1000 automatically generated exercises with n-gram grammars

Exercise 1.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes ab, \rtimes bb, aab, aba, abb, baa, bbb, bb\ltimes, b \ltimes \ltimes\}$

1. aab
2. bb
3. abb
4. bbb

Exercise 2.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, abd, caa, cba, dad, dcc, ddc\}$

1. cba
2. dabcdbcd
3. dcdbacac
4. ε

Exercise 3.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaac, abaa, abba, abbb, cabb, cbab\}$

1. ε
2. b
3. bccccca
4. bcaa

Exercise 4.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, acba, adac, beca, cbdb, cecb, dacd, ebcd\}$

1. d
2. deddbed
3. baeeedd

4. ε

Exercise 5.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes d, ba, cc, cd, db, dc, a\ltimes\}$

1. cabd
2. dba
3. edced
4. ε

Exercise 6.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes d, \rtimes\ \rtimes\ bc, \rtimes\ \rtimes\ bd, \rtimes\ \rtimes\ da, \rtimes da\ltimes, \rtimes bdb, \rtimes bcc, accc, bcca, cacc, ccac, cccd, ccdb, cdbc, bdb\ltimes, dbc\ltimes, db\ltimes\ltimes, bc\ltimes\ltimes, da\ltimes\ltimes, c\ltimes\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. bdb
2. dd
3. da
4. cca

Exercise 7.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bab, ccb, dac, dba, dbd\}$

1. acab
2. bbbdcbba
3. d
4. ε

Exercise 8.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, da, de, ed, ee\}$

1. ε
2. cbab
3. e

4. bebbec

Exercise 9.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes\ltimes, \rtimes\ \rtimes\ b\ltimes, \rtimes\ \rtimes\ \ltimes\ltimes, \rtimes\ \rtimes\ bb, \rtimes\ \rtimes\ b\ltimes, \rtimes\ \ltimes\ \ltimes\ltimes, \rtimes bbb, \rtimes b\ \ltimes\ltimes, aabb, abbb, baab, bbaa, bbba, bbbb, bbb\ltimes, bb\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. ε
2. aabb
3. b
4. aab

Exercise 10.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{adc, bdb, bdd, cad\}$

1. baabdd
2. bca
3. bbaddcb
4. ε

Exercise 11.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes c, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ c\ltimes, \rtimes\ \rtimes\ bc, \rtimes c\ \ltimes\ltimes, \rtimes bcc, bcbc, bccb, bcdc, bddb, cbcd, cbdd, ccbd, dbcb, ddbc, cdc\ltimes, dc\ \ltimes\ltimes, c\ \ltimes\ltimes\ltimes\}$

1. b
2. dbaddcdcaaa
3. cad
4. d

Exercise 12.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes a\ltimes, \rtimes\ltimes\ltimes, \rtimes ab, \rtimes bb, aaa, aab, aba, baa, bab, bba, ab\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. bbabbab

2. aabaabbb
3. ε
4. baba

Exercise 13.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aba, abb, bab, bba\}$

1. baabb
2. baa
3. ε
4. b

Exercise 14.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ae, cc, cd, dd, ec\}$

1. daaaeb
2. dee
3. e
4. ε

Exercise 15.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aac, abc, acb, baa, bab, bca, cbb\}$

1. b
2. ε
3. bc
4. aac

Exercise 16.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes b\ltimes, \rtimes ab, \rtimes ba, aba, abb, acb, bab, bac, bba, bbb, bbc, cbb, bc\ltimes, ba\ltimes, c\ltimes \ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. cccc
2. baabbacab

3. b
4. cab

Exercise 17.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acbd, bdbc, cadd, cbab, cbcc, ccca, cdcc, ddca\}$

1. cdab
2. c
3. ε
4. bcc

Exercise 18.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes\ltimes, \rtimes\rtimes c, \rtimes c\ltimes, \rtimes\ltimes\ltimes, \rtimes cc, aba, acb, bab, bac, bba, bbb, bca, cbb, cbc, ccb, ca\ltimes, a\ltimes\ltimes, c\ltimes\ltimes\}$

1. ε
2. bacbccca
3. c
4. abcbcbccbb

Exercise 19.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abb, bad, bbd, bda, dca, dcb, dcd, dda\}$

1. dcccda
2. a
3. ε
4. b

Exercise 20.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{adaa, baaa, bbdc, caab, ddad\}$

1. ε
2. bbddada
3. cacccbad

4. abba

Exercise 21.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{adab, cccb, cccc, dccc, dcdd\}$

1. ε
2. bbadbcd
3. b
4. a

Exercise 22.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{bebb, cbce, cddb, ebaa\}$

1. bbbede
2. e
3. ε
4. dea

Exercise 23.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes dc, \rtimes \rtimes c\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes cc, \rtimes \rtimes ad, \rtimes cca, \rtimes c \ltimes \ltimes, \rtimes dc\ltimes, \rtimes \ltimes \ltimes\ltimes, \rtimes ada, aada, abdd, adab, caad, ccaa, dabd, bdd\ltimes, ada\ltimes, dc \ltimes \ltimes, dd \ltimes \ltimes, da \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. cbccbad
2. ε
3. ccc
4. ba

Exercise 24.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abc, acc, bad, cac, ccd, daa, dbb, dda\}$

1. dcbddbdd
2. bdccab

3. ε
4. b

Exercise 25.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes bb, aca, ada, bac, bba, bbb, cad, dad, ad\ltimes, d \ltimes \ltimes\}$

1. cbabbaba
2. bbbacad
3. ε
4. bbacad

Exercise 26.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{bacd, bbdd, cbba, ccbb, cccb, dabc, dbbc\}$

1. cd
2. dca
3. ε
4. a

Exercise 27.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, caa, cab, cba\}$

1. cbccaaa
2. c
3. cc
4. bcbcb

Exercise 28.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes d, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes d \ltimes, \rtimes \rtimes ca, \rtimes cab, \rtimes d \ltimes \ltimes, \rtimes \ltimes \ltimes \ltimes, abcd, bcdc, cabc, cdcc, dcca, cca \ltimes, ca \ltimes \ltimes, a \ltimes \ltimes \ltimes, d \ltimes \ltimes \ltimes\}$

1. abcb
2. aaacd
3. acdbcddb

4. ε

Exercise 29.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ba, bc, cb, da, dc, eb\}$

1. acc
2. bd
3. dcbec
4. aecbdce

Exercise 30.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes \ltimes, \rtimes\ \rtimes\ bc, \rtimes\ \rtimes\ ac, \rtimes\ \rtimes\ \ltimes\ltimes, \rtimes\ \rtimes aa, \rtimes aaa, \rtimes acc, \rtimes bc\ltimes, \rtimes\ltimes\ltimes\ltimes, accb, bcbb, cbcb, ccbc, aaa\ltimes, cbb\ltimes, aa\ltimes\ltimes, bc\ltimes\ltimes, bb\ltimes\ltimes, c\ltimes\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. bbac
2. aababc
3. cbbbc
4. ccc

Exercise 31.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, bd, cc, da, db, dc, dd\}$

1. bdddcdcb
2. ε
3. acacbaab
4. ddb

Exercise 32.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes d, \rtimes\ \rtimes\ db, \rtimes\ \rtimes\ bd, \rtimes\ \rtimes\ a\ltimes, \rtimes db\ltimes, \rtimes a\ltimes\ltimes, \rtimes bdb, acbd, bacb, bdba, bddb, cbdd, dbac, ddbb, dbb\ltimes, db\ltimes\ltimes, bb\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. abb

2. ddc
3. aacddddc
4. b

Exercise 33.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{baaa, baba, bbaa, bbab, bbbb\}$

1. bbbabaabaaab
2. bbaa
3. bbaababbb
4. ε

Exercise 34.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, abba, bbce, ddea, dded, ecde, edbd, eeee\}$

1. acbb
2. b
3. e
4. ε

Exercise 35.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes ac, \rtimes\rtimes aa, \rtimes aae, \rtimes aca, aaec, aeac, aece, cedd, daea, ddae, eced, edda, aca\ltimes, eac\ltimes, ac\ltimes\ltimes, ca\ltimes\ltimes, c\ltimes\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. a
2. dd
3. aca
4. cbaabbccd

Exercise 36.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{caae, cbdb, ccdb, cdce, dceb\}$

1. b
2. d

3. ε
4. e

Exercise 37.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, aba, abb, baa, bab, bba, bbb\}$

1. aaabbba
2. bbbbaab
3. ε
4. baababa

Exercise 38.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaba, abaa, baaa, bbba, bbbb\}$

1. ε
2. babba
3. aa
4. b

Exercise 39.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aabb, abbb, baab, bbaa, bbab, bbbb\}$

1. ab
2. baba
3. bbbab
4. ε

Exercise 40.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abaa, abab, abba, babb, bbab, bbbb\}$

1. a
2. abbaaaaa
3. ε
4. b

Exercise 41.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ad, bb, bc, ca, cb, cc\}$

1. cb
2. bc
3. cabbabbba
4. bcbc

Exercise 42.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes d, \rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ be, \rtimes\ \rtimes\ ac, \rtimes\ \rtimes\ d\ltimes, \rtimes d\ \ltimes\ \ltimes, \rtimes bec, \rtimes ac\ltimes, becd, cdce, ecdc, dce\ltimes, ce\ltimes\ltimes, ac\ltimes\ltimes, c\ltimes\ltimes\ltimes, e\ltimes\ltimes\ltimes, d\ltimes\ltimes\ltimes\}$

1. d
2. ab
3. abbbe
4. bb

Exercise 43.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes ac, \rtimes\rtimes a\ltimes, \rtimes a\ltimes\ltimes, \rtimes acb, aaab, acaa, acba, baca, caaa, cbac, aab\ltimes, ab\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. cabcaa
2. a
3. cbbcccaa
4. bbaca

Exercise 44.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes b\ltimes, \rtimes ca, aab, aba, abc, bab, bca, caa, cab, ba\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. ε
2. bbcacbb
3. b
4. bcbbbbc

Exercise 45.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes a, \rtimes a \ltimes, \rtimes ca, abb, bbc, bca, cab, ab \ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. a
2. cab
3. ccab
4. cbbca

Exercise 46.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abaa, bedd, cbbd, cbca, dbcb, eeec\}$

1. ddadbda
2. ecc
3. eaebdea
4. b

Exercise 47.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, abb, bab, bba, bbb\}$

1. ε
2. ababa
3. a
4. b

Exercise 48.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes ab, abc, aca, bac, bcb, cba, ca \ltimes, a \ltimes \ltimes\}$

1. cabaca
2. bcbcb
3. ε
4. aabcabb

Exercise 49.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes e, \rtimes \rtimes c, \rtimes \rtimes \ltimes, \rtimes c \ltimes, \rtimes \ltimes \ltimes, \rtimes ee, aad, ada, dad, eaa, eea, ad\ltimes, d \ltimes \ltimes, c \ltimes \ltimes\}$

1. dbdad
2. edad
3. daccac
4. adbe

Exercise 50.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bec, cab, cad, cdb, ceb, daa, ebb\}$

1. b
2. ed
3. e
4. ε

Exercise 51.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aec, bae, bcc, cee, eae, eba\}$

1. b
2. abee
3. cbcbddca
4. dbacc

Exercise 52.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \rtimes e, \rtimes \rtimes eb, \rtimes \rtimes ce, \rtimes \rtimes \ltimes \ltimes, \rtimes cec, \rtimes eb \ltimes, \rtimes \ltimes \ltimes \ltimes, bdce, cbdc, ccbd, cecc, ceee, dcee, eccb, eee\ltimes, eb \ltimes \ltimes, ee \ltimes \ltimes, e \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. eb
2. ε
3. aaeaedabd
4. bee

Exercise 53.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, bc, cc, cd, db, b\ltimes\}$

1. ε
2. a
3. dacb
4. dadcaa

Exercise 54.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\ \rtimes\ c, \rtimes\ \rtimes\ \ltimes, \rtimes\ \rtimes\ d, \rtimes\ \rtimes\ b, \rtimes cb, \rtimes db, \rtimes\ \ltimes\ \ltimes, \rtimes b\ltimes, aba, bbd, bdb, bee, dbb, dbe, eab, eea, cb\ltimes, ba\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. cb
2. ε
3. dbddaee
4. b

Exercise 55.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, \rtimes e, bd, ce, db, dc, ed, e\ltimes, b\ltimes\}$

1. b
2. eaa
3. ε
4. adaac

Exercise 56.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aca, bac, bca, cba, ccc\}$

1. ca
2. abcccaa
3. acbc
4. bcba

Exercise 57.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, ba, bc, cb, cc\}$

1. ε
2. cccbcbac
3. abcbcabbbb
4. cbbbacacc

Exercise 58.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes c\ltimes, \rtimes \rtimes cc, \rtimes \rtimes bc, \rtimes cca, \rtimes c \ltimes \ltimes, \rtimes bcb, adcd, cadc, ccad, dcdc, cdc\ltimes, bcb\ltimes, dc \ltimes \ltimes, cb \ltimes \ltimes, c \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. d
2. dcadb
3. bcd
4. ε

Exercise 59.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes bc, \rtimes \rtimes ac, \rtimes \rtimes ca, \rtimes \rtimes b\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes bcb, \rtimes ca\ltimes, \rtimes aca, \rtimes \ltimes \ltimes\ltimes, \rtimes b \ltimes \ltimes, acad, adad, adcc, cada, dadc, dcc\ltimes, bcb\ltimes, cb \ltimes \ltimes, cc \ltimes \ltimes, ca \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. ε
2. aabacbdb
3. b
4. aca

Exercise 60.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes ab, \rtimes b\ltimes, \rtimes ba, aab, abc, baa, bca, bcc, caa, ccc, ab\ltimes, cc\ltimes, b\ltimes \ltimes, c \ltimes \ltimes\}$

1. abbbcca
2. bbab

3. acaacc
4. ccbbcca

Exercise 61.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaac, babc, caaa, cbab, cbcc\}$

1. caacac
2. cab
3. ε
4. abcab

Exercise 62.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes cb, \rtimes ca, abb, aca, cab, cac, bb\ltimes, cb\ltimes, b \ltimes \ltimes\}$

1. cb
2. cabb
3. abccb
4. bac

Exercise 63.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes aa, \rtimes\rtimes ab, \rtimes aba, \rtimes aaa, \rtimes ab\ltimes, aaba, aabb, abaa, abba, baab, bbaa, baa\ltimes, aaa\ltimes, ab\ltimes \ltimes, aa \ltimes \ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. abaa
2. ε
3. aaa
4. ab

Exercise 64.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, ab, ac, ba, bb, bc, ca, cb, cc, a\ltimes, b\ltimes\}$

1. ab
2. a
3. bbabbbbcca

4. acb

Exercise 65.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, cc, db, dc\}$

1. ddc
2. ddaa
3. dabdaa
4. aaacbcc

Exercise 66.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes c, aa, ab, bb, bc, ca, cb, a\ltimes, c\ltimes\}$

1. c
2. ε
3. a
4. cbcbb

Exercise 67.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes\ltimes, \rtimes\ \rtimes\ \ltimes\ltimes, \rtimes\ \rtimes\ ab, \rtimes aba, \rtimes\ \ltimes\ \ltimes\ltimes, aaba, aabb, abaa, abab, baab, baba, aba\ltimes, abb\ltimes, ba\ \ltimes\ \ltimes, bb\ \ltimes\ \ltimes, a\ \ltimes\ \ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. ε
2. babbbbaba
3. bbbb
4. aba

Exercise 68.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes b, \rtimes\rtimes ba, \rtimes\rtimes b\ltimes, \rtimes b\ltimes\ltimes, \rtimes baa, aaab, aabb, abbb, baaa, bbaa, bbba, baa\ltimes, aa\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. b
2. aaabbbbbb

3. ε
4. babbbaaaa

Exercise 69.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes b \ltimes, \rtimes bb, bac, bbc, bcb, cba, ac \ltimes, b \ltimes \ltimes, c \ltimes \ltimes\}$

1. bcca
2. cb
3. c
4. b

Exercise 70.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bac, bcb, cab, cac, cca, ccb\}$

1. acaaaaa
2. baccab
3. ε
4. ab

Exercise 71.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, abe, bcc, cab, dca, edb, eea\}$

1. dbbe
2. cebbbccebb
3. cbdbbee
4. e

Exercise 72.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abe, ada, adc, aed, cad, cea, deb\}$

1. ε
2. b
3. ebbca
4. daabeea

Exercise 73.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, abab, abbb, baab, bbba, bbbb\}$

1. ba
2. ε
3. b
4. bb

Exercise 74.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{acb, bab, bbb, bbc, cac, cba, cbc\}$

1. bccbbc
2. ε
3. b
4. cccbaaca

Exercise 75.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes e, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes ea, \rtimes ead, \rtimes \ltimes \ltimes \ltimes, adbe, becc, ccea, cead, dbec, eadb, ecce, adb \ltimes, db \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. eabcc
2. e
3. adbabdaa
4. ebaadcedae

Exercise 76.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, ac, ca, cc, c \ltimes\}$

1. a
2. bbcb
3. caabaccc
4. c

Exercise 77.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, aba, baa, bba, bbb\}$

1. bba
2. ε
3. b
4. abbbab

Exercise 78.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aabb, abab, abbb, baab, bbbb\}$

1. ε
2. abbbab
3. bbaaaaa
4. aaaaaaaa

Exercise 79.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, bc, cc, cd, da, db, dc, dd\}$

1. bbc
2. abad
3. abbacab
4. ε

Exercise 80.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abb, abc, acc, bbc, cab, cbb, cbc, ccc\}$

1. cccc
2. ε
3. aaca
4. b

Exercise 81.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aad, abc, bbd, bda, bdc, dad, dcb, dcc\}$

1. bacc
2. cd
3. aa
4. adcc

Exercise 82.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes e, ad, ba, bb, bc, cb, de, eb, ec, b\ltimes\}$

1. eddcddce
2. eddcdab
3. abbcaeeaba
4. c

Exercise 83.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes d, ab, bc, cd, da, dd, d\ltimes\}$

1. ε
2. dc
3. cb
4. bbaada

Exercise 84.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, aa, ab, ac, ba, bc, ca, cb, cc, c\ltimes\}$

1. cabc
2. aa
3. bbb
4. aaabbaaa

Exercise 85.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{cabe, cdaa, cdca, cddc, cecc, dddd\}$

1. ade
2. dc
3. aeda
4. b

Exercise 86.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes a, \rtimes\rtimes d, \rtimes a\ltimes, \rtimes dd, \rtimes cc, aad, aca, adb, bac, cad, daa, dba, dda, ad\ltimes, cc\ltimes, d\ltimes \ltimes, c \ltimes \ltimes, a \ltimes \ltimes\}$

1. a
2. dbdbc
3. dcacbdbcdc
4. cc

Exercise 87.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes b, \rtimes c\ltimes, \rtimes ba, abc, aee, bae, dab, dda, edd, eed, bc\ltimes, c \ltimes \ltimes\}$

1. dbcba
2. c
3. cdae
4. dded

Exercise 88.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes bc, \rtimes \rtimes cb, \rtimes \rtimes \ltimes\ltimes, \rtimes bcb, \rtimes cbc, \rtimes \ltimes \ltimes\ltimes, babb, bbab, bbba, bbbb, bcbb, cbbb, cbc\ltimes, abb\ltimes, bc\ltimes\ltimes, bb\ltimes\ltimes, c\ltimes\ltimes\ltimes, b\ltimes \ltimes\ltimes\}$

1. cacb
2. bacccca
3. aac
4. abcaabcb

Exercise 89.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aca, bac, bba, bbd, bcd, dcb, dcc\}$

1. ε
2. b
3. cbddddd
4. dda

Exercise 90.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aca, bbc, beb, ceb, cee, dde, ded\}$

1. e
2. ε
3. b
4. ec

Exercise 91.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes b \ltimes, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes aa, \rtimes \rtimes ba, \rtimes aaa, \rtimes baa, \rtimes ba \ltimes, \rtimes \ltimes \ltimes \ltimes, \rtimes b \ltimes \ltimes, aaaa, aaab, aabb, abba, baa \ltimes, bba \ltimes, ba \ltimes \ltimes, aa \ltimes \ltimes, a \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. bbbaa
2. ε
3. baaa
4. a

Exercise 92.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abca, bbbc, bbcc, bcca, caaa, cbbb, ccbc, ccca\}$

1. b
2. a
3. ε
4. abbbaabbbc

Exercise 93.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, abb, baa, bab, bbb\}$

1. bb
2. a
3. ε
4. b

Exercise 94.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes b\ltimes, \rtimes bb, \rtimes aa, aaa, aab, aba, baa, bb\ltimes, aa\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. abb
2. abababa
3. aaabb
4. ε

Exercise 95.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, abbb, baba, babb, bbba\}$

1. baa
2. abaaaa
3. ε
4. abbbbaaab

Exercise 96.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abab, acce, cbae, ceee, dbba, ddcc, ecdd, edbc\}$

1. eeaecb
2. aadaa
3. ε
4. e

Exercise 97.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aba, baa, bab, bba\}$

1. b
2. ε
3. bbabaabaa
4. aabbabaa

Exercise 98.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ba, bb, cb, cc\}$

1. c
2. cabaaaa
3. ε
4. accbaaa

Exercise 99.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes ba, \rtimes aa, aab, abb, baa, bba, bbb, aa\ltimes, ba\ltimes, a \ltimes \ltimes\}$

1. abbbab
2. aa
3. babaaa
4. ba

Exercise 100.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abab, abba, abbb, baba, babb, bbab, bbba\}$

1. b
2. ε
3. a
4. baabbab

Exercise 101.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, bd, cc, dd\}$

1. ab
2. bcbddaba
3. acadb
4. ε

Exercise 102.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abe, bbb, ccb, ddb, dde, eca, eee\}$

1. ε
2. e
3. b
4. eb

Exercise 103.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes b\ltimes, \rtimes aa, aaa, aab, aba, abb, baa, bab, bba, aa\ltimes, b\ltimes \ltimes, a \ltimes \ltimes\}$

1. ε
2. b
3. baba
4. aa

Exercise 104.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{adac, adcd, cbed, eaee, ebdc\}$

1. b
2. e
3. cdbada
4. ε

Exercise 105.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \quad \rtimes \quad \rtimes\ltimes, \rtimes \quad \rtimes \quad \rtimes b, \rtimes \quad \rtimes \quad \ltimes\ltimes, \rtimes \quad \rtimes \quad ba, \rtimes \quad \ltimes \quad \ltimes\ltimes, \rtimes baa, aabb, abba, baab, baba, bbab, aba\ltimes, ba \ltimes \ltimes, a \ltimes \ltimes\ltimes\}$

1. babaab
2. bbbba
3. ab
4. abaabb

Exercise 106.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, aa, ab, ac, ba, ca, cc, c\ltimes\}$

1. cbc
2. ε
3. abcaac
4. c

Exercise 107.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{cdec, dbea, dcba, eebb\}$

1. cd
2. caedbdeeb
3. ε
4. aaedbaeec

Exercise 108.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, abb, caa, cba, cbb, cca, ccb\}$

