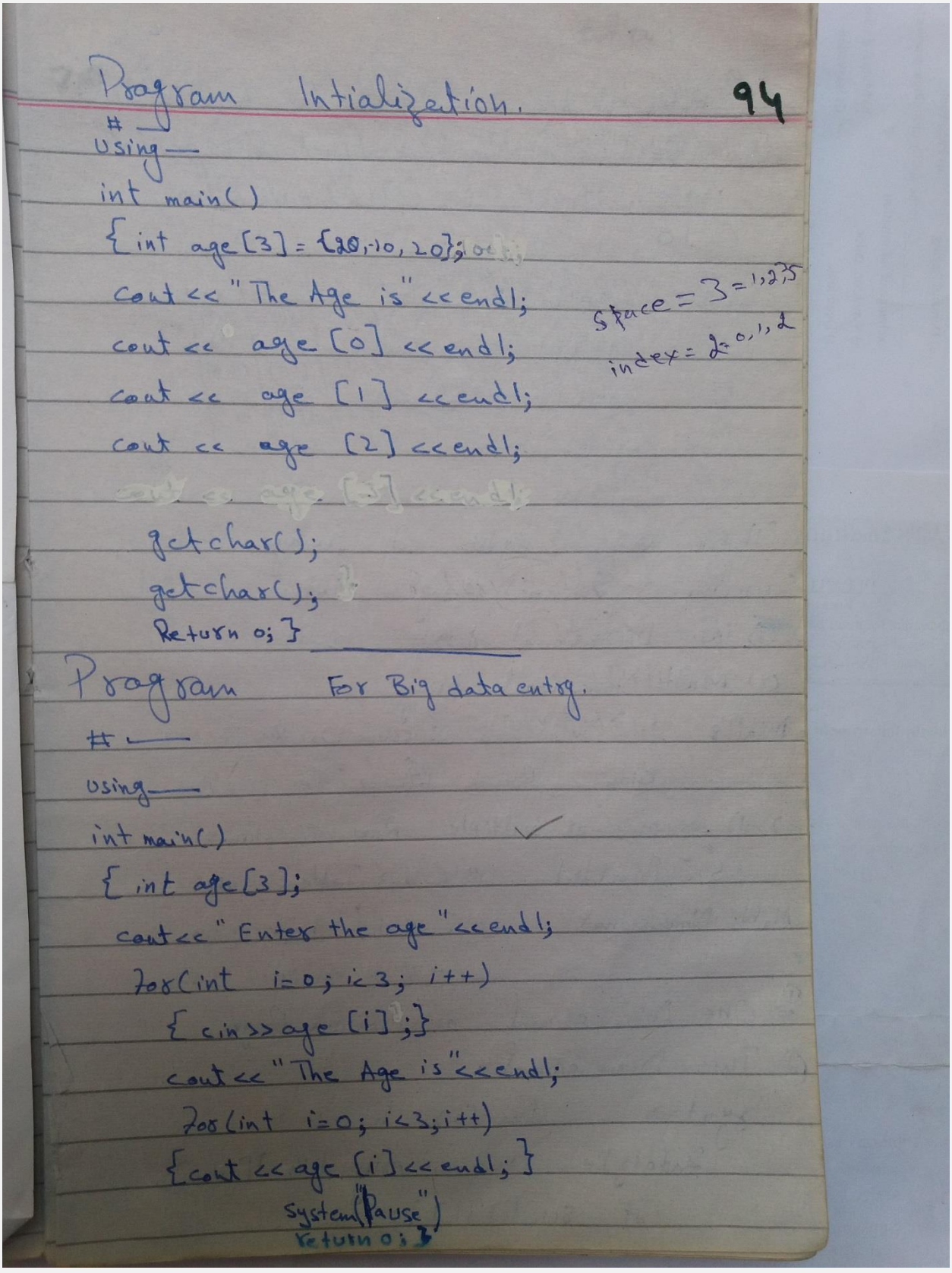
output.

age[0] =	Enter the Age	The Age is
age[1] =	15	15
age[2] =	20	20
	100	100

```
int a;
cout<<"Enter Number"<<endl;
cin>>a;
getchar(); }
```

Enter NO

10



Program Intialization. 94

#
Using—

```
int main()
{ int age[3] = {20,-10,20};
cout << "The Age is" << endl;
cout << age[0] << endl;
cout << age[1] << endl;
cout << age[2] << endl;
getchar();
getchar();
Return 0; }
```

space = 3 = 1,2,3
index = 3 = 0,1,2

Program For Big data entry.

#
Using—

```
int main()
{ int age[3];
cout << "Enter the age" << endl;
for(int i=0; i<3; i++)
{ cin >> age[i];}
cout << "The Age is" << endl;
for(int i=0; i<3; i++)
{cout << age[i] << endl; }
System("Pause")
return 0; }
```

out Put

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Enter the Age	The Age is
50	50
20	20
10	10

as age[i] ← age[0], age[1], age[2]

There are 3 type of Arrays

(1) One Dimensional Array. 1-D

(2) Two Dimensional Array 2-D

(3) Multi Dimensional Array

Details 1-D اس میں Row اور Colum بھی اکٹھے نہیں آتے۔

دونوں میں سے کوئی ایک آتا یا Row یا Colum

2-D ⇒ one or multiple Row & Colums

مثلاً Table کی شکل میں output آتا ہے۔

Multi Dimensional اس میں ملٹی پل ٹیبل ہوتے ہیں۔

یعنی matrix بناتے ہیں۔

(1) ⇒ One Dimensional on Previous Page

(2) Two Dimensional.

Syntax Declared.

Datatype Name of Array [Row][Colum];

int sun[3][2];

Syntax Initialized

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Datatype Array Name [Row][colum] = { list of values };

int sum [3][3] = {2,4,5};

	0	1	2
0	(0,0) 10	(0,1) 20	(0,2) 30
1	(1,0) 40	(1,1) 50	(1,2) 60
2	(2,0) 70	(2,1) 80	(2,2) 90

→ index of colum

OR

index of Row

[0][0] = 10
[0][1] = 20
[0][2] = 30
[1][0] = 40
[1][1] = 50
[1][2] = 60
[2][0] = 70
[2][1] = 80
[2][2] = 90

Program of two-Dimensional. 97

1-D کے اندر ایک loop

2-D کے اندر دو loops اور MultiD کے اندر Multiloops چلتی ہے۔

const کا مطلب value کو fix کرنا ہے۔

const کو ہم مین کے اندر نہیں لکھتے

Const اصل میں constant ہے۔

Const is Keyword.

```
# ____
using ____
const int District = 3;
const int Month = 2;
void main()
{double S[3][2]; for(int d=0;d<District; d++)
  { for(int m=0 ; m<month; m++)
      {cout<<" Enter the Sales for District "<<d+1;
      cout<<" AND Month"<<m+1<<" : ";
      cin >> S[d][m];}
  }
  cout << "\n\n";
  cout << " months " <<endl;
  cout << " ___1____2_______ "<< endl;
  cout << "     1   2 " << endl;
  cout << " ------------- "<<endl;
    for(int d=0; d< District; d++)
      { for( int m=0; m< month; m++)
      {cout << "\t "<< S[d][m]<< "\t";}
      cout <<endl; }
    }

        getchar();
        getchar(); }
```

out Put

Enter the Sales for District 1 AND Month 1: 20
Enter the Sales for District 1 AND Month 2: 30
false ⇒
Enter the Sales for District 2 AND Month 1: 15
Enter the Sales for District 2 AND Month 2: 25
false ⇒
Enter the Sales for District 3 AND Month 1: 9.50
Enter the Sale for District 3 AND Month 2: 10
false ⇒

months	
1	2
20	30
15	25
9.50	10

Dry Run 98

s[0][0]	d=0, m=0
s[0][1]	d=0, m=1
s[0][2]	d=0, m=2
s[1][0]	d=1, m=0
s[1][1]	d=1, m=1
s[1][2]	d=1, m=2
s[2][0]	d=2, m=0
s[2][1]	d=2, m=1
s[2][2]	d=2, m=2

d=0, m=0
d=0, m=1
d=1 m=0
d=1 m=1
d=2 m=0
d=2 m=1

initalized

Datatyp Name of Arry [][] = { List of value };

Same out Put.

int s[3][2] = {20,30,15,25,9.50,10};

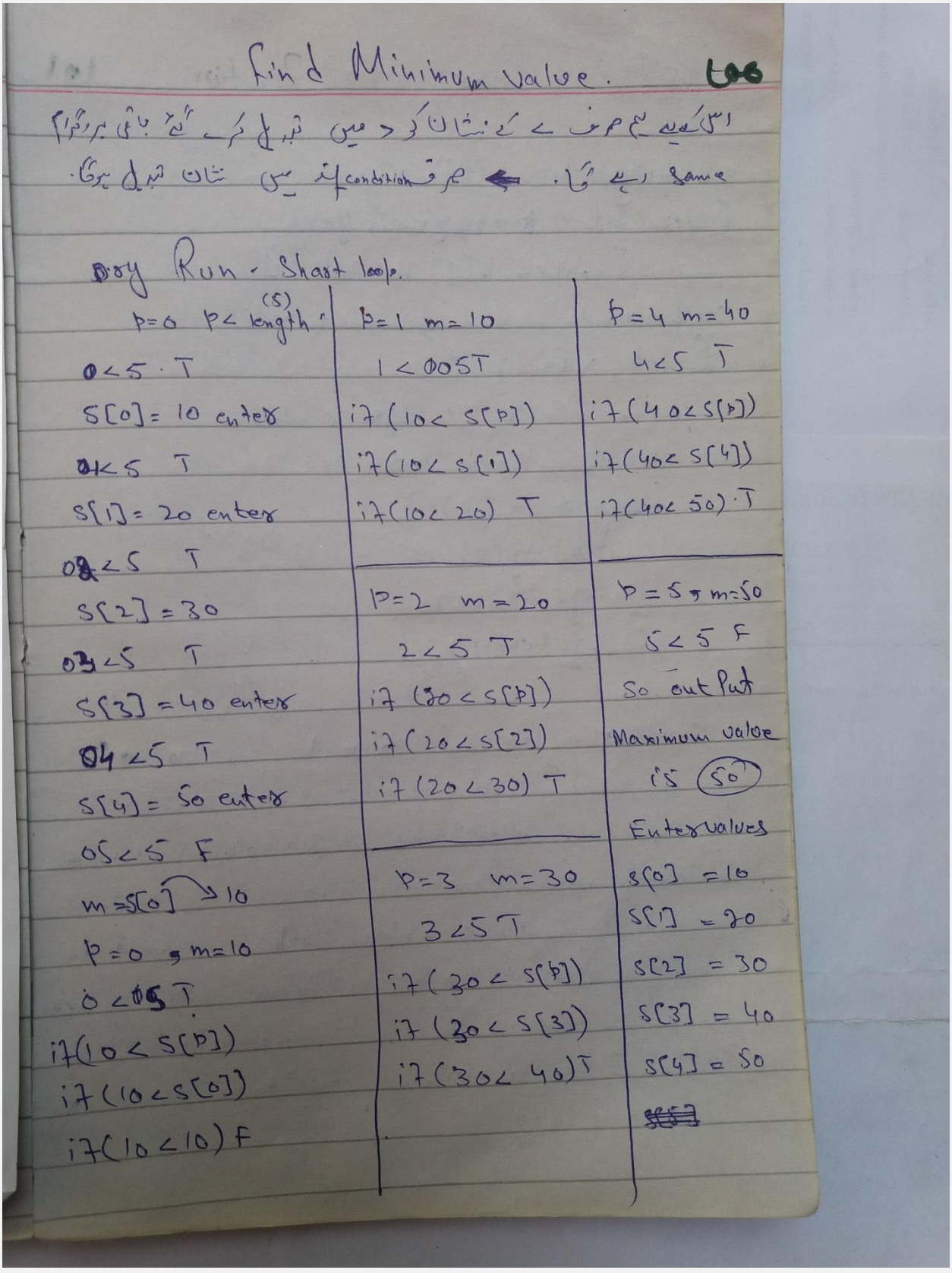
Searcing in Array. 99

Find Maximum value

```
# ___
using ___
Const int length = 5;
Void main()                       // index (0-4)
 { int s[Length], m;
   cout << "Enter the Elements" << endl;
   For (int p=0; p<length; p++)
     { cin >> S[p]; }
   m= S[0];
   For (int p=0; p<length; p++)
   { if (m< S[p])      // > for mini
       { m= S[p]; }
   }

   Cout << "Maximum value is" << m << endl;
           getchar();
           getchar(); }
```

Rule کے مطابق output کو Row فارم میں شو ہونا چاہئے مگر 1-D Array کی یہ property ہے کہ وہ کالم میں values شو کروائے گا یعنی endl; لگائے بغیر وہ کالم میں values کو شو کروائے گا۔



Find Minimum value. 106

اس کوڈ میں صرف نشان کو > میں تبدیل کرنے باقی برقرار
رہے گا۔ ⬅ صرف condition میں نشان تبدیل ہوگا۔

Dry Run - Short loop.

p=0 p< length (5)

0<5 T
s[0] = 10 enter
1<5 T
s[1] = 20 enter
2<5 T
s[2] = 30
3<5 T
s[3] = 40 enter
4<5 T
s[4] = 50 enter
5<5 F
m = s[0] → 10
p=0 , m=10
0<5 T
if(10 < s[p])
if(10 < s[0])
if(10 < 10) F

p=1 m=10
1<5 T
if(10 < s[p])
if(10 < s[1])
if(10 < 20) T

p=2 m=20
2<5 T
if(30 < s[p])
if(20 < s[2])
if(20 < 30) T

p=3 m=30
3<5 T
if(30 < s[p])
if(30 < s[3])
if(30 < 40) T

p=4 m=40
4<5 T
if(40 < s[p])
if(40 < s[4])
if(40 < 50) T

p=5 , m=50
5<5 F
So out Put
Maximum value
is (50)

Enter values
s[0] = 10
s[1] = 20
s[2] = 30
s[3] = 40
s[4] = 50

Passing Array to Function. 101

#=

```
Void display (int b[5])        <- Called Function
{ for (int g=0; g<5; g++)
      { cout<< b[g] <<endl; } }
Void main( )
{ int a[5];                    <- Datatype
  cout << "Enter the Age" <<endl;
  for(int p=0, p<5; p++)
  { cin>> a[p]; }
      display (a);             <- Calling function
      getchar();
      getchar(); }
```

calling function میں جو Argument (Parameter) استعمال ہوتا وہ ہیں فنکشن میں Name of variable کے طور پر استعمال ہوتا.

← calling function میں اور Called Function میں loop کے variable بھی مختلف ہوں گے مگر اگر فنکشن کو Called نہیں کیا تو دونوں loop کے variables ایک جیسے ہو سکتے ہیں۔

← called فنکشن میں length لکھے گئے مگر Calling میں length نہیں لکھتے.

OutPut Enter the Age.

20 30 40 50 60

out Put
20
30
40
50
60

Multi Dimensional Array.

Syntax

Data type Name of Array [Length1][length2][Length3]...[lengthn];

int a[2][3][4];

Exp=> int b[2][3][4];

```
for(int i=0; i<2; i++)
{ for (int j=0; j<3; j++)
  { for(int k=0; k<4; k++)
    { cin>> b[i][j][k]; }
  }
}
```

(1) (2) (3)

Built-in-function / Math function.

