G.C.E. O/L Grade 11 ICT · Lesson 1

1.5 Operators: Arithmetic, Comparison and Logical

Syllabus 10.5. Operators are symbols that do work on values. **Arithmetic** operators calculate (+ − × ÷). **Comparison** (relational) operators compare two values and give True or False. **Logical** operators join conditions (AND, OR, NOT). When there are many operators in one line, **precedence** decides which is done first – just like BODMAS in maths.

1. Arithmetic operators

Operation	Pascal	Python	17 and 5
Addition	+	+	22
Subtraction	-	-	12
Multiplication	*	*	85
Division (decimal answer)	/	/	3.40
Whole-number division (quotient)	div	//	3
Remainder (modulus)	mod	%	2

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Arithmetic operators

Pascal

```
program Operators;
var
  a, b: integer;
begin
  a := 17;
  b := 5;
  writeln('Sum = ', a + b);
  writeln('Difference = ', a - b);
  writeln('Product = ', a * b);
  writeln('Division = ', a / b:0:2);
  writeln('Quotient = ', a div b);
  writeln('Remainder = ', a mod b);
end.
```

Python

```
a = 17
b = 5
print("Sum =", a + b)
print("Difference =", a - b)
print("Product =", a * b)
print(f"Division = {a / b:.2f}")
print("Quotient =", a // b)
print("Remainder =", a % b)
```

Sample run

```
Sum = 22
Difference = 12
Product = 85
Division = 3.40
Quotient = 3
Remainder = 2
```

> 💡 **mod** is very useful: N mod 2 = 0 means N is **even**. 17 mod 5 = 2 because 17 = 3 × 5 + 2.

2. Comparison operators

A comparison always gives a **logical** result: True or False. Be careful – Pascal and Python write “equal” and “not equal” differently.

Meaning	Pascal / pseudocode	Python	Example (A = 8, B = 5)
Equal to	=	==	A = B → False
Not equal to	<>	!=	A <> B → True
Greater than	>	>	A > B → True
Less than	<	<	A < B → False
Greater than or equal	>=	>=	A >= 8 → True

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Less than or equal	<=	<=	B <= 4 → False

3. Logical operators

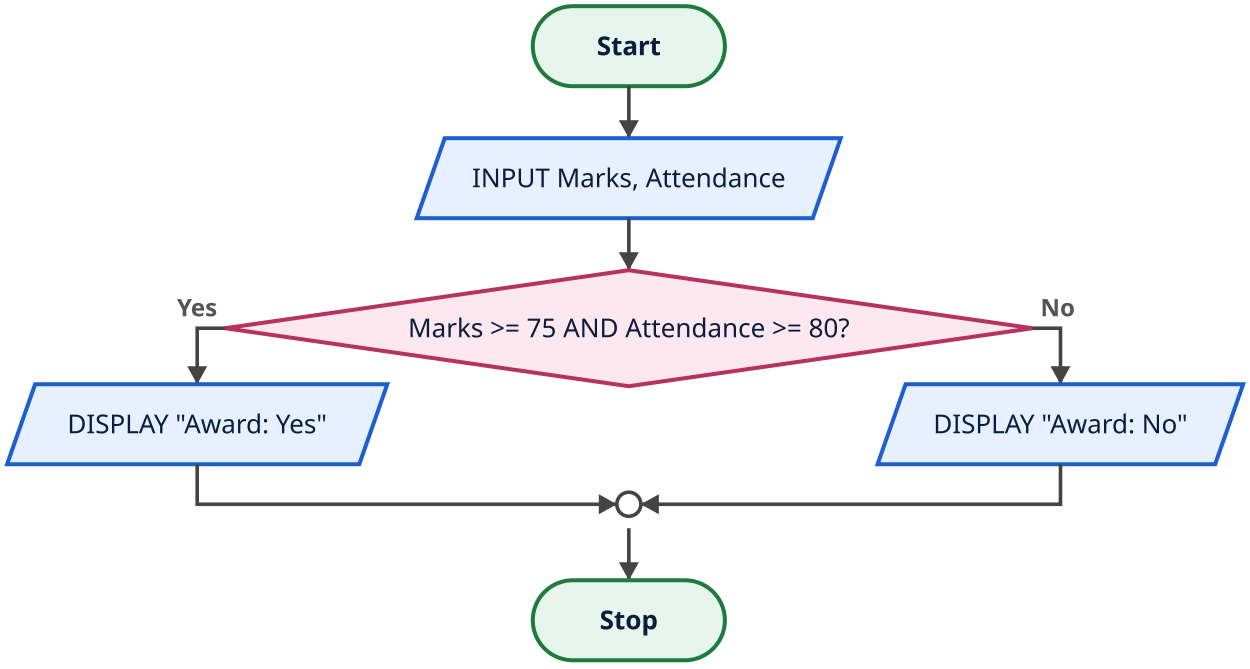
AND is True only when **both** conditions are True. **OR** is True when **at least one** is True. **NOT** reverses the value. (You met these as logic gates in Grade 10.)