1. b
2. aac
3. ε
4. ba

Exercise 109.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes b, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes be, \rtimes\rtimes c\ltimes, \rtimes\rtimes bb, \rtimes\rtimes\ltimes\ltimes, \rtimes bb\ltimes, \rtimes bed, \rtimes c\ltimes \ltimes, \rtimes\ltimes\ltimes\ltimes, acdb, bede, deac, eacd, edea, cdb\ltimes, db\ltimes\ltimes, bb\ltimes\ltimes, c\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. eceab
2. dacacaab
3. daaeebd
4. ε

Exercise 110.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bcd, bdb, cba, cda, cdd, ced, dbb, eae\}$

1. ddaddcbda
2. cdbaaaed
3. ced
4. ε

Exercise 111.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aac, baa, bab, bdb, ccc, daa, dcc\}$

1. b
2. a
3. ε
4. cabbacbdbd

Exercise 112.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes ba, \rtimes cd, abd, bab, bdc, cce, cde, cec, dcc, ecd, de\ltimes, cd\ltimes, e\ltimes \ltimes, d\ltimes\ltimes\}$

1. deebebab
2. d
3. dcddcdcee
4. abcdecdbc

Exercise 113.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abc, bcb, beb, cae, cbd, dcd, ebd\}$

1. ecebabce
2. dbaa
3. eb
4. ccac

Exercise 114.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aeb, bce, bea, dbb\}$

1. ε
2. dddceed
3. e
4. b

Exercise 115.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abbb, baaa, babb, bbbb\}$

1. b
2. ε
3. abbbbabbb
4. a

Exercise 116.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes ab, \rtimes b\ltimes, aab, abb, baa, bba, bb\ltimes, ab\ltimes, b \ltimes \ltimes\}$

1. aabbab
2. b
3. abbbaa
4. aaaa

Exercise 117.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes b, \rtimes\rtimes bb, \rtimes bba, \rtimes bb\ltimes, \rtimes bbb, babb, bbab, bbba, bbbb, bba\ltimes, abb\ltimes, ba\ltimes\ltimes, bb\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. b
2. bb
3. aaaa
4. bba

Exercise 118.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes ba, aaa, aab, aba, baa, bab, ab\ltimes, b\ltimes\ltimes\}$

1. abaaabb
2. bbbabbba
3. ε
4. ababbbb

Exercise 119.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bcc, cad, ccd, cdc\}$

1. ε
2. d
3. dd
4. bacbadb

Exercise 120.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaca, accb, bacb, cccb\}$

1. acaccbcca
2. bcba
3. ε
4. bca

Exercise 121.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ae, de, ea, ec\}$

1. badbbacc
2. bba
3. cdce
4. aaa

Exercise 122.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abda, adcb, bccc, ccca, daab\}$

1. a
2. dcbb
3. ε
4. b

Exercise 123.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{adae, ccdc, cebd, dedc\}$

1. adedc
2. ε
3. b
4. e

Exercise 124.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \rtimes a, \rtimes \rtimes aa, \rtimes \rtimes \ltimes\ltimes, \rtimes \ltimes \ltimes\ltimes, \rtimes aab, aabb, abba, baaa, bbaa, aaa\ltimes, aa \ltimes \ltimes, a \ltimes \ltimes\ltimes\}$

1. bbbaa
2. ab
3. ε
4. abbaba

Exercise 125.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes b, \rtimes\rtimes aa, \rtimes\rtimes ba, \rtimes aa\ltimes, \rtimes aaa, \rtimes baa, aaab, aaba, abaa, baab, baa\ltimes, aba\ltimes, aa\ltimes\ltimes, ba\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. aa
2. ε
3. ccc
4. aacc

Exercise 126.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, ab, ac, ad, ba, ca, de, ea, c\ltimes\}$

1. a
2. ac
3. abac
4. acac

Exercise 127.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abb, acb, bbc, ccb, cce, edc\}$

1. eede
2. e
3. abaed
4. ε

Exercise 128.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, ac, ad, bc, ca, cb, cc, cd, da, db, c\ltimes\}$

1. aacd
2. bcadadbd
3. ccbbb
4. ac

Exercise 129.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes d, \rtimes d\ltimes, \rtimes ac, aab, aac, abd, aca, acb, bcd, caa, cbc, cda, daa, bd\ltimes, d\ltimes \ltimes\}$

1. d
2. acaabd
3. caac
4. cacacbba

Exercise 130.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{acd, bac, bda, cbb, daa, dab, dcc, ddb\}$

1. a
2. ε
3. adcac
4. b

Exercise 131.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes a, \rtimes c\ltimes, \rtimes ac, abb, aca, bbb, bbc, bcb, cab, cbb, bb\ltimes, b \ltimes \ltimes, c \ltimes \ltimes\}$

1. bbb
2. ε
3. ca
4. abcc

Exercise 132.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ba, bb, bd, db, a\ltimes\}$

1. a
2. aa
3. dba
4. ε

Exercise 133.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abab, bacc, bccb, caaa, caba, cabb, cbcc\}$

1. ε
2. cabc
3. accb
4. bbbaa

Exercise 134.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abab, abba, baaa, baab, baba\}$

1. ε
2. a
3. b
4. abbab

Exercise 135.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acdc, addb, bddd, cbbb, dbdc, ddca\}$

1. b
2. ε
3. da
4. a

Exercise 136.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, bab, bba, bbb\}$

1. abbabaaba
2. ε
3. baaabaab
4. bbbb

Exercise 137.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, \rtimes c, bc, bd, cb, cc, cd, db, dc, dd, c\ltimes, d\ltimes\}$

1. dabbbca
2. c
3. ε
4. abdbc

Exercise 138.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aba, abb, bba, bbb\}$

1. abbbaabaa
2. baaba
3. bbab
4. bbb

Exercise 139.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{babd, bcac, bcdb, cbbd, cdab, ddad, dddd\}$

1. adccca
2. ε
3. bdadcdaad
4. b

Exercise 140.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes d, \rtimes ca, \rtimes de, \rtimes d\ltimes, aba, aec, bae, cab, ced, dec, eca, ece, edc, dc\ltimes, ca\ltimes, d\ltimes \ltimes, c \ltimes \ltimes, a \ltimes \ltimes\}$

1. ε
2. eadb
3. eadbaebeaa
4. dedb

Exercise 141.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes d, ac, bd, da, dd, de, eb, ee, c\ltimes\}$

1. ε
2. accebcbbc
3. eecdbbbebe
4. beedbebece

Exercise 142.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, cc, cd, dc, dd, c\ltimes\}$

1. ace
2. deeda
3. c
4. cc

Exercise 143.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes b, \rtimes\rtimes aa, \rtimes\rtimes ba, \rtimes aab, \rtimes baa, aabb, abbb, baab, babb, bbab, bbba, aab\ltimes, abb\ltimes, ab\ltimes\ltimes, bb\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. aabbbbb
2. ε
3. babb
4. b

Exercise 144.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes e, \rtimes\rtimes ea, \rtimes ead, adbb, bbee, beee, dbbe, eadb, eddb, eedd, eeed, eeee, ddb\ltimes, db\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. ebeeacd
2. cbceced
3. eba
4. eadbbeeeddb

Exercise 145.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, ac, ad, ba, cd, da, dd, a\ltimes, b\ltimes\}$

1. ε
2. ababdabc
3. b
4. ddb

Exercise 146.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, abb, baa, bba\}$

1. ε
2. abaababa
3. a
4. b

Exercise 147.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ba, bd, ca, dc\}$

1. cddbdcc
2. ddd
3. ε
4. bba

Exercise 148.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, abb, bbc, cca, ccc\}$

1. cbacab
2. ε
3. aacacab
4. b

Exercise 149.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, ab, ba, bb, a\ltimes, b\ltimes\}$

1. b
2. ababbaaaa
3. aaba
4. bbabba

Exercise 150.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \rtimes a, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes ac, \rtimes \rtimes a\ltimes, \rtimes a \ltimes \ltimes, \rtimes acb, \rtimes \ltimes \ltimes\ltimes, acbd, bdca, cbdc, acb\ltimes, dca\ltimes, cb \ltimes \ltimes, ca \ltimes \ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. ε
2. cccdd
3. b
4. bacaab

Exercise 151.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes b, \rtimes bc, \rtimes bb, aac, aba, aca, baa, bab, bbb, bbc, bcc, cba, ccb, bc\ltimes, ca\ltimes, c\ltimes \ltimes, a \ltimes \ltimes\}$

1. bc
2. bbbc
3. bbc
4. cbabaaaab

Exercise 152.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes b, \rtimes\rtimes bc, \rtimes\rtimes ca, \rtimes bca, \rtimes cab, aaaa, aaab, aabc, abcd, bcaa, bcda, caaa, cdaa, cab\ltimes, da \ltimes \ltimes, aa \ltimes \ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. bcaaabcdaa
2. dcddcca
3. cab
4. cdddddcbdad

Exercise 153.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, aa, ab, ba, bb, a\ltimes\}$

1. abaaaa
2. ba
3. bbbbbbbba
4. bbbbabbabb

Exercise 154.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes c, aa, ac, ad, ca, cd, da, d\ltimes\}$

1. cd
2. ca
3. ε
4. cad

Exercise 155.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaac, aabc, abbc, acaa, bbcb, bcbc, cabc, cbbc\}$

1. abc
2. acaccaaa
3. bbbacc
4. ε

Exercise 156.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ bb, \rtimes\ \rtimes\ a\ltimes, \rtimes bba, \rtimes a\ \ltimes\ \ltimes, aaab, abba, baaa, babb, bbaa, bbab, aab\ltimes, ab\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. a
2. abbbbaa
3. baaba
4. babbbb

Exercise 157.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, ba, bc, cb\}$

1. cbacc
2. b
3. ε
4. cba

Exercise 158.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, ba, bc, ca, cb, a\ltimes, b\ltimes\}$

1. bcabccacbabb
2. c
3. bbccabacaacb
4. bbabaa

Exercise 159.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, aca, bbd, ccd\}$

1. adbd
2. abaa
3. d
4. ε

Exercise 160.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes c, aa, ac, bb, bc, cb, cc, c\ltimes\}$

1. babd
2. c
3. cc
4. ac

Exercise 161.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ba, bd, cd, db, dc, dd\}$

1. ε
2. accaddc
3. bcac
4. ddacdbada

Exercise 162.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes \ltimes, \rtimes \rtimes a, \rtimes \rtimes b, \rtimes \ltimes \ltimes, \rtimes bc, \rtimes aa, abc, bab, bba, bcb, cbb, bc\ltimes, aa\ltimes, a\ltimes \ltimes, c \ltimes \ltimes\}$

1. bc
2. bab
3. ε
4. aa

Exercise 163.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ba, bb, cb, cc\}$

1. ε
2. ccb
3. b
4. a

Exercise 164.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes \ltimes, \rtimes \rtimes a, \rtimes \ltimes \ltimes, \rtimes ac, acd, ace, cdd, cec, dac, dda, ecd, cd\ltimes, d \ltimes \ltimes\}$

1. bbdccceab
2. acecd
3. ε
4. acd

Exercise 165.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ad, ca, cc, db\}$

1. ea
2. ε
3. dbaea
4. abb

Exercise 166.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bbc, bcb, bda, bdb, cbd, ccc, dad, dcc\}$

1. bcac
2. ddaacaa
3. c
4. aca

Exercise 167.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ba, bb, b\ltimes\}$

1. abbbab
2. ab
3. abbbbabbb
4. ε

Exercise 168.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abcb, beba, cbdb, cddc, ceed, ceee, dcba, eadb\}$

1. e
2. b
3. dedc
4. ε

Exercise 169.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acab, babb, bcbb, bcca, ccca\}$

1. a
2. b
3. bcb
4. ε

Exercise 170.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abc, acb, dab, dad, ddb\}$

1. b
2. ccdaccdca
3. ε
4. aadcacba

Exercise 171.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, \rtimes c, ad, bd, cb, da, a\ltimes, b\ltimes\}$

1. dcbbad
2. bccc
3. ε
4. dcab

Exercise 172.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, \rtimes d, aa, ab, bc, bd, cd, da, db, a\ltimes, c\ltimes\}$

1. ca
2. dbdc
3. ε
4. ddadcdbca

Exercise 173.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, aa, ab, ba, a\ltimes\}$

1. aaabbaba
2. a
3. bba
4. baaa

Exercise 174.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, abaa, baab, bbaa\}$

1. bbbbb
2. aba
3. bbaa
4. ε

Exercise 175.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes ab, \rtimes aa, aaa, aab, aba, baa, ab\ltimes, aa\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. abaabaaa
2. ab
3. bbbbaabaab
4. aa

Exercise 176.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{cb, ce, da, ea\}$

1. cbeeccadca
2. e
3. b
4. ε

Exercise 177.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes c, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes e, \rtimes\ \rtimes\ e \ltimes, \rtimes\ \rtimes\ ca, \rtimes\ \rtimes\ ba, \rtimes cac, \rtimes e\ \ltimes\ \ltimes, \rtimes ba \ltimes, acbb, bacb, bbac, bbdc, bdcb, cacb, cbba, cbbd, dcb \ltimes, ba\ \ltimes\ \ltimes, cb\ \ltimes\ \ltimes, a \ltimes \ltimes \ltimes, e \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. ba
2. cacbbdcb
3. e
4. cbbabaacdc

Exercise 178.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes \ltimes, \rtimes b, aa, ab, ba, bb, b \ltimes\}$

1. baaaba
2. bb
3. baaab
4. abbaabaaa

Exercise 179.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{bd, cb, cc, cd, da, dc\}$

1. cbcdad
2. ε
3. b
4. dcbccdabd

Exercise 180.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, baa, bba, bbb\}$

1. ε
2. b
3. aabba
4. aaa

Exercise 181.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, aa, ac, ca, cc, c\ltimes\}$

1. aac
2. acc
3. cbbc
4. ac

Exercise 182.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes d, \rtimes da, acc, acd, bac, cba, ccb, dac, cd\ltimes, d \ltimes \ltimes\}$

1. acedededeb
2. bbd
3. ddbecae
4. cca

Exercise 183.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes \ltimes, \rtimes \rtimes c, \rtimes \ltimes \ltimes, \rtimes ca, abc, bcc, cab, cba, ccb, ba\ltimes, a \ltimes \ltimes\}$

1. ac
2. accca
3. ε
4. acbbbc

Exercise 184.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{acd, bce, bda, cab, cad, ddb, deb\}$

1. b
2. e
3. ε
4. dee

Exercise 185.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes cb, \rtimes \rtimes ac, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes a\ltimes, \rtimes a \ltimes \ltimes, \rtimes ac\ltimes, \rtimes cbb, \rtimes \ltimes \ltimes\ltimes, abca, babc, bbcb, bcab, bcba, cabc, cbab, cbbc, abc\ltimes, ac \ltimes \ltimes, bc \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. ac
2. ε
3. cbbcba
4. ccbbcbabc

Exercise 186.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{bcab, dabd, dacd, dbda, dcdc\}$

1. baadacbc
2. abdbccddcd
3. badddbdc
4. ε

Exercise 187.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes e, \rtimes \rtimes ea, \rtimes eac, accc, ccca, cccc, eacc, cca\ltimes, ca \ltimes \ltimes, a \ltimes \ltimes\ltimes\}$

1. eaccca
2. cdbcce
3. a
4. bdc

Exercise 188.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ba, bb, db, dc, ec, ed\}$

1. dbced
2. daebcaeea
3. abdaccece
4. baebedaaac

Exercise 189.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaab, aabb, babb, bbaa, bbab, bbba\}$

1. aabbaa
2. ε
3. babaab
4. bbbb

Exercise 190.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes \ltimes, \rtimes \rtimes a, \rtimes a \ltimes, \rtimes \ltimes \ltimes, \rtimes ac, aab, acb, baa, bba, cbb, ab\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. bba
2. c
3. a
4. ε

Exercise 191.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes \ltimes, aa, ab, ba, bb, b\ltimes\}$

1. ε
2. bba
3. aaabaaba
4. a

Exercise 192.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abaa, abbc, bbca, bcaa, cbac, cbbc, cccc\}$

1. b
2. ababcbca
3. cbbcac
4. ε

Exercise 193.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes ba, aaa, aab, aba, abb, baa, bab, bba, ab\ltimes, b \ltimes \ltimes\}$

1. baaba
2. bab
3. bbaaab
4. baab

Exercise 194.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes d, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes de, ace, ada, ced, dac, dda, dea, ead, edd, da\ltimes, a \ltimes \ltimes\}$

1. ebaeceda
2. daaaaaccac
3. ε
4. deada

Exercise 195.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aadc, adde, bacc, bdea, cded, daea, ddcc\}$

1. bac
2. bdddb
3. e
4. abcc

Exercise 196.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes d, \rtimes da, aba, abb, bbe, bed, dab, eda, ba\ltimes, a \ltimes \ltimes\}$

1. cdccada
2. d
3. ab
4. daba

Exercise 197.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes ab, \rtimes b\ltimes, abb, bbb, bb\ltimes, b \ltimes \ltimes\}$

1. aaa
2. ε
3. aab
4. babaab

Exercise 198.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes e, \rtimes\rtimes eb, \rtimes\rtimes ed, \rtimes ebd, \rtimes eda, aace, aced, cedb, daac, dbda, edaa, edbd, ebd\ltimes, bda\ltimes, bd\ltimes \ltimes, da \ltimes \ltimes, a \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes\}$

1. ceaee
2. aacccca
3. aedbb
4. beeede

Exercise 199.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, ad, bc, da\}$

1. ε
2. b
3. cddaa
4. a

Exercise 200.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes d\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes cc, \rtimes \rtimes cd, \rtimes cda, \rtimes d \ltimes \ltimes, \rtimes cc\ltimes, \rtimes\ltimes\ltimes\ltimes, abbe, cdab, dabb, bbe\ltimes, be\ltimes\ltimes, cc\ltimes\ltimes, c\ltimes\ltimes\ltimes, d\ltimes\ltimes\ltimes, e\ltimes\ltimes\ltimes\}$

1. d
2. ε
3. b
4. da

Exercise 201.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, bd, be, db, ea, ec, ed, ee\}$

1. e
2. ecbaece
3. b
4. ε

Exercise 202.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aaba, abba, bbba\}$

1. ε
2. abababa
3. b
4. baaabb

Exercise 203.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aabd, acbd, baad, bbab, cbba, cddb, cddc, ddbb\}$

1. abbdacb
2. cd
3. bacdbaa
4. ε

Exercise 204.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes bc, aac, baa, bbc, bcb, bcd, cba, cbb, cdc, dcb, ac\ltimes, c \ltimes \ltimes\}$

1. abdba
2. abdccca
3. cd
4. aa

Exercise 205.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, ba, bb\}$

1. cbcabbba
2. baccb
3. bbc
4. caccbbc

Exercise 206.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes ab, \rtimes bb, aab, aba, baa, bb\ltimes, ba\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. aba
2. bb
3. c
4. ε

Exercise 207.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaed, accb, baec, dcdd, deeb, eacc, ecac, eeac\}$

1. c
2. e
3. b
4. ε

Exercise 208.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, acba, bbba, cbaa\}$

1. aa
2. aabaac
3. cabba
4. bb

Exercise 209.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abdb, baaa, bbbd, bcbb, cdbc, cddc, dbdb, dcad\}$

1. ε
2. a
3. b
4. dbbb

Exercise 210.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, aa, ab, ac, ba, bc, ca, cb, cc, a\ltimes\}$

1. aaa
2. ab
3. a
4. aa

Exercise 211.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, \rtimes c, ac, ca, cc, a\ltimes, b\ltimes\}$

1. accb
2. bcbc
3. ε
4. caaac

Exercise 212.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes ab, \rtimes\rtimes a\ltimes, \rtimes a\ltimes\ltimes, \rtimes abc, abca, abcb, bcab, bcbb, cabc, cbb\ltimes, bb\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. cc
2. cabcba
3. a
4. abcbb

Exercise 213.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ba, bd, ca, cd\}$

1. ε
2. b
3. a
4. daacbacccc

Exercise 214.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ad, bd, dd\}$

1. ε
2. ababbbbccc
3. a
4. b

Exercise 215.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes e, aa, ab, ad, ae, be, de, ea, e\ltimes\}$

1. ε
2. eabcccb
3. baddcabece
4. adbbcaad

Exercise 216.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, abb, bcb, cbb, cbc\}$

1. acabca
2. cacacccaac
3. accbaacb
4. cccbb

Exercise 217.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes bb, \rtimes ad, acb, bac, bba, bbd, bde, cbb, ad\ltimes, de\ltimes, e\ltimes\ltimes, d\ltimes\ltimes\}$

1. caaeac
2. bbde
3. ad
4. abb

Exercise 218.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ae, ba, ce, da\}$

1. e
2. acbaebe
3. ε
4. b

Exercise 219.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes b\ltimes, \rtimes bb, \rtimes aa, aab, aba, abb, baa, bab, bba, bbb, aa\ltimes, ba\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. b
2. aa
3. bba
4. aaa

Exercise 220.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, aba, bba, bbb\}$

1. a
2. ε
3. b
4. abbb

Exercise 221.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{adb, cac, dbd, ece, edb\}$

1. aacaaeda
2. eccaed
3. cddce
4. ε

Exercise 222.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{acd, bde, ccb, dea\}$

1. abbbcbecbabb
2. bedbcbadae
3. ε
4. abcaeeeb

Exercise 223.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aabb, abaa, abbb, babb, bbab, bbbb\}$

1. aa
2. ε
3. a
4. b

Exercise 224.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes d, aa, bb, be, cb, cc, ce, dc, ea, ec, a\ltimes, d\ltimes\}$

1. dcea
2. d
3. dccea
4. adcad

Exercise 225.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aaba, abbb, baaa, babb, bbaa, bbbb\}$

1. ababa
2. bbaaab
3. ε
4. bbaaa

Exercise 226.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes \ltimes, \rtimes \rtimes a, \rtimes \rtimes b, \rtimes \rtimes d, \rtimes \ltimes \ltimes, \rtimes d \ltimes, \rtimes aa, \rtimes bd, bbc, bcc, bdb, cbd, ccb, dbb, aa \ltimes, bd \ltimes, d \ltimes \ltimes, a \ltimes \ltimes\}$

1. ε
2. ab
3. badbad
4. bd

Exercise 227.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes \ltimes, \rtimes d, ab, ac, ba, bb, be, ca, da, ea, a \ltimes\}$

1. beeee
2. aca
3. a
4. deebaeab

Exercise 228.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, aa, ac, bc, ca, cb, c \ltimes\}$

1. cbcc
2. a
3. bc
4. ccacbca

Exercise 229.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abab, abba, baaa, baab, babb\}$

1. bbbba
2. babbab
3. b
4. aababb

Exercise 230.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes ba, aab, aba, abb, baa, bab, bb\ltimes, b \ltimes \ltimes\}$

1. ε
2. aa
3. ba
4. aab

Exercise 231.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aac, aca, acb, ccc\}$

1. c
2. ε
3. b
4. ccb

Exercise 232.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aabb, abaa, baba, babb, bbab, bbbb\}$

1. aabbba
2. ε
3. baa
4. b

Exercise 233.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, ba, bb, bc, ca, cb\}$

1. a
2. cabb
3. ε
4. b

Exercise 234.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{baa, bab, bbd, bdc, cda, dbe, ddc, edc\}$

1. ba
2. a
3. adeaecadcaa
4. ceead

Exercise 235.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{add, cab, cbc, dad, dbb, dbd, dcd\}$