(1) abs() → Absolute funtion -1 = 1

(2) fabs() → Fractional Absolute funtion -0.1 = 0.1

(3) ceil() 0.5 = 1 , -0.5 = -0

(4) floor() 0.5 = 0 , -0.5 = -1

(5) Sin()

(6) Cos()

(7) tan()

(8) log()

(9) log10()

(10) Sqrt() 103

(11) Pow (a,b) → 2nd Parameter always for exponent

Note: pow(2,3) is mean $2^3 = 8$

① صرف absolute فنکشن کے ساتھ int آ سکتا باقیوں کے ساتھ نہیں آ سکتا. یعنی absolute نہ Float ہوتا ہے اور نہ ہی char صرف اور صرف int. data type ہو گی.

② Pow کے علاوہ باقی سبھی میں ایک ہی parameter آ سکتا.

③ pow() میں صرف 2 variable آ سکتے ہیں مگر باقی ساروں کے ساتھ صرف ایک variable یعنی Argument|Parameter آ سکتا.

Function calling Rule.

User define function. (UDF)

✓ UDF میں ہم values کو cout کرواتے ہیں. اگر return نہ کیا ہو

✓ UDF میں ہم constant کو Pass کرواتے ہیں.

✓ UDF میں ہم سارے loops, conditions, if else, switch آ سکتا.

Main function (MF)

✓ MF میں ہم calling کرتے ہیں.

✓ MF میں ہم values کو cin کرواتے ہیں.

✓ UDF میں return دے گے تو cout بھی main میں آئے گا.

کیونکہ Return value main کے variable میں سٹور ہوتی ہے.

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String:-

String is the combination of characters written in double Quotation. also called string constant.

Example Programming → "Programming" } are string.
123 → "123"

جب digits کے ساتھ بھی Double Quotation لگا دیں تو وہ بھی string بن جاتے ہیں۔

"* # Good Luck # *"

space ایک charater ہے ایک character بھی space لیتا ہے۔

⇒ String is basically Array of characters.

0	1	2	3	4	5
10	20	30	40	50	60

→ index of Array.

Similarly index of String ↘

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
p	r	o	g	r	a	m	m	i	n	g		i	s	\0

null character \0 black slach & zero

یہ میموری میں سٹور ہوتا ہے اور at the end of string آتا ہے۔

null character come at always at the end of string & take one index space.

Two, Two methods of initilization & Declaration of string.

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→ char array name [length];

Syntax char a[5];

- char ↓ Data type of String.
- a ↓ Name of String
- [5] → Length of String.

Ⓐ Two Method of Declaration of string.

① cin Method.

② cin.get() Method.

Program.

```
#=
int main()
{ char k[5];
cout << "Enter the string" << endl;
cin >> k;      → یہ نام آتا ہے  Name of string
cout << " string is" << endl << k << endl;
    system("Pause");
    return 0; }
```

output.

Ali

0	1	2	3	4
A	l	i	\0	X

X → خالی رہتا ہے.

cin کا نقصان ہے کہ اگر space ہو تو وہ space کے بعد والا لکھا ہوا شو نہیں کرواتا۔

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cin → Ali usman.

cout → Ali   space سے پہلے والی چیز کو شو کروائے گا۔

② cin.get()   یہ space کے بعد والا بھی شو کروائے گا۔

```
#
int main()
{ char k[10];
cout << "Enter the string" << endl;
cin.get(k, 10);
cout << "String is" << endl << k << endl;
        system("Pause");
        return 0; }
```

(both same)

③ ⟹

```
cin.get(k, 10, '*');
```

اس پر ہم * (Bound) پابند ہو جائے گے کہ ⑩ string ہو گے تو compiler ہمیں output دکھائے گا۔

مگر اگر ہم اس لفظ کے ساتھ وہی character لگا دے تو output آجائے گا

eg   Junaid Bilal ⟹ Junaid*

output Junaid ✓

Program Intialization

(14)

```
#
int main()
{ char k[20] = "Ghauricenter";
  cout << "string is <<endl<< k<<endl;
      System("Pause");
      Return 0; }
```

اگر ہم [ ] کو خالی چھوڑ دے تو بھی output آ جاتی ہے

Automatic یہ string کی length کو Adjust کر لیتا ہے۔

⇒ 2nd way of intialization

```
char k[20]= {'G','h','a','u','r','i',' ','c','e','n','t','e','r'};
```

اس میں length نہیں دی جاتی ہے۔

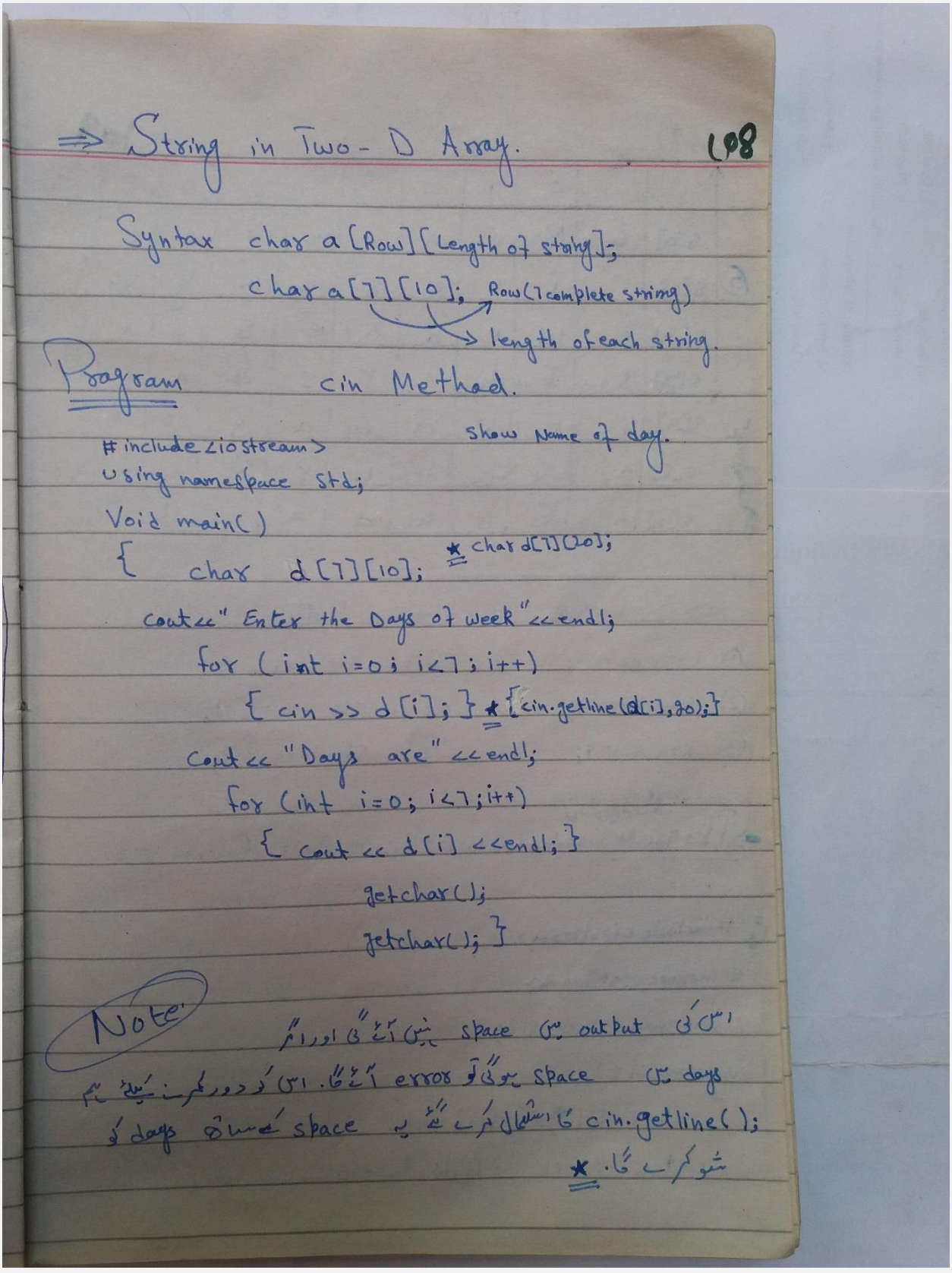
Syntax char array_name[length] = Value;

information.

```
int a=10;
float b=10.5;
Char z= 'J';
String a[] = {.};
```

→ بریکٹ تک بھی لکھ سکتے ہیں اور نہیں بھی

Example



⇒ String in Two-D Array. L08

Syntax `char a[Row][Length of string];`

`char a[7][10];` Row(1 complete string)

length of each string.

Program cin Method.

Show Name of day.

```
#include<iostream>
using namespace std;
Void main()
{   char d[7][10];   * char d[7][10];
cout<<" Enter the Days of week"<<endl;
   for (int i=0; i<7; i++)
     { cin >> d[i]; }  * {cin.getline(d[i],20);}
cout<< "Days are"<<endl;
   for (int i=0; i<7;i++)
     { cout << d[i] <<endl; }
        getchar();
        getchar(); }
```

Note:

اس کی output میں space نہیں آئے گی اور اگر space دیں گے تو error آئے گا۔ اس کو دور کرنے کے لیے days کے space سے cin.getline(); استعمال کرے گے یہ شروع کرے گا۔ *

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(10)

		0	1	2	3	4	5	6	7	8
s[0]	0	M	u	n	d	a	y	\0		
(7) s[1]	1	T	u	e	s	d	a	y	\0	
s[2]	2	W	e	d	n	e	s	d	a	y
s[3]	3	T	h	u	r	s	d	a	y	\0
s[4]	4	F	r	i	d	a	y	\0		
s[5]	5	S	a	t	u	r	d	a	y	\0
s[6]	6	S	u	n	d	a	y	\0		

⇒ String functions (Bulit in function)

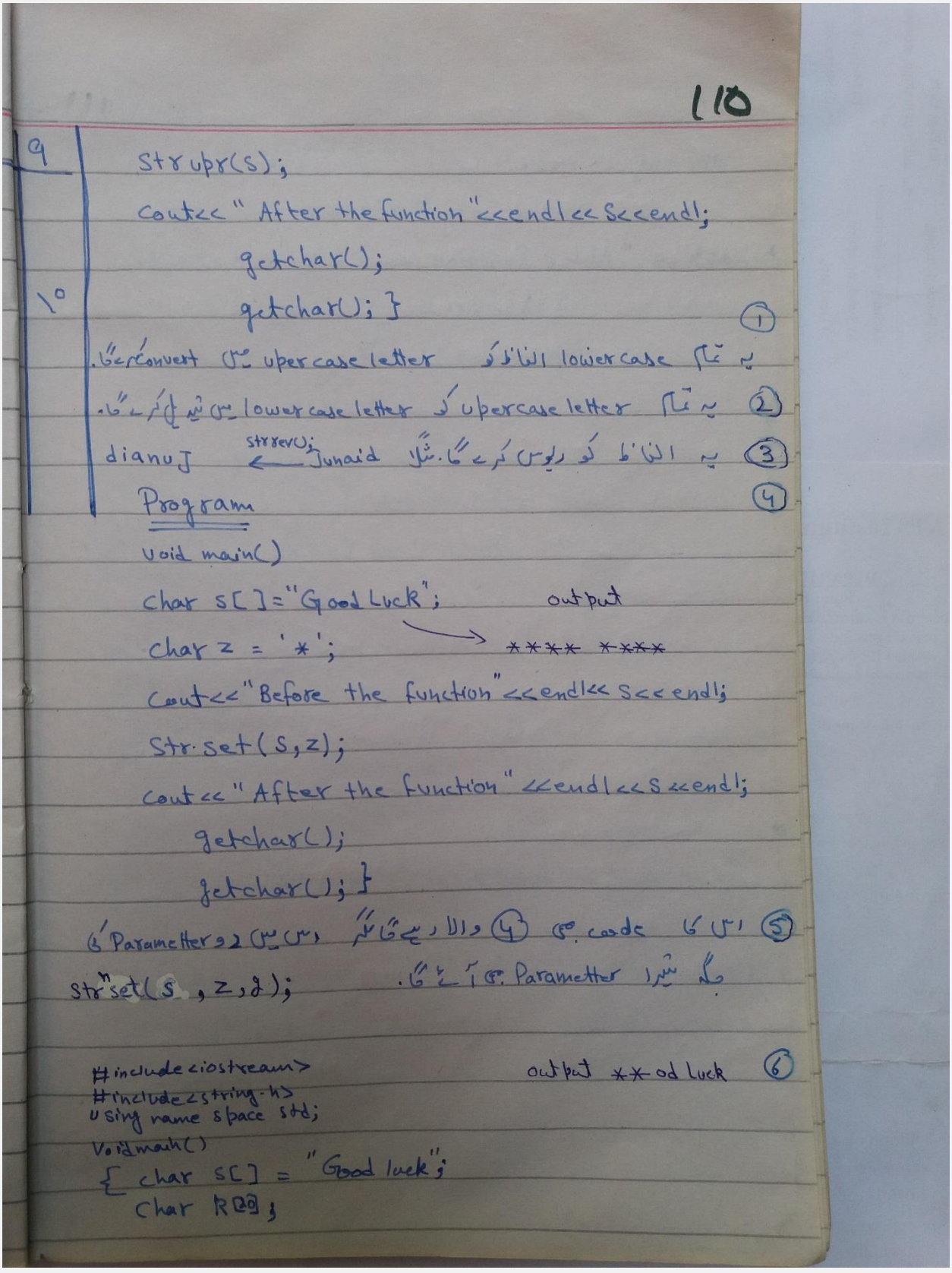
① strupr(); ④ str[illegible]set( );

② strlwr(); ⑤ strnset( );

③ strrev(); ⑥ strcpy( );

⇒ **Program** # include<string.h> لگانا ہوتا ہے Built in function ان استعمال کرتے ہیں۔

```
#include<iostream>
#include<string.h>
using namespace std;
void main()
{ char s[]=" Good luck";
  cout<<" Before the funtion"<<endl<<s<<endl;
```



110

```
9   Strupr(s);
    cout<<" After the function"<<endl<<s<<endl;
        getchar();
10      getchar(); }
```

① یہ تمام lowercase الفاظ کو convert کرے گا uppercase letter میں۔

② یہ تمام uppercase letter کو lowercase letter میں تبدیل کرے گا۔

③ یہ الفاظ کو ریورس کرے گا۔ مثلاً Junaid ← strrev(); dianuJ

④ Program

```
void main()
char s[]="Good Luck";
char z = '*';
cout<<"Before the function"<<endl<<s<<endl;
Str.set(s,z);
cout<<"After the function"<<endl<<s<<endl;
    getchar();
    getchar(); }
```

