

Compiler
Assignment 5
Top-Down Parsing

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1 Question 1

a) First sets and follow sets

- First set:
 - $\text{first}(A) = \{a, b, c, d, e, \epsilon\}$
 - $\text{first}(B) = \{a, b, \epsilon\}$
 - $\text{first}(C) = \{c, \epsilon\}$
 - $\text{first}(D) = \{d, \epsilon\}$
- Follow set:
 - $\text{follow}(A) = \{\$ \}$
 - $\text{follow}(B) = \{c, \$ \}$
 - $\text{follow}(C) = \{d, \$ \}$
 - $\text{follow}(D) = \{e\}$

b) Procedures of recursive-decent parser

```
1  const int a = 1, b = 2, c = 3, d = 4, e = 5, END = 6;
2  int token = lexer();
3  void match(int t)
4  {
5      if (token == t)
6          token = lexer();
7      else
8          error();
9  }
```

- A:

```
1  void A() {
2      switch (token) {
3          case a:
4          case b:
5          case c:
6              B();
7              C();
8              break;
9          case d:
10         case e:
11             D();
12             match(e);
13             break;
14         case END:
15             break;
16         default:
17             error();
18     }
19 }
```

- B:

```
1 void B() {  
2     switch (token) {  
3         case a:  
4             match(a);  
5             B();  
6             break;  
7         case b:  
8             match(b);  
9             break;  
10        case END:  
11            match(END);  
12            break;  
13        default:  
14            error();  
15    }  
16 }
```

- C:

```
1 void C() {  
2     switch (token) {  
3         case c:  
4             match(c);  
5             C();  
6             match(d);  
7             break;  
8         case END:  
9             match(END);  
10            break;  
11        default:  
12            error();  
13    }  
14 }
```

- D:

```
1 void D() {  
2     switch (token) {  
3         case d:  
4             match(d);  
5             D();  
6             break;  
7         case END:  
8             match(END);  
9             break;  
10        default:  
11            error();  
12    }  
13 }
```

c) Parsing table of table-driven predictive parser

	A	B	C	D
a	$A \rightarrow BC$	$B \rightarrow aB$		
b	$A \rightarrow BC$	$B \rightarrow b$		
c	$A \rightarrow BC$		$C \rightarrow cCd$	
d	$A \rightarrow De$			$D \rightarrow dD$
e	$A \rightarrow De$			
\$				