1. bdacbc
2. b
3. ε
4. a

Exercise 236.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes a\ltimes, \rtimes\rtimes ab, \rtimes aba, \rtimes a\ltimes\ltimes, aabb, abaa, baab, abb\ltimes, bb\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. a
2. abbc
3. caab
4. b

Exercise 237.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{da, de, eb, ee\}$

1. ε
2. e
3. dcacdd
4. cbdedebc

Exercise 238.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ad, bb, cc, cd, da, dd\}$

1. ε
2. bcccd
3. b
4. dd

Exercise 239.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, ba, b\ltimes\}$

1. bbab
2. aabb
3. abbaa
4. ε

Exercise 240.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ae, ba, ca\}$

1. b
2. ad
3. ε
4. ecac

Exercise 241.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, bc, ca, cc\}$

1. ε
2. b
3. acbbcc
4. a

Exercise 242.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes a, \rtimes cb, \rtimes a\ltimes, acb, bac, bca, cac, cba, cbc, cb\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. ccacaa
2. baabbccc
3. bccac
4. cb

Exercise 243.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, ad, ca, cc, da, db, dd\}$

1. ε
2. bdbdbadcb
3. dbca
4. db

Exercise 244.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes bb, aab, abd, baa, bba, bdd, daa, dda, ab\ltimes, b \ltimes \ltimes\}$

1. deccae
2. ε
3. bbaab
4. bbdaedbe

Exercise 245.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes a \ltimes, \rtimes bd, aba, bab, bdb, dba, ba \ltimes, a \ltimes \ltimes\}$

1. a
2. bdba
3. d
4. dabca

Exercise 246.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, ba, bb, bc, ca, cb\}$

1. bbcaa
2. ε
3. bcbb
4. a

Exercise 247.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, bd, cb, cc, dd\}$

1. da
2. d
3. ccda
4. a

Exercise 248.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, bd, ca, cd, db, dd\}$

1. dbaccabb
2. ca
3. cddbca
4. aaa

Exercise 249.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aacb, abac, accb, baaa, bbac, bbbb, cacc, cbab\}$

1. b
2. abcc
3. ε
4. a

Exercise 250.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes a\ltimes, \rtimes\ltimes\ltimes, \rtimes ba, \rtimes bb, aab, aba, abb, baa, bab, bba, ab\ltimes, bb\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. aab
2. ε
3. aaabbbbabbb
4. bbabbaa

Exercise 251.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, ae, bc, ca, cd, de, eb, ec, ee, c\ltimes\}$

1. baccac
2. aec
3. ce
4. aeec

Exercise 252.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abc, aca, bab, bcb, caa, cca\}$

1. b
2. caabbc
3. ε
4. cba

Exercise 253.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ce, db, dc, ec\}$

1. caacbdbedab
2. ε
3. cbdacadd
4. a

Exercise 254.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ba, ca, cb, cd, db, dc, dd\}$

1. dcbc
2. ε
3. bbcbaaab
4. baabbb

Exercise 255.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes c, ab, bc, ca, cb, cc, a\ltimes\}$

1. cabcabba
2. ε
3. ca
4. ccacca

Exercise 256.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, \rtimes d, aa, ab, ad, ba, bd, da, db, b\ltimes, d\ltimes\}$

1. b
2. ε
3. d
4. dcbb

Exercise 257.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, bb, bc, bd, cb, cc, dc, b\ltimes\}$

1. ε
2. b
3. bdbabac
4. dabd

Exercise 258.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aadb, bacc, bcac, bdbd, dcca\}$

1. ε
2. dccccc
3. d
4. bbabaaad

Exercise 259.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes e, \rtimes \rtimes c, \rtimes \rtimes \ltimes, \rtimes c\ltimes, \rtimes \ltimes \ltimes, \rtimes ec, ade, bad, cba, ecb, de\ltimes, e \ltimes \ltimes, c \ltimes \ltimes\}$

1. e
2. bec
3. aaab
4. dbcdcc

Exercise 260.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, ab, ba, b\ltimes\}$

1. ε
2. abbbb
3. aa
4. bb

Exercise 261.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, bc, cb, cc\}$

1. ε
2. b
3. ccbccccc
4. bcbcbacaaa

Exercise 262.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes ac, \rtimes \rtimes ca, \rtimes \rtimes b\ltimes, \rtimes \rtimes ba, \rtimes bac, \rtimes acc, \rtimes ca\ltimes, \rtimes b \ltimes \ltimes, accc, ccca, cccc, bac\ltimes, cca\ltimes, ac \ltimes \ltimes, ca \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. cac
2. b
3. cbc
4. ca

Exercise 263.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, ba, bb, cb, cc\}$

1. bbb
2. a
3. ε
4. b

Exercise 264.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{baaa, baab, baba, babb, bbaa, bbba, bbbb\}$

1. aa
2. ε
3. a
4. ab

Exercise 265.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abcc, adad, bdaa, dacb, dbbc\}$

1. dcddcb
2. bdb
3. ε
4. c

Exercise 266.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abab, abba, baaa, baba, babb, bbaa\}$

1. baabab
2. bb
3. ε
4. a

Exercise 267.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, ab, ba, bb, b\ltimes\}$

1. ε
2. bbabba
3. bba
4. aab

Exercise 268.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, caa, dcc, dda\}$

1. ε
2. b
3. cdbca
4. ab

Exercise 269.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes\ltimes, \rtimes\rtimes b, \rtimes c\ltimes, \rtimes\ltimes\ltimes, \rtimes bc, \rtimes bd, aab, abc, acc, bca, bda, caa, cca, dac, ca\ltimes, bc\ltimes, c\ltimes\ltimes, a\ltimes\ltimes\}$

1. dde
2. aebbdbbcdb
3. ε
4. cebbaebd

Exercise 270.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes\ltimes\ltimes, \rtimes\rtimes a\ltimes, \rtimes\rtimes cd, \rtimes a\ltimes\ltimes, \rtimes cdb, \rtimes\ltimes\ltimes\ltimes, aacd, acda, baac, cdaa, cdba, daac, dbaa, acd\ltimes, cd\ltimes\ltimes, d\ltimes\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. ε
2. badddbbbdba
3. dcba
4. cddaaabbc

Exercise 271.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aba, abb, bba\}$

1. ε
2. b
3. aabaa
4. a

Exercise 272.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, acb, bba, cca\}$

1. a
2. ε
3. aaaa
4. b

Exercise 273.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, aa, ab, ba, a\ltimes\}$

1. aa
2. b
3. bbaaaaab
4. a

Exercise 274.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ba, bb, bc, bd, da, db, dc\}$

1. b
2. ε
3. bcaa
4. abdbcca

Exercise 275.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes b, aa, ac, bc, ca, cb, cc, a\ltimes, b\ltimes\}$

1. ac
2. babcabb
3. cacabbc
4. bccaba

Exercise 276.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, abaa, abba, baaa, babb, bbaa, bbba\}$

1. b
2. ε
3. aaaaa
4. a

Exercise 277.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{baac, bbba, bcab, bcbc, bccc, cccc\}$

1. abca
2. ε
3. aababbbb
4. bcbbacba

Exercise 278.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bba, bdb, dde, edd\}$

1. e
2. cb
3. cbaeebccac
4. ε

Exercise 279.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes b, \rtimes\rtimes bb, \rtimes\rtimes ba, \rtimes bab, \rtimes bb\ltimes, \rtimes baa, abbb, babb, bbab, bbba, bbbb, baa\ltimes, bab\ltimes, ab\ltimes \ltimes, aa \ltimes \ltimes, bb \ltimes \ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. bab
2. baa
3. bb
4. a

Exercise 280.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes e, \rtimes \rtimes a, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes ae, \rtimes ea, ade, deb, ead, eba, ae\ltimes, ba\ltimes, e \ltimes \ltimes, a \ltimes \ltimes\}$

1. ea
2. c
3. ε
4. abdde

Exercise 281.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes bb, \rtimes ad, ada, aec, cac, cda, dae, eca, ecd, bb\ltimes, ac\ltimes, b\ltimes \ltimes, c \ltimes \ltimes\}$

1. aaebcba
2. bb
3. ε
4. adaecac

Exercise 282.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes e, \rtimes\rtimes ee, \rtimes eeb, \rtimes ee\ltimes, abba, bcdc, cdcd, cdda, dabb, dcdd, ddab, ebcd, eebc, bba\ltimes, ee\ltimes \ltimes, ba \ltimes \ltimes, a \ltimes \ltimes\ltimes, e \ltimes \ltimes\ltimes\}$

1. ee
2. bccddedcbcee
3. bedbcb
4. eaddab

Exercise 283.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes b, aa, ab, ba, bb, b\ltimes\}$

1. bab
2. ε
3. abbb
4. baaba

Exercise 284.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ca, cb, cc, cd, da, dd\}$

1. e
2. aaedddc
3. ε
4. c

Exercise 285.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, ac, bc, ca, cc, c\ltimes\}$

1. aab
2. bc
3. ba
4. ε

Exercise 286.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes c, \rtimes\ \rtimes\ \rtimes\ltimes, \rtimes\ \rtimes\ \rtimes d, \rtimes\ \rtimes\ \rtimes e, \rtimes\ \rtimes ea, \rtimes\ \rtimes\ d\ltimes, \rtimes\ \rtimes\ \ltimes\ltimes, \rtimes\ \rtimes\ aa, \rtimes\ \rtimes\ cc, \rtimes cca, \rtimes aa\ltimes, \rtimes d\ \ltimes\ \ltimes, \rtimes\ \ltimes\ltimes\ltimes, \rtimes eac, acac, acba, baca, cbac, eacb, cca\ltimes, cac\ltimes, ac\ \ltimes\ \ltimes, aa\ \ltimes\ \ltimes, ca\ \ltimes\ltimes, c\ltimes\ltimes\ltimes, d\ltimes\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. aabd
2. bbdabed
3. d
4. ε

Exercise 287.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes b, aa, ab, ba, bb, a\ltimes\}$

1. ε
2. abaaaaabab
3. baaaaaabb
4. a

Exercise 288.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaba, abaa, bbaa, bbba\}$

1. bbbbaa
2. ε
3. baababb
4. baa

Exercise 289.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes ab, \rtimes\rtimes c\ltimes, \rtimes\rtimes ae, \rtimes\rtimes\ltimes\ltimes, \rtimes c\ltimes\ltimes, \rtimes ab\ltimes, \rtimes\ltimes\ltimes\ltimes, \rtimes aee, aeed, dded, edde, eedd, ded\ltimes, ab\ltimes\ltimes, ed\ltimes\ltimes, c\ltimes\ltimes\ltimes, d\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. babedee
2. cbcadbb
3. ε
4. cddbaa

Exercise 290.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, ae, ba, cd, db, dd, ec, d\ltimes\}$

1. dabcbeca
2. eaaae
3. cbccdd
4. cd

Exercise 291.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes\ltimes, \rtimes a\ltimes, \rtimes\ltimes\ltimes, \rtimes ab, aac, abb, acb, baa, bba, bca, cbc, ab\ltimes, ca\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. a
2. ε
3. abca
4. abccbaac

Exercise 292.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, ab, ac, bc, bd, ca, cd, da, db, dd, a\ltimes\}$

1. bca
2. dcabdcbadd
3. bcdabc
4. baabbabaacc

Exercise 293.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, aa, ab, ba, bb, a\ltimes\}$

1. baa
2. ba
3. bba
4. ababbb

Exercise 294.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes c, \rtimes\rtimes ca, \rtimes\rtimes ab, \rtimes abb, \rtimes ca\ltimes, abba, babc, bbab, abc\ltimes, bc\ltimes\ltimes, ca\ltimes\ltimes, a\ltimes\ltimes\ltimes, c\ltimes\ltimes\ltimes\}$

1. aaabb
2. ccc
3. ca
4. ac

Exercise 295.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes b, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes bb, \rtimes\rtimes ac, \rtimes\rtimes\ltimes\ltimes, \rtimes\rtimes cc, \rtimes bb\ltimes, \rtimes acb, \rtimes ccc, \rtimes\ltimes\ltimes\ltimes, abba, bbac, bbcc, bcca, cabb, cbbc, ccab, ccbb, cccb, acb\ltimes, bac\ltimes, ac\ltimes\ltimes, cb\ltimes\ltimes, bb\ltimes\ltimes, c\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. b
2. ε
3. bbbbcbbcaca
4. bb

Exercise 296.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes\ltimes, \rtimes\rtimes c, \rtimes\rtimes b, \rtimes\ltimes\ltimes, \rtimes ba, \rtimes cc, aad, adc, caa, cbd, cca, dcb, ba\ltimes, bd\ltimes, d\ltimes\ltimes, a\ltimes\ltimes\}$

1. bccdbbab
2. bbac

3. c
4. addb

Exercise 297.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes b, \rtimes\rtimes ab, \rtimes\rtimes bb, \rtimes bba, \rtimes ab\ltimes, abab, baba, bbab, bab\ltimes, ab\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. aba
2. ε
3. ab
4. aa

Exercise 298.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes c, \rtimes\rtimes a\ltimes, \rtimes\rtimes cd, \rtimes a\ltimes\ltimes, \rtimes cdb, abda, babd, bbab, bdad, cdbb, dadb, dbba, adb\ltimes, db\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. dcbcdcbbc
2. a
3. ddccacac
4. dbdda

Exercise 299.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, bb, bc, cb, cd, da, db, dd\}$

1. ε
2. aabc
3. bbbb
4. dbb

Exercise 300.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ba, bb, bc, ca, cb\}$

1. a

2. caabaaaabcba
3. ε
4. b

Exercise 301.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aba, ada, cab, cda, dca, ddb\}$

1. d
2. ε
3. ddd
4. cac

Exercise 302.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes b, aa, ab, ba, bb, a\ltimes, b\ltimes\}$

1. abbbabbb
2. b
3. abbbbb
4. aaaaaabaaab

Exercise 303.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes d, \rtimes\ \rtimes\ \rtimes e, \rtimes\ \rtimes\ ae, \rtimes\ \rtimes\ ec, \rtimes\ \rtimes\ d\ltimes, \rtimes\ \rtimes\ ba, \rtimes bac, \rtimes ecb, \rtimes d\ltimes\ltimes, \rtimes ae\ltimes, acae, baca, caeb, ecb\ltimes, aeb\ltimes, ae\ltimes\ltimes, cb\ltimes\ltimes, eb\ltimes\ltimes, d\ltimes\ltimes\ltimes, e\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. ae
2. ε
3. b
4. d

Exercise 304.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\ \rtimes b, \rtimes\ \rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes ba, aca, acb, bac, bdd, cac, cbd, dd\ltimes, d\ltimes\ltimes\}$

1. bbc

2. bcdccb
3. cec
4. addded

Exercise 305.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes ba, \rtimes aa, aab, aba, aca, bac, caa, ab\ltimes, ba\ltimes, b\ltimes \ltimes, a\ltimes\ltimes\}$

1. ba
2. ε
3. bb
4. ccbccacb

Exercise 306.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abba, baab, bbab, bbbb\}$

1. a
2. aabb
3. b
4. ε

Exercise 307.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes d, \rtimes\ \rtimes\ \rtimes e, \rtimes\ \rtimes\ db, \rtimes\ \rtimes\ ea, \rtimes\ \rtimes\ d\ltimes, \rtimes ead, \rtimes d\ \ltimes \ltimes, \rtimes dbd, abde, bdda, bded, dabd, dbdd, ddab, dedc, edc\ltimes, ead\ltimes, dc\ \ltimes\ \ltimes, ad\ \ltimes \ltimes, c\ltimes\ltimes\ltimes, d\ltimes\ltimes\ltimes\}$

1. cd
2. eeecc
3. aebceeaae
4. ε

Exercise 308.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes b, \rtimes bc, aac, acc, bcc, caa, cca, ca\ltimes, a\ltimes\ltimes\}$

1. acabcacb
2. a
3. bcca
4. bac

Exercise 309.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes \rtimes d, \rtimes db, \rtimes bd, bbd, bdd, dbb, ddb, db\ltimes, bd\ltimes, b \ltimes \ltimes, d \ltimes \ltimes\}$

1. aaadda
2. ε
3. db
4. bd

Exercise 310.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ac, ba, bb, cc, cd, db, a\ltimes, b\ltimes\}$

1. bdccc
2. bb
3. bbdadbccc
4. abaabbbda

Exercise 311.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ae, cc, da, dd, ed\}$

1. cbdeda
2. bddeae
3. dddeb
4. ecceecb

Exercise 312.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes c, ab, ac, bd, ca, cc, da, a\ltimes\}$

1. cca
2. ccaccbc

3. ca
4. ε

Exercise 313.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes ba, \rtimes \rtimes bb, \rtimes \rtimes a\ltimes, \rtimes a \ltimes \ltimes, \rtimes ba\ltimes, \rtimes bbb, aabb, abaa, abbb, baab, baba, bbab, bbba, bba\ltimes, ba \ltimes \ltimes, a \ltimes \ltimes\ltimes\}$

1. a
2. ε
3. babaabbaa
4. aaaabab

Exercise 314.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ac, ad, bb, cc, da, db, dc\}$

1. b
2. dbdbd
3. ε
4. a

Exercise 315.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abba, abca, bacb, cacc\}$

1. abbb
2. accbbbbbac
3. aac
4. accabbacc

Exercise 316.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ba, bb, ca\}$

1. ac
2. a

3. b
4. ε

Exercise 317.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abdb, acca, adea, ddbc, deac, eacb, ebdc\}$

1. ε
2. b
3. e
4. abeacb

Exercise 318.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes dc, \rtimes \rtimes c \ltimes, \rtimes \rtimes ca, \rtimes \rtimes \ltimes \ltimes, \rtimes ca \ltimes, \rtimes c \ltimes \ltimes, \rtimes dcc, \rtimes \ltimes \ltimes \ltimes, aaaa, caaa, ccdc, cdca, dcaa, dccd, aaa \ltimes, aa \ltimes \ltimes, ca \ltimes \ltimes, c \ltimes \ltimes \ltimes, a \ltimes \ltimes \ltimes\}$

1. ddcb
2. ccddacbbcb
3. aacbacd
4. abbbbdbc

Exercise 319.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes d, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes dd, aca, adb, bdd, caa, dac, dad, dbd, dda, aa \ltimes, a \ltimes \ltimes\}$

1. acba
2. ε
3. caabdcaabd
4. addcbbbbd

Exercise 320.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, bab, bbb\}$

1. aaba

2. a
3. ε
4. b

Exercise 321.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{baad, bdae, edaa, edee\}$

1. e
2. cb
3. ε
4. b

Exercise 322.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abb, bbb, cab, cac, ccb\}$

1. b
2. ε
3. a
4. cb

Exercise 323.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaac, bbaa, bbca, bbcc, caab, cdab, dbab\}$

1. b
2. a
3. dcbcbcabb
4. ε

Exercise 324.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes b, \rtimes\rtimes cb, \rtimes\rtimes bb, \rtimes bbb, \rtimes cb\ltimes, aaea, aeae, baae, bbaa, bbba, eaee, aee\ltimes, ee\ltimes \ltimes, cb \ltimes \ltimes, e \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. abeada
2. aaabdaae

3. dcdbea
4. ecda

Exercise 325.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, bb, bc, cb\}$

1. bba
2. cbb
3. ε
4. c

Exercise 326.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes aa, \rtimes \rtimes bb, \rtimes aa \ltimes, \rtimes \ltimes \ltimes \ltimes, \rtimes bbb, aabb, abbb, baab, bbaa, bbba, baa \ltimes, aa \ltimes \ltimes, a \ltimes \ltimes \ltimes\}$

1. abab
2. abaaabbb
3. bbbbb
4. abbaabb

Exercise 327.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes a, \rtimes c \ltimes, \rtimes ac, aca, adc, cad, dcb, cb \ltimes, b \ltimes \ltimes, c \ltimes \ltimes\}$

1. ε
2. ccadaa
3. c
4. cdbcb

Exercise 328.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aacb, aada, accd, addb, dacd, dbcc\}$

1. ε
2. b
3. ddcaaccccbd

4. a

Exercise 329.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ba, bb, b\ltimes\}$

1. ab
2. aab
3. bbaab
4. ε

Exercise 330.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes da, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes aa, \rtimes aaa, \rtimes dac, \rtimes \ltimes \ltimes\ltimes, aaad, aada, acab, adac, daca, cab\ltimes, dac\ltimes, ac\ltimes\ltimes, ab\ltimes\ltimes, c\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. dacab
2. ε
3. dac
4. cacd

Exercise 331.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, aabb, abaa, abba, baba, bbaa\}$

1. b
2. bababaa
3. a
4. ε

Exercise 332.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, ba, bb, a\ltimes\}$

1. babbaabaaa
2. ba
3. aabaaba
4. ε

Exercise 333.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, ac, bb, bc, ca, c\ltimes, b\ltimes\}$

1. bb
2. b
3. ccbac
4. bbcbc

Exercise 334.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes d, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes dd, acb, adc, cac, cad, cba, cca, dca, dcc, ddc, ba\ltimes, a\ltimes\ltimes\}$

1. ba
2. adcccbddbd
3. ddcacba
4. ε

Exercise 335.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, ab, ba, a\ltimes\}$

1. ababa
2. babab
3. a
4. ε

Exercise 336.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, acd, bab, bbb\}$

1. ε
2. ccdd
3. b
4. db

Exercise 337.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, \rtimes d, aa, ac, ae, ba, be, cb, ea, ec, ee, c\ltimes, d\ltimes\}$

1. cacdeebde
2. ε
3. d
4. b

Exercise 338.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes b, aa, ab, ba, bb, a\ltimes\}$

1. ababaa
2. ε
3. abaaba
4. b

Exercise 339.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes d, ab, bb, bc, ce, da, e\ltimes\}$

1. dabce
2. ae
3. ε
4. ce

Exercise 340.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, abaa, abab, abbb, baaa, babb\}$

1. bba
2. aab
3. bb
4. ε

Exercise 341.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aac, bab, bbb, caa, cbb, ccb\}$

1. b
2. ε
3. a
4. acbcacc

Exercise 342.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ac, ba, bb, bc, ca, cb, cc\}$

1. aaccaaac
2. aa
3. b
4. ccbbbcccaac

Exercise 343.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aac, abc, baa, cac\}$

1. b
2. ε
3. bbbccc
4. aabbab

Exercise 344.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abba, abca, acaa, bbaa, bbab, cabc, cccb\}$

1. bba
2. a
3. ε
4. b

Exercise 345.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abcd, aebc, bade, baec, beeb, cadd, cdcb, decc\}$

1. daddcba
2. b
3. ad
4. ε

Exercise 346.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes bb, \rtimes aa, aaa, aba, baa, bab, bba, bbb, aa\ltimes, a\ltimes\ltimes\}$

1. ε
2. bababbb
3. bbabab
4. bbb

Exercise 347.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{adb, bcd, bda, bdb, cbb, cdb, dca, dcc\}$

1. ε
2. ba
3. b
4. dbdd

Exercise 348.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aac, abb, bca, bcb, bcc, caa, cca, ccb\}$

1. aacc
2. bcbabcaabcca
3. ccc
4. acaccbbacaa

Exercise 349.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, abbc, baab, cabb, caca, ccaa\}$