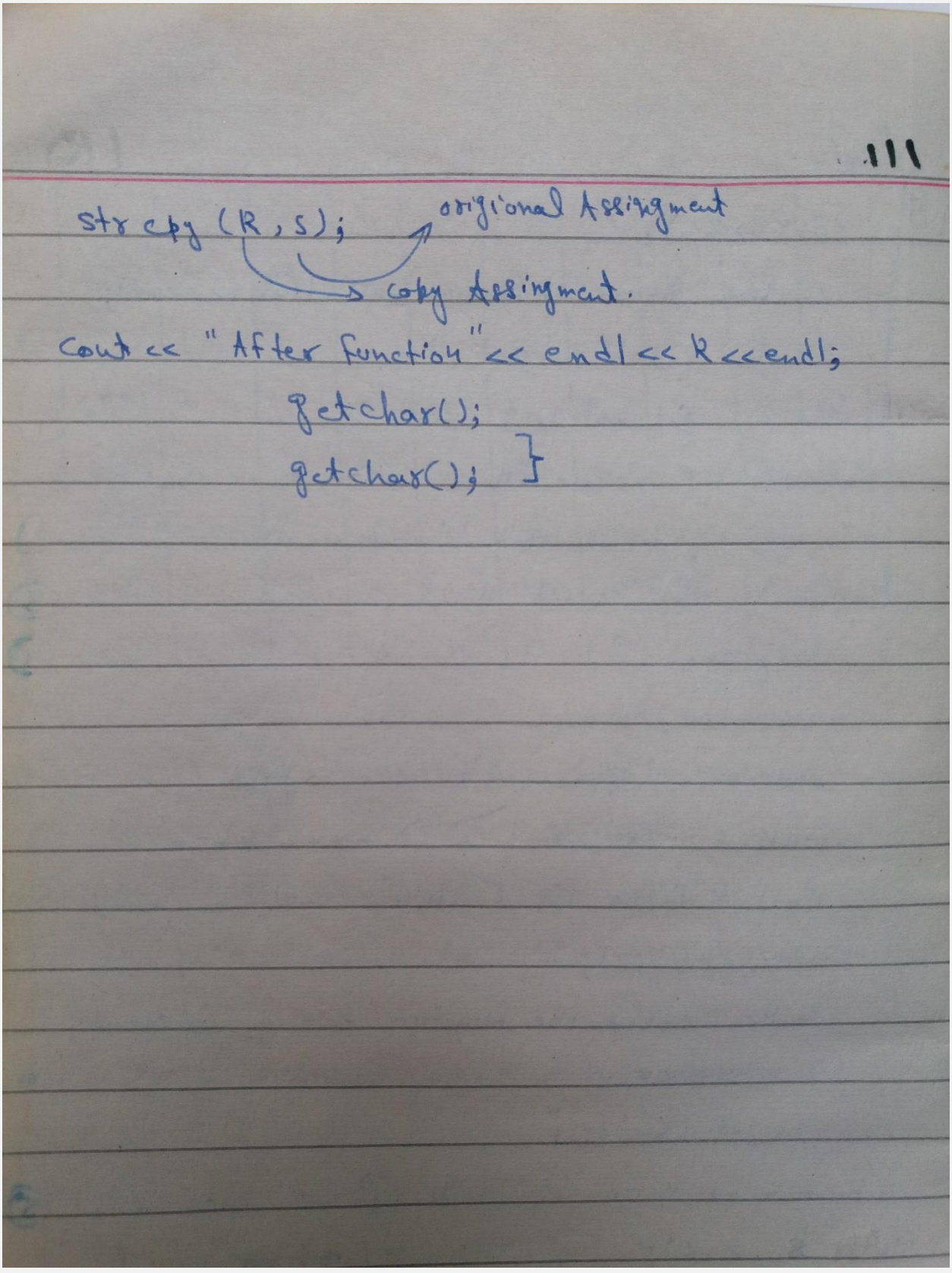
output → **** ****

⑤ اس کا code بھی ④ والا رہے گا لیکن Parameter کی جگہ تیسرا Parameter آئے گا۔

Str^n set(s , z, 2);

⑥ output **od Luck

```
#include<iostream>
#include<string.h>
using name space std;
Void main()
{ char s[] = "Good luck";
  Char R[9];
```


111
strcpy (R, S);
original Assignment
copy Assignment.
Cout << "After function" << endl << R << endl;
getchar();
getchar(); }

⇒ Pointers:-

112

Pointer is a variable that is used to store the memory address of other variable.

Syntax:-

Datatype space *Name of variable;

Asterisk.

int (*z);

Pointer variable

Program:- Point declaration.

```
#____
void main()
{ int *z;
  int m;
  int n;
  z = &m;
  cout << "Address of m" << endl << z << endl;
  z = &n;
  cout << " Address of n" << endl << z << endl;
  getchar();
  getchar();
}
```

Datatype
values

113

⇒ Indirectional operater / Dereffference operater.

Symbol:. *

⇒ Program

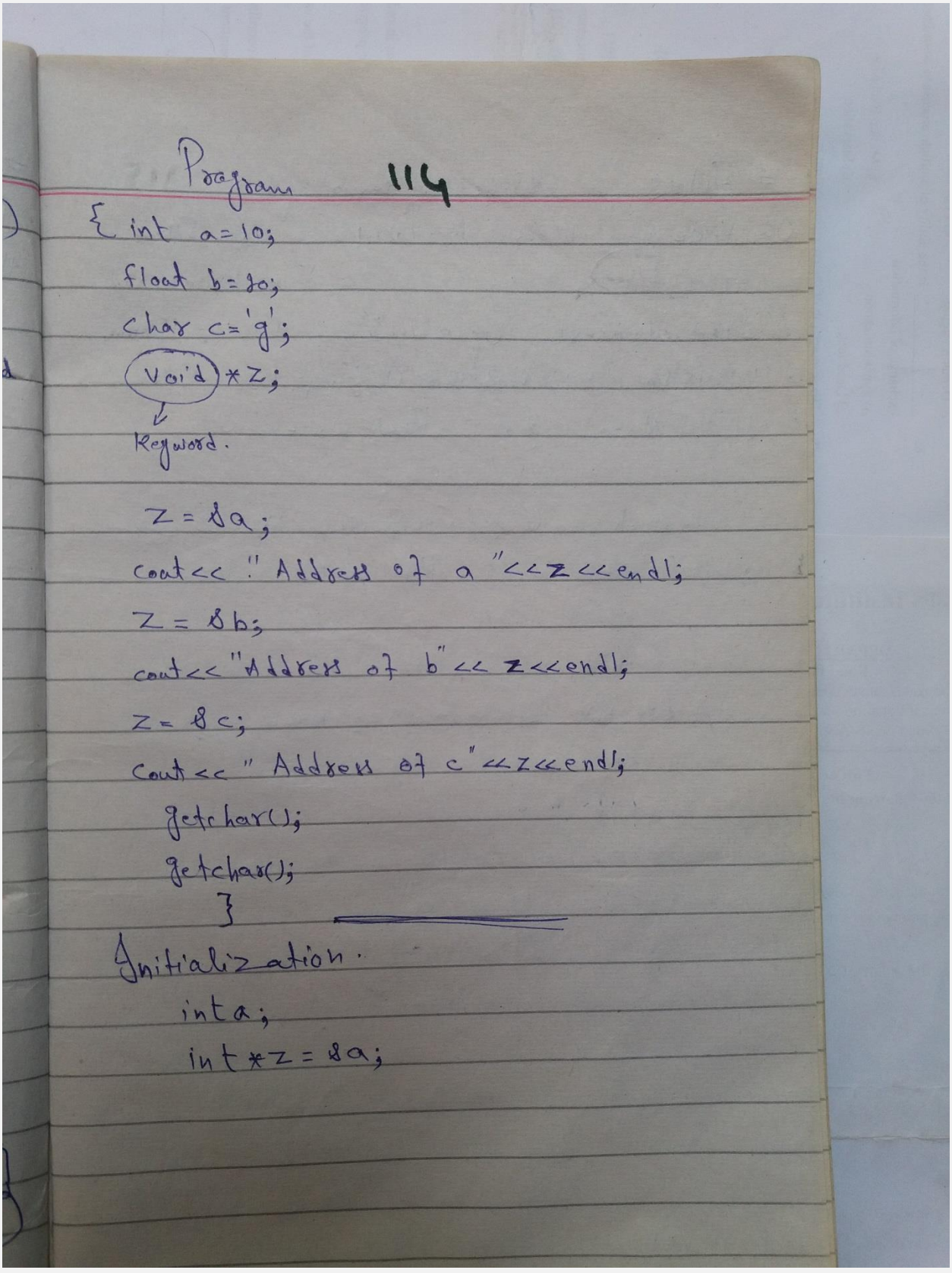
It is use to access the value of the variable whose memory Address stored in Pointer variable.

```
#=
{ int *z;
  int m=10;
  int n=20;
  z = &m
cout << "Address of m" <<endl<< z <<endl;
cout << " Value of m" <<endl<<*z << endl;
 z = &n;
cout << "Address of n" <<endl<<z<< endl;
cout << " value of n" << endl<<*z<<endl;
  getchar();
  getchar();
  }
```

⇒ Void Pointer

Program

```
#=
'void main( )
```



Program 114

```
{ int a=10;
  float b=20;
  char c='g';
  void *z;
```

Keyword.

```
  z = &a;
  cout<< " Address of a "<<z<<endl;
  z = &b;
  cout<< "Address of b"<< z<<endl;
  z = &c;
  cout<< " Address of c"<<z<<endl;
    getchar();
    getchar();
      }
```

Initialization.

```
  int a;
  int *z = &a;
```

⇒ Files (Slides sy kerna hy) 115

files میں ایک Readoprates اور دوسرا files میں

Note

Write opreters ہوتا ہے ۔

ifstream میں فائل بنائے گئے اور اس میں data insert کروائے گئے۔

ofstream میں ہم فائل میں جو لکھا ہوا ہے read کرنا ہو تو ofstream کروائے گئے۔

اگر دونوں Read & write کرنا ہو تو Fstream استعمال کر سکتے۔

جب کوئی Builtin function استعمال ہو گا تب h. لگے گا۔

جب فائل کو Read/input کرنا ہو تب Initialized کروائے گئے۔

(Continiveto Slides)

اس میں Name ایک جیسے ہونے چاہئے ہم consoul ۔

"Structures"

116

Structures is the Combination | Collection of different datatype with same name.

(i) Declaration (ii) Defining (iii) Accessing.

(i) Declaration the Sturctures

Syntax.

```
Struct  space  Name of structure
{ Datatype1  space  variable1;
  Datatype2  space  variable2;
      :              :
  Datatypen  space  Variable n};
```

Example

```
Struct  Student
{int    roll no;
 int    mark;
};
```

Variable کی طرح یہ بھی structures میں ہوتے ہیں

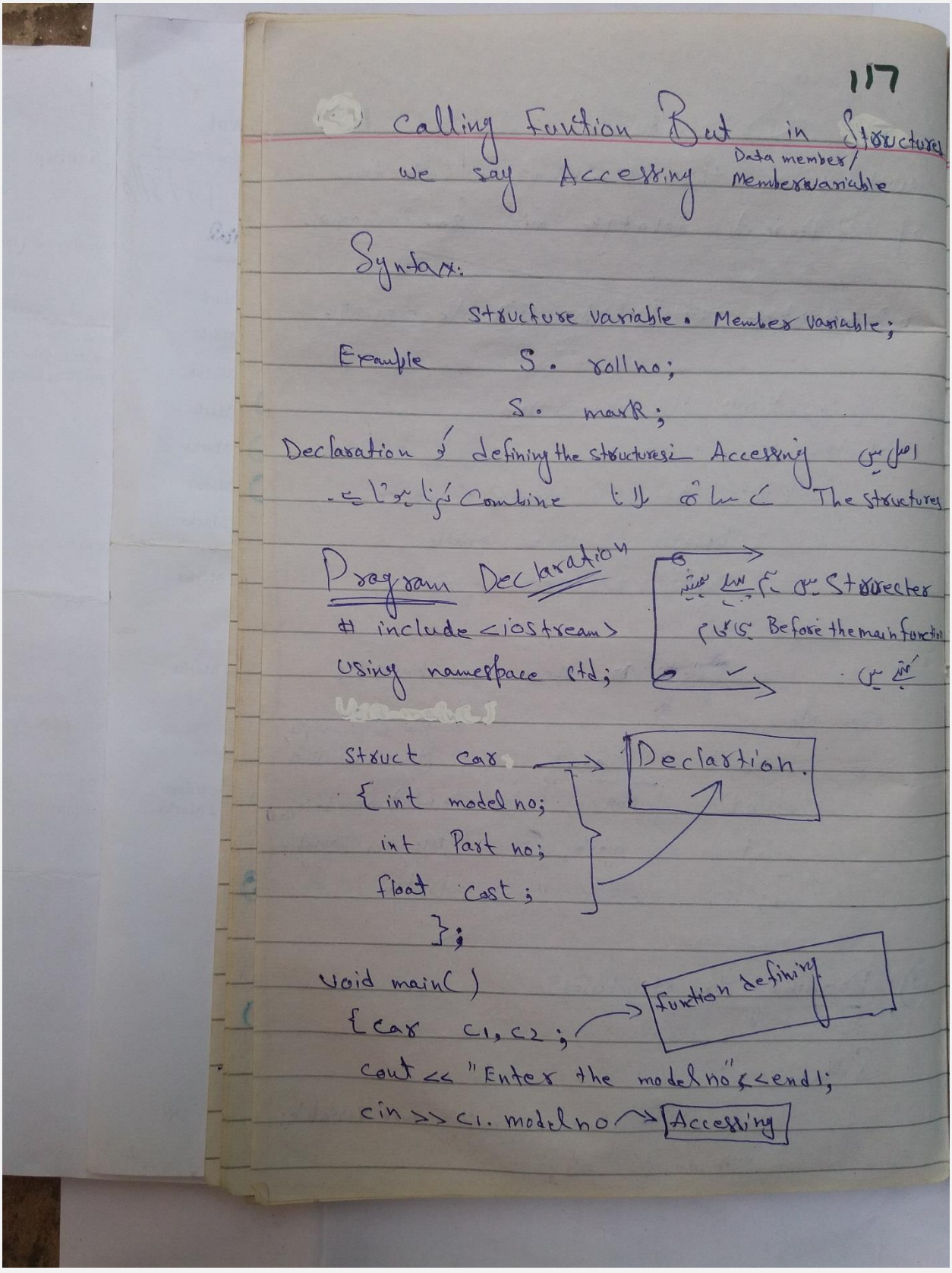
→ Datmember (OR) Member Variable

(2) Defining the structures:

Syntax:

```
Name of structure   Structure Variable;
```

Example Student S;



117

Calling Function But in Structure
we say Accessing Data member / Member variable

Syntax:

Structure variable . Member variable;

Example S . roll no;

S . mark;

Declaration ؛ defining the structures ؛ Accessing ؛ Combine ؛ The structures

Program Declaration

#include <iostream>
using namespace std;

Structure ؛ Before the main function

struct car
{ int model no;
int Part no;
float cost;
};

Declartion

void main( )
{ car c1, c2;

