

Question 1.

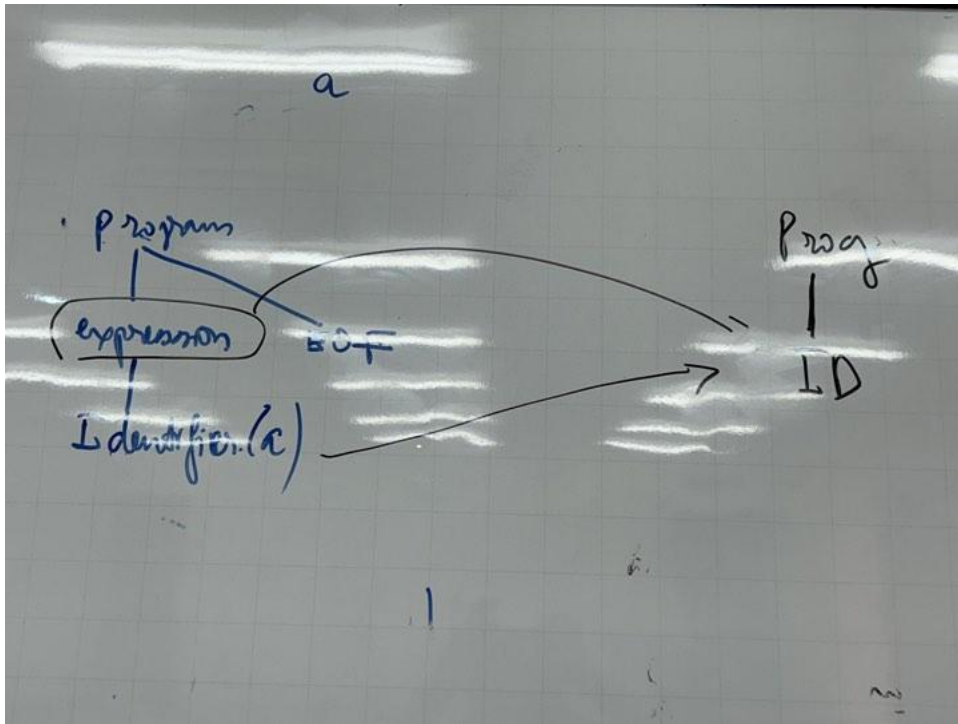
<i>Grammar</i>	<i>AST definition</i>
<pre>program : (expression) * EOF ; expression : Integer Identifier ; Integer: [0-9]+ ; Identifier: [a-z]+ ;</pre>	<pre>@dataclass class Prog(AST): expr : List[Exp] class Exp(AST): __metaclass__ = ABCMeta pass @dataclass class Id(Exp): def __str__(self): return "ID" @dataclass class Int(Exp): def __str__(self): return "INT"</pre>

Transformation table

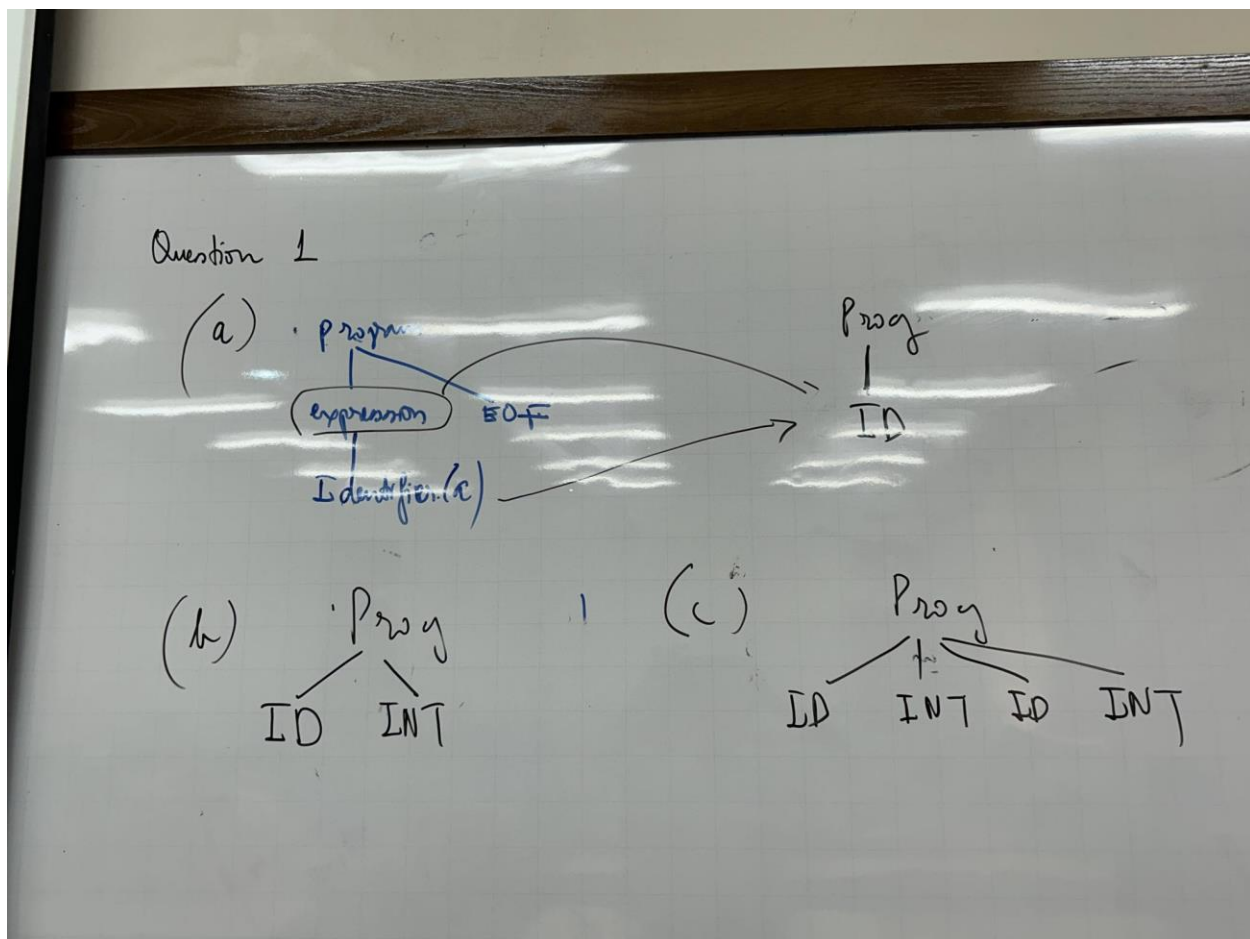
Grammar	AST
program	Prog
expression	Exp (abstract)
Integer	Int (Exp)
Identifier	ID(Exp)

