

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?

CS4250, Spring 2006, Test 1

Chapters 1-6. Time 60 min. Closed books, notes, except your minds only. Use extra paper as needed, but make sure to identify each answer. All questions weight evenly.

YOU MUST RETURN THIS PAGE. NAME _____

- 1 What are the three main language evaluation criteria?
- 2 Explain the concept of orthogonality of a language.
 - a) what does it mean?
 - b) what was one of the most orthogonal languages?
 - c) what are the trade-offs in less vs. more orthogonality?
- 3 Explain the most important trade-offs in compilation vs. interpretation.
- 4 Imagine a language with programs like this:

```
main() begin
variable x, y;
print(x);
end.
```

Suppose every program looks like this. Variable are optional. The only statements are print statements, which can print only single variable or number. There must be at least one print statement. Nothing else. Write BNF, not extended.
- 5 Write a grammar for assignment statement only. Assignment has a variable on the left and any expression on the right as in the example:

```
x=x+2*5;
```

Make sure the grammar is unambiguous. Use the standard precedence, except that * is weaker than /, and the standard associativity except that * associates right to left. We also have () and we also have unary associative minus.
- 6 Using your grammar, write, for the example above
 - a) leftmost derivation
 - b) parse tree
- 7 Why C/C++ are not strongly typed? Give a few reasons/examples.
- 8 Assume that we wanted to make C strongly typed, to improve reliability. What would we sacrifice if any?
- 9 What are the trade-offs in automatic garbage collection such as Java's, vs. programmer's control as in C/C++?
- 10 Assuming automatic garbage collection as in Java, what are the trade-offs between lazy and immediate memory reclamation?
- 11 Problem 5/14 use both static and dynamic binding separately part (a) b)
- 12 In row-major array, is it possible and at what cost, to process a 2dim array col-by-col?