Function defining

cout << "Enter the model no" << endl;
cin >> c1. model no

Accessing

اگر cin میں بھی c1 کو استعمال کرتے ہیں تو cout میں بھی c1 ہی لکھنا ہے۔

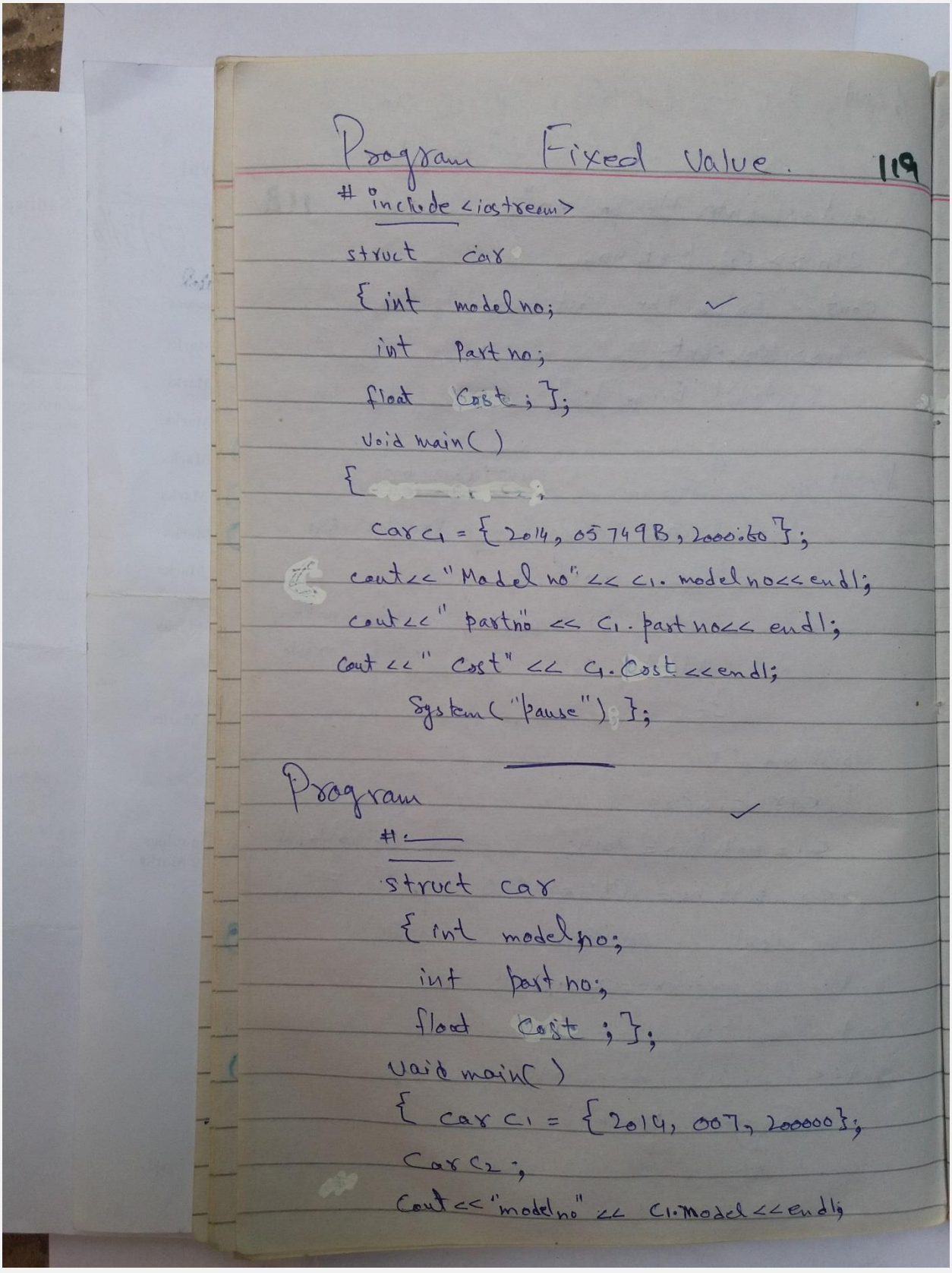
118

```
cout<<"Enter the part no"<<endl;
 cin>>c2.part no;
cout<<"Enter the cost"<<endl;
cin>>c2.cost;
   System("Pause"); }
```

Program (initialized)

```
#___
using___
struct car                 --> Declaration.
{int   modelno;   ]
 int   part no;   ]  --> Data member/
 float Cost;      ]      member variable.
};

Void main()
 {car c1, c2;
  c1.modelno = 2014;         ]
  c2.part no = J89017B5;     ]  --> initialized
  c2.Cost = 200000;          ]
cout<<"c1.modelno"<<endl;
Cout<<"c2.part no"<<endl;
Cout<<"c2.Cost"<<endl;
       System("pause"); }
```

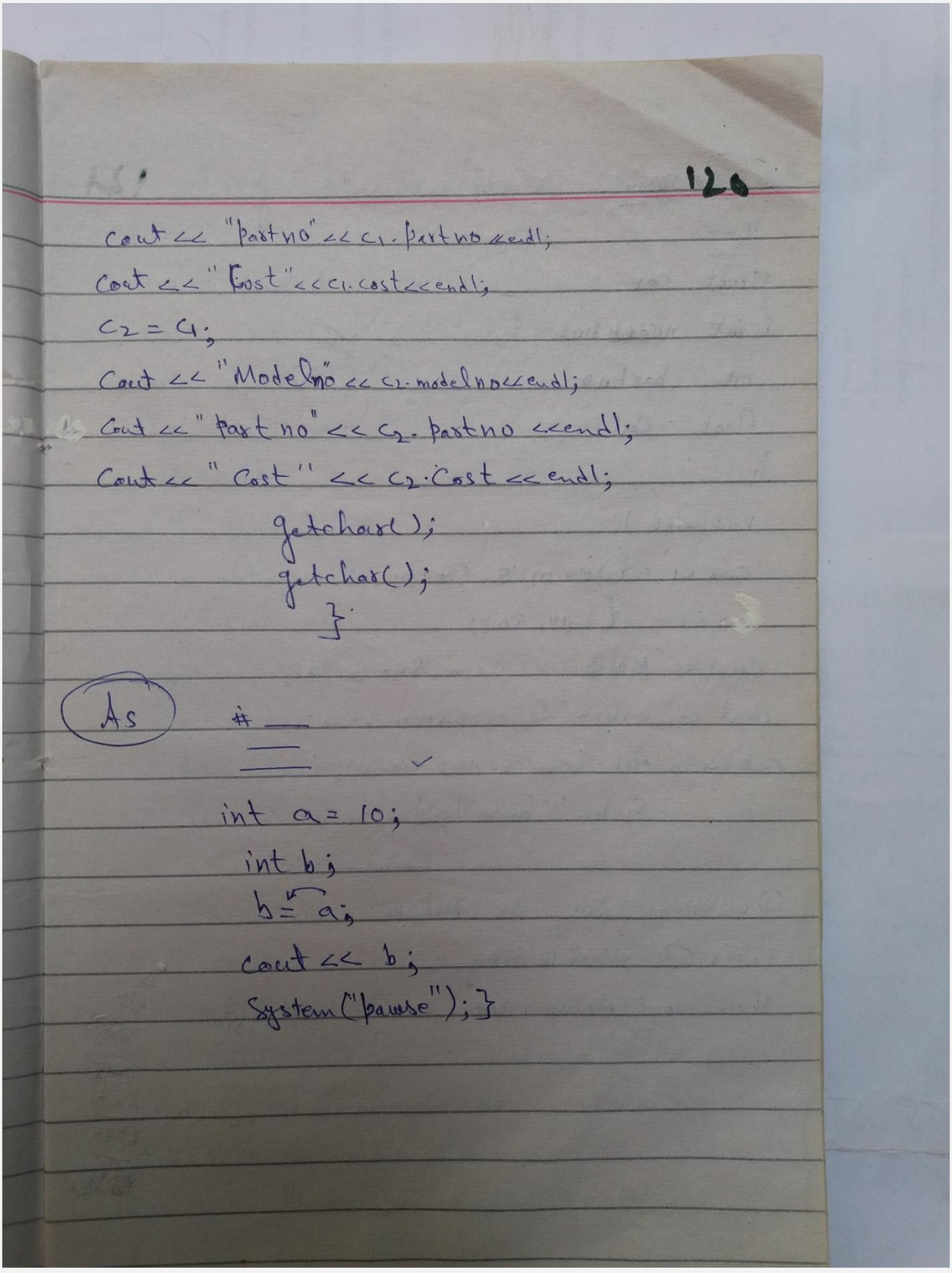


Program Fixed value. 119

```
#include <iostream>
struct car
{int modelno;
 int Partno;
 float Cost;};
Void main( )
{
 car c1 = {2014, 05749B, 2000.60};
cout<<"Model no" << c1. modelno<<endl;
cout<<" partno" << c1. partno<< endl;
Cout <<" Cost" << c1. Cost <<endl;
    System("Pause"); };
```

Program

```
#:
struct car
 {int modelno;
  int partno;
  float cost;};
Vaid main( )
{ car c1 = {2014, 007, 200000};
 Car c2;
Cout<<"modelno" << c1.model<<endl;
```



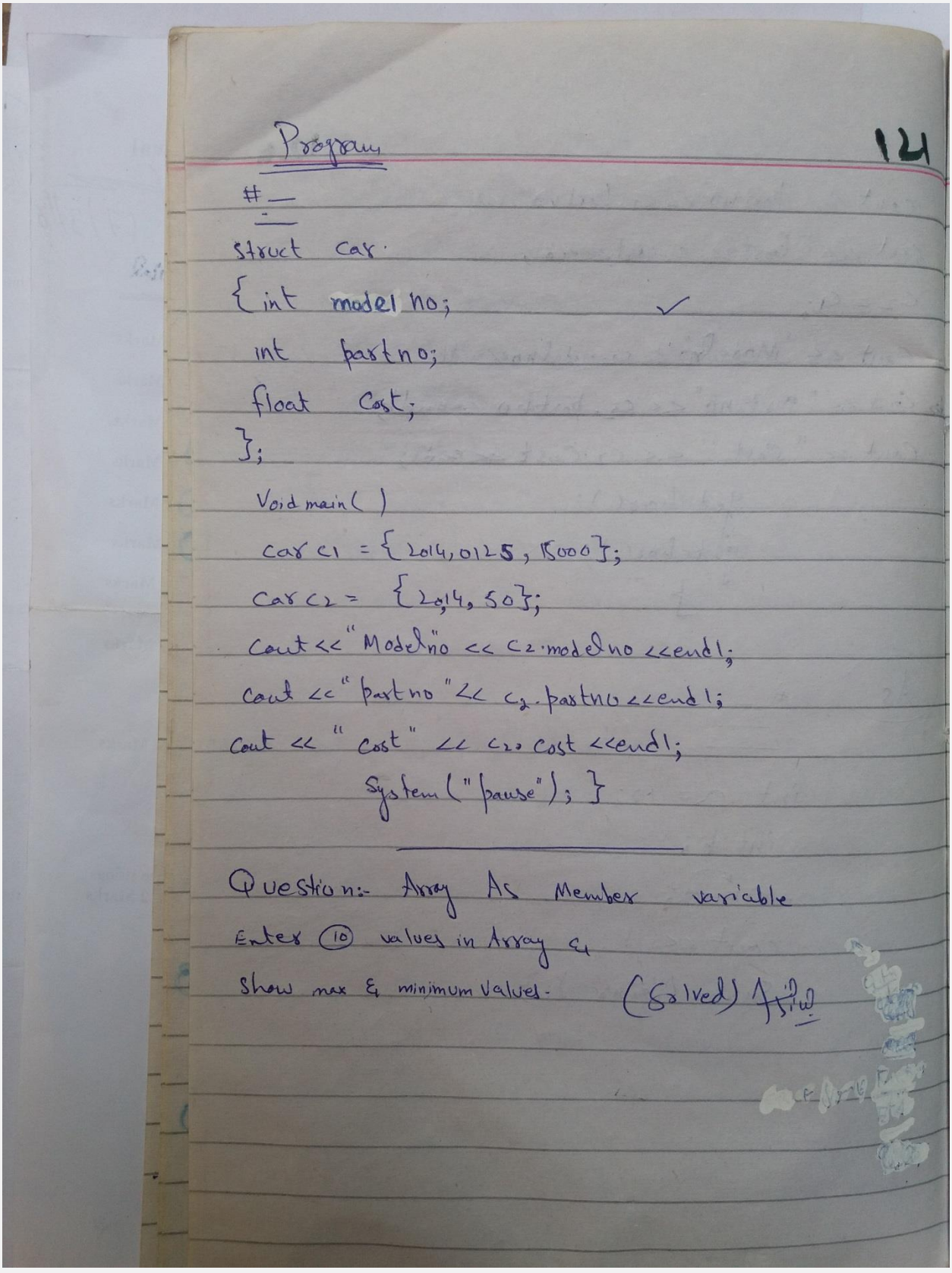
120

```
cout << "partno" << c1.partno << endl;
cout << "Cost" << c1.cost << endl;
c2 = c1;
cout << "Modelno" << c2.modelno << endl;
cout << "partno" << c2.partno << endl;
cout << "Cost" << c2.Cost << endl;
        getchar();
        getchar();
        }
```

As

#

```
int a = 10;
int b;
b = a;
cout << b;
system("pause"); }
```



Program 14

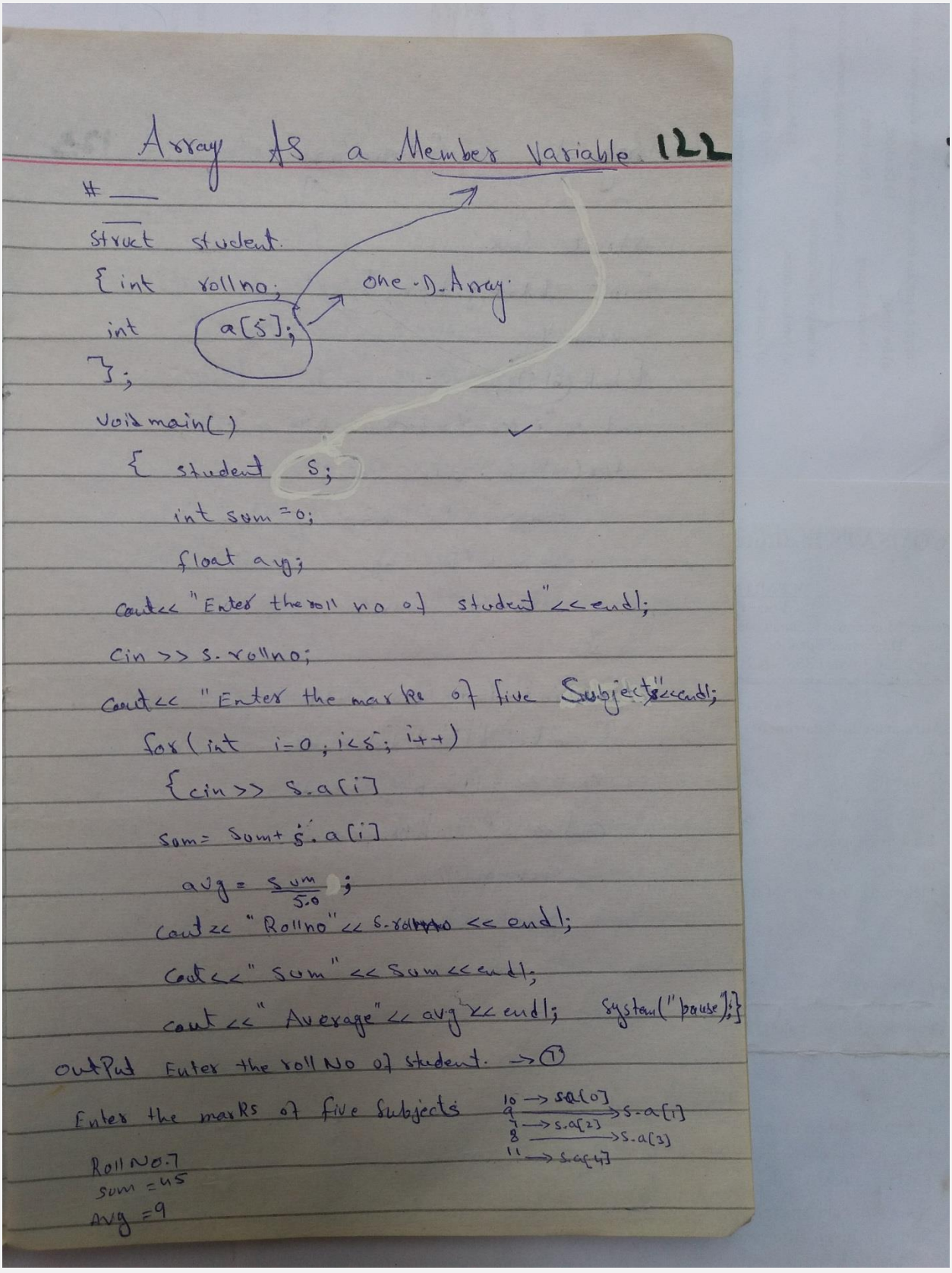
#

```
struct car
{ int model no;
  int partno;
  float cost;
};
Void main( )
 car c1 = {2014, 0125, 5000};
 car c2 = {2,14, 50};
 Cout << "Model no << c2.model no <<endl;
 Cout << "partno " << c2.partno <<endl;
Cout << " cost " << c2.cost <<endl;
        System ("pause"); }
```