A	B	A AND B	A OR B	NOT A
True	True	True	True	False
True	False	False	True	False
False	True	False	True	True
False	False	False	False	True

Example: a scholarship is given only if marks ≥ 75 **AND** attendance ≥ 80%.

Pseudocode

```
BEGIN
  INPUT Marks, Attendance
  IF Marks >= 75 AND Attendance >= 80 THEN
    DISPLAY "Award: Yes"
  ELSE
    DISPLAY "Award: No"
  ENDIF
END
```



Flowchart – Logical operator AND: scholarship award

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Logical operator AND: scholarship award

Pascal

```
program Award;
var
  marks, attendance: integer;
begin
  write('Enter marks: ');
  readln(marks);
  write('Enter attendance %: ');
  readln(attendance);
  if (marks >= 75) and (attendance >= 80) then
    writeln('Award: Yes')
  else
    writeln('Award: No');
end.
```

Python

```
marks = int(input("Enter marks: "))
attendance = int(input("Enter attendance %: "))
if marks >= 75 and attendance >= 80:
    print("Award: Yes")
else:
    print("Award: No")
```

Sample run 1

```
Enter marks: 80
Enter attendance %: 85
Award: Yes
```

Sample run 2

```
Enter marks: 80
Enter attendance %: 70
Award: No
```

4. Operator precedence

Order	Operators
1	( ) brackets
2	NOT
3	* / div mod (Python: * / // %)
4	+ −
5	Comparison = <> < > <= >=
6	AND, then OR

Operators at the **same level** are done **left to right**. So 20 − 8 / 4 × 2 = 20 − 2 × 2 = 20 − 4 = 16, and 10 − 4 − 3 = 6 − 3 = 3. When in doubt, **use brackets** – they make the order clear to everyone.

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Operator precedence

Pascal

```
program Precedence;
begin
  writeln('2 + 3 * 4 = ', 2 + 3 * 4);
  writeln('(2 + 3) * 4 = ', (2 + 3) * 4);
  writeln('20 - 8 / 4 * 2 = ', 20 - 8 / 4 * 2:0:2);
  writeln('10 - 4 - 3 = ', 10 - 4 - 3);
end.
```

Python

```
print("2 + 3 * 4 =", 2 + 3 * 4)
print("(2 + 3) * 4 =", (2 + 3) * 4)
print("20 - 8 / 4 * 2 =", f"{20 - 8 / 4 * 2:.2f}")
print("10 - 4 - 3 =", 10 - 4 - 3)
```

Sample run

```
2 + 3 * 4 = 14
(2 + 3) * 4 = 20
20 - 8 / 4 * 2 = 16.00
10 - 4 - 3 = 3
```

💡 Pascal note: in Pascal, AND and OR are done **before** comparisons, so you must put brackets: if (Marks >= 75) and (Att >= 80) then ... Python does not need them, but brackets never hurt.

Key Words

Operator – A symbol that does work on values, e.g. +.

Operand – A value an operator works on, e.g. 17 and 5 in 17 + 5.

Arithmetic operator – Calculates: + − * / div mod.

div / // – Whole-number division: 17 div 5 = 3.

mod / % – Remainder after division: 17 mod 5 = 2.

Comparison operator – Compares two values and gives True or False.

Not equal – <> in Pascal, != in Python.

Logical operator – Joins or reverses conditions: AND, OR, NOT.

AND – True only if both conditions are True.

OR – True if at least one condition is True.

NOT – Changes True to False and False to True.

Precedence – The order in which operators are done.

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Sample Q&A

1. Find 17 div 5 and 17 mod 5.

> **Answer:** 3 and 2.

2. How do you write “not equal” in Pascal and Python?

> **Answer:** Pascal <>, Python !=.

3. When is A AND B True?

> **Answer:** Only when both A and B are True.

4. Evaluate 2 + 3 * 4.

> **Answer:** 14 (multiply first).

5. Evaluate 20 − 8 / 4 * 2.

> **Answer:** 16 (8 / 4 = 2, 2 × 2 = 4, 20 − 4 = 16).

6. How can you test whether N is even?

> **Answer:** N mod 2 = 0 (Python: N % 2 == 0).

MCQ

1. 17 mod 5 is...

A. 12
B. 3
C. 3.4
D. 2

2. 17 div 5 is...

