

**TÖL304G Forritunarmál**  
**Miðmisserispróf 2022 heimadæmi**  
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1.

BNF:

$\langle S \rangle ::= \langle S \rangle + \langle S \rangle \mid$   
 $(\langle S \rangle) \mid a$

2.

a.

1	2	3	4	5	6	7	8	9	10
X	X	X				X			

b.

1	2	3	4	5	6	7	8
	X	X		X		X	X

3.

a	b	c	d	e	f	g	h	i	j	k
	X	X	X	X		X	X	X		

4.

```

;;; Notkun: (iota n);
;;; Fyrir: n er heiltala, n>=0.
;;; Gildi: x er listinn [1,2,...,n]
(define (iota n)
  ;; Notkun: (hjalp r x);
  ;; Fyrir: r er heiltala, 0 <= r <= n.
  ;; x er listinn (r+1, r+2 ... n).
  ;; Gildi: Listinn (1 2 ... n).
  (define (hjalp r x)
    (if (= r 0)
        x
        (hjalp (- r 1) (cons r x))
    )
  )
  (hjalp n '())
)

```

5.

```

;; Notkun: (foldl f u x)
;; Fyrir: f er tviundarfall,
;; u er eitthvert gildi,
;; x=(x1 ... xN) er listi einhverra gilda
;; Gildi: (f (f ... (f (f u x1) x2) ...) xN)
;; Ath.: (foldl f u '()) skal skila u
(define (foldl f u x)
  (if (null? x)
      u
      (foldl f (f u (car x)) (cdr x))
  )
)

```

6.

```

;; Notkun: (powerList n)
;; Fyrir: n er heiltala, n>=0.
;; Gildi: Listi allra undirlista listans
;; (n ... 2 1).
;; Þetta er listi sem inniheldur 2^n
;; undirlista.
(define (powerlist n)
  (if (= n 0)
      '()
      (append (powerlist (- n 1))
                (map (lambda (x) (cons n x))
                     (powerlist (- n 1))
                )
      )
  )
)

```

7.

```
;; Notkun: (cross a b)
;; Fyrir: a og b eru óendanlegir straumar,
;;        a=[a1 a2 a3 ...]
;;        b=[b1 b2 b3 ...]
;; Gildi: Óendanlegi straumurinn af
;;        óendanlegum straumum af tveggja
;;        staka listum
;;        [(a1 b1) (a1 b2) (a1 b3) ...]
;;        [(a2 b1) (a2 b2) (a2 b3) ...]
;;        [(a3 b1) (a3 b2) (a3 b3) ...]
;;        .
;;        .
;;        .
;;        ]
;;        sem inniheldur nokkurs konar
;;        krossmargfeldi a og b.
(define (cross a b)
  (cons-stream
    (stream-map
      (lambda (c) (* c (stream-car b)))
      a
    )
    (cross a (stream-cdr b))
  )
)
```

8.

a	b	c	d	e	f	g	h	i	j	k	l	m
X								X		X	X	X