Question:- Array As Member variable

Enter (10) values in Array &

Show max & minimum values. (Solved) Friend



Array As a Member Variable 122

#___

```
struct student
{ int rollno;
  int a[5];
};
void main()
  { student s;
    int sum=0;
    float avg;
cout<< "Enter the roll no of student" <<endl;
cin >> s.rollno;
cout<< "Enter the marks of five Subjects"<<endl;
  for(int i=0; i<5; i++)
   {cin >> s.a[i]
   sum= sum+ s.a[i]
    avg= sum/5.0;
cout<< "Rollno" << s.rollno << endl;
cout<< " sum" << sum <<endl;
cout<< " Average" << avg << endl;  system("pause");}
```

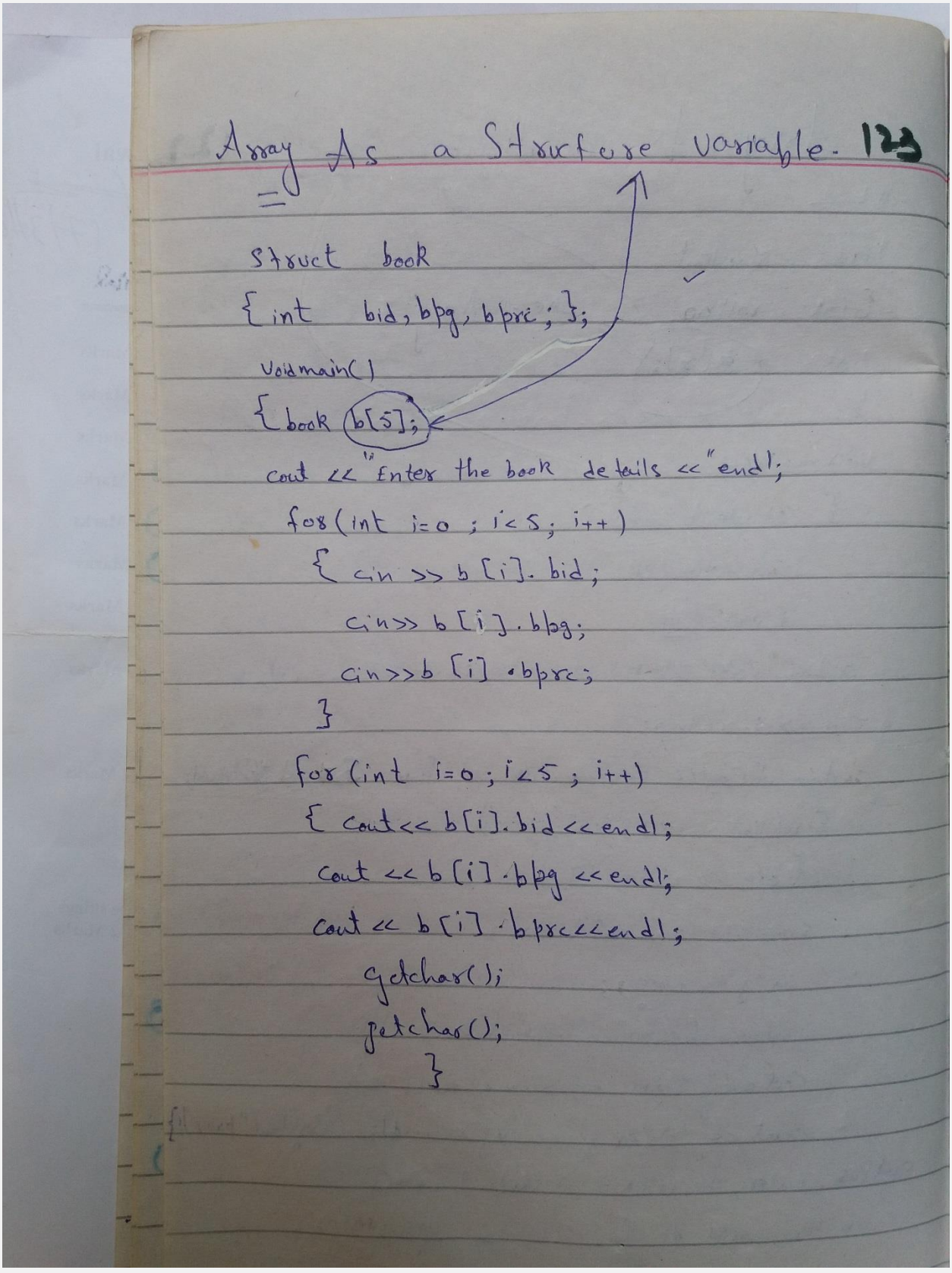
one-D-Array

OutPut Enter the roll No of student. → 7

Enter the marks of five subjects

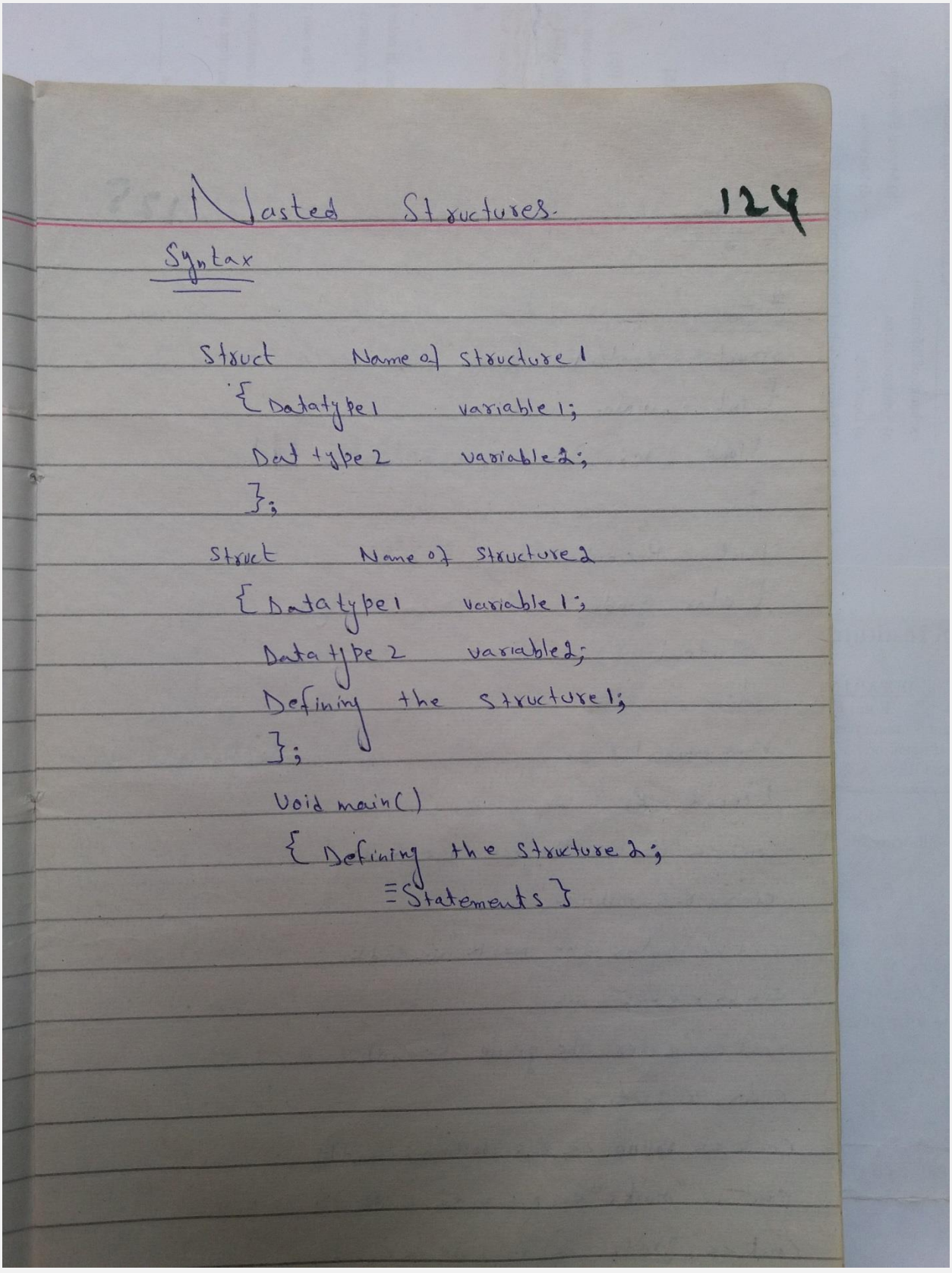
10 → s.a[0]
9 → s.a[1]
7 → s.a[2]
8 → s.a[3]
11 → s.a[4]

Roll NO.7
sum = 45
Avg = 9



Array As a Structure variable. 123

```
struct book
{ int bid, bpg, bprc; };
void main()
{ book b[5];
cout << "Enter the book details" << "end";
for(int i=0 ; i<5; i++)
  { cin >> b[i].bid;
    cin>> b[i].bpg;
    cin>>b[i].bprc;
  }
for (int i=0 ; i<5 ; i++)
{ cout<< b[i].bid << endl;
cout << b[i].bpg << endl;
cout << b[i].bprc<<endl;
   getchar();
   getchar();
     }
```

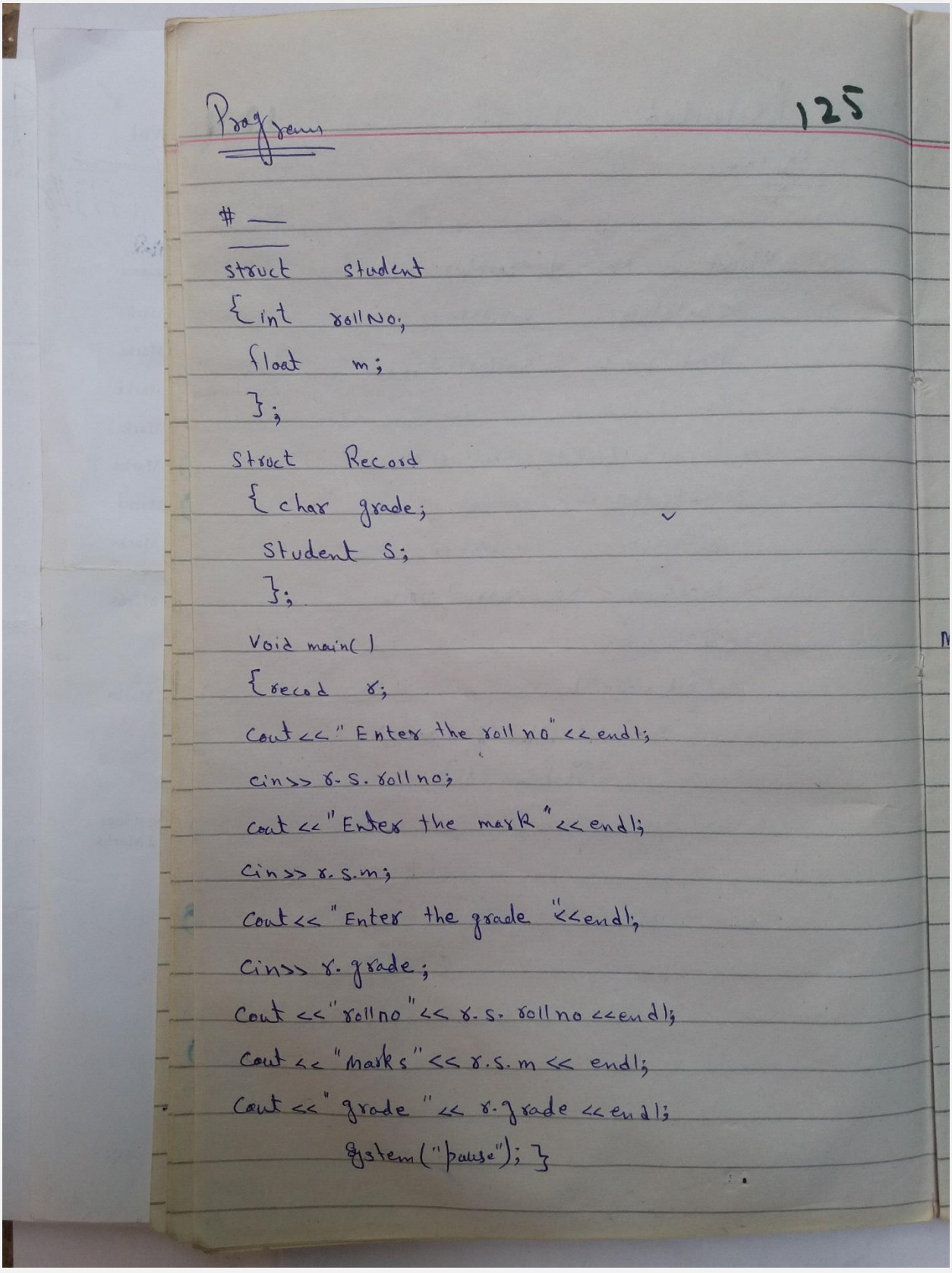


Nested Structures.

124

Syntax

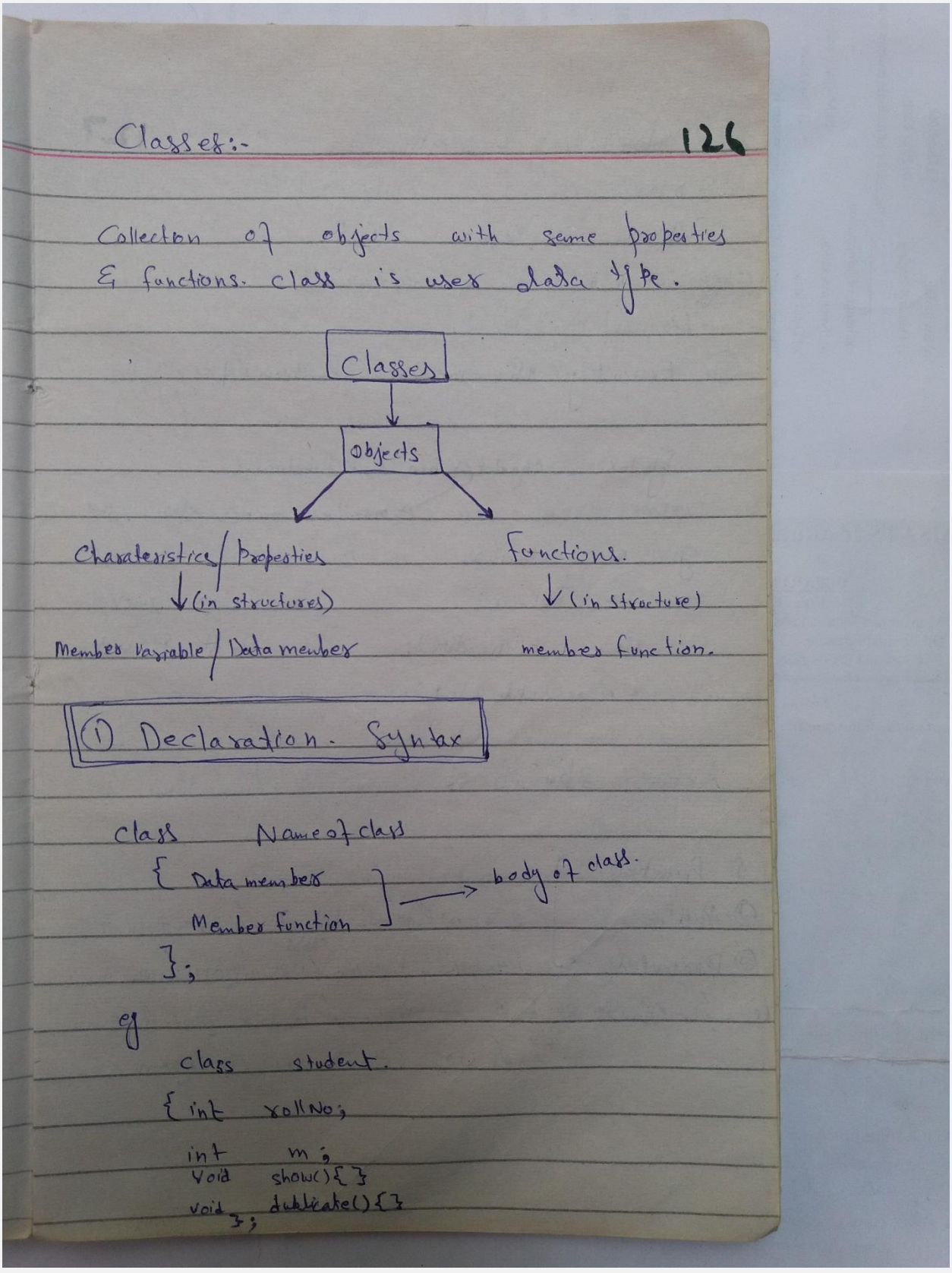
```
Struct      Name of structure 1
 {Datatype1     variable1;
  Dat type2     variable2;
 };
Struct      Name of structure 2
 {Datatype1     variable1;
  Data type 2   variable2;
  Defining the structure1;
 };
  Void main()
  {Defining the structure 2;
     =Statements }
```