1. b
2. ε
3. aabcacbbbccb
4. acccaaabcb

Exercise 350.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, \rtimes e, bd, de, eb, ed, ee, e\ltimes, b\ltimes\}$

1. bcbbba
2. ε
3. e
4. b

Exercise 351.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, ac, ca, cc, a\ltimes\}$

1. aaacc
2. bababcb
3. a
4. ε

Exercise 352.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes d, \rtimes \rtimes db, \rtimes \rtimes ab, \rtimes \rtimes b\ltimes, \rtimes dbb, \rtimes ab\ltimes, \rtimes b \ltimes \ltimes, aabd, abda, babd, bbab, bdaa, daab, dbba, abd\ltimes, ab\ltimes\ltimes, bd\ltimes\ltimes, d\ltimes\ltimes\ltimes, b\ltimes \ltimes\ltimes\}$

1. b
2. ddaa
3. ab
4. ebaecacbbb

Exercise 353.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aadd, bddd, dabb, dbbb, dcbb, ddda\}$

1. dbbdabdb
2. aadbada
3. db
4. cbdbcd

Exercise 354.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ba, bc, db, dc, eb, ed, ee\}$

1. b
2. bc
3. ε
4. e

Exercise 355.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ac, ba, bb, bc, ca, cb, cc, a\ltimes, b\ltimes\}$

1. abcaab
2. accaaaacaca
3. aaa
4. bcb

Exercise 356.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes\ltimes, \rtimes\rtimes d, \rtimes\rtimes b, \rtimes\ltimes\ltimes, \rtimes be, \rtimes dc, aac, acc, caa, cba, cca, ccb, ccc, dcc, be\ltimes, ba\ltimes, e\ltimes \ltimes, a \ltimes \ltimes\}$

1. be
2. eddbb
3. dccba
4. ε

Exercise 357.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, aa, ab, ad, bd, da, dc, dd, c\ltimes\}$

1. adc
2. aadc
3. abdc
4. ε

Exercise 358.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes bd, \rtimes \rtimes ce, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes aa, \rtimes \rtimes a\ltimes, \rtimes ceb, \rtimes a \ltimes \ltimes, \rtimes aa\ltimes, \rtimes bdd, \rtimes \ltimes \ltimes\ltimes, aeec, bcea, cbdd, ceae, cebc, eaee, ebce, ecbd, eecb, bdd\ltimes, aa \ltimes \ltimes, dd \ltimes \ltimes, d \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. ebcdcddcba
2. ε
3. ba
4. aeeddeabddcb

Exercise 359.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aba, abb, bba, bbc, cbb, cca, ccc\}$

1. bbbcbbaab
2. b
3. a
4. ε

Exercise 360.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes e, \rtimes\rtimes b, \rtimes b\ltimes, \rtimes ea, aad, adc, ade, caa, dca, deb, ead, ebe, be\ltimes, e\ltimes\ltimes, b\ltimes\ltimes\}$

1. ad
2. adba
3. caede

4. b

Exercise 361.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, acc, baa, bcc, cbb, cbc, cca\}$

1. b
2. abababab
3. ε
4. a

Exercise 362.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, aa, ab, ac, ba, bd, cb, da, dd, c\ltimes\}$

1. cbac
2. cbcbdccccb
3. ε
4. c

Exercise 363.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aada, abac, abdb, bbac, cbbb, daca\}$

1. cbdaaadda
2. a
3. ε
4. b

Exercise 364.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{acb, bac, bbb, bbc, cbb\}$

1. ε
2. c
3. accabbc
4. cacca

Exercise 365.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acaa, addd, beec, cacc, cccd, dccd\}$

1. ddedea
2. ε
3. e
4. bacdbcaa

Exercise 366.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes e, \rtimes d, ab, ba, be, cc, ce, dc, eb, ec, e\ltimes, c\ltimes\}$

1. e
2. ababadbb
3. aeceeab
4. ec

Exercise 367.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes d, \rtimes \rtimes bc, \rtimes \rtimes dd, \rtimes \rtimes de, \rtimes \rtimes d\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes ddd, \rtimes d \ltimes \ltimes, \rtimes deb, \rtimes bc\ltimes, \rtimes \ltimes \ltimes\ltimes, abba, babb, bade, bbad, bceb, ceba, debc, ebab, ebce, ddd\ltimes, ade\ltimes, de \ltimes \ltimes, bc \ltimes \ltimes, dd \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes, e \ltimes \ltimes\ltimes\}$

1. eaaadeceddc
2. ε
3. baaede
4. abc

Exercise 368.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abab, aeae, bded, dbee, ddec\}$

1. dbdeea
2. d
3. edaaa
4. cb

Exercise 369.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abba, abbc, acab, ccbc\}$

1. aaccbac
2. cacaaabc
3. aaabb
4. c

Exercise 370.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, ab, ac, ad, ba, ce, ea, d\ltimes\}$

1. ebcc
2. eb
3. ε
4. eeeb

Exercise 371.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes\ltimes, \rtimes\ \rtimes\ bb, \rtimes\ \rtimes\ \ltimes\ltimes, \rtimes\ \rtimes\ aa, \rtimes\ \rtimes\ a\ltimes, \rtimes\ \rtimes\ ba, \rtimes aaa, \rtimes a\ \ltimes\ltimes, \rtimes bbb, \rtimes ba\ltimes, \rtimes\ \ltimes\ltimes\ltimes, aaab, aaba, aabb, abaa, abba, baaa, bba\ltimes, bbb\ltimes, ba\ \ltimes\ltimes, bb\ \ltimes\ltimes, a\ \ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. ε
2. aaba
3. bbaba
4. bbbabb

Exercise 372.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, ab, ba, bb, b\ltimes\}$

1. aaababb
2. bb
3. baabbaa
4. aabbba

Exercise 373.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes b \ltimes, \rtimes ba, aab, aba, abb, baa, bab, bba, bb\ltimes, b \ltimes \ltimes\}$

1. bababa
2. ababa
3. baaaba
4. abbbbbbbb

Exercise 374.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes b, \rtimes ca, \rtimes be, aba, abb, bab, bbe, bea, beb, eab, ebc, bc\ltimes, ca\ltimes, a \ltimes \ltimes, c \ltimes \ltimes\}$

1. bca
2. badb
3. bebc
4. ca

Exercise 375.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes bb, \rtimes \rtimes da, \rtimes \rtimes \ltimes \ltimes, \rtimes da \ltimes, \rtimes dab, \rtimes bbe, \rtimes \ltimes \ltimes \ltimes, acca, bbea, beac, cacd, ccac, eacc, acd\ltimes, dab\ltimes, cd \ltimes \ltimes, ab \ltimes \ltimes, da \ltimes \ltimes, d \ltimes \ltimes \ltimes, a \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. e
2. abdded
3. cbdaddc
4. ecdbaaebc

Exercise 376.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{bdcc, bdcd, cacd, cdab, cddc\}$

1. dbbbac
2. ε
3. a
4. ba

Exercise 377.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, bd, ca, dc, ed, ee\}$

1. adddbe
2. ea
3. e
4. ε

Exercise 378.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ba, bb\}$

1. aabbabb
2. bba
3. abbbbab
4. aba

Exercise 379.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{⋊⋊⋊a, ⋊⋊⋊c, ⋊⋊aa, ⋊⋊c⋉, ⋊aad, ⋊c⋉⋉, aadd, addc, ddcd, dcd⋉, cd⋉⋉, c⋉⋉⋉, d⋉⋉⋉\}$

1. b
2. bb
3. aabdb
4. ε

Exercise 380.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, baa, bab, bba, bbb\}$

1. bbbaababbb
2. aaaabbbbb
3. abaab
4. aaabbbaaa

Exercise 381.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes d, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes db, \rtimes \ltimes \ltimes\ltimes, \rtimes dbb, bbdb, bdbd, dbbd, dbdb, bdb\ltimes, db \ltimes \ltimes, b \ltimes \ltimes\ltimes\}$

1. daddaa
2. ε
3. d
4. dcd

Exercise 382.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes cb, \rtimes \rtimes cc, \rtimes \rtimes ad, \rtimes cbd, \rtimes cc\ltimes, \rtimes ada, acbd, bdac, cbda, cbdd, dacb, bdd\ltimes, ada\ltimes, cc \ltimes \ltimes, dd \ltimes \ltimes, da \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. d
2. ε
3. cdc
4. ccaba

Exercise 383.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, ab, ba, bc, bd, cb, cd, db, b\ltimes\}$

1. bbbdca
2. cbadaacab
3. cb
4. cdddbdd

Exercise 384.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes ca, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes ba, \rtimes bab, \rtimes cab, \rtimes \ltimes \ltimes\ltimes, aacb, abba, abca, babb, babc, bbab, bcaa, caac, acb\ltimes, cab\ltimes, ab \ltimes \ltimes, cb \ltimes \ltimes, b \ltimes \ltimes\ltimes\}$

1. ε
2. babcaacb

3. bbbccb
4. cab

Exercise 385.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aabb, aadb, bbad, bbbb, dada, dbad\}$

1. a
2. b
3. dddac
4. ε

Exercise 386.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes d, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes db, \rtimes ba, acb, bac, bda, cbd, dba, da\ltimes, ba\ltimes, a\ltimes\ltimes\}$

1. ccdc
2. d
3. db
4. ε

Exercise 387.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, ac, bb, bc, bd, ca, cb, cc, cd, db, dc, c\ltimes\}$

1. cc
2. bdbbabda
3. ε
4. c

Exercise 388.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes e, ac, ae, cd, da, ea, e\ltimes\}$

1. e
2. ba
3. edc

4. ε

Exercise 389.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes \ltimes, \rtimes \rtimes d, \rtimes \rtimes b, \rtimes \rtimes e, \rtimes \ltimes \ltimes, \rtimes d \ltimes, \rtimes bc, \rtimes ed, acc, bcb, cbc, ccb, dac, dda, ddd, edd, cb \ltimes, bc \ltimes, d \ltimes \ltimes, c \ltimes \ltimes, b \ltimes \ltimes\}$

1. cdbbadd
2. dcdeceab
3. acad
4. ε

Exercise 390.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, bab\}$

1. b
2. abbaa
3. a
4. ba

Exercise 391.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes b, ab, ac, ba, bd, cb, b \ltimes, d \ltimes\}$

1. bcddcbad
2. b
3. ab
4. ccc

Exercise 392.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes \ltimes, ab, ba, bb, a \ltimes, b \ltimes\}$

1. ε
2. abbb
3. a

4. ab

Exercise 393.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bda, dce, dee, eaa, ebc\}$

1. be
2. ε
3. bbabb
4. dcbdb

Exercise 394.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ac, bb, bc, ca, cc\}$

1. b
2. cbbb
3. a
4. ε

Exercise 395.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes a\ltimes, \rtimes \rtimes ab, \rtimes aba, \rtimes a \ltimes \ltimes, \rtimes \ltimes \ltimes\ltimes, abab, abea, babe, bea\ltimes, ea \ltimes \ltimes, a \ltimes \ltimes\ltimes\}$

1. a
2. abe
3. c
4. ε

Exercise 396.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes d, aa, ad, ba, cd, db, dc, a\ltimes, d\ltimes\}$

1. ε
2. a
3. d
4. cbbb

Exercise 397.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, acca, baab, bacb, bcca, cbba, cbcb\}$

1. ccbccc
2. b
3. ε
4. a

Exercise 398.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes a \ltimes, \rtimes \rtimes bc, \rtimes a \ltimes \ltimes, \rtimes bcc, aacc, accc, bccc, caac, ccaa, ccca, cccc, ccc\ltimes, cc \ltimes \ltimes, a \ltimes \ltimes\ltimes, c \ltimes \ltimes\ltimes\}$

1. a
2. aabc
3. bbaa
4. bccc

Exercise 399.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abab, babc, bcab, caab, ccbc\}$

1. abaca
2. ε
3. cbacca
4. aaabbcbc

Exercise 400.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes d, \rtimes \rtimes \rtimes e, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes e\ltimes, \rtimes \rtimes da, \rtimes dae, \rtimes \ltimes \ltimes\ltimes, \rtimes e \ltimes \ltimes, aeaa, daea, eaad, aad\ltimes, ad \ltimes \ltimes, d \ltimes \ltimes\ltimes, e \ltimes \ltimes\ltimes\}$

1. ε
2. ddaebe
3. e
4. c

Exercise 401.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, baa, bab, bba, bbb\}$

1. bbb
2. ε
3. bababab
4. baaabbbabb

Exercise 402.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, \rtimes c, bb, bc, cb, cc, b\ltimes\}$

1. cb
2. bb
3. babbaa
4. b

Exercise 403.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abdc, bbac, bccb, bccd, bcdc, ccbd, dbbc\}$

1. bdcadab
2. c
3. ca
4. ε

Exercise 404.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \rtimes e, \rtimes \rtimes bb, \rtimes \rtimes ec, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes a \ltimes, \rtimes a \ltimes \ltimes, \rtimes bbb, \rtimes ecc, \rtimes \ltimes \ltimes \ltimes, cccb, cccc, eccc, ccb \ltimes, bbb \ltimes, cb \ltimes \ltimes, bb \ltimes \ltimes, a \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. eeee
2. ecba
3. ea
4. badc

Exercise 405.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ae, bb, be, ca, dd, ed\}$

1. b
2. ε
3. d
4. e

Exercise 406.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aac, aca, bbb, bbc, bca, cbb\}$

1. ε
2. aca
3. a
4. b

Exercise 407.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes bc, \rtimes \rtimes bd, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes a \ltimes, \rtimes a \ltimes \ltimes, \rtimes bde, \rtimes bc \ltimes, \rtimes \ltimes \ltimes \ltimes, bdee, deeb, ebac, eeba, bac \ltimes, ac \ltimes \ltimes, bc \ltimes \ltimes, c \ltimes \ltimes \ltimes, a \ltimes \ltimes \ltimes\}$

1. dceabe
2. ε
3. cabac
4. cececcd

Exercise 408.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes \ltimes, \rtimes b, aa, ab, ba, bb, a \ltimes\}$

1. aaba
2. aba
3. ε
4. b

Exercise 409.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ba, cc, cd, ce, dd, eb, ec\}$

1. acdddeaa
2. ac
3. badbdedd
4. ε

Exercise 410.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes ba, aaa, aab, aba, abb, baa, bab, bba, ab\ltimes, b \ltimes \ltimes\}$

1. bbabaa
2. aabbabbbba
3. aaaa
4. aba

Exercise 411.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abda, bddd, dadd, dbaa, dbca, ddda\}$

1. ε
2. b
3. ac
4. a

Exercise 412.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{badd, beae, bebc, caca, ccad, dbce\}$

1. cc
2. cccb
3. adb
4. ε

Exercise 413.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, bd, cc, cd, dc, dd\}$

1. ε
2. bababba
3. bbdacbc
4. b

Exercise 414.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{accb, cabe, cada, ccec, dabb, dbdd\}$

1. ε
2. b
3. cbade
4. addbdcbb

Exercise 415.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes b, \rtimes\rtimes ba, \rtimes\rtimes b\ltimes, \rtimes b\ltimes\ltimes, \rtimes baa, \rtimes ba\ltimes, aaab, aabb, baaa, abb\ltimes, ba\ltimes \ltimes, bb \ltimes \ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. b
2. aabaa
3. ε
4. ab

Exercise 416.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes d, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes d\ltimes, \rtimes ce, acb, bac, bce, cbc, ceb, ced, dce, eba, edc, ed\ltimes, d\ltimes \ltimes\}$

1. dbdcd
2. aeeddbcaa
3. bcdebb
4. da

Exercise 417.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaae, adab, baca, bbca, bccb, bdbc, ddcc, ddcd\}$

1. ε
2. ccbedca
3. a
4. cceedd

Exercise 418.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ba, bb, bc, ca, cc\}$

1. ba
2. babb
3. ac
4. ε

Exercise 419.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, bb, bc, ca\}$

1. cbc
2. b
3. ε
4. aaca

Exercise 420.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes d, \rtimes c \ltimes, \rtimes de, bec, ceb, dec, ebe, ece, ec \ltimes, c \ltimes \ltimes\}$

1. c
2. ecc
3. dccbdb
4. dec

Exercise 421.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes c, bb, bc, cb, cc, c\ltimes\}$

1. acac
2. cc
3. bcb
4. b

Exercise 422.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aabb, abaa, abab, abba, baaa, babb, bbaa\}$

1. b
2. a
3. ε
4. baab

Exercise 423.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bba, bbc, bcc, bdb, bdc, cdd, dad\}$

1. a
2. cbdacb
3. b
4. ε

Exercise 424.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes ab, \rtimes\rtimes c\ltimes, \rtimes\rtimes\ltimes\ltimes, \rtimes aba, \rtimes c\ltimes\ltimes, \rtimes abc, \rtimes\ltimes \ltimes\ltimes, aaaa, abab, abbc, acaa, babb, bbca, bcac, caaa, caca, abc\ltimes, aaa\ltimes, aa \ltimes \ltimes, bc \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. ε
2. ccca
3. bbabcab
4. aba

Exercise 425.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes cc, \rtimes cca, abbb, bbbb, bbbc, bbcc, cabb, ccab, bcc\ltimes, cc \ltimes \ltimes, c \ltimes \ltimes \ltimes\}$

1. ccabbbcc
2. ba
3. cababaccc
4. cabccaaaa

Exercise 426.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abba, accb, accc, bcbb, bccc\}$

1. ε
2. caba
3. b
4. acabbabc

Exercise 427.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes b \ltimes, \rtimes ba, aaa, aab, aba, baa, bab, aa\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. ε
2. ba
3. bbabb
4. bbbabaabbbbb

Exercise 428.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acdb, badc, bcaa, cbda, cbdb, ddbc\}$

1. bbcd
2. a
3. ε
4. b

Exercise 429.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abe, acb, adc, cca, edb, eea, eed, eee\}$

1. ε
2. e
3. b
4. aac

Exercise 430.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes d, \rtimes \rtimes \rtimes e, \rtimes \rtimes ea, \rtimes \rtimes c\ltimes, \rtimes \rtimes ae, \rtimes \rtimes da, \rtimes ea\ltimes, \rtimes aea, \rtimes c \ltimes \ltimes, \rtimes dae, aeae, aeec, eaee, ecdd, eecd, dae\ltimes, cdd\ltimes, ae \ltimes \ltimes, ea \ltimes \ltimes, dd \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes, e \ltimes \ltimes\ltimes\}$

1. ea
2. cdbe
3. aaeabc
4. c

Exercise 431.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aabb, abab, baab, baba\}$

1. ε
2. ab
3. bbabbba
4. baabaaa

Exercise 432.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes d, \rtimes \rtimes dd, \rtimes \rtimes cb, \rtimes \rtimes c\ltimes, \rtimes ddd, \rtimes c \ltimes \ltimes, \rtimes cbb, bbdd, bddc, cbbd, cdda, daaa, dcdd, ddaa, ddcd, ddd\ltimes, aaa\ltimes, aa \ltimes \ltimes, dd \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. c
2. bcccddbbbab
3. aac

4. ddd

Exercise 433.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes ab, \rtimes \rtimes bb, \rtimes \rtimes a\ltimes, \rtimes a \ltimes \ltimes, \rtimes abb, \rtimes bbb, aaaa, aaab, baaa, bbaa, bbba, aab\ltimes, abb\ltimes, ab \ltimes \ltimes, bb \ltimes \ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. a
2. ab
3. aaaabaaa
4. abb

Exercise 434.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, acb, acc, bab, bac, cab, cbb, ccb\}$

1. ca
2. abc
3. bbbabbcba
4. ε

Exercise 435.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aaba, aabb, abaa, abab, abba, baab, bbba\}$

1. b
2. bbb
3. aaab
4. ε

Exercise 436.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes bb, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes aa, \rtimes aaa, \rtimes bb\ltimes, \rtimes \ltimes \ltimes\ltimes, aaac, aacc, accb, adbd, badb, cbad, ccba, dbdd, bdd\ltimes, dd \ltimes \ltimes, bb \ltimes \ltimes, d \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. dddaddbacd

2. bdbcdbcd
3. bb
4. ε

Exercise 437.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, ba, bb, bc, ca, cb\}$

1. bbaaba
2. a
3. ε
4. b

Exercise 438.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, ba, bb, b\ltimes\}$

1. baaabaab
2. abb
3. ε
4. bababaaaa

Exercise 439.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes c, \rtimes\rtimes cb, \rtimes\rtimes ac, \rtimes acc, \rtimes aca, \rtimes cb\ltimes, abcb, acca, baac, bcba, cabc, cbaa, ccab, aca\ltimes, aa$
$\ltimes, cb \ltimes \ltimes, ca \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. ac
2. caccac
3. aacc
4. abbccc

Exercise 440.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abca, bbbc, bcac, cacb, cbbb, ccbc\}$

1. b
2. aab

3. ε
4. c

Exercise 441.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes ac, aca, acb, bca, cac, cbc, ca\ltimes, a \ltimes \ltimes\}$

1. abcb
2. ac
3. bdca
4. ccdaabb

Exercise 442.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, aa, ac, ca, a\ltimes\}$

1. cbbb
2. c
3. ε
4. bccb

Exercise 443.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \rtimes a, \rtimes \rtimes aa, \rtimes \rtimes \ltimes\ltimes, \rtimes \ltimes \ltimes\ltimes, \rtimes aaa, aaab, aabb, abba, baaa, bbaa, abb\ltimes, bb \ltimes \ltimes, b \ltimes \ltimes\ltimes\}$

1. aaabb
2. abbabbba
3. ε
4. bbaaabaaa

Exercise 444.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes b, \rtimes c\ltimes, \rtimes bb, bbc, bcb, cbb, bc\ltimes, c \ltimes \ltimes\}$

1. c
2. bbbcac
3. ε

4. bab

Exercise 445.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, ba, bb, b\ltimes\}$

1. a
2. bbbbabb
3. ε
4. b

Exercise 446.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes ac, \rtimes \rtimes ad, \rtimes acc, \rtimes ad\ltimes, accb, cbcd, ccbc, bcd\ltimes, cd \ltimes \ltimes, ad \ltimes \ltimes, d \ltimes \ltimes\ltimes\}$

1. b
2. ad
3. ε
4. a

Exercise 447.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, ba, bb, bc, ca, cb, cc\}$

1. bcbbacb
2. accaaaacbc
3. b
4. ε

Exercise 448.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, baa, bab, bba\}$

1. baaba
2. ba
3. bbbab
4. ε

Exercise 449.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes \ltimes, \rtimes a \ltimes, \rtimes \ltimes \ltimes, \rtimes ab, \rtimes aa, aba, abb, bab, bba, aa \ltimes, ba \ltimes, a \ltimes \ltimes\}$

1. ε
2. a
3. b
4. baba

Exercise 450.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes e, \rtimes \rtimes e \ltimes, \rtimes \rtimes ab, \rtimes \rtimes ce, \rtimes \rtimes ad, \rtimes e \ltimes \ltimes, \rtimes cee, \rtimes ab \ltimes, \rtimes adb, adbd, bddc, cade, dbdd, dcad, ddca, ade \ltimes, cee \ltimes, de \ltimes \ltimes, ab \ltimes \ltimes, ee \ltimes \ltimes, e \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. eddade
2. abccbdece
3. bddaebbac
4. de

Exercise 451.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, acb, adb, cdb, daa, dbd\}$

