Example of Constructing a Predictive Parsing Table

Grammar:

$\underline{e}$	→	$\underline{t}\ \underline{e'}$
$\underline{e'}$	→	$+\ \underline{t}\ \underline{e'}$
	|	ε
$\underline{t}$	→	$\underline{f}\ \underline{t'}$
$\underline{t'}$	→	$*\ \underline{f}\ \underline{t'}$
	|	ε
$\underline{f}$	→	$(\ \underline{e}\ )$
	|	x
	|	y

first and ***follow*** sets:

Non-Terminal	*first*	*follow*
$\underline{e}$	'(', 'x', 'y'	$, ')'
$\underline{e'}$	'+', ε	$, ')'
$\underline{t}$	'(', 'x', 'y'	'+', $, ')'
$\underline{t'}$	'*', ε	'+', $, ')'
$\underline{f}$	'(', 'x', 'y'	'*', '+', ')', $

Start with an empty parsing table; the **rows** are non-terminals and the **columns** are terminals.

Non-Terminal	Input Symbol						
	x	*y*	*+*	***	*(*	*)*	*$*
$\underline{e}$							
$\underline{e'}$							
$\underline{t}$							
$\underline{t'}$							
$\underline{f}$							

for each *production* $\underline{n} \rightarrow \alpha$

   for each *a* $\in$ ***first***(α)

      add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

   if $\varepsilon \in$ ***first***(α) ***then***

      for each *b* $\in$ ***follow***$(\underline{n})$

         add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{e} \rightarrow \underline{t}\ \underline{e'}$

first$(\ \underline{t}\ \underline{e'}\ )$ = '(', 'x', 'y'

Non-Terminal	Input Symbol						
	x	*y*	+	*	(	)	$
$\underline{e}$					$\underline{e} \rightarrow \underline{t}\ \underline{e'}$		
$\underline{e'}$							
$\underline{t}$							
$\underline{t'}$							
$\underline{f}$							

for each *production* *n* → *α*

    for each *a* ∈ ***first****(α)*

        add *n* → *α to T[n , a]*

    if *ε* ∈ ***first****(α)* ***then***

        for each *b* ∈ ***follow****(n)*

            add *n* → *α to T[n , a]*

Current production:

e → *t e'*

first*(t e') = '(', 'x', 'y'*

Non-Terminal	Input Symbol						
	x	*y*	+	*	(	)	$
e	*e* → *t e'*				*e* → *t e'*		
e'							
t							
t'							
f							

for each *production* $\underline{n} \rightarrow \alpha$
for each *a* ∊ ***first***(α)
add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$
if $\varepsilon \in$ ***first***(α) ***then***
for each *b* ∊ ***follow***$(\underline{n})$
add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{e} \rightarrow \underline{t}\ \underline{e'}$

first$(\underline{t}\ \underline{e'})$ = '(', 'x', 'y'

Non-Terminal	Input Symbol					
	x	*y*	+	*	(	)	$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$			$\underline{e} \rightarrow \underline{t}\ \underline{e'}$		
$\underline{e'}$							
$\underline{t}$							
$\underline{t'}$							
$\underline{f}$							

for each *production* $\underline{n} \rightarrow \alpha$
for each *a* $\in$ ***first***(α)
add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$
if $\varepsilon \in$ ***first***(α) ***then***
for each *b* $\in$ ***follow***$(\underline{n})$
add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{e}' \rightarrow + \underline{t}\ \underline{e}'$

first$(+ \underline{t}\ \underline{e}') =$ '+'

Non-Terminal	Input Symbol					
	x	y	+	*	(	)	$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$			$\underline{e} \rightarrow \underline{t}\ \underline{e}'$		
$\underline{e}'$			$\underline{e}' \rightarrow + \underline{t}\ \underline{e}'$				
$\underline{t}$							
$\underline{t}'$							
$\underline{f}$							

for each *production* $\underline{n} \rightarrow \alpha$

for each *a* $\in$ ***first***(α)

add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

if $\varepsilon \in$ ***first***(α) ***then***

for each *b* $\in$ ***follow***$(\underline{n})$

add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{e'} \rightarrow \varepsilon$

follow$(\underline{e'}) =$ $, ')'