A. 85
B. 3.4
C. 3
D. 2

3. In Python, whole-number division is written...

A. //
B. /
C. div
D. %

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4. In Python, the remainder operator is…

A. #
B. %
C. //
D. mod

5. In Pascal, “not equal to” is written…

A. <>
B. ==
C. !=
D. =<

6. In Python, “equal to” in a comparison is written…

A. <>
B. :=
C. ==
D. =

7. A comparison operator always gives…

A. a decimal
B. a string
C. True or False
D. a character

8. True AND False gives…

A. Error
B. 1
C. True
D. False

9. True OR False gives…

A. False
B. 0
C. True
D. Error

10. NOT True gives…

A. False
B. 0.5
C. Nothing
D. True

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11. 2 + 3 * 4 =

A. 9
B. 14
C. 24
D. 20

12. (2 + 3) * 4 =

A. 9
B. 20
C. 24
D. 14

13. 10 − 4 − 3 =

A. 3
B. 9
C. 17
D. −3

14. Marks = 80, attendance = 70. “Marks >= 75 AND attendance >= 80” is…

A. True
B. 80
C. Error
D. False

15. Which operator is done first?

A. +
B. ( ) brackets
C. AND
D. >=

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Structured Questions

1. Using A = 17 and B = 5, find: (a) A + B (b) A / B (c) A div B (d) A mod B. (4 marks) *(4 marks)*

(a) 22 (b) 3.4 (c) 3 (d) 2.

Arithmetic operators

Pascal

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var
  a, b: integer;
begin
  a := 17;
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  writeln('Difference = ', a - b);
  writeln('Product = ', a * b);
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  writeln('Quotient = ', a div b);
  writeln('Remainder = ', a mod b);
end.
```

Python

```
a = 17
b = 5
print("Sum =", a + b)
print("Difference =", a - b)
print("Product =", a * b)
print(f"Division = {a / b:.2f}")
print("Quotient =", a // b)
print("Remainder =", a % b)
```

Sample run

```
Sum = 22
Difference = 12
Product = 85
Division = 3.40
Quotient = 3
Remainder = 2
```

2. Complete the truth table for A AND B, A OR B and NOT A. (4 marks) *(4 marks)*

AND: T only for T,T; OR: F only for F,F; NOT A: reverse of A (see the table in the notes).

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3. Evaluate, showing steps: (a) 2 + 3 * 4 (b) (2 + 3) * 4 (c) 20 − 8 / 4 * 2. (3 marks) *(3 marks)*

(a) 2 + 12 = 14 (b) 5 × 4 = 20 (c) 20 − 2 × 2 = 20 − 4 = 16.

Operator precedence

Pascal

```
program Precedence;
begin
  writeln('2 + 3 * 4 = ', 2 + 3 * 4);
  writeln('(2 + 3) * 4 = ', (2 + 3) * 4);
  writeln('20 - 8 / 4 * 2 = ', 20 - 8 / 4 * 2:0:2);
  writeln('10 - 4 - 3 = ', 10 - 4 - 3);
end.
```

Python

```
print("2 + 3 * 4 =", 2 + 3 * 4)
print("(2 + 3) * 4 =", (2 + 3) * 4)
print("20 - 8 / 4 * 2 =", f"{20 - 8 / 4 * 2:.2f}")
print("10 - 4 - 3 =", 10 - 4 - 3)
```

Sample run

```
2 + 3 * 4 = 14
(2 + 3) * 4 = 20
20 - 8 / 4 * 2 = 16.00
10 - 4 - 3 = 3
```

4. A student gets a scholarship if marks ≥ 75 and attendance ≥ 80. Write the condition, and give the result for marks 80 / attendance 85 and marks 80 / attendance 70. (3 marks) *(3 marks)*

(Marks >= 75) AND (Attendance >= 80) (1); 80/85 → Yes (1); 80/70 → No (1).

5. Explain the difference between = and == in Python. (2 marks) *(2 marks)*

= assigns (stores) a value in a variable (1); == compares two values and gives True or False (1).

Summary

- Arithmetic: + − * / div mod.
- Python uses // for div and % for mod.
- Comparison gives True or False.
- Not equal: Pascal <>, Python !=.
- AND: both true; OR: one true; NOT: reverse.
- Brackets first, then * /, then + −.
- Same level: left to right.
- N mod 2 = 0 means N is even.

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MCQ answer key – 1.5

1. **D** – Remainder 2.
2. **C** – Whole quotient.
3. **A** – //.
4. **B** – %.
5. **A** – <>.
6. **C** – == compares; = assigns.
7. **C** – Logical result.
8. **D** – AND needs both true.
9. **C** – OR needs one true.
10. **A** – NOT reverses.
11. **B** – Multiply first.
12. **B** – Brackets first.
13. **A** – Left to right.
14. **D** – Second part false.
15. **B** – Brackets highest.

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