1. dbb
2. b
3. ε
4. cc

Exercise 452.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ac, bc, ca, cb, cc\}$

1. ε
2. c
3. b
4. aa

Exercise 453.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes c, \rtimes\ \rtimes\ \rtimes \ltimes, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ bc, \rtimes\ \rtimes\ cb, \rtimes\ \rtimes\ ac, \rtimes\ \rtimes \ltimes\ltimes, \rtimes bcb, \rtimes acd, \rtimes cb\ltimes, \rtimes\ \ltimes\ \ltimes\ltimes, acda, adcd, cdad, dadc, bcb\ltimes, dcd\ltimes, cd\ \ltimes \ltimes, cb \ltimes \ltimes, d \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. b
2. cb
3. ε
4. babca

Exercise 454.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes\ltimes, \rtimes\rtimes a, \rtimes a\ltimes, \rtimes\ltimes\ltimes, \rtimes ad, aac, abd, acc, ada, bdd, ccd, daa, dab, dda, ddd, cd\ltimes, ad\ltimes, d\ltimes \ltimes, a \ltimes \ltimes\}$

1. ε
2. ad
3. a
4. acdb

Exercise 455.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, ad, ba, bb, cb, cc, dc, dd, de, ec, c\ltimes\}$

1. abbb
2. adc
3. e
4. adec

Exercise 456.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{bb, ca, cd, dd\}$

1. dbbadbbcabd
2. b
3. dacbbaccda
4. ε

Exercise 457.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, ba, a\ltimes\}$

1. aaaba
2. aa
3. ab
4. ε

Exercise 458.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaab, abaa, abba, baab, bbbb\}$

1. aaaaaa
2. bbababbab
3. bbba
4. aaa

Exercise 459.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abaa, accb, bcae, bebe, ecdb\}$

1. b
2. dedbcacdceca
3. bcc
4. caeaabebb

Exercise 460.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes c, \rtimes d, bb, bc, cb, cc, cd, db, dc, c\ltimes, d\ltimes\}$

1. c
2. ε
3. d
4. aabbddccaa

Exercise 461.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, abb, baa, bab, bba\}$

1. b
2. bbbaa
3. ε
4. aa

Exercise 462.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ad, bb, bd, cb, cd\}$

1. d
2. dccbd
3. bdadaadab
4. cbad

Exercise 463.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes d, \rtimes \rtimes b, \rtimes dd, \rtimes bc, aca, cad, dac, dda, bc\ltimes, ad\ltimes, d \ltimes \ltimes, c \ltimes \ltimes\}$

1. dbdadb
2. badc
3. dc
4. abae

Exercise 464.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes db, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes aa, \rtimes aa\ltimes, \rtimes dbb, \rtimes \ltimes \ltimes\ltimes, acdc, bbca, bcac, cacd, cdcd, dbbc, dcd\ltimes, cd \ltimes \ltimes, aa \ltimes \ltimes, d \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. aa
2. ε
3. cbdbabb
4. acbadcaa

Exercise 465.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes cc, \rtimes \rtimes b \ltimes, \rtimes ccb, \rtimes b \ltimes \ltimes, abea, aecd, babe, beae, cbab, ccba, eaec, ecda, cda \ltimes, da \ltimes \ltimes, a \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. aedaaadae
2. bbb
3. b
4. ecaccbacccd

Exercise 466.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaac, baab, cbba, cccb\}$

1. babba
2. cac
3. abacab
4. ca

Exercise 467.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaab, abaa, abba, baaa, baab, babb\}$

1. baa
2. aababaabaa
3. abaa
4. aababbb

Exercise 468.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{cbda, ccda, cdcb, ecea\}$

1. acbabbce
2. de
3. ea
4. eaeaeda

Exercise 469.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes c \ltimes, \rtimes \rtimes cb, \rtimes \rtimes ac, \rtimes \rtimes \ltimes \ltimes, \rtimes acb, \rtimes c \ltimes \ltimes, \rtimes cb \ltimes, \rtimes \ltimes \ltimes \ltimes, acbb, bbcb, bcbc, cbbc, cbcb, bcb \ltimes, cb \ltimes \ltimes, c \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. acaab
2. ε
3. cababa
4. acacac

Exercise 470.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aac, acd, bab, bac, bca, cdb, dcd\}$

1. ε
2. a
3. abcddba
4. b

Exercise 471.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, bc, cd, db\}$

1. adadaccd
2. ε
3. dadccddcbdad
4. bccdbd

Exercise 472.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, abd, adc, bbb, cbd, cdd, dba, dca\}$

1. ε
2. a
3. cbc
4. b

Exercise 473.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ba, bb\}$

1. abaab
2. a
3. baaa
4. aabab

Exercise 474.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abd, acc, bac, cdd, dab, dbc\}$

1. ddddbbb
2. dbacabbdcdb
3. bacb
4. ε

Exercise 475.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{ace, adb, cab, cdd\}$

1. dbdabaeaccca
2. dacaea
3. dcea
4. ε

Exercise 476.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, aa, ab, ba, bb, a\ltimes\}$

1. aaa
2. ε
3. aba
4. ba

Exercise 477.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abd, baa, bac, bbc, cda\}$

1. cdcaaccc
2. ε
3. ccadcda
4. cbdcbabba

Exercise 478.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes d, \rtimes \rtimes db, \rtimes \rtimes bc, \rtimes \rtimes bb, \rtimes bbc, \rtimes bc\ltimes, \rtimes dbd, bbcd, bcdc, bcdd, bddb, cddb, dbcd, dbdd, ddbc, ddbd, cdc\ltimes, dbd\ltimes, dc\ltimes \ltimes, bd \ltimes \ltimes, bc \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes\}$

1. addbdbdddb
2. dbbcbcba
3. dabb
4. cadadda

Exercise 479.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aac, bcc, bda, bdd, cba, dab, ddb\}$

1. b
2. bdbddddca
3. ε
4. dc

Exercise 480.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaab, aaba, aabb, baab, baba, bbba\}$

1. baabab
2. bbaa
3. bab
4. ε

Exercise 481.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aac, abc, bca, cba, cbb\}$

1. cbac
2. ba
3. bab
4. babccbca

Exercise 482.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, bb, ca, cb, cc\}$

1. ε
2. abcbccccacb
3. b
4. a

Exercise 483.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes b \ltimes, \rtimes ba, aab, aad, abd, add, baa, bda, daa, dd \ltimes, b \ltimes \ltimes, d \ltimes \ltimes\}$

1. bbd
2. ccadcbda
3. ε
4. aabab

Exercise 484.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes e, \rtimes eb, bdb, bdd, dbc, dbd, ddb, ddd, ebd, bc \ltimes, c \ltimes \ltimes\}$

1. aeed
2. ebdbc
3. ee
4. c

Exercise 485.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes e, \rtimes \rtimes b, \rtimes e \ltimes, \rtimes bb, add, bbc, bce, cea, ead, dd \ltimes, e \ltimes \ltimes, d \ltimes \ltimes\}$

1. aba
2. cc
3. ε
4. c

Exercise 486.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ad, ba, bb, ca, db, dd\}$

1. bbca
2. abbdccddac
3. a
4. acabcaddbc

Exercise 487.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes a, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes cc, \rtimes aa, aad, adc, ccc, ccd, cdd, dcc, dcd, ddc, cc \ltimes, cd \ltimes, d \ltimes \ltimes, c \ltimes \ltimes\}$

1. bbababdac
2. acdc
3. ε
4. caabab

Exercise 488.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes e, ab, bd, ca, cc, ce, db, ec, b \ltimes\}$

1. bdde
2. cbdbbb
3. ecab
4. eee

Exercise 489.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes aa, aac, acc, cbb, ccb, bb\ltimes, aa\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. aa
2. caaabc
3. acacc
4. aaca

Exercise 490.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acac, accb, bbcb, bcac, cbcb, cbcc, ccbc, cccc\}$

1. ε
2. aaacbc
3. a
4. b

Exercise 491.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, bbca, bbcc, bcbc, caaa, caba, cabb\}$

1. a
2. b
3. ε
4. acaaaaac

Exercise 492.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ac, bc, ca, cb, a\ltimes, b\ltimes\}$

1. c
2. bca
3. ε
4. bc

Exercise 493.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes d, \rtimes\rtimes dd, \rtimes ddc, bcbd, bdcd, cbcb, cbdc, dcbc, dcda, ddcb, cda\ltimes, da\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. bbcdd
2. bdacb
3. ε
4. aca

Exercise 494.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aabb, abaa, abba, babb, bbab, bbba, bbbb\}$

1. ε
2. abbbba
3. baabaabbb
4. bbbbabbabbaa

Exercise 495.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abd, adb, ceb, daa, dba\}$

1. cecaaadaab
2. cecdbbdebd
3. ecaecbbbab
4. ebc

Exercise 496.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes b\ltimes, \rtimes ba, aab, aba, abb, baa, bab, bba, bbb, bb\ltimes, b\ltimes\ltimes\}$

1. babb
2. b
3. ε
4. abaaab

Exercise 497.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes ba, \rtimes bb, bac, bbc, bcc, cba, cbc, ccb, ccc, ac\ltimes, ba\ltimes, a \ltimes \ltimes, c \ltimes \ltimes\}$

1. cabac
2. ba
3. c
4. aacbcbcaacc

Exercise 498.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes c\ltimes, \rtimes \rtimes bb, \rtimes \rtimes \ltimes\ltimes, \rtimes bbb, \rtimes c \ltimes \ltimes, \rtimes \ltimes \ltimes\ltimes, acba, baca, bacb, bbbc, bbcb, bcba, cbac, aca\ltimes, ca \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. ε
2. bcacccbaa
3. bbbcbaca
4. c

Exercise 499.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes ab, \rtimes b\ltimes, \rtimes ba, aab, aba, abb, baa, bba, bbb, ba\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. baaaaaba
2. b
3. aabba
4. a

Exercise 500.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes bb, \rtimes aa, aaa, aab, abb, baa, bba, bbb, ab\ltimes, bb\ltimes, b \ltimes \ltimes\}$

1. a
2. aababa
3. baabbb
4. aabbbaaa

Exercise 501.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: {⋊⋊⋊a, ⋊⋊⋊b, ⋊⋊ab, ⋊⋊ba, ⋊aba, ⋊baa, $aaba$, $abaa$, $abab$, $baaa$, $baab$, $baba$, aba⋉, aaa⋉, aa⋉⋉, ba ⋉ ⋉, a ⋉ ⋉⋉}

1. ab
2. bababaa
3. abbb
4. baabaaba

Exercise 502.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: {⋊ ⋊ c, ⋊ ⋊ a, ⋊ ⋊ b, ⋊c⋉, ⋊ac, ⋊ba, aca, acb, bac, cac, cbc, bc⋉, ac⋉, c ⋉ ⋉}

1. babc
2. abbcba
3. cca
4. c

Exercise 503.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: {⋊ ⋊ a, ⋊ac, abd, acb, bab, bba, cbb, bd⋉, d ⋉ ⋉}

1. ccacc
2. abbddae
3. ε
4. edeba

Exercise 504.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: {$acde$, $baab$, $bbdd$, $ceab$, $ebdc$}

1. e
2. cbebdb
3. eeaccba
4. ε

Exercise 505.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abc, cbd, cce, ddb\}$

1. aacca
2. ec
3. eacac
4. ε

Exercise 506.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aba, abc, bca, caa, cab\}$

1. ccacccc
2. ε
3. a
4. b

Exercise 507.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes aa, \rtimes \rtimes ba, \rtimes aaa, \rtimes ba \ltimes, \rtimes \ltimes \ltimes \ltimes, aaab, aaba, abab, abba, abbb, babb, bbab, bbbb, bbb \ltimes, ba \ltimes \ltimes, bb \ltimes \ltimes, a \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. aaaaababa
2. abbbabab
3. abbbbaaa
4. ε

Exercise 508.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aaba, abaa, abbb, bbbb\}$

1. ba
2. ε
3. bba
4. bb

Exercise 509.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{baa, bca, cab, cbc, cca\}$

1. ccbaab
2. acabbcccc
3. acc
4. bcaccaa

Exercise 510.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes a \ltimes, \rtimes ba, aaa, aab, aba, baa, bab, ab \ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. babbaa
2. abbbab
3. ε
4. aaaaa

Exercise 511.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abbc, adbc, cbab, cbad, dbbb, dddc\}$

1. dbd
2. abcdcaabc
3. ε
4. b

Exercise 512.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes ab, \rtimes \rtimes b \ltimes, \rtimes \rtimes \ltimes \ltimes, \rtimes abb, \rtimes \ltimes \ltimes \ltimes, \rtimes b \ltimes \ltimes, abab, abba, abbb, baab, baba, babb, bbaa, bbab, bbba, aab \ltimes, ab \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. ababbabaaab
2. ε
3. b
4. abbaab

Exercise 513.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ba, cb, cc\}$

1. aaaa
2. bcaca
3. ε
4. b

Exercise 514.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, bb, bc, ca, cc\}$

1. b
2. ε
3. abaccacc
4. bbcaabbba

Exercise 515.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aaba, baab, baba, bbaa, bbba\}$

1. bbbaaa
2. baaabbab
3. a
4. aababbbb

Exercise 516.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes c, ab, ac, bb, bc, ca, c\ltimes\}$

1. ε
2. baca
3. aaba
4. aaa

Exercise 517.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes ac, abc, aca, acc, bca, cab, cac, cca, ac\ltimes, c \ltimes \ltimes\}$

1. bc
2. ε
3. b
4. babac

Exercise 518.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, baa, bab, bba, bbb\}$

1. bbaaba
2. ε
3. baa
4. aaa

Exercise 519.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes\ltimes, \rtimes\rtimes a, \rtimes\rtimes b, \rtimes ac, \rtimes\ltimes\ltimes, \rtimes ba, abc, acb, bab, bba, bbb, bcc, cbb, cbc, ccb, bc\ltimes, ba\ltimes, c\ltimes \ltimes, a \ltimes \ltimes\}$

1. ε
2. ba
3. cccbcbbca
4. ac

Exercise 520.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes \rtimes d, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes db, \rtimes ba, adb, bad, bee, dbe, db\ltimes, ee\ltimes, e \ltimes \ltimes, b \ltimes \ltimes\}$

1. cab
2. ebca
3. abcd
4. ε

Exercise 521.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes cc, \rtimes \rtimes a \ltimes, \rtimes a \ltimes \ltimes, \rtimes \ltimes \ltimes \ltimes, \rtimes ccb, aaaa, baaa, bbaa, cbba, ccbb, aaa \ltimes, aa \ltimes \ltimes, a \ltimes \ltimes \ltimes\}$

1. ε
2. cc
3. ccbbaaa
4. a

Exercise 522.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, aac, bab, bbc, cac\}$

1. bacbbc
2. bbccababc
3. bbaaaabacc
4. bccbacaaaa

Exercise 523.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes ba, abb, bab, bbc, bcc, ccc, cc \ltimes, c \ltimes \ltimes\}$

1. ca
2. babbcc
3. bacbbb
4. ε

Exercise 524.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, adb, bbd, cdb, dba, dda\}$

1. a
2. ε
3. b
4. ba

Exercise 525.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{bb, bd, be, cd, da, dd, eb\}$

1. ε
2. bb
3. ccabaeccabe
4. dbdeacbddaa

Exercise 526.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aca, bcb, caa, cbc\}$

1. b
2. ε
3. a
4. ba

Exercise 527.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{acb, bad, bcd, caa, dca, ddd\}$

1. aadbbc
2. ad
3. bcbaaa
4. cadcadb

Exercise 528.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes a, \rtimes a\ltimes, \rtimes cb, aad, adb, baa, bba, cbb, dba, ba\ltimes, cb\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. abaa
2. a
3. cb
4. adcdab

Exercise 529.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes b\ltimes, \rtimes ba, \rtimes bb, aaa, aab, abb, baa, bba, bb\ltimes, ba\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. bb
2. bba
3. a
4. ba

Exercise 530.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ae, be, ea, eb\}$

1. ee
2. ea
3. aec
4. ε

Exercise 531.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes e, ab, bd, be, ca, da, db, dd, ec, ed, b\ltimes\}$

1. a
2. aaee
3. dddeadebc
4. ε

Exercise 532.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes ba, aaa, aab, abb, baa, bba, bbb, ab\ltimes, b \ltimes \ltimes\}$

1. a
2. b
3. bbbaaaaabba
4. baababbbb

Exercise 533.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes d, \rtimes da, abe, bed, dab, dac, eda, ac\ltimes, c \ltimes \ltimes\}$

1. eb
2. bbe
3. dac
4. a

Exercise 534.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes a\ltimes, \rtimes aa, aaa, aab, abb, baa, bba, bbb, aa\ltimes, a \ltimes \ltimes\}$

1. abbaaaabaaa
2. aaa
3. aa
4. a

Exercise 535.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aad, abd, adb, caa, cca, dbd\}$

1. b
2. ε
3. bad
4. cddaacc

Exercise 536.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes b, ab, ba, bb, a\ltimes, b\ltimes\}$

1. abbaaab
2. a
3. b
4. ab

Exercise 537.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes ab, \rtimes aa, aab, aba, abb, baa, bab, bba, ab\ltimes, b \ltimes \ltimes\}$

1. abbbbaaabba
2. bbb
3. babbbbb
4. bbbbbbbbbab

Exercise 538.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, bab, bba, caa, cab, cca, ccc\}$

1. b
2. ε
3. cb
4. aabcac

Exercise 539.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes bb, \rtimes \rtimes bd, \rtimes \rtimes ce, \rtimes bb\ltimes, \rtimes cee, \rtimes bdd, abde, bded, cabd, ceec, dabc, deda, ecab, edab, eeca, abc\ltimes, bdd\ltimes, bc\ltimes \ltimes, dd \ltimes \ltimes, bb \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. bb
2. baaecd
3. acbca
4. edeebb

Exercise 540.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aabb, abbb, acbb, baca, bbba, cbcc, cccc\}$

1. ε
2. a
3. b
4. acc

Exercise 541.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{adc, cba, cca, ddc\}$

1. accdbd
2. abbcc
3. dda
4. daddc

Exercise 542.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, ab, ba, bd, da, b\ltimes\}$

1. cdcbbc
2. b
3. ddddca
4. ε

Exercise 543.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes\ltimes, \rtimes\rtimes a, \rtimes\rtimes d, \rtimes\ltimes\ltimes, \rtimes d\ltimes, \rtimes ab, abd, aee, bdc, cae, cde, dca, dcd, dee, edc, eed, ee\ltimes, d\ltimes\ltimes, e\ltimes\ltimes\}$

1. ε
2. c
3. abdcdee
4. d

Exercise 544.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaab, aabb, abaa, abab, abba, baaa, bbab\}$

1. a
2. bbababbaaab
3. b
4. ε

Exercise 545.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aca, acb, bbb, cab, ccb\}$

1. b
2. aacaabca
3. a
4. ε

Exercise 546.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bed, ccc, cce, dee, eaa\}$

1. dc
2. eddbae
3. bdcb
4. ε

Exercise 547.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes b \ltimes, \rtimes bb, acc, bac, bba, cac, cca, ccb, ccc, cb \ltimes, b \ltimes \ltimes\}$

1. bbaccb
2. a
3. b
4. caaacac

Exercise 548.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \rtimes a, \rtimes \rtimes aa, \rtimes \rtimes \ltimes \ltimes, \rtimes aaa, \rtimes \ltimes \ltimes \ltimes, aaab, aaba, aabb, abaa, abab, baaa, baba, abb \ltimes, bb \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. abbbbbabaab
2. aaabbba
3. ε
4. aaabb

Exercise 549.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abca, acca, baaa, babb, bccc, cabb, cabc, ccbc\}$

1. a
2. ε
3. caaca
4. b

Exercise 550.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, bb, bc, ca, cb, a\ltimes\}$

1. aabaac
2. c
3. abacc
4. cba

Exercise 551.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acbc, adab, cabd, cada, ceee\}$

1. cbaaedadcd
2. edbcbdac
3. d
4. ε

Exercise 552.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, ba, bd, dd\}$

1. ε
2. b
3. a
4. dcdb

Exercise 553.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, baa, bab, bba\}$

1. aabbbba
2. ε
3. bbabaabaab
4. b

Exercise 554.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes c, \rtimes\rtimes c\ltimes, \rtimes\rtimes cc, \rtimes c\ltimes\ltimes, \rtimes ccd, bccd, cbcc, ccda, ccdd, cdad, cddc, dcbc, ddcb, dad\ltimes, ad\ltimes\ltimes, d\ltimes\ltimes\ltimes, c\ltimes\ltimes\ltimes\}$

1. c
2. ccdad
3. ddbaaaabcab
4. cdaba

Exercise 555.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{bbeb, ddbe, dedb, ecbe, eeea\}$

1. beceaa
2. acdc
3. cdbaddc
4. ε

Exercise 556.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, abaa, abab, abbb\}$

1. ba
2. aabbb
3. baa
4. ε

Exercise 557.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes c, \rtimes\rtimes aa, \rtimes\rtimes ce, \rtimes aae, \rtimes cee, aaeb, aebe, bedc, caee, dcae, ebed, edca, aee\ltimes, cee\ltimes, ee\ltimes\ltimes, e\ltimes\ltimes\ltimes\}$

1. ε
2. cee
3. be
4. e

Exercise 558.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, aba, abb, bab, bba\}$

1. b
2. bbbba
3. baabaabbbba
4. ε

Exercise 559.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes b, \rtimes b\ltimes, \rtimes ca, aaa, aba, baa, cab, aa\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. b
2. aacaaa
3. cabaa
4. ε

Exercise 560.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, da, dd, ec\}$

1. d
2. dabac
3. db
4. acb

Exercise 561.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: {⋊ ⋊ ⋊e, ⋊ ⋊ e⋉, ⋊ ⋊ eb, ⋊ebc, ⋊e ⋉ ⋉, $bccb$, $ccbc$, $ebcc$, cbc⋉, bc ⋉ ⋉, c ⋉ ⋉⋉, e ⋉ ⋉⋉}

1. edcc
2. ε
3. beeb
4. e

Exercise 562.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: {$acaa$, $baba$, $bcbc$, $cbcc$, $ccab$, $ccac$}

1. c
2. ε
3. a
4. b

Exercise 563.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: {⋊a, ⋊⋉, ⋊c, ad, bd, be, cc, db, dd, ec, c⋉}

1. aacdeeecee
2. c
3. ε
4. ccaeeccbeb

Exercise 564.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: {⋊⋊a, ⋊⋊b, ⋊⋊⋉, ⋊⋉⋉, ⋊b⋉, ⋊aa, ⋊bc, aab, abb, baa, bab, bba, bcc, caa, cca, aa⋉, b⋉ ⋉, a ⋉ ⋉}

1. b
2. ε
3. bbbc
4. cbacbbacab

Exercise 565.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, be, cc, ed\}$

1. ea
2. bbacbcb
3. ε
4. bace

Exercise 566.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ad, ba, ca, de, ed\}$

1. bbb
2. aa
3. a
4. dedbd

Exercise 567.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes d, ad, da, dd, a\ltimes, d\ltimes\}$

1. b
2. aecee
3. d
4. a

Exercise 568.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aada, abaa, abbc, abda, baba, bcda, dbca\}$