Programs 125

#—

```
struct student
{int rollNo;
 float m;
};
Struct Record
{char grade;
 Student S;
};
Void main()
{record r;
Cout<<" Enter the roll no"<<endl;
cin>>r.S.rollno;
Cout<<"Enter the mark"<<endl;
Cin>>r.S.m;
Cout<<"Enter the grade "<<endl;
Cin>>r.grade;
Cout<<"rollno"<<r.S.rollno<<endl;
Cout<<"marks"<<r.S.m<<endl;
Cout<<" grade "<<r.grade<<endl;
        System("pause"); }
```



Classes:- 126

Collection of objects with same properties & functions. class is user data type.

Classes
↓
objects

Charateristics / Properties
↓ (in structures)
Member variable / Data member

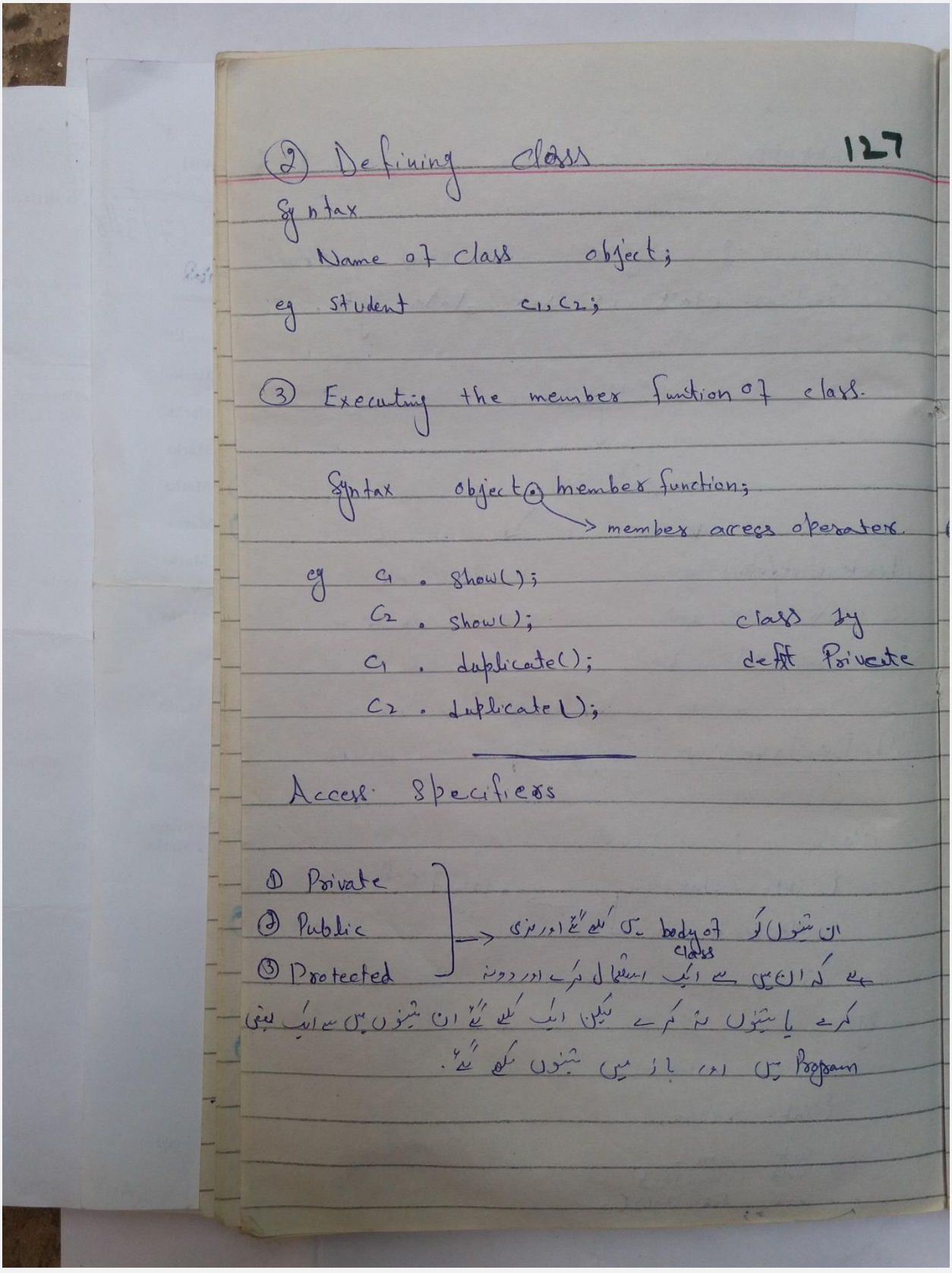
Functions.
↓ (in structure)
member function.

① Declaration. Syntax

class Name of class
{ Data member
Member function } → body of class.
};

eg

class student.
{ int rollNo;
int m;
void show(){}
void dublicate(){}
};



127

② Defining class

Syntax

Name of class object;

eg Student c1, c2;

③ Executing the member function of class.

Syntax object . member function;

→ member access operater.

eg c1 . show();
c2 . show();
c1 . duplicate();
c2 . duplicate();

class by deft Private

Access Specifiers

① Private
② Public
③ Protected

→ ان شبوں کو body of class میں لکھے گئے اور بتائی ہے کہ ان میں سے ایک استعمال کرے اور دونہ کرے یا شبوں نہ کرے لیکن ایک لکھے گئے ان شبوں میں سے ایک بھی Program میں اور باز میں شبوں لکھے گئے۔

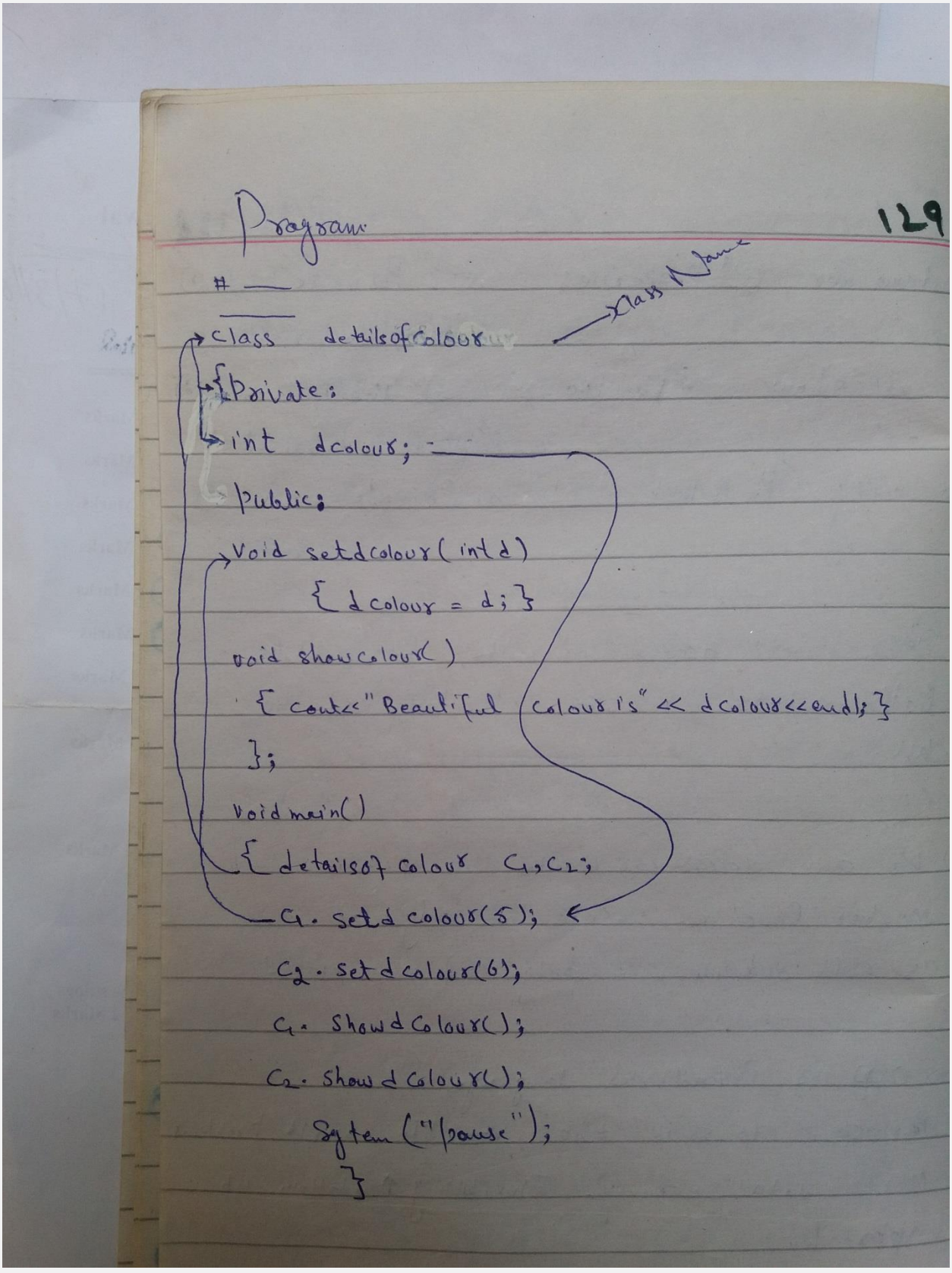
Rule 128

Datamember کو properties کہتے ہیں Private (1)
Member variable کو "ڈیٹا" کہتے ہیں
show کو function کہتے ہیں Public (2)
Functionality کو "ڈپلیکیٹ" کہتے ہیں
Protected Private (3)
Same

(1) We cannot access or write the private Data members out side the body of the class.

(2) We can access or write the public Member function inside the body of class as well out side the body of the class.

=> OOP is Procedural language.
Perpose is to solve the real life world problems
More data security. Flexibility ↑, bottom up approch.



Program 129

#

class detailsofcolour → Class Name

{ Private:

int dcolour;

Public:

Void setdcolour(int d)

{ dcolour = d; }

void showcolour()

{ cout<<"Beautiful colour is" << dcolour<<endl; }

};

Void main()

{ detailsof colour C1, C2;

C1. setd colour(5);

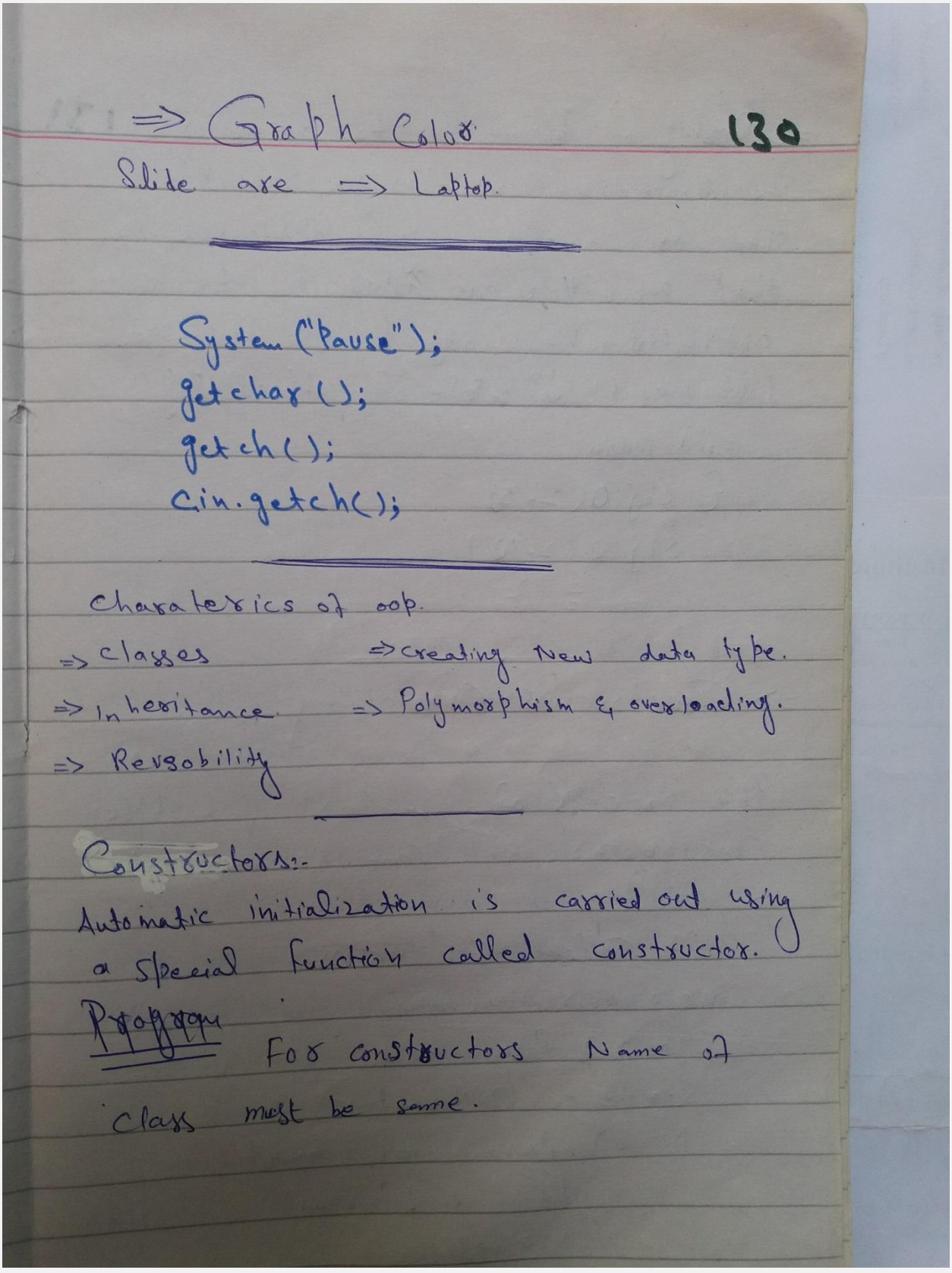
C2. setd colour(6);

C1. Showd Colour();

C2. Showd colour();

System("Pause");

}



⇒ Graph Color 130

Slide are ⇒ Laptop.