Draw the parse trees and AST trees for the following strings

a. a



- b. ab 12
- c. ab 12 ab 123



Question 2.

Grammar	AST definition
<pre> program : (expression) * EOF ; expression : expression '+' term term ; term : Integer Identifier ; </pre>	<pre> @dataclass class Prog(AST): expr : List[Exp] class Exp(AST): __metaclass__ = ABCMeta pass @dataclass class Id(Exp): def __str__(self): return "ID" @dataclass </pre>

Integer: [0-9]+ ; Identifier: [a-z]+ ;	<pre> class Int(Exp): def __str__(self): return "INT" @dataclass class BinOp(Exp): op:str left:Exp right:Exp </pre>
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Transformation Table

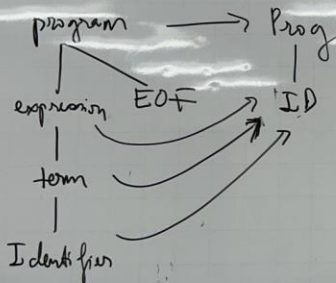
Grammar	AST
program	Prog
expression	Exp (abstract)
term	
Integer	Int (Exp)
Identifier	ID (Exp)
expresion	BinOp: string (op) EXP(left) EXP (right)

Draw the parse trees and AST trees for the following strings

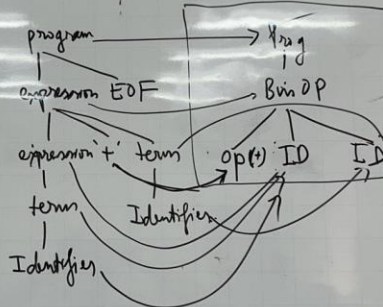
- a
- a + b
- a a + b

Question 2

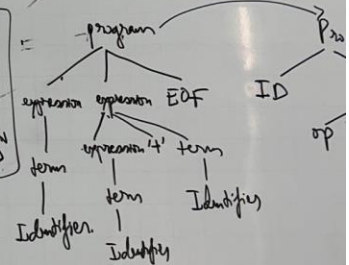
a) a



b) a + b



c) a a + b



Question 3.

Grammar	AST definition
<pre> program : statements EOF ; statements: statements statement ; statement : (IntType FloatType) left right ';' ; left: left ',' Identifier Identifier; right: '=' Integer ; </pre>	<pre> @dataclass class Prog(AST): stmt : List[Stmt] class Stmt(AST): __metaclass__ = ABCMeta pass class Id(AST): def __str__(self): return "ID" class Integer(AST): value: int </pre>

IntType: 'int'; FloatType: 'float'; Identifier: [a-z]+ ; Integer: [1-9][0-9]* [0];	class Decl(Stmt): type : Type vars : List[Id] value: None or str
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- Develop transformation table
- Draw the AST for

```
int a;
float a, b, c;
int a, b = 10;
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