1. acab
2. ε
3. aaaccddbd
4. ada

Exercise 569.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes e, \rtimes\rtimes\rtimes c, \rtimes\rtimes ee, \rtimes\rtimes ce, \rtimes ee\ltimes, \rtimes cea, aacc, abdb, acca, cabd, ccab, ceaa, eaac, bdb\ltimes, db\ltimes\ltimes, ee\ltimes\ltimes, e\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. c
2. ε
3. ee
4. abae

Exercise 570.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ba, bb, a\ltimes\}$

1. baaabbbb
2. ε
3. abbaaaaa
4. aaaaaaaba

Exercise 571.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes\ltimes, \rtimes\ \rtimes\ \rtimes d, \rtimes\ \rtimes ba, \rtimes\ \rtimes\ da, \rtimes\ \rtimes\ltimes\ltimes, \rtimes\ \rtimes\ a\ltimes, \rtimes da\ltimes, \rtimes bab, \rtimes a\ltimes\ltimes, \rtimes\ltimes\ltimes\ltimes, aaab, aabc, abaa, abcd, baaa, baba, bcdc, cdcd, dcdc, cdc\ltimes, dc\ltimes\ltimes, da\ltimes\ltimes, c\ltimes\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. a
2. ba
3. cdcabccbd
4. ε

Exercise 572.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes ab, aab, aba, baa, ba\ltimes, a\ltimes\ltimes\}$

1. ccc
2. bb
3. bcabaa

4. aabca

Exercise 573.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bdd, cab, dbd, dcd\}$

1. bdd
2. ad
3. dcccadc
4. adcac

Exercise 574.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, ab, ba, bb, b\ltimes\}$

1. aa
2. bb
3. bbb
4. b

Exercise 575.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ac, bc, ca, cb, cc, a\ltimes, c\ltimes\}$

1. aacaabaabc
2. ccaaaba
3. abbb
4. ε

Exercise 576.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaab, abaa, abbb, baab, bbaa, bbab, bbbb\}$

1. babab
2. bba
3. ε
4. aabaa

Exercise 577.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes\ltimes, \rtimes\rtimes a, \rtimes\ltimes\ltimes, \rtimes ad, abc, ada, bbc, bca, bcd, cad, cbb, cdc, dab, dcb, ad\ltimes, d\ltimes \ltimes\}$

1. ε
2. bdbbbb
3. dcada
4. dacbddb

Exercise 578.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes \ltimes, \rtimes \rtimes c, \rtimes \rtimes a, \rtimes c\ltimes, \rtimes cc, \rtimes \ltimes \ltimes, \rtimes aa, acc, cac, cca, ccb, ccc, aa\ltimes, cb\ltimes, b \ltimes \ltimes, a \ltimes \ltimes, c \ltimes \ltimes\}$

1. babcbc
2. ε
3. cbbccba
4. bc

Exercise 579.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes c, aa, ab, ac, ba, cc, cd, da, a\ltimes, d\ltimes\}$

1. cbccccbbd
2. aa
3. ε
4. a

Exercise 580.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes d, aa, ab, ac, bb, bc, ca, cd, da, d\ltimes\}$

1. d
2. ccaad
3. ε
4. ccbb

Exercise 581.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes c, \rtimes\rtimes ac, \rtimes\rtimes ca, \rtimes caa, \rtimes ac\ltimes, aabc, abcc, bccc, caaa, caab, ccaa, ccca, aaa\ltimes, aa\ltimes \ltimes, ac \ltimes \ltimes, a \ltimes \ltimes\ltimes, c \ltimes \ltimes\ltimes\}$

1. ε
2. ac
3. bcacabcb
4. bbcbabccca

Exercise 582.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, ca, cb\}$

1. c
2. babcccc
3. acaac
4. b

Exercise 583.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes a, \rtimes a\ltimes, \rtimes cb, adb, bad, bba, bbb, bbc, cbb, dbb, bc\ltimes, a\ltimes\ltimes, c\ltimes\ltimes\}$

1. ε
2. cddbd
3. aa
4. c

Exercise 584.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes cb, abc, bab, bcb, cba, ba\ltimes, a \ltimes \ltimes\}$

1. bac
2. cba
3. aa
4. bba

Exercise 585.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes\rtimes e, \rtimes\rtimes ea, \rtimes\rtimes c\ltimes, \rtimes\rtimes ce, \rtimes\rtimes\ltimes\ltimes, \rtimes ea\ltimes, \rtimes cee, \rtimes c\ltimes \ltimes, \rtimes\ltimes\ltimes\ltimes, ceee, eeac, eeea, eac\ltimes, ac\ltimes\ltimes, ea\ltimes\ltimes, c\ltimes\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. cece
2. c
3. bdbac
4. cdca

Exercise 586.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ae, ba, bc, ca, dd, eb\}$

1. e
2. ε
3. daed
4. adbabb

Exercise 587.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ad, bd, cb, cd, da, dc\}$

1. aadcc
2. b
3. ε
4. adcbcbb

Exercise 588.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{cba, cbd, cda, dcd\}$

1. b
2. ababddccacbc
3. ddbacdadbba
4. ε

Exercise 589.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes b, \rtimes\rtimes aa, \rtimes\rtimes bb, \rtimes aaa, \rtimes bbb, aaab, baaa, bbaa, bbba, aab\ltimes, aaa\ltimes, ab\ltimes \ltimes, aa \ltimes \ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. aaab
2. baaab
3. ba
4. aaa

Exercise 590.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes a\ltimes, \rtimes ab, \rtimes aa, abc, bcc, cba, ccb, aa\ltimes, ba\ltimes, a \ltimes \ltimes\}$

1. bbcbcc
2. caab
3. ε
4. cbcbbb

Exercise 591.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{bb, cb, de, ea, ec\}$

1. ce
2. ε
3. c
4. d

Exercise 592.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{caba, ccaa, ccdc, cdad, ceeb, dbaa, ddea\}$

1. b
2. ε
3. e
4. cbc

Exercise 593.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, aabb, abab, abbb, baaa, baab, baba\}$

1. aaaba
2. abba
3. aaaa
4. aaaabbaabb

Exercise 594.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, ac, bc, ca, cb, a\ltimes\}$

1. bca
2. ε
3. bcbca
4. bcbcbca

Exercise 595.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abbc, abcb, bbab, bcac, caac, cbba, ccba\}$

1. b
2. a
3. abba
4. ε

Exercise 596.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aabc, abca, bcbb, bccb, cbac, dbac, dcba\}$

1. adbbcb
2. bc
3. caaaad
4. ε

Exercise 597.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abbb, accc, bcac, cbab, cdbb\}$

1. bcdacad
2. b
3. a
4. ε

Exercise 598.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, bab, bba, bbb\}$

1. a
2. b
3. ε
4. bbbbba

Exercise 599.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, aa, ae, bc, ce, ea, eb, ec, ee, e\ltimes\}$

1. ae
2. aee
3. cb
4. aae

Exercise 600.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes\ltimes, \rtimes\ \rtimes\ aa, \rtimes\ \rtimes\ \ltimes\ltimes, \rtimes\ \rtimes\ ba, \rtimes\ \ltimes\ \ltimes\ltimes, \rtimes aaa, \rtimes ba\ltimes, aaaa, aaab, aabb, abb\ltimes, ba\ltimes\ltimes, bb\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. ba
2. ε
3. b
4. aaabb

Exercise 601.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaab, aaba, abba, baaa, baab, bbba\}$

1. bbbbaaa
2. baaaabaaba
3. aaabbaab
4. ε

Exercise 602.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, abb, bab, bba\}$

1. baab
2. aabbabaa
3. bb
4. ε

Exercise 603.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, baac, babb, bbaa, bbbb, bcba\}$

1. a
2. ε
3. ccabcbaa
4. b

Exercise 604.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{baae, bebc, ceac, eaac, eaec, ebcb, ebed\}$

1. b
2. ecceb
3. ad
4. eae

Exercise 605.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, cb, cd, db, dc, dd\}$

1. b
2. aaaa
3. ccddadd
4. ε

Exercise 606.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes c, \rtimes\rtimes cb, \rtimes\rtimes ae, \rtimes ae\ltimes, \rtimes cbb, addb, aead, bbca, bcae, caea, cbbc, ddbd, eadd, dbd\ltimes, ae\ltimes, bd\ltimes\ltimes, d\ltimes\ltimes\ltimes, e\ltimes\ltimes\ltimes\}$

1. a
2. deeaabc
3. bebebb
4. cdbcbabeed

Exercise 607.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes d, \rtimes\rtimes\rtimes c, \rtimes\rtimes c\ltimes, \rtimes\rtimes da, \rtimes dae, \rtimes c\ltimes\ltimes, aeeb, daee, eebe, ebe\ltimes, be\ltimes\ltimes, c\ltimes\ltimes\ltimes, e\ltimes\ltimes\ltimes\}$

1. deeb
2. ε
3. dceaac
4. c

Exercise 608.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{acc, ada, bbd, cba, ccb, dab, ddb, ddc\}$

1. cabca
2. c
3. ε
4. cadbc

Exercise 609.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ac, ba, cb, a\ltimes\}$

1. aa
2. adaaac
3. ε
4. a

Exercise 610.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aca, acb, bac, bca, cac, cba, cca\}$

1. c
2. bcaacc
3. bbbbcba
4. ε

Exercise 611.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes aa, \rtimes \rtimes ba, \rtimes bab, \rtimes aac, \rtimes \ltimes \ltimes\ltimes, abca, babc, bcac, cacb, acb\ltimes, aac\ltimes, ac \ltimes \ltimes, cb \ltimes \ltimes, c \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. ε
2. aac
3. aca
4. a

Exercise 612.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abb, aca, baa, bcc, cba, cbc\}$

1. cb
2. cbcbca
3. cca
4. bb

Exercise 613.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, aabb, bacb, bccb, bccc, caaa, cacb, cbca\}$

1. accbc
2. abbb
3. aab
4. bacbca

Exercise 614.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, bba, bcb, caa, cba\}$

1. bcbcb
2. cb
3. ac
4. bbac

Exercise 615.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, aa, ab, ac, ba, bc, ca, cb, c\ltimes\}$

1. baabaccabac
2. aac
3. abc
4. ac

Exercise 616.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes a, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes ac, \rtimes cd, aad, ada, cdd, daa, dad, dda, ac\ltimes, da\ltimes, a\ltimes\ltimes, c\ltimes\ltimes\}$

1. adbcccbaa
2. ac
3. cccbbbcd
4. ε

Exercise 617.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aac, abb, acb, bbb, bca, caa, cac, cbc\}$

1. cbbb
2. ε
3. acbccccb
4. abccb

Exercise 618.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, ab, ba, bb, bc, cb, cc, a\ltimes\}$

1. aacbaba
2. bbb
3. bcaca
4. acbbabbb

Exercise 619.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes e, \rtimes \rtimes ea, \rtimes ead, adbc, dbcb, eadb, bcb\ltimes, cb \ltimes \ltimes, b \ltimes \ltimes\ltimes\}$

1. a
2. ε
3. c
4. dcdcbd

Exercise 620.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes d, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes db, aea, aeb, bea, dbe, eae, eba, ba\ltimes, a \ltimes \ltimes\}$

1. ε
2. dadbbb
3. dbeaeba
4. c

Exercise 621.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes b \ltimes, \rtimes \rtimes ad, \rtimes b \ltimes \ltimes, \rtimes adc, adcd, cbdb, cdcb, dcbd, dcdc, bdb \ltimes, db \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. ε
2. bad
3. acbccb
4. c

Exercise 622.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ad, ba, bc, cc, ec, ee\}$

1. ε
2. e
3. eaccb
4. bcba

Exercise 623.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes e, \rtimes \rtimes d, \rtimes \rtimes \ltimes, \rtimes eb, \rtimes \ltimes \ltimes, \rtimes d \ltimes, bed, cde, dcd, ebe, edc, de \ltimes, e \ltimes \ltimes, d \ltimes \ltimes\}$

1. acd
2. ccdc
3. eacbdab
4. dcebc

Exercise 624.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ad, db, dd\}$

1. ε
2. dc
3. da
4. caa

Exercise 625.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes b, \rtimes\rtimes cb, \rtimes\rtimes bd, \rtimes bde, \rtimes cba, aace, aced, bdec, cdda, cedb, daac, ddaa, decd, ecdd, edb\ltimes, db\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. dbdeaab
2. ε
3. cba
4. ebeae

Exercise 626.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes ba, aab, abb, baa, bbc, bc\ltimes, c\ltimes\ltimes\}$

1. aaaac
2. bba
3. bbc
4. ε

Exercise 627.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, bebe, cbee, ddba, debe\}$

1. cbeeeb
2. ccdaa
3. e
4. ε

Exercise 628.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes a\ltimes, \rtimes\ltimes\ltimes, \rtimes bb, \rtimes aa, aaa, aab, aba, abb, baa, bab, bba, bb\ltimes, ba\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. ε
2. bb
3. abbaabbbaaa
4. bbaaaaba

Exercise 629.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes ca, \rtimes \rtimes b\ltimes, \rtimes \rtimes ad, \rtimes ad\ltimes, \rtimes caa, \rtimes b \ltimes \ltimes, aaac, aaca, acaa, caaa, caac, aac\ltimes, ac \ltimes \ltimes, ad \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. baa
2. a
3. b
4. ad

Exercise 630.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, ab, bc, ca, cb, cc, a\ltimes\}$

1. ccabcaac
2. ε
3. baaaab
4. abcaacbb

Exercise 631.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes d, \rtimes\rtimes dc, \rtimes\rtimes ab, \rtimes abb, \rtimes dcc, abbc, adee, bbca, bcad, becd, cade, deeb, ebec, eebe, ecd\ltimes \ltimes, cc \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes\}$

1. dcc
2. eceddede
3. ceaadadb
4. a

Exercise 632.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{adcb, bbcb, bcca, caaa, caad, cbbc, dbad, dbba\}$

1. a
2. dadcdc
3. dabccbabacc
4. dacbdbdbac

Exercise 633.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ad, bb, bc, cc, cd, db, dd\}$

1. adaa
2. d
3. abababac
4. bcad

Exercise 634.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes aa, \rtimes \rtimes ab, \rtimes \rtimes ba, \rtimes aba, \rtimes aab, \rtimes ba\ltimes, aaab, aabb, abbb, baaa, bbaa, bbba, aba\ltimes, bba\ltimes, ba \ltimes \ltimes, a \ltimes \ltimes\ltimes\}$

1. aaaaabaaabab
2. bbabaaab
3. ba
4. bb

Exercise 635.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes d, \rtimes dd, abd, adb, bbc, bda, dab, dad, dbb, dda, ddd, bc\ltimes, c \ltimes \ltimes\}$

1. aabccbcebaa
2. ddadbbc
3. ddddadbbc
4. dddadbbc

Exercise 636.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes e, bc, cd, db, ed, ee, d\ltimes\}$

1. bdc
2. eadbc
3. dedbbb
4. caaa

Exercise 637.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, ac, ad, be, ce, da, db, ed, ee, e\ltimes, a\ltimes\}$

1. ε
2. eebae
3. acab
4. bdecd

Exercise 638.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes ab, \rtimes \rtimes be, \rtimes \rtimes ae, \rtimes aba, \rtimes be\ltimes, \rtimes aed, aedb, bddc, cadc, dbdd, dcad, ddca, edbd, adc\ltimes, aba\ltimes, dc\ltimes \ltimes, ba \ltimes \ltimes, be \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes, e \ltimes \ltimes\ltimes\}$

1. ab
2. be
3. da
4. decd

Exercise 639.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aee, ced, dca, dda, dea, ded, ead\}$

1. dbccce
2. ε
3. b
4. e

Exercise 640.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes cc, abc, acc, bca, cab, cac, cca, cc\ltimes, c \ltimes \ltimes\}$

1. ba
2. ccbc
3. ε
4. bccba

Exercise 641.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes cb, \rtimes \rtimes cc, \rtimes cca, \rtimes cbb, bbcc, bccc, cbbc, cccc, ccc\ltimes, cca\ltimes, cc \ltimes \ltimes, ca \ltimes \ltimes, a \ltimes \ltimes\ltimes, c \ltimes \ltimes\ltimes\}$

1. cca
2. ab
3. bac
4. cbbccc

Exercise 642.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \rtimes e, \rtimes \rtimes ea, \rtimes \rtimes ed, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes a\ltimes, \rtimes ead, \rtimes a \ltimes \ltimes, \rtimes\ltimes\ltimes\ltimes, \rtimes ede, decd, ecdd, edec, cdd\ltimes, ead\ltimes, ad\ltimes\ltimes, dd\ltimes\ltimes, d\ltimes\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. e
2. a
3. dd
4. ε

Exercise 643.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acaa, acca, baab, baac, bacb, bcac, caaa, cccc\}$

1. b
2. a
3. baabcaacc
4. ε

Exercise 644.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaba, abaa, abab, babb, bbaa, bbab, bbbb\}$

1. abbba
2. aba
3. ε
4. ba

Exercise 645.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acdc, adec, bbcd, bdda, ccbb, eaca, ecba, eeca\}$

1. e
2. bdecdbabdb
3. baeeeedae
4. ε

Exercise 646.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ba, bb, bd, ca, cc, da, dc\}$

1. caccab
2. cacacdccbcd
3. addbaccbb
4. dcabcdcdca

Exercise 647.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aba, abb, baa, bab, bba, bbb\}$

1. b
2. aaaabbbbaaba
3. a
4. ε

Exercise 648.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes d, aa, ae, bd, db, de, ea, ed, ee, e\ltimes, d\ltimes\}$

1. eabdaab
2. cd
3. aa
4. aebbc

Exercise 649.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{acd, baa, cba, dec, ece\}$

1. ε
2. e
3. ed
4. b

Exercise 650.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ae, bb, ca, cd, ec\}$

1. e
2. b
3. ε
4. aaea

Exercise 651.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes d, \rtimes\rtimes b, \rtimes cb, \rtimes db, \rtimes b\ltimes, aad, adb, adc, bdc, caa, cad, dbc, dbd, dca, cb\ltimes, bc\ltimes, c\ltimes \ltimes, b \ltimes \ltimes\}$

1. b
2. cb
3. dbc
4. cdacaadbc

Exercise 652.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes e, \rtimes \rtimes ea, \rtimes \rtimes c\ltimes, \rtimes \rtimes bd, \rtimes \rtimes ec, \rtimes ece, \rtimes ea\ltimes, \rtimes bde, \rtimes c \ltimes \ltimes, aabd, abdc, bdcc, ccdb, ceaa, dccd, eaab, ecea, cdb\ltimes, bde\ltimes, db \ltimes \ltimes, de \ltimes \ltimes, ea \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes, e \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. c
2. ebdede
3. ecdccaeeebe

4. ea

Exercise 653.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, ab, ba, bc, ca, cb, cc, a\ltimes\}$

1. bca
2. ε
3. ccbaacacca
4. ba

Exercise 654.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{bacd, badd, bbda, cbcc, cdca, dbcd, ddac\}$

1. ε
2. bb
3. ddbbbccad
4. bcaaa

Exercise 655.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abb, aca, bac, cba, cbb, cca, ccc\}$

1. bbcaaaabcb
2. cbbbcbbb
3. ca
4. bcccaaa

Exercise 656.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, abb, abc, aca, bbc, cac, ccc\}$

1. b
2. accb
3. a
4. ε

Exercise 657.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes bc, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes cc, \rtimes cca, \rtimes bc\ltimes, \rtimes \ltimes \ltimes\ltimes, aacc, accb, bbaa, caac, cbba, ccaa, ccbb, baa\ltimes, aa \ltimes \ltimes, bc \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. c
2. accbcacb
3. aaaab
4. ε

Exercise 658.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, abba, abbb, bbba\}$

1. abbaa
2. ε
3. a
4. b

Exercise 659.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, bab, bba, bbb\}$

1. aa
2. baa
3. ε
4. b

Exercise 660.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, bc, ca, cc, b\ltimes\}$

1. ε
2. ca
3. b
4. a

Exercise 661.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes c, ab, bc, ca, cc, b\ltimes\}$

1. bbaccb
2. bc
3. acabc
4. bcab

Exercise 662.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes a\ltimes, \rtimes ab, aab, aba, abb, baa, bab, bb\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. aaaab
2. bbba
3. bbbabbbb
4. bbbbaa

Exercise 663.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, baa, bab, bba, bbb\}$

1. a
2. aaaa
3. ε
4. b

Exercise 664.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, bc, ea, ec\}$

1. dcaccbece
2. ε
3. eebdcbdbbbec
4. ec

Exercise 665.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{badb, bccc, bebc, cabe, deda, dedb, deed, eabd\}$

1. e
2. dd
3. ceaa
4. ε

Exercise 666.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abcc, abcd, cdbd, ddbc\}$

1. b
2. ε
3. ccbddca
4. dbdbda

Exercise 667.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acbc, bbba, bbca, bcac, caab, cccb\}$

1. cba
2. b
3. ε
4. abb

Exercise 668.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes \ltimes, \rtimes \rtimes b, \rtimes cb, \rtimes c\ltimes, \rtimes \ltimes \ltimes, \rtimes ba, aac, abc, aca, bab, bcc, caa, cab, cca, cb\ltimes, ab\ltimes, c \ltimes \ltimes, b \ltimes \ltimes\}$

1. c
2. ε
3. abccbbcab
4. cb

Exercise 669.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes a, \rtimes a \ltimes, \rtimes cc, acd, add, bad, cce, cdb, ceb, dac, dda, eba, db \ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. ε
2. bccedcbb
3. eeecddc
4. d

Exercise 670.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abbb, accb, cbbb, ccaa, ccba, cccc\}$

1. b
2. a
3. bbab
4. ε

Exercise 671.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes \ltimes, \rtimes \rtimes b, \rtimes \rtimes d, \rtimes \ltimes \ltimes, \rtimes d \ltimes, \rtimes ba, aac, acc, baa, bcc, cbc, ccb, ccc, cb \ltimes, b \ltimes \ltimes, d \ltimes \ltimes\}$

1. bbca
2. d
3. ccbcd
4. ε

Exercise 672.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes \ltimes, \rtimes c, ac, bb, bd, ca, cb, cc, d \ltimes\}$

1. cabbdbd
2. bad
3. ε
4. cbd

Exercise 673.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, aa, ac, bc, ca, a\ltimes\}$

1. bca
2. bcaa
3. bcaaa
4. cbaa

Exercise 674.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aabd, aadc, adda, caaa, caba, cada, dbcb\}$

1. b
2. a
3. bcbdcdcd
4. ε

Exercise 675.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ba, bb, bc, cc\}$

1. accbabacb
2. baaa
3. accb
4. acbabbac

Exercise 676.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acac, babe, bdee, cabd, cacd, cbae, ccbe, edcb\}$

1. adce
2. de
3. bdbabe
4. cdbc

Exercise 677.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ba, bb, bc, cc\}$

1. cbbaccc
2. bbaaccb
3. ε
4. ccbb

Exercise 678.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes c, aa, ab, ac, ba, bb, bc, ca, a\ltimes\}$

1. caa
2. ε
3. cabac
4. ca

Exercise 679.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ba, bb, b\ltimes\}$

1. ab
2. aaab
3. ε
4. aab

Exercise 680.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aabd, adda, cdaa, cdba, cdca\}$