System ("Pause");
getchar ();
getch ();
Cin.getch();

Charaterics of oop.

⇒ classes ⇒ creating New data type.

⇒ Inheritance ⇒ Polymorphism & overloading.

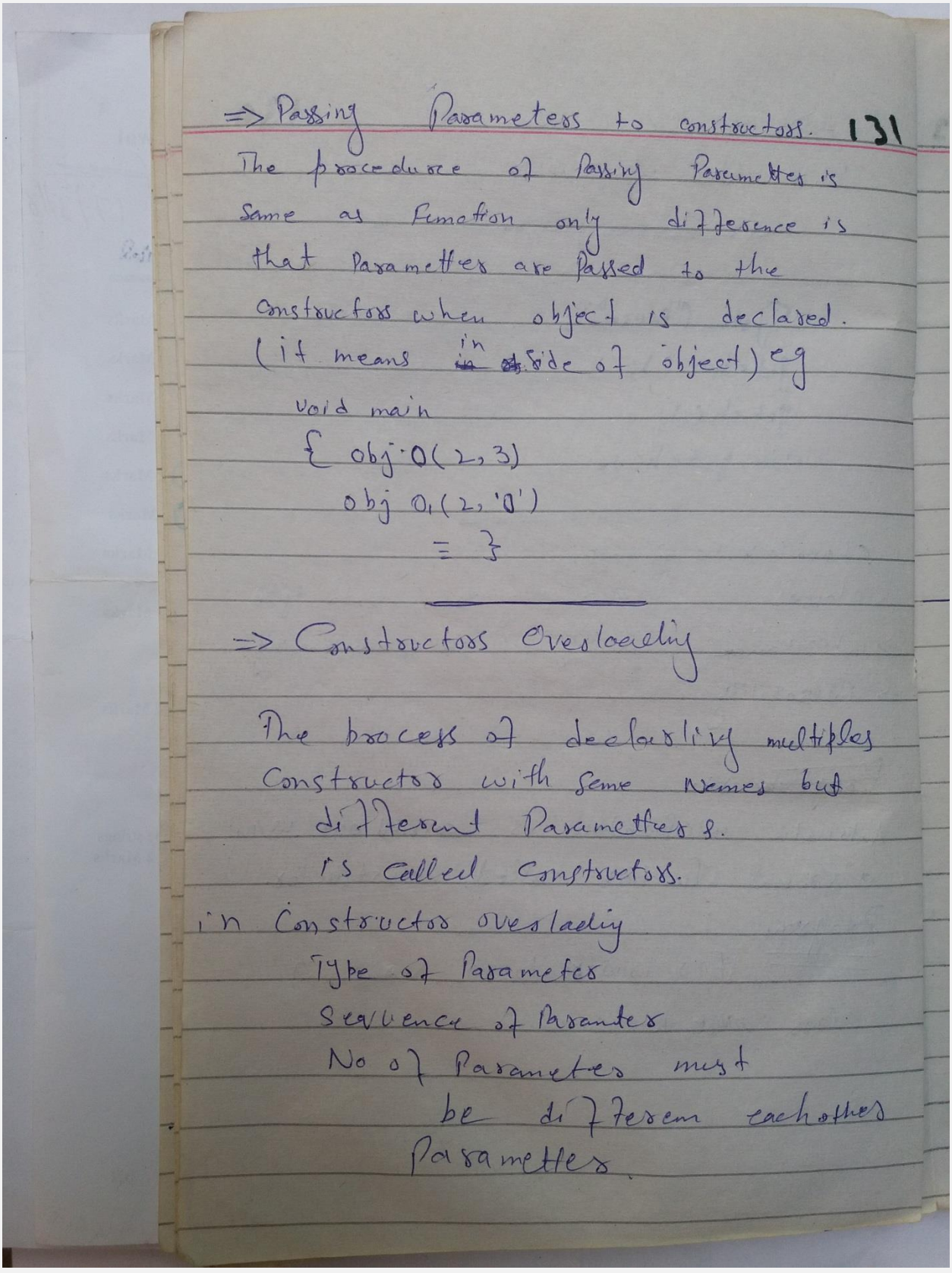
⇒ Revsobility

Constructors:-

Automatic initialization is carried out using a special function called constructor.

Program

For constructors Name of class must be same.



=> Passing Parameters to constructors. 131

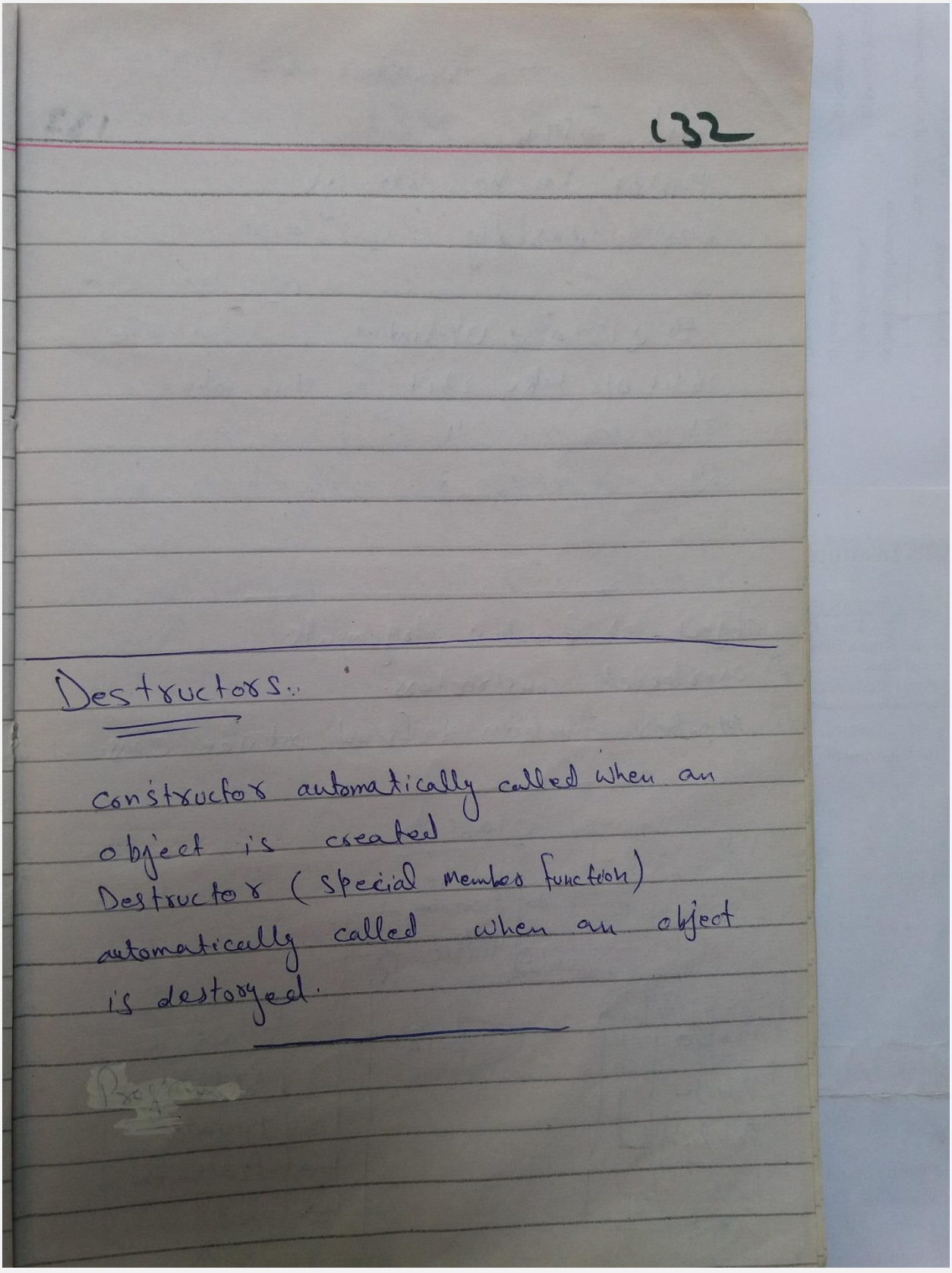
The procedure of passing Parameters is same as Fumction only difference is that Parameters are passed to the constructors when object is declared. (it means in side of object) eg

```
void main
{ obj.O(2,3)
  obj O1(2,'O')
  = }
```

=> Constructors Overloading

The process of declaring multiples Constructor with same Names but different Parameters is called Constructors.

in Constructor overloading
Type of Parameter
Sequence of Parameter
No of Parameters must be different eachothers Parameters.


132
Destructors:
Constructor automatically called when an object is created
Destructor (special member function) automatically called when an object is destoryed.

This asterik means Pointer to

int *Ptr

133

Pointer has no data type

اس بات پر منحصر ہے کہ آپ کتنی capacity کی value کو store کروا رہے ہیں

variable , Operating پر منحصر کرتا ہے

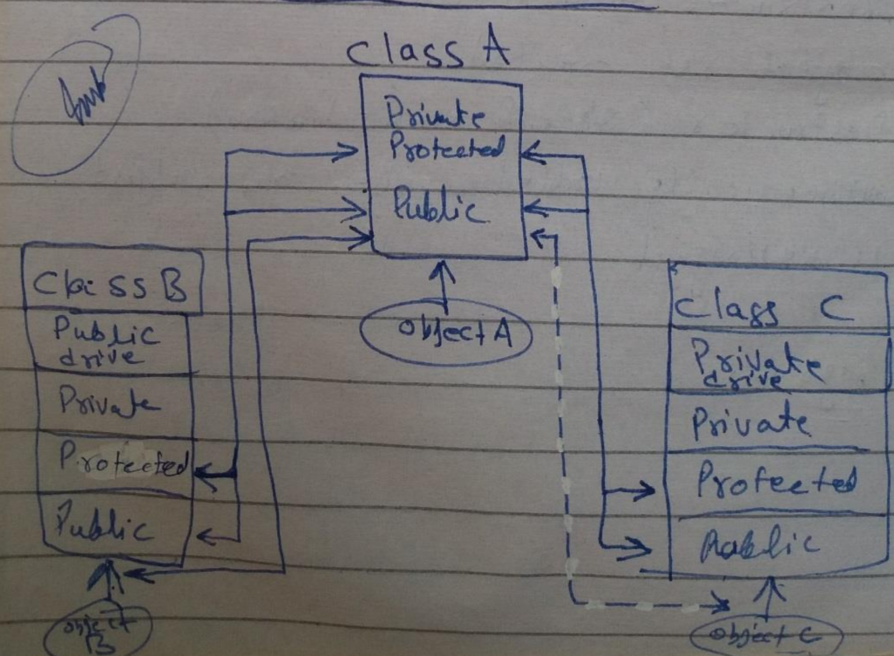
16 bit O/S take 2 bit. to store value

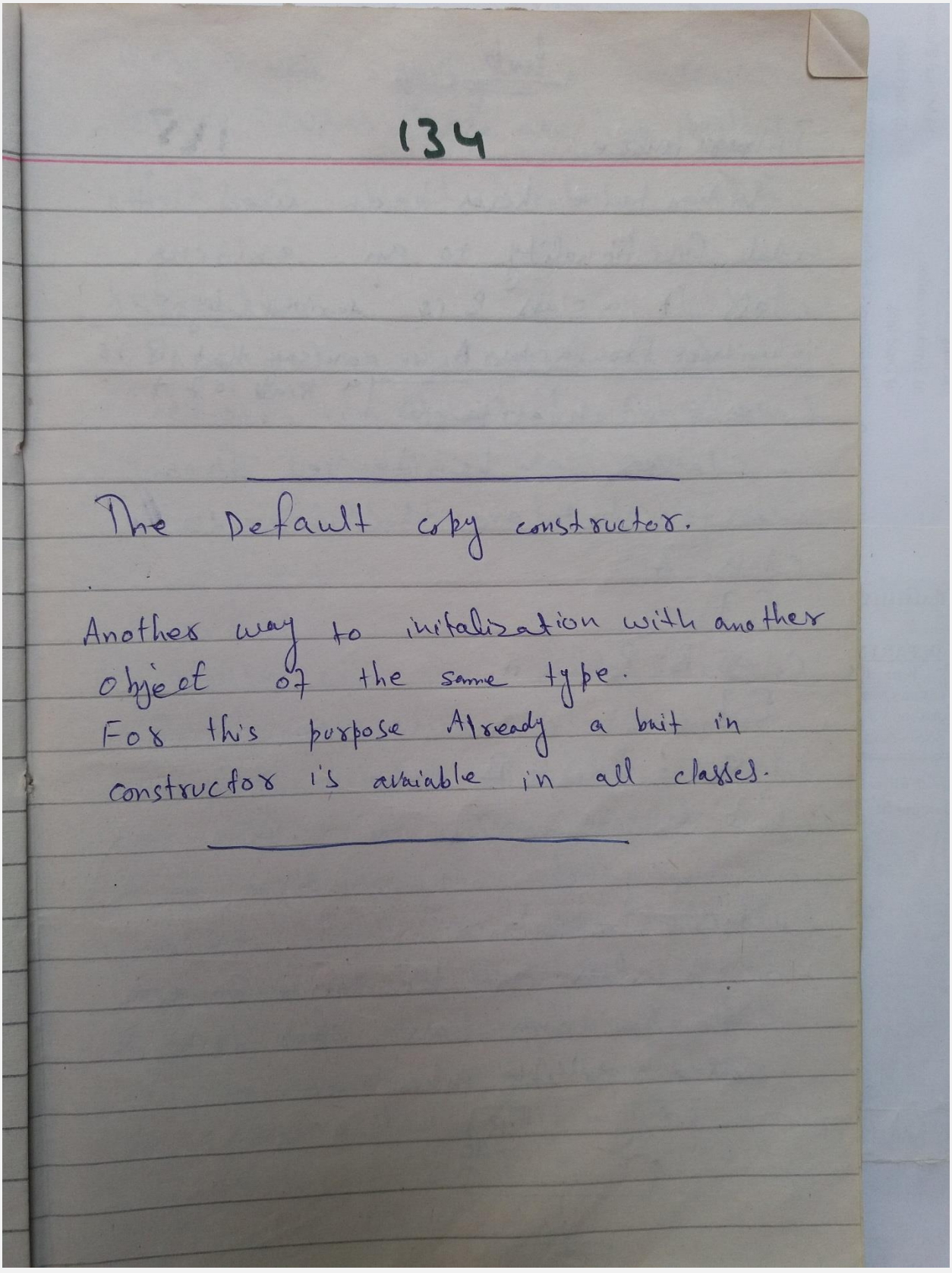
32 " " " 4 " " " "

64 " " " " " " 8 " " " " "