Non-Terminal	Input Symbol					
	x	y	+	*	(	)	$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$			$\underline{e} \rightarrow \underline{t}\ \underline{e'}$		
$\underline{e'}$			$\underline{e'} \rightarrow + \underline{t}\ \underline{e'}$				$\underline{e'} \rightarrow \varepsilon$
$\underline{t}$							
$\underline{t'}$							
$\underline{f}$							

for each *production* $\underline{n} \rightarrow \alpha$

for each $a \in$ ***first***(α)

add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

if $\varepsilon \in$ ***first***(α) ***then***

for each $b \in$ ***follow***$(\underline{n})$

add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{e}' \rightarrow \varepsilon$

follow$(\underline{e}') = \$, ')'$

Non-Terminal	Input Symbol						
	x	*y*	+	*	(	)	$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$			$\underline{e} \rightarrow \underline{t}\ \underline{e}'$		
$\underline{e}'$			$\underline{e}' \rightarrow + \underline{t}\ \underline{e}'$			$\underline{e}' \rightarrow \varepsilon$	$\underline{e}' \rightarrow \varepsilon$
$\underline{t}$							
$\underline{t}'$							
$\underline{f}$							

for each *production* $\underline{n} \rightarrow \alpha$
for each *a* ∈ ***first***(α)
add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$
if $\varepsilon \in$ ***first***(α) ***then***
for each *b* ∈ ***follow***$(\underline{n})$
add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{t} \rightarrow \underline{f}\ \underline{t'}$

first$(\underline{f}\ \underline{t'})$ = '(', 'x', 'y'

Non-Terminal	Input Symbol					
	x	*y*	+	*	(	)	$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$			$\underline{e} \rightarrow \underline{t}\ \underline{e'}$		
$\underline{e'}$			$\underline{e'} \rightarrow + \underline{t}\ \underline{e'}$			$\underline{e'} \rightarrow \varepsilon$	$\underline{e'} \rightarrow \varepsilon$
$\underline{t}$					$\underline{t} \rightarrow \underline{f}\ \underline{t'}$		
$\underline{t'}$							
$\underline{f}$							

for each *production* $\underline{n} \rightarrow \alpha$
  for each $a \in$ ***first***(α)
    add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$
  if $\varepsilon \in$ ***first***(α) ***then***
    for each $b \in$ ***follow***$(\underline{n})$
      add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{t} \rightarrow \underline{f}\ \underline{t}'$

first$(\underline{f}\ \underline{t}') =$ '(', 'x', 'y'

Non-Terminal	Input Symbol						
	x	*y*	+	*	(	)	$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$			$\underline{e} \rightarrow \underline{t}\ \underline{e}'$		
$\underline{e}'$			$\underline{e}' \rightarrow + \underline{t}\ \underline{e}'$			$\underline{e}' \rightarrow \varepsilon$	$\underline{e}' \rightarrow \varepsilon$
$\underline{t}$	$\underline{t} \rightarrow \underline{f}\ \underline{t}'$				$\underline{t} \rightarrow \underline{f}\ \underline{t}'$		
$\underline{t}'$							
$\underline{f}$							

for each *production* $\underline{n} \rightarrow \alpha$
    for each *a* $\in$ ***first***(α)
        add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$
    if $\varepsilon \in$ ***first***(α) ***then***
        for each *b* $\in$ ***follow***$(\underline{n})$
            add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{t} \rightarrow \underline{f}\ \underline{t'}$

first$(\underline{f}\ \underline{t'})$ = '(', 'x', 'y'

Non-Terminal	Input Symbol						
	x	*y*	+	*	(	)	$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$			$\underline{e} \rightarrow \underline{t}\ \underline{e'}$		
$\underline{e'}$			$\underline{e'} \rightarrow + \underline{t}\ \underline{e'}$			$\underline{e'} \rightarrow \varepsilon$	$\underline{e'} \rightarrow \varepsilon$
$\underline{t}$	$\underline{t} \rightarrow \underline{f}\ \underline{t'}$	$\underline{t} \rightarrow \underline{f}\ \underline{t'}$			$\underline{t} \rightarrow \underline{f}\ \underline{t'}$		
$\underline{t'}$							
$\underline{f}$							

for each *production* $\underline{n} \rightarrow \alpha$

for each *a* ∈ ***first***(α)

add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

if $\varepsilon \in$ ***first***(α) ***then***

for each *b* ∈ ***follow***$(\underline{n})$

add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{t}' \quad \rightarrow \quad \alpha$

follow$(\underline{t}') =$ '+', \$, ')'