1. ε
2. aa
3. bdbbbcabcbbd
4. abbacc

Exercise 681.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes bb, abb, abc, bab, bba, bbb, bbc, bca, bcb, cab, cb\ltimes, b\ltimes\ltimes\}$

1. bbcb
2. b
3. accbbab
4. ε

Exercise 682.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes d, ac, ad, cc, ce, dd, ea, d\ltimes\}$

1. cbad
2. ε
3. bdcaeac
4. d

Exercise 683.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aba, abb, baa, bab\}$

1. aaa
2. ε
3. b
4. a

Exercise 684.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes ac, \rtimes aca, acac, acba, cacb, cba\ltimes, ba\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. c
2. cbccb
3. baa
4. acccab

Exercise 685.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aba, abb, baa, bab, bbb\}$

1. ε
2. baab
3. aa
4. abab

Exercise 686.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, abaa, abab, abbb, baaa, bbaa, bbba\}$

1. bbaaababa
2. ε
3. b
4. bbbbbb

Exercise 687.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, aba, abb, acb, bdc, cdb\}$

1. bc
2. adcbb
3. abcd
4. dbdbac

Exercise 688.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, bab, bba, bbb\}$

1. babaaab
2. ε
3. bababab
4. babbbabb

Exercise 689.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{adab, bdca, dccb, eaec\}$

1. e
2. ε
3. ceaaecbccbea
4. b

Exercise 690.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes e, ac, ae, ca, cd, da, ec, ee, c\ltimes\}$

1. ε
2. bbdbd
3. edbbded
4. acecdddbc

Exercise 691.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aca, baa, bac, bbb, caa, ccb\}$

1. bacbb
2. bcaabbacabc
3. ε
4. ca

Exercise 692.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ba, bb, b\ltimes\}$

1. abbaba
2. aab
3. ε
4. ab

Exercise 693.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes b, \rtimes\rtimes ac, \rtimes\rtimes b\ltimes, \rtimes b\ltimes\ltimes, \rtimes acb, acbb, bbca, cbbc, bca\ltimes, ca\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. aa
2. b
3. bbb
4. c

Exercise 694.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aba, baa, bdd, cba, ddc\}$

1. b
2. cbdabbcdbbdc
3. dbdbacbaca
4. ε

Exercise 695.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abbb, bbee, cada, caea, dcda, ddec, dece, ebee\}$

1. e
2. ε
3. aeadeaa
4. ba

Exercise 696.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abb, adc, add, bbc, cdd, dba, eed\}$

1. edeedd
2. ε
3. dac
4. cbbac

Exercise 697.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acbc, baad, bbcd, ccaa, ddad\}$

1. ε
2. bd
3. a
4. b

Exercise 698.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes e, \rtimes\rtimes a, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes e\ltimes, \rtimes ab, abb, add, bad, bbd, bdb, beb, dbe, ddb, eba, db\ltimes, b\ltimes\ltimes, e\ltimes\ltimes\}$

1. eeebc
2. cbbeee
3. aabcbddbca
4. cecd

Exercise 699.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, ba, bb, b\ltimes\}$

1. ε
2. aabbbaa
3. bababbbaabab
4. aaabbabbab

Exercise 700.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes d, \rtimes\ \rtimes\ db, \rtimes\ \rtimes\ dd, \rtimes\ \rtimes\ b\ltimes, \rtimes ddb, \rtimes db\ltimes, \rtimes dbb, \rtimes b\ \ltimes\ltimes, aaab, aabd, abdc, baaa, bbaa, bbba, dbbb, ddbb, dbb\ltimes, bdc\ltimes, dc\ \ltimes\ \ltimes, db\ \ltimes\ltimes, bb\ltimes\ltimes, c\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. ababcb
2. dcd
3. bbccbaddbc
4. dcdcccaadab

Exercise 701.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes\rtimes d, \rtimes\rtimes dc, \rtimes\rtimes ca, \rtimes\rtimes\ltimes\ltimes, \rtimes\rtimes a\ltimes, \rtimes dca, \rtimes a\ltimes \ltimes, \rtimes cad, \rtimes \ltimes \ltimes\ltimes, adcd, caaa, cadc, cdca, dcaa, dcad, dcdc, aaa\ltimes, cad\ltimes, ad \ltimes \ltimes, aa \ltimes \ltimes, d \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. bbd
2. acbbabcb
3. cbcb
4. a

Exercise 702.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ba, bb\}$

1. bbabbaa
2. ba
3. abbbbab
4. aaaa

Exercise 703.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, bba, bca, bcc, cac\}$

1. bb
2. ε
3. bbbbbbb
4. cccaba

Exercise 704.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes be, ace, bac, beb, bee, eba, ebe, eeb, ce\ltimes, e \ltimes \ltimes\}$

1. cccabbd
2. ccaecbea
3. d
4. a

Exercise 705.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abcc, adad, badd, bbdb, bddb, ccda, dbcb\}$

1. dddb
2. dbbcb
3. dbd
4. ddbcbddba

Exercise 706.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, ab, ba, ca, cc, ce, ec, a\ltimes\}$

1. eada
2. dcbbda
3. cca
4. ca

Exercise 707.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes d, \rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes dd, \rtimes \rtimes ab, \rtimes \rtimes b\ltimes, \rtimes ddb, \rtimes abd, \rtimes b \ltimes \ltimes, bbbb, dbbb, ddbb, abd\ltimes, bbb\ltimes, bd \ltimes \ltimes, bb \ltimes \ltimes, d \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. ε
2. bbca
3. cc
4. dcadbd

Exercise 708.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aba, baa, bab, bba\}$

1. a
2. b
3. bb
4. ε

Exercise 709.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes d, \rtimes d \ltimes, \rtimes da, acb, adc, bdd, cbd, dac, dad, dcd, dda, cd \ltimes, d \ltimes \ltimes\}$

1. d
2. baabad
3. dadcd
4. acbcacbcbd

Exercise 710.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aace, abdd, cabe, cbdd, ccda, eddb, eecd\}$

1. ecaadd
2. e
3. ε
4. b

Exercise 711.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes ab, \rtimes \rtimes bb, \rtimes \rtimes b \ltimes, \rtimes \rtimes ba, \rtimes baa, \rtimes bba, \rtimes ab \ltimes, \rtimes b \ltimes \ltimes, aaba, abab, abbb, baab, babb, bbaa, bbba, baa \ltimes, bba \ltimes, ba \ltimes \ltimes, ab \ltimes \ltimes, aa \ltimes \ltimes, a \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. ab
2. baa
3. bba
4. b

Exercise 712.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{bddd, bedc, cbea, cdce, ebca, ecab\}$

1. ε
2. becaae
3. bcebadc
4. e

Exercise 713.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ad, ca, cb, cd\}$

1. ddb
2. adaabdda
3. c
4. ε

Exercise 714.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes e, \rtimes \rtimes e \ltimes, \rtimes \rtimes ea, \rtimes \rtimes be, \rtimes \rtimes ba, \rtimes e \ltimes \ltimes, \rtimes bea, \rtimes eaa, \rtimes ba \ltimes, abac, aeab, beae, eaba, eaea, eaa \ltimes, bac \ltimes, ba \ltimes \ltimes, ac \ltimes \ltimes, aa \ltimes \ltimes, c \ltimes \ltimes \ltimes, a \ltimes \ltimes \ltimes, e \ltimes \ltimes \ltimes\}$

1. eaa
2. ba
3. e
4. accadead

Exercise 715.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{bbba, bbbb, bcdd, cbac, dacb\}$

1. bacaaac
2. bcdcdba
3. cbcdaabc
4. ε

Exercise 716.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, ca, ce, dc, ec, ed, ee, a \ltimes\}$

1. b
2. cdaa
3. ddd
4. ca

Exercise 717.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes e, \rtimes \rtimes ae, \rtimes \rtimes e\ltimes, \rtimes aeb, \rtimes e \ltimes \ltimes, aebb, bbeb, bebe, ebbe, ebe\ltimes, be \ltimes \ltimes, e \ltimes \ltimes\ltimes\}$

1. edadaea
2. a
3. edb
4. aa

Exercise 718.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aadd, abba, addb, bacb, cbec, cdcb\}$

1. b
2. e
3. ε
4. ce

Exercise 719.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes d, \rtimes \rtimes b, \rtimes dd, \rtimes ba, bac, cdb, dba, dcd, ddc, ac\ltimes, ba\ltimes, c \ltimes \ltimes, a \ltimes \ltimes\}$

1. ba
2. bbbadab
3. babdaab
4. bac

Exercise 720.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, ac, ba, bb, ca, cb, b\ltimes\}$

1. cabc
2. ε
3. ccaabbb
4. c

Exercise 721.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ca, cd, eb\}$

1. e
2. ddede
3. ε
4. eeecbad

Exercise 722.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, bc, be, ca, cc, da, db, dc\}$

1. bdcaec
2. ε
3. bdabdb
4. cbccbc

Exercise 723.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bbb, bcb, bce, bed, cea, daa, dbc\}$

1. dcedc
2. ε
3. e
4. d

Exercise 724.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, baa, bab, bbb\}$

1. ε
2. b
3. a
4. ababa

Exercise 725.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes ab, \rtimes b\ltimes, \rtimes ba, abb, bab, bba, ab\ltimes, b \ltimes \ltimes\}$

1. a
2. ε
3. abb
4. bbbaab

Exercise 726.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, baa, bab, bba, bbb\}$

1. abaaa
2. aaaaa
3. aaaaabaaa
4. bbbbbb

Exercise 727.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aacd, abad, acbb, cade, cdee, ddad, edac\}$

1. ε
2. edceee
3. ce
4. acacae

Exercise 728.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes b, \rtimes cd, \rtimes bd, ace, bda, ced, dac, dcb, edc, cd\ltimes, cb\ltimes, b \ltimes \ltimes, d \ltimes \ltimes\}$

1. abadad
2. becba
3. dbdedca
4. dbb

Exercise 729.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes b, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes bc, \rtimes\rtimes c\ltimes, \rtimes\rtimes\ltimes\ltimes, \rtimes\rtimes ba, \rtimes baa, \rtimes bca, \rtimes c\ltimes \ltimes, \rtimes\ltimes\ltimes\ltimes, aabb, abbb, baab, bca\ltimes, bbb\ltimes, ca\ltimes\ltimes, bb\ltimes\ltimes, c\ltimes\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes \ltimes\ltimes\}$

1. ε
2. aac
3. c
4. bca

Exercise 730.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaab, abab, abba, abbb, baaa, babb, bbbb\}$

1. b
2. ε
3. a
4. abbb

Exercise 731.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, ba, bb, b\ltimes\}$

1. ε
2. abbbaa
3. bbabaa
4. aabbbbbaaaaa

Exercise 732.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, bb, bc, cb, c\ltimes\}$

1. ε
2. b
3. a
4. ab

Exercise 733.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{acc, bdc, cbd, ccc, daa, dab, dcd, ddc\}$

1. ε
2. bacbbc
3. b
4. dcaabda

Exercise 734.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes d, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes d\ltimes, \rtimes dc, \rtimes bc, bcc, cce, ced, edb, dc\ltimes, db\ltimes, b\ltimes\ltimes, d\ltimes\ltimes, c\ltimes\ltimes\}$

1. ebd
2. dc
3. d
4. ε

Exercise 735.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes b\ltimes, \rtimes aa, aaa, aab, aba, abb, baa, bab, bb\ltimes, b\ltimes\ltimes\}$

1. ε
2. aaababab
3. bbbab
4. b

Exercise 736.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, cb, cc\}$

1. b
2. ε
3. aba
4. bcacb

Exercise 737.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes a \ltimes, \rtimes bb, aab, abb, baa, bab, bba, bb \ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. bbbbba
2. aaba
3. a
4. bb

Exercise 738.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, ba, bb, da\}$

1. a
2. b
3. bcc
4. ε

Exercise 739.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes ab, \rtimes \rtimes b \ltimes, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes aa, \rtimes aaa, \rtimes abb, \rtimes ab \ltimes, \rtimes \ltimes \ltimes \ltimes, \rtimes b \ltimes \ltimes, aaaa, aaab, aaba, abaa, baaa, aaa \ltimes, abb \ltimes, ab \ltimes \ltimes, aa \ltimes \ltimes, bb \ltimes \ltimes, a \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. b
2. ab
3. bab
4. ε

Exercise 740.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes \ltimes, \rtimes d, aa, ac, ae, bc, ca, cb, ce, dc, dd, ea, eb, b \ltimes\}$

1. eecbbdbdb
2. ccc
3. cbdbead
4. dcbebca

Exercise 741.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes a \ltimes, \rtimes \rtimes ba, \rtimes a \ltimes \ltimes, \rtimes baa, aabc, abcb, baab, bcba, cba \ltimes, ba \ltimes \ltimes, a \ltimes \ltimes \ltimes\}$

1. ε
2. caaaba
3. a
4. bac

Exercise 742.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes \ltimes, \rtimes b, \rtimes c, ad, bb, bc, ca, cd, db, dc, dd, c \ltimes\}$

1. ε
2. dbb
3. bdaabddcca
4. ccabbacbcd

Exercise 743.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes \ltimes, \rtimes \rtimes c, \rtimes \rtimes a, \rtimes a \ltimes, \rtimes cb, \rtimes \ltimes \ltimes, \rtimes ac, aca, bac, bba, cbb, ac \ltimes, ca \ltimes, a \ltimes \ltimes, c \ltimes \ltimes\}$

1. ε
2. ddcd
3. daada
4. ca

Exercise 744.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{baaa, bbcb, bccb, bdaa, cdab, cdcd, ddbd, dddc\}$

1. dbcc
2. ε
3. cabda
4. adcdda

Exercise 745.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes d, \rtimes \rtimes cb, \rtimes \rtimes da, \rtimes \rtimes b\ltimes, \rtimes dad, \rtimes cb\ltimes, \rtimes b \ltimes \ltimes, aaab, aaba, abaa, adca, baaa, caab, dadc, dcaa, aab\ltimes, ab \ltimes \ltimes, cb \ltimes \ltimes, b \ltimes \ltimes\ltimes\}$

1. caaddaccada
2. cb
3. b
4. dadcaab

Exercise 746.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aabb, abba, baaa, bbbb\}$

1. babab
2. b
3. bbb
4. ε

Exercise 747.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, ba, b\ltimes\}$

1. b
2. abbabb
3. ababab
4. ε

Exercise 748.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes b, \rtimes c\ltimes, \rtimes bc, aac, acb, baa, bca, bcb, cba, cbc, bc\ltimes, ca\ltimes, c\ltimes\ltimes, a\ltimes \ltimes\}$

1. ca
2. aabbc
3. baa
4. ε

Exercise 749.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, abba, baab, babb, bbaa, bbab, bbba\}$

1. baaaaaaaba
2. bababbbba
3. ba
4. aabbb

Exercise 750.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, aa, ab, ba, bb, a\ltimes\}$

1. abab
2. aabbaba
3. bb
4. aa

Exercise 751.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes db, \rtimes \rtimes cb, \rtimes \rtimes \ltimes\ltimes, \rtimes dbc, \rtimes cb\ltimes, \rtimes \ltimes \ltimes\ltimes, abad, acab, adac, bada, bcda, cdab, daba, daca, dbcd, cab\ltimes, ab \ltimes \ltimes, cb \ltimes \ltimes, b \ltimes \ltimes\ltimes\}$

1. a
2. cb
3. ε
4. bc

Exercise 752.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aacc, bbcc, cbac, cbcb\}$

1. aa
2. bc
3. ba
4. bbbac

Exercise 753.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ac, ba, db, dc\}$

1. b
2. ε
3. aaaba
4. bdb

Exercise 754.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ca, dd, ee\}$

1. cc
2. adaaeab
3. e
4. ε

Exercise 755.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes d, bc, bd, cd, db, de, ea, eb, ed, a\ltimes\}$

1. dea
2. ecdbedacba
3. bedcdcdbdd
4. beecaceda

Exercise 756.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes e, \rtimes \rtimes a, \rtimes eb, \rtimes aa, aac, acd, bba, cdb, dbb, eb\ltimes, ba\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. c
2. eeeb
3. dddbb
4. ddeda

Exercise 757.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes ab, \rtimes \rtimes c\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes aba, \rtimes c \ltimes \ltimes, \rtimes \ltimes \ltimes\ltimes, aacc, abaa, accb, baac, bbca, bcab, cabc, cbbc, ccbb, abc\ltimes, bc \ltimes \ltimes, c \ltimes \ltimes\ltimes\}$

1. aabcaab
2. c
3. ε
4. cabacaac

Exercise 758.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, ba, ca, cb\}$

1. acc
2. ε
3. a
4. b

Exercise 759.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ac, ad, cb, db, dc, dd\}$

1. bdaad
2. ε
3. b
4. a

Exercise 760.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes a, \rtimes c\ltimes, \rtimes ac, ace, ade, bad, ceb, ded, eba, eda, da\ltimes, a \ltimes \ltimes, c \ltimes \ltimes\}$

1. beee
2. c
3. ecbbbab
4. b

Exercise 761.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes cb, bbc, bcc, cbb, cca, ca\ltimes, a \ltimes \ltimes\}$

1. cbbc
2. c
3. b
4. a

Exercise 762.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ad, ba, bb, bc, db, dd\}$

1. bccabbbd
2. a
3. ε
4. b

Exercise 763.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes db, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes cc, \rtimes \rtimes a\ltimes, \rtimes a \ltimes \ltimes, \rtimes dbb, \rtimes cc\ltimes, \rtimes \ltimes \ltimes\ltimes, aaba, acaa, bbdc, bdca, caab, caca, dbbd, dcac, aba\ltimes, ba \ltimes \ltimes, cc \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. ε
2. abaddeddc
3. dbabdebbbe
4. edcaccde

Exercise 764.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abaa, baba, bbaa, bbba\}$

1. ε
2. ababaaa
3. bbabbb
4. b

Exercise 765.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes b, ab, ac, ba, cb, cc, a\ltimes, b\ltimes\}$

1. ε
2. cab
3. cc
4. cacab

Exercise 766.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ac, ba, bb, bc, ca, cb, cc\}$

1. ε
2. bbba
3. a
4. b

Exercise 767.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes ba, \rtimes aa, acb, bac, bcc, cbc, ccc, ccd, cda, da\ltimes, aa\ltimes, a\ltimes\ltimes\}$

1. c
2. bacbccda
3. ε
4. aa

Exercise 768.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes bb, aab, baa, bba, bbb, ab\ltimes, b \ltimes \ltimes\}$

1. ε
2. ba
3. abba
4. bbaab

Exercise 769.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes b, \rtimes\rtimes bb, \rtimes\rtimes b\ltimes, \rtimes\rtimes aa, \rtimes\rtimes ba, \rtimes aaa, \rtimes bb\ltimes, \rtimes bab, \rtimes b\ltimes \ltimes, abba, babb, bbab, bab\ltimes, aaa\ltimes, ab\ltimes\ltimes, aa\ltimes\ltimes, bb\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. b
2. bb
3. aaa
4. aaaaaaaa

Exercise 770.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ac, bb, cc, cd, da, dc, dd\}$

1. aacdccb
2. ε
3. ccaabdcd
4. b

Exercise 771.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ad, bd, cd, dc, dd\}$

1. b
2. ε
3. dcccaca
4. a

Exercise 772.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, baa, bab, bbb\}$

1. abba
2. b
3. bba
4. ε

Exercise 773.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aba, baa, bbb\}$

1. aa
2. baaabb
3. baabbbaba
4. aab

Exercise 774.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes b, \rtimes cd, \rtimes bd, aab, abc, acd, aea, bca, cae, cda, daa, dac, ea\ltimes, bd\ltimes, d\ltimes\ltimes, a\ltimes\ltimes\}$

1. cdaabcaea
2. daedeeabad
3. bebcdbbbd
4. bd

Exercise 775.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, ab, ad, bc, bd, ca, db, dc, dd, c\ltimes\}$

1. aada
2. cdccdaad
3. ε
4. bdcb

Exercise 776.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes a, \rtimes\ \rtimes\ \rtimes c, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes\ltimes, \rtimes\ \rtimes\ ac, \rtimes\ \rtimes\ \ltimes\ltimes, \rtimes\ \rtimes\ cc, \rtimes\ \rtimes\ ba, \rtimes acc, \rtimes baa, \rtimes cc\ltimes, \rtimes\ltimes\ltimes\ltimes, aabc, abcc, baab, bccb, ccba, acc\ltimes, cba\ltimes, ba\ltimes\ltimes, cc\ltimes\ltimes, c\ltimes\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. acc
2. ε
3. cabacc
4. cc

Exercise 777.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \ \rtimes \ \rtimes a, \rtimes \ \rtimes \ \rtimes b, \rtimes \ \rtimes \ bb, \rtimes \ \rtimes \ a \ltimes, \rtimes \ \rtimes \ ba, \rtimes bab, \rtimes a \ \ltimes \ltimes, \rtimes bb \ltimes, abba, abbb, babb, bbab, bbbb, bbb \ltimes, bb \ltimes \ltimes, a \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. a
2. abbaaa
3. ε
4. babbaabb

Exercise 778.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes b \ltimes, \rtimes ba, \rtimes aa, aab, aba, abb, bab, bbc, bcb, cbc, bc \ltimes, ba \ltimes, b \ltimes \ltimes, a \ltimes \ltimes, c \ltimes \ltimes\}$

1. b
2. bc
3. ba
4. cab

Exercise 779.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, bb, bc\}$

1. ε
2. acccb
3. ba
4. b

Exercise 780.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abc, acd, baa, bdc, dac, dcd\}$

1. b
2. ε
3. bdabddbbd
4. a

Exercise 781.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{bd, cb, eb, ec, ee\}$

1. eecde
2. ε
3. eadaab
4. eaebdebbd

Exercise 782.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, ba, bc, ca, cb\}$

1. ccca
2. acca
3. c
4. acbcb

Exercise 783.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ad, bc, bd, cd, da, dd\}$

1. ddcaddaa
2. cbdadad
3. ε
4. daccacbacd

Exercise 784.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aadb, abbb, adbd, cdac, dcac, dcdb\}$

1. a
2. b
3. ε
4. cadcb

Exercise 785.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, ba, bb, bc, ca, cb\}$

1. cacbba
2. cb
3. ccbbac
4. ε

Exercise 786.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes a, \rtimes a \ltimes, \rtimes cb, \rtimes aa, bcc, bdb, cbd, dbc, cc\ltimes, aa\ltimes, a \ltimes \ltimes, c \ltimes \ltimes\}$

1. aa
2. acc
3. a
4. bcc

Exercise 787.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes cc, \rtimes \rtimes b\ltimes, \rtimes ccb, \rtimes b \ltimes \ltimes, bccb, bccc, cbcc, ccbc, cccb, cccc, ccb\ltimes, cb \ltimes \ltimes, b \ltimes \ltimes\ltimes\}$

1. ccb
2. b
3. acbccacbbbc
4. ccbccb

Exercise 788.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes cb, \rtimes \rtimes ba, \rtimes cbd, \rtimes \ltimes \ltimes\ltimes, \rtimes baa, aaba, abab, baab, cbd\ltimes, bab\ltimes, ab \ltimes \ltimes, bd \ltimes \ltimes, d \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. cbbcbc
2. aac
3. cbd
4. ε