---

1. Object as Function Arguments.
2. Overloaded constructors.
3. Member Function defined outside class.

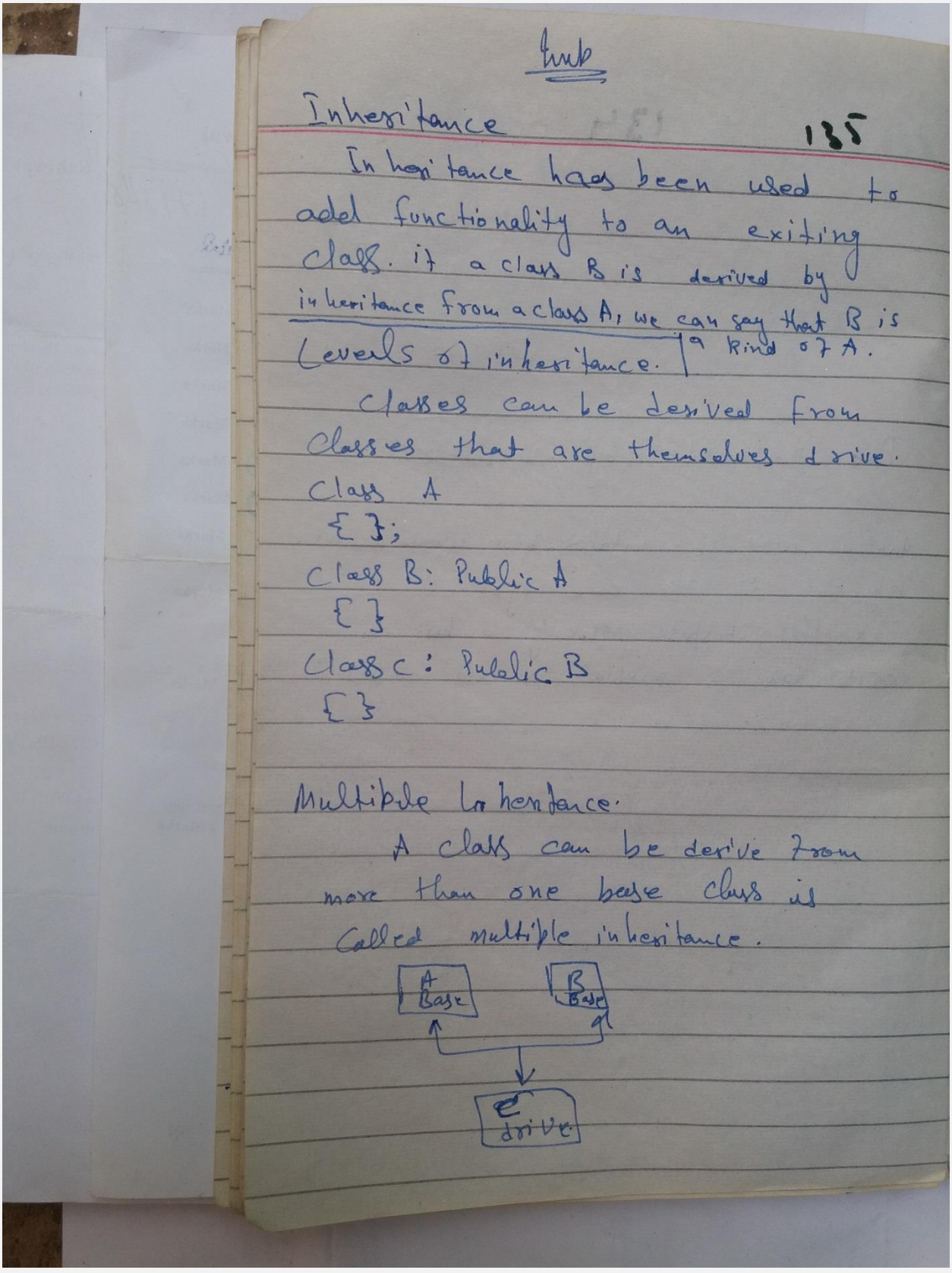




134

The Default copy constructor.

Another way to initialization with another object of the same type.
For this purpose Already a buit in constructor is avaiable in all classes.



Inheritance

135

Inheritance has been used to add functionality to an exiting class. if a class B is derived by inheritance from a class A, we can say that B is a kind of A.

Levels of inheritance.

Classes can be derived from classes that are themselves drive.

```
Class A
{};
Class B: Public A
{}
Class C: Public B
{}
```

Multiple Inheritance.

A class can be derive from more than one base class is called multiple inheritance.

These terms signify the relationship between classes. These are the building block of object oriented 136

Association

· Association is a relationship between two Objects. In other words association defines the multiplicity between object

→

Aggregation :-

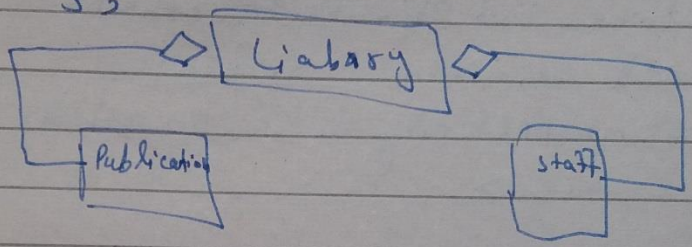
Both aggregation & inheritance are class relationship. that are more specialized than associations. it is instructive to compare & contrast them.

Aggregation is called has a relation ship. we say a library has a book or an invoice has a item line. it is also called Part whole relationship. The book is part of the library.

Aggregation is a special case of association

137

```
class A
{};
class B
{};
A object A;
};
```



Composition 2-

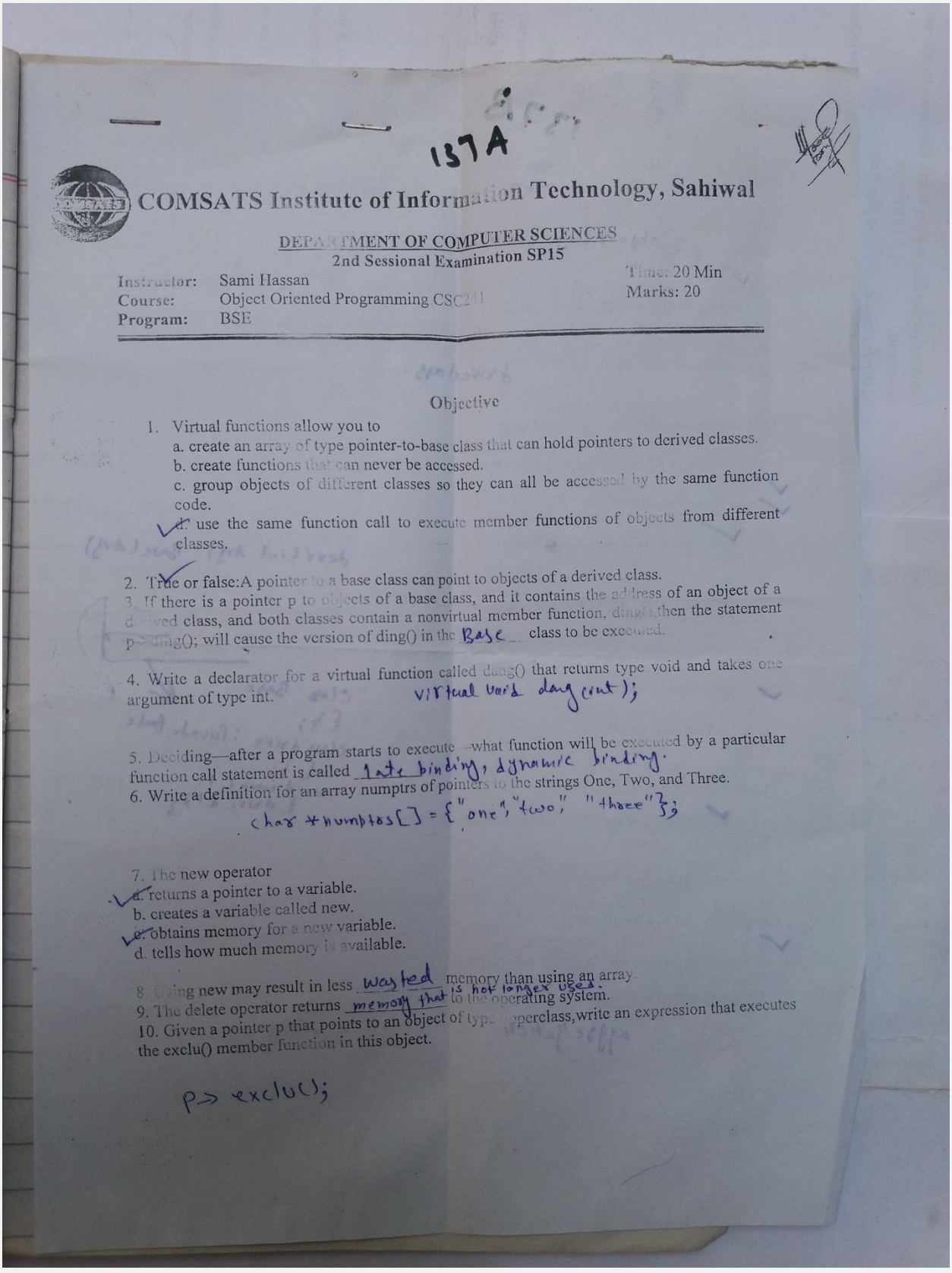
Composition is a special case of aggregation. In a more specific manner a restricted aggregation is called composition

it is a stroger form of aggreation with two addition.

① The Part ~~mean~~ may belong to only one whole

② The life time of Part is the same as the life time of the whole.

A room is composed of a floor.



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COMSATS Institute of Information Technology, Sahiwal

DEPARTMENT OF COMPUTER SCIENCES

2nd Sessional Examination SP15

Instructor: Sami Hassan
Course: Object Oriented Programming CSC211
Program: BSE

Time: 20 Min
Marks: 20

Objective

1. Virtual functions allow you to
   a. create an array of type pointer-to-base class that can hold pointers to derived classes.
   b. create functions that can never be accessed.
   c. group objects of different classes so they can all be accessed by the same function code.
   d. use the same function call to execute member functions of objects from different classes.

2. True or false: A pointer to a base class can point to objects of a derived class.
3. If there is a pointer p to objects of a base class, and it contains the address of an object of a derived class, and both classes contain a nonvirtual member function, ding(), then the statement p->ding(); will cause the version of ding() in the Base class to be executed.
4. Write a declarator for a virtual function called dang() that returns type void and takes one argument of type int. virtual void dang(int);
5. Deciding—after a program starts to execute—what function will be executed by a particular function call statement is called late binding, dynamic binding.
6. Write a definition for an array numptrs of pointers to the strings One, Two, and Three.
   char *numptrs[] = {"one", "two", "three"};
7. The new operator
   a. returns a pointer to a variable.
   b. creates a variable called new.
   c. obtains memory for a new variable.
   d. tells how much memory is available.
8. Using new may result in less wasted memory than using an array.
9. The delete operator returns memory that is not longer used. to the operating system.
10. Given a pointer p that points to an object of type superclass, write an expression that executes the exclu() member function in this object.

p-> exclu();

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11. Given an object with index number 7 in array objarr, write an expression that executes the exclu() member function in this object.

objarr[7].exclu();

12. True or false: If no constructors are specified for a derived class, objects of the derived class will use the constructors in the base class.

13. If a base class and a derived class each include a member function with the same name, which member function will be called by an object of the derived class, assuming the scope-resolution operator is not used? derivedclass.

14. The scope-resolution operator usually
a. limits the visibility of variables to a certain function.
b. tells what base class a class is derived from.
c. specifies a particular class.
d. resolves ambiguities.

15. True or false: It is sometimes useful to specify a class from which no objects will ever be created.

16. Assume that there is a class Derv that is derived from a base class Base. Write the declarator for a derived class constructor that takes one argument and passes this argument along to the constructor in the base class.

derv(int Arg) : Base(Arg)

17. Assume a class Derv that is privately derived from class Base. An object of class Derv located in main() can access
a. public members of Derv.
b. protected members of Derv.
c. private members of Derv.
d. public members of Base.
e. protected members of Base.
f. private members of Base.

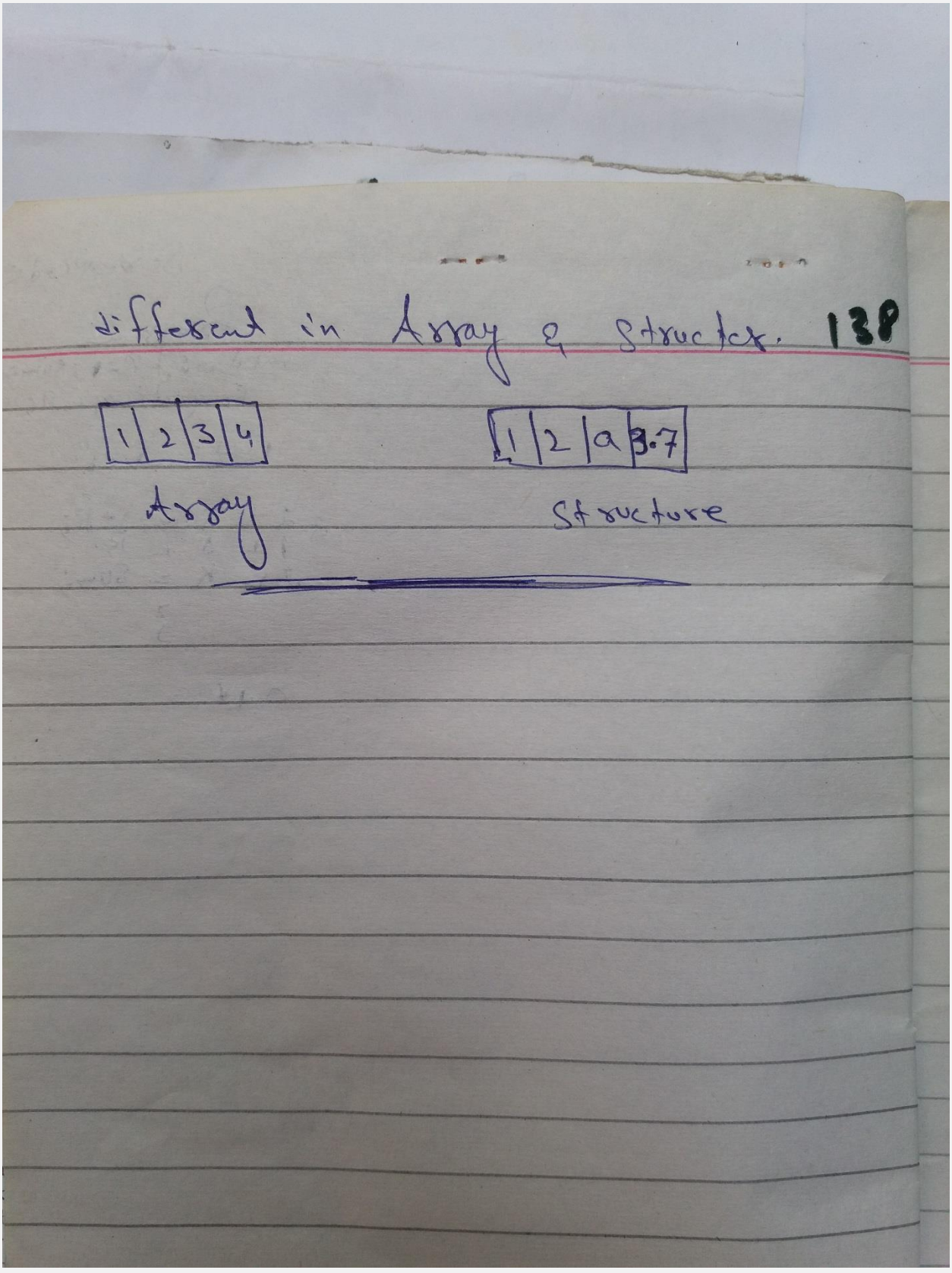
class Base
{};
class drive : Private Base
{};
void main()
{ drive d1;}

18. True or false: A class D can be derived from a class C, which is derived from a class B, which is derived from a class A.

19. A class hierarchy
a. shows the same relationships as an organization chart.
b. describes "has a" relationships.
c. describes "is a kind of" relationships.
d. shows the same relationships as a family tree.

20. Composition is a _____ form of Aggregation.

aggregation


different in Array & Structer. 138
1 2 3 4
Array
1 2 a 3.7
Structure