Non-Terminal	Input Symbol					
	x	*y*	+	*	(	)	\$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$			$\underline{e} \rightarrow \underline{t}\ \underline{e}'$		
$\underline{e}'$			$\underline{e}' \rightarrow + \underline{t}\ \underline{e}'$			$\underline{e}' \rightarrow \varepsilon$	$\underline{e}' \rightarrow \varepsilon$
$\underline{t}$	$\underline{t} \rightarrow \underline{f}\ \underline{t}'$	$\underline{t} \rightarrow \underline{f}\ \underline{t}'$			$\underline{t} \rightarrow \underline{f}\ \underline{t}'$		
$\underline{t}'$			$\underline{t}' \rightarrow \varepsilon$	$\underline{t}' \rightarrow * \underline{f}\ \underline{t}'$			
$\underline{f}$							

for each *production* $\underline{n} \rightarrow \alpha$
  for each *a* $\in$ ***first***(α)
    add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$
  if $\varepsilon \in$ ***first***(α) ***then***
    for each *b* $\in$ ***follow***$(\underline{n})$
      add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{t'} \rightarrow \alpha$

follow$(\underline{t'})$ = '+', $, ')'

Non-Terminal	Input Symbol						
	x	y	+	*	(	)	$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$			$\underline{e} \rightarrow \underline{t}\ \underline{e'}$		
$\underline{e'}$			$\underline{e'} \rightarrow + \underline{t}\ \underline{e'}$			$\underline{e'} \rightarrow \varepsilon$	$\underline{e'} \rightarrow \varepsilon$
$\underline{t}$	$\underline{t} \rightarrow \underline{f}\ \underline{t'}$	$\underline{t} \rightarrow \underline{f}\ \underline{t'}$			$\underline{t} \rightarrow \underline{f}\ \underline{t'}$		
$\underline{t'}$			$\underline{t'} \rightarrow \varepsilon$	$\underline{t'} \rightarrow * \underline{f}\ \underline{t'}$			$\underline{t'} \rightarrow \varepsilon$
$\underline{f}$							

for each *production* $\underline{n} \rightarrow \alpha$

  for each $a \in$ ***first***(α)

    add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

  if $\varepsilon \in$ ***first***(α) ***then***

    for each $b \in$ ***follow***$(\underline{n})$

      add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{t}' \rightarrow \alpha$

follow$(\underline{t}')$ = '+', $, ')'

Non-Terminal	Input Symbol					
	x	*y*	+	*	(	)	$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$			$\underline{e} \rightarrow \underline{t}\ \underline{e}'$		
$\underline{e}'$			$\underline{e}' \rightarrow +\ \underline{t}\ \underline{e}'$			$\underline{e}' \rightarrow \varepsilon$	$\underline{e}' \rightarrow \varepsilon$
$\underline{t}$	$\underline{t} \rightarrow \underline{f}\ \underline{t}'$	$\underline{t} \rightarrow \underline{f}\ \underline{t}'$			$\underline{t} \rightarrow \underline{f}\ \underline{t}'$		
$\underline{t}'$			$\underline{t}' \rightarrow \varepsilon$	$\underline{t}' \rightarrow *\ \underline{f}\ \underline{t}'$		$\underline{t}' \rightarrow \varepsilon$	$\underline{t}' \rightarrow \varepsilon$
$\underline{f}$							

for each *production* $\underline{n} \rightarrow \alpha$
for each $a \in$ ***first***(α)
add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$
if $\varepsilon \in$ ***first***(α) ***then***
for each $b \in$ ***follow***$(\underline{n})$
add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{f} \rightarrow (\underline{e})$

first$((\underline{e}))$ = '('

Non-Terminal	Input Symbol						
	x	y	$+$	$*$	$($	$)$	$\$$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$	$\underline{e} \rightarrow \underline{t}\ \underline{e}'$			$\underline{e} \rightarrow \underline{t}\ \underline{e}'$		
$\underline{e}'$			$\underline{e}' \rightarrow + \underline{t}\ \underline{e}'$			$\underline{e}' \rightarrow \varepsilon$	$\underline{e}' \rightarrow \varepsilon$
$\underline{t}$	$\underline{t} \rightarrow \underline{f}\ \underline{t}'$	$\underline{t} \rightarrow \underline{f}\ \underline{t}'$			$\underline{t} \rightarrow \underline{f}\ \underline{t}'$		
$\underline{t}'$			$\underline{t}' \rightarrow \varepsilon$	$\underline{t}' \rightarrow * \underline{f}\ \underline{t}'$		$\underline{t}' \rightarrow \varepsilon$	$\underline{t}' \rightarrow \varepsilon$
$\underline{f}$					$\underline{f} \rightarrow (\underline{e})$		

for each *production* $\underline{n} \rightarrow \alpha$

    for each $a \in$ ***first***(α)

        add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

    if $\varepsilon \in$ ***first***(α) ***then***

        for each $b \in$ ***follow***$(\underline{n})$

            add $\underline{n} \rightarrow \alpha$ *to* $T[\underline{n}, a]$

Current production:

$\underline{f} \rightarrow x$

first(*x*) = ‘*x*’

Non-Terminal	Input Symbol						
	x	*y*	+	*	(	)	$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$			$\underline{e} \rightarrow \underline{t}\ \underline{e'}$		
$\underline{e'}$			$\underline{e'} \rightarrow +\ \underline{t}\ \underline{e'}$			$\underline{e'} \rightarrow \varepsilon$	$\underline{e'} \rightarrow \varepsilon$
$\underline{t}$	$\underline{t} \rightarrow \underline{f}\ \underline{t'}$	$\underline{t} \rightarrow \underline{f}\ \underline{t'}$			$\underline{t} \rightarrow \underline{f}\ \underline{t'}$		
$\underline{t'}$			$\underline{t'} \rightarrow \varepsilon$	$\underline{t'} \rightarrow *\ \underline{f}\ \underline{t'}$		$\underline{t'} \rightarrow \varepsilon$	$\underline{t'} \rightarrow \varepsilon$
$\underline{f}$	$\underline{f} \rightarrow x$				$\underline{f} \rightarrow (\ \underline{e}\ )$		

for each *production* $\underline{n} \rightarrow \alpha$

  for each *a* ∊ ***first***(α)

    add $\underline{n} \rightarrow \alpha$ *to T[*$\underline{n}$*, a]*

  if $\varepsilon \in$ ***first***(α) ***then***

    for each *b* ∊ ***follow***$(\underline{n})$

      add $\underline{n} \rightarrow \alpha$ *to T[*$\underline{n}$*, a]*

Current production:

$\underline{f} \rightarrow y$

first(*y*) = ‘*y*’

Non-Terminal	Input Symbol						
	x	*y*	+	*	(	)	$
$\underline{e}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$	$\underline{e} \rightarrow \underline{t}\ \underline{e'}$			$\underline{e} \rightarrow \underline{t}\ \underline{e'}$		
$\underline{e'}$			$\underline{e'} \rightarrow + \underline{t}\ \underline{e'}$			$\underline{e'} \rightarrow \varepsilon$	$\underline{e'} \rightarrow \varepsilon$
$\underline{t}$	$\underline{t} \rightarrow \underline{f}\ \underline{t'}$	$\underline{t} \rightarrow \underline{f}\ \underline{t'}$			$\underline{t} \rightarrow \underline{f}\ \underline{t'}$		
$\underline{t'}$			$\underline{t'} \rightarrow \varepsilon$	$\underline{t'} \rightarrow * \underline{f}\ \underline{t'}$		$\underline{t'} \rightarrow \varepsilon$	$\underline{t'} \rightarrow \varepsilon$
$\underline{f}$	$\underline{f} \rightarrow x$	$\underline{f} \rightarrow y$			$\underline{f} \rightarrow (\underline{e})$		