Exercise 789.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes d, aa, ad, da, dd, d\ltimes\}$

1. d
2. ddd
3. bd
4. dd

Exercise 790.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes e, \rtimes\rtimes c, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes e\ltimes, \rtimes ca, aab, abb, abc, baa, bba, bca, cab, cac, ac\ltimes, e\ltimes\ltimes, c\ltimes\ltimes\}$

1. bbabea
2. cbeccbcad
3. aceaae
4. ε

Exercise 791.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes b, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes ab, \rtimes\rtimes b\ltimes, \rtimes\rtimes\ltimes\ltimes, \rtimes aba, \rtimes\ltimes\ltimes\ltimes, \rtimes b\ltimes\ltimes, aaab, aabb, abaa, abbb, baaa, bbaa, bbba, baa\ltimes, aa\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. abaa
2. b
3. ε
4. aabaa

Exercise 792.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes b, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes ab, \rtimes\rtimes bb, \rtimes\rtimes\ltimes\ltimes, \rtimes\rtimes a\ltimes, \rtimes aba, \rtimes a\ltimes\ltimes, \rtimes bba, \rtimes\ltimes\ltimes\ltimes, aaac, aaca, acaa, acca, bacc, bbac, caaa, caca, ccac, aca\ltimes, aba\ltimes, ba\ltimes\ltimes, ca\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. bbaccabca
2. acbccbccbcb

3. ε
4. a

Exercise 793.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes ac, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes ba, \rtimes aca, \rtimes ba\ltimes, \rtimes \ltimes \ltimes\ltimes, aacc, acaa, accc, caac, cccc, ccc\ltimes, ba \ltimes \ltimes, cc \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. baaaa
2. ccaa
3. bccac
4. cab

Exercise 794.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes b, \rtimes\rtimes aa, \rtimes\rtimes bb, \rtimes aab, \rtimes bbb, aaba, abaa, baab, bbb\ltimes, aba\ltimes, ba\ltimes \ltimes, bb \ltimes \ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. a
2. abbbaa
3. abbabba
4. aaabb

Exercise 795.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ba, bb\}$

1. ε
2. a
3. bbbabb
4. abb

Exercise 796.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes bc, \rtimes \rtimes da, \rtimes \rtimes \ltimes\ltimes, \rtimes dad, \rtimes bc\ltimes, \rtimes \ltimes \ltimes\ltimes, adad, adbc, bcda, cdad, dada, dadb, dbcd, dad\ltimes, ad\ltimes\ltimes, bc\ltimes\ltimes, c\ltimes\ltimes\ltimes, d\ltimes \ltimes\ltimes\}$

1. badcc
2. bc
3. ε
4. cbcdad

Exercise 797.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aabc, abab, abba, acab, cabb\}$

1. acacccbab
2. ε
3. cc
4. bacbbccccc

Exercise 798.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ba, bb, ca, cc, ce, db, eb\}$

1. bebecda
2. ε
3. b
4. e

Exercise 799.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes c, ac, ba, bb, ca, cd, db, a\ltimes\}$

1. ddda
2. dbad
3. ε
4. ca

Exercise 800.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes aa, \rtimes aab, aaab, aabb, abba, baaa, bbaa, aab\ltimes, ab\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. aab
2. baa

3. abbbaab
4. abbb

Exercise 801.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{bb, bc, be, ca, cb, ea, eb, ee\}$

1. ε
2. a
3. bacacbc
4. dbcae

Exercise 802.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaca, aacb, abba, abbb, abca, abcb, babc, ccaa\}$

1. ε
2. ac
3. b
4. a

Exercise 803.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aad, ada, baa, bcb, bcc, cab, ccd, dcd\}$

1. aaabddabd
2. ε
3. dbaaa
4. abacd

Exercise 804.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aac, abc, aca, baa, cac, cbb, cbc\}$

1. ε
2. acbcbcbaccb
3. ab
4. bbcca

Exercise 805.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes d, \rtimes cb, \rtimes dc, add, bca, cad, cbc, dcc, ddc, ddd, dc\ltimes, cc\ltimes, c \ltimes \ltimes\}$

1. ddccc
2. dc
3. bbbaaa
4. dcc

Exercise 806.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, bac, bcd, bdc, cca, cdb\}$

1. b
2. ε
3. cadc
4. acacdd

Exercise 807.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes e, \rtimes d, be, de, eb, ed, ee, e\ltimes, d\ltimes\}$

1. ed
2. a
3. d
4. e

Exercise 808.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes c, \rtimes d, ab, ad, ba, bb, bc, cb, da, db, dd, c\ltimes, b\ltimes\}$

1. accaacd
2. cccbbcab
3. b
4. caddad

Exercise 809.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aabb, abba, baab\}$

1. bbababbbabab
2. ba
3. ε
4. aaababaaa

Exercise 810.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{baaa, baeb, bcaa, ccce, ebea\}$

1. bcdddbe
2. de
3. a
4. ε

Exercise 811.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes d, ac, bc, cb, cd, da, dc, dd, b\ltimes\}$

1. bdbdaaa
2. dbbba
3. adddc
4. cca

Exercise 812.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, bba\}$

1. aaababaabb
2. bb
3. bba
4. aaaab

Exercise 813.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{acbb, acec, bcaa, cbad, cead, ebee\}$

1. ε
2. cdebcbb
3. dad
4. eed

Exercise 814.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes ab, \rtimes \rtimes b\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes aba, \rtimes abb, \rtimes \ltimes \ltimes\ltimes, \rtimes b\ltimes\ltimes, aabb, abba, abbb, baab, bbaa, bbba, bbbb, aba\ltimes, bba\ltimes, ba\ltimes\ltimes, a\ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. b
2. ε
3. aaa
4. aba

Exercise 815.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes cb, \rtimes \rtimes bb, \rtimes \rtimes b\ltimes, \rtimes bbc, \rtimes cba, \rtimes b \ltimes \ltimes, aacb, acba, bbca, bcaa, caac, cbab, bab\ltimes, cba\ltimes, ba \ltimes\ltimes, ab \ltimes\ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. ε
2. abc
3. acaccb
4. caaaaca

Exercise 816.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{cabd, cbbc, daeb, eccc\}$

1. deeaaab
2. ε
3. adba

4. ddadbced

Exercise 817.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{adac, cbcd, dacb, dacc, dcaa\}$

1. abcbbbdaad
2. b
3. dbcdddda
4. ε

Exercise 818.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes d, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes da, abc, aca, bcb, bda, cab, cbd, dac, ac\ltimes, c \ltimes \ltimes\}$

1. bdbb
2. bddeecacce
3. ε
4. dac

Exercise 819.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, bb, cc, cd, da, dc\}$

1. bbda
2. a
3. ε
4. b

Exercise 820.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aeed, baae, baea, bdec, caad, ecbd\}$

1. eddc
2. ε
3. deacdaa
4. deddcbdd

Exercise 821.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes aa, aab, aba, abb, baa, bab, bba, aa\ltimes, a \ltimes \ltimes\}$

1. a
2. abbbaaaabb
3. bbbbbaaaa
4. ε

Exercise 822.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes b, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes ab, \rtimes\rtimes\ltimes\ltimes, \rtimes\rtimes a\ltimes, \rtimes\rtimes ba, \rtimes baa, \rtimes aba, \rtimes a\ltimes \ltimes, \rtimes \ltimes \ltimes\ltimes, aaba, abaa, abab, baab, baa\ltimes, bab\ltimes, ab \ltimes \ltimes, aa \ltimes \ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. ε
2. baaa
3. bbaaab
4. aaabaaa

Exercise 823.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, baa, bab, bba, bbb\}$

1. ababa
2. ab
3. abbbaa
4. b

Exercise 824.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, aa, ab, ba, bb, b\ltimes\}$

1. babbb
2. b
3. aaaabb
4. ε

Exercise 825.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aed, bea, cee, dbe, dcd, ded, edd\}$

1. cee
2. baceaa
3. ε
4. ce

Exercise 826.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abba, abcb, acaa, acab\}$

1. b
2. ε
3. a
4. c

Exercise 827.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes c, ab, bb, bc, ca, cb, cc, b\ltimes\}$

1. ε
2. aacbbbcb
3. abbbcb
4. cabbabbb

Exercise 828.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, abab, baba, bbab, bbbb\}$

1. ε
2. bb
3. abaab
4. bbaaaa

Exercise 829.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes cb, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes aa, \rtimes aaa, \rtimes cbc, \rtimes \ltimes \ltimes\ltimes, aaac, aaba, aacb, abaa, acbc, baab, bcaa, caab, cbca, aab\ltimes, cbc\ltimes, ab \ltimes \ltimes, bc \ltimes \ltimes, c \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. ε
2. cbc
3. ccbccb
4. aaa

Exercise 830.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes \ltimes, \rtimes \rtimes c, \rtimes c\ltimes, \rtimes \ltimes \ltimes, \rtimes cc, cab, cca, ccc, ab\ltimes, b \ltimes \ltimes, c \ltimes \ltimes\}$

1. acbbaacacaa
2. ε
3. ca
4. c

Exercise 831.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes db, \rtimes \rtimes bb, \rtimes \rtimes d\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes db\ltimes, \rtimes d \ltimes \ltimes, \rtimes bba, \rtimes \ltimes \ltimes\ltimes, \rtimes bbd, acac, bbdc, bdca, caca, cacc, dcac, acc\ltimes, bba\ltimes, ba \ltimes \ltimes, db \ltimes \ltimes, cc \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. dcbaadd
2. db
3. ε
4. d

Exercise 832.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, aa, ab, ba, bb, a\ltimes\}$

1. bbb
2. ba
3. bba

4. baaab

Exercise 833.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, acbd, cbad, cbcb, ddbc\}$

1. dbcabcdcda
2. ca
3. ccbaabdbd
4. abccbada

Exercise 834.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes b, aa, bb, bc, ca, cc, a\ltimes\}$

1. ε
2. bbbca
3. abb
4. cbbaba

Exercise 835.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ba, bc, cb, db, dd, ee\}$

1. ε
2. bcdcb
3. eeecdedc
4. becb

Exercise 836.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes b, aa, ab, ba, b\ltimes\}$

1. b
2. aba
3. aaab
4. aaabbabaa

Exercise 837.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abbb, cbcd, ccbb, dccc\}$

1. c
2. a
3. b
4. ε

Exercise 838.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes ab, \rtimes \rtimes da, \rtimes \rtimes \ltimes \ltimes, \rtimes aba, \rtimes dac, \rtimes \ltimes \ltimes \ltimes, abac, acac, acdb, baca, cacd, cdb \ltimes, dac \ltimes, db \ltimes \ltimes, ac \ltimes \ltimes, c \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. addd
2. ε
3. dac
4. bdcbbcbd

Exercise 839.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, acac, cbaa, cbcb, ccaa, ccca\}$

1. ccac
2. ccbbc
3. b
4. ε

Exercise 840.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes d, \rtimes \rtimes da, \rtimes dad, abec, adda, adea, beca, cade, dabe, dadd, ddab, ecad, dea \ltimes, ea \ltimes \ltimes, a \ltimes \ltimes \ltimes\}$

1. bbdeb
2. ebcac
3. aee
4. cbada

Exercise 841.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes bc, \rtimes ca, adb, bcc, bda, cad, cca, daa, dbd, aa\ltimes, ca\ltimes, a\ltimes\ltimes\}$

1. abb
2. ε
3. bcca
4. ca

Exercise 842.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, \rtimes d, ac, bb, bc, ca, cb, b\ltimes, d\ltimes\}$

1. da
2. bca
3. ca
4. dbadc

Exercise 843.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes aa, aaa, aab, abb, bbb, bb\ltimes, aa\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. aa
2. aaa
3. abaaaa
4. ba

Exercise 844.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes bc, \rtimes \rtimes c\ltimes, \rtimes \rtimes bb, \rtimes \rtimes cd, \rtimes cdd, \rtimes bbb, \rtimes c \ltimes \ltimes, \rtimes bc\ltimes, cdda, daca, ddac, aca\ltimes, bbb\ltimes, bc \ltimes \ltimes, ca \ltimes \ltimes, bb \ltimes \ltimes, c \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. c
2. abba
3. bb
4. dba

Exercise 845.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes c, aa, ab, ba, bb, bc, ca, cb, cc, b\ltimes\}$

1. dcaaba
2. cb
3. ccb
4. cbb

Exercise 846.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes bb, aaa, abb, baa, bab, bba, bbb, aa\ltimes, a \ltimes \ltimes\}$

1. bbaa
2. b
3. bbaaa
4. bbbaa

Exercise 847.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, aa, ab, ba, bb, bd, db, d\ltimes\}$

1. bd
2. ε
3. cdacaa
4. bbd

Exercise 848.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, bba, bca, bcb, cbb\}$

1. bbac
2. bbc
3. bbccb
4. ε

Exercise 849.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes d, bb, bc, bd, cd, db, dc, dd, c\ltimes\}$

1. cbaaa
2. ε
3. cacda
4. ddcbccdbd

Exercise 850.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes b, aa, ab, ba, a\ltimes, b\ltimes\}$

1. babb
2. a
3. b
4. aa

Exercise 851.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes e, aa, bd, be, db, dd, ea, eb, e\ltimes, a\ltimes\}$

1. ε
2. e
3. ea
4. ddd

Exercise 852.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes\ltimes, \rtimes\ \rtimes\ \rtimes d, \rtimes\ \rtimes\ \ltimes\ltimes, \rtimes\ \rtimes\ d\ltimes, \rtimes\ \rtimes\ da, \rtimes d\ \ltimes\ \ltimes, \rtimes\ \ltimes\ \ltimes\ltimes, \rtimes dad, adcb, adcd, bcad, cadc, cbca, dadc, dcbc, dcd\ltimes, cd\ \ltimes\ \ltimes, d\ \ltimes\ \ltimes\ltimes\}$

1. ccaddcbcc
2. a
3. d
4. ε

Exercise 853.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: {⋊⋊⋉, ⋊⋊a, ⋊⋊b, ⋊aa, ⋊⋉⋉, ⋊b⋉, aaa, aac, ace, adb, bae, bda, ceb, dad, dba, ebd, ae⋉, e⋉⋉, b ⋉ ⋉}

1. daad
2. dcaa
3. ε
4. b

Exercise 854.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: {⋊⋊⋉, ⋊⋊d, ⋊⋊e, ⋊db, ⋊⋉⋉, ⋊ed, bbd, bdc, bee, cde, ceb, dbe, dcd, ebb, ece, eec, ed⋉, de⋉, d⋉⋉, e ⋉ ⋉}

1. ed
2. ε
3. badde
4. eaccecaed

Exercise 855.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: {⋊ ⋊ b, ⋊ ⋊ ⋉, ⋊ ⋉ ⋉, ⋊ba, abb, bab, bba, bbb, bb⋉, b ⋉ ⋉}

1. babb
2. ε
3. babbb
4. aa

Exercise 856.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: {ae, bc, bd, cb, dc}

1. bcbcdba
2. d
3. bceecaabbee
4. ab

Exercise 857.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb, baa, bab, bba, bbb\}$

1. bbbaba
2. bbabbba
3. b
4. ε

Exercise 858.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abd, dae, dbc, eab\}$

1. ε
2. eaaccb
3. bacaecec
4. dabedb

Exercise 859.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bed, cce, cdb, cdd\}$

1. ε
2. be
3. abbaddd
4. cdcd

Exercise 860.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{adbd, badd, bdbd, ccba, dbdb, deab, eacb\}$

1. aa
2. ebce
3. dead
4. ε

Exercise 861.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aaba, baaa, baba, bbaa, bbab, bbba, bbbb\}$

1. babbb
2. ε
3. aaaabbab
4. b

Exercise 862.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes ba, aaa, abc, bab, bca, caa, aa\ltimes, a \ltimes \ltimes\}$

1. aabbaa
2. ccbcaabc
3. bcbbcca
4. ccbab

Exercise 863.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes\ltimes, \rtimes\rtimes c, \rtimes\rtimes d, \rtimes\ltimes\ltimes, \rtimes dc, \rtimes cc, bda, cbd, ccb, ccc, dac, dc\ltimes, ac\ltimes, c\ltimes\ltimes\}$

1. cbabdca
2. dc
3. abdd
4. ε

Exercise 864.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes d, ab, ba, bc, cb, cc, b\ltimes, d\ltimes\}$

1. dbbbabdc
2. d
3. abbbdd
4. ddab

Exercise 865.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aac, ada, cad, dad\}$

1. a
2. baabbaba
3. ε
4. b

Exercise 866.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes aa, \rtimes aad, aadb, abdd, adba, babd, dbab, bdd\ltimes, dd \ltimes \ltimes, d \ltimes \ltimes\ltimes\}$

1. cb
2. aad
3. bbc
4. adcb

Exercise 867.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aeb, bbe, bdb, cad, cba, dcb, eac, edc\}$

1. dabcecbbccbe
2. ε
3. e
4. b

Exercise 868.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ba, bc, ca\}$

1. cbb
2. bb
3. cccbabb
4. ε

Exercise 869.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, abb, baa, bbb\}$

1. bbb
2. aaaaaabba
3. ababaaba
4. bba

Exercise 870.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aba, abb, bba\}$

1. aaaaa
2. b
3. ε
4. babba

Exercise 871.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, abb, bab, bba\}$

1. bb
2. b
3. a
4. ε

Exercise 872.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ba, bb, bd, db, dc, dd\}$

1. abca
2. ε
3. b
4. badbab

Exercise 873.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes \ltimes, \rtimes \rtimes c, \rtimes \ltimes \ltimes, \rtimes cc, cbd, ccb, ccc, bd\ltimes, d \ltimes \ltimes\}$

1. a
2. c
3. ccbd
4. ε

Exercise 874.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aabb, abaa, abab, abbb, baba, babb, bbba\}$

1. bbbab
2. ε
3. abbbb
4. b

Exercise 875.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes cc, aba, abb, bab, bbc, bcc, cab, cba, cca, ccb, ccc, ba\ltimes, a \ltimes \ltimes\}$

1. ccbabccbc
2. ccba
3. ccccabbaaaba
4. cccba

Exercise 876.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abb, ada, add, bdc, cba, dad, dcb\}$

1. ε
2. dbddc
3. b
4. ddc

Exercise 877.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes d, aa, ab, ba, bc, cb, cc, cd, da, a\ltimes\}$

1. ε
2. dbabdcc
3. a
4. aa

Exercise 878.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aaba, abba, baaa, baba, bbab, bbba\}$

1. ε
2. aaab
3. bbbab
4. ababbb

Exercise 879.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes ab, \rtimes bb, aab, aba, abb, baa, bab, bba, bbb, bb\ltimes, ba\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. baabaa
2. ε
3. bbb
4. aabbab

Exercise 880.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes ac, \rtimes ba, aba, abc, bab, bcc, ac\ltimes, cc\ltimes, c\ltimes\ltimes\}$

1. ac
2. bb
3. babcc
4. acbacb

Exercise 881.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes b, \rtimes c\ltimes, \rtimes bc, \rtimes ca, aac, acc, bbb, caa, cbb, ccb, bb\ltimes, bc\ltimes, b\ltimes\ltimes, c\ltimes\ltimes\}$

1. caabcbc
2. c
3. bc
4. aacba

Exercise 882.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, aba, bba, bbb\}$

1. babba
2. ε
3. abaababaa
4. baabbb

Exercise 883.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ad, ca, cc, cd, ed\}$

1. bd
2. cecd
3. abcaeb
4. abdbadad

Exercise 884.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{acc, aeb, aed, bba, cde, ded, edd\}$

1. bdc
2. ε
3. aa
4. e

Exercise 885.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, abcb, acbc, bcac, bcba, cabb, cbbc, ccaa\}$

1. a
2. ac
3. ε
4. b

Exercise 886.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, abab, abba, bbbb, caab, cbac, ccac, ccba\}$

1. bcbbcaccbbcb
2. ab
3. abbbacbbaaa
4. aacbacbbab

Exercise 887.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, ba, bb, bc, cb, cc\}$

1. aca
2. ε
3. b
4. a

Exercise 888.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ad, bb, bc, cb, cd, db, dd\}$

1. aabc
2. bdd
3. ε
4. ccbb

Exercise 889.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaac, aaba, babb, bbba, bcac, bcbc, caaa, ccba\}$

1. aabc
2. b
3. bbbaccaca
4. ε

Exercise 890.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \quad \rtimes \quad \rtimes a, \rtimes \quad \rtimes \quad \rtimes\ltimes, \rtimes \quad \rtimes \quad \ltimes\ltimes, \rtimes \quad \rtimes \quad ab, \rtimes aba, \rtimes \quad \ltimes \ltimes\ltimes, abac, acde, bacd, cdec, decc, eccc, ccc\ltimes, cc \ltimes \ltimes, c \ltimes \ltimes\ltimes\}$

1. adbaebec
2. ε
3. edcedaae
4. b

Exercise 891.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaba, abba, baaa, baba, babb\}$

1. babba
2. b
3. baaabb
4. ε

Exercise 892.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes d, cc, cd, ce, da, dc, dd, ec, a\ltimes\}$

1. abdb
2. dd
3. ε
4. eccdcaadca

Exercise 893.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, accb, bbbb, cadc, cbcd, ccbb, ddcb, dddb\}$

1. cbbb
2. ddcca
3. acb
4. ccdbbcd

Exercise 894.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abc, aca, acb, bab, bbb, bcc, cba, ccb\}$

1. bbcbabcb
2. cbbcabaaca
3. bb
4. baaabb

Exercise 895.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, \rtimes c, ab, ac, ba, bb, bc, cb, cc, c\ltimes, b\ltimes\}$

1. aacbabbbccab
2. bbacbcbbbaa
3. acaaaccabbca
4. bcabcbcc

Exercise 896.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aabb, abaa, abba, baaa, baab, baba, bbaa, bbab\}$

1. ε
2. aaaaba
3. abb
4. abbba

Exercise 897.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes bd, \rtimes \rtimes c\ltimes, \rtimes bdb, \rtimes c \ltimes \ltimes, aaab, aaba, baaa, bbaa, bdbb, dbba, aba\ltimes, ba \ltimes \ltimes, a \ltimes \ltimes\ltimes, c \ltimes \ltimes\ltimes\}$

1. ddcbaaac
2. dbbabc
3. ε
4. c

Exercise 898.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ac, ad, bb, bd, ca, ee\}$

1. b
2. e
3. ε
4. c

Exercise 899.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes e, \rtimes \rtimes ab, \rtimes \rtimes c\ltimes, \rtimes \rtimes ee, \rtimes ee\ltimes, \rtimes aba, \rtimes c \ltimes \ltimes, abac, abdc, acab, baca, bdce, cabd, ceeb, dcee, eeb\ltimes, eb\ltimes\ltimes, ee\ltimes\ltimes, c\ltimes\ltimes\ltimes, e\ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. dbdbc
2. c
3. beba
4. ee

Exercise 900.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes \ltimes, \rtimes \rtimes a, \rtimes \rtimes b, \rtimes cb, \rtimes \ltimes \ltimes, \rtimes b\ltimes, \rtimes ab, aab, abb, aca, bbc, bca, bcb, caa, cac, cba, cbc, ab\ltimes, ba\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. acc
2. cabccacbbcba

3. ε
4. baaabaabaabb

Exercise 901.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, bc, bd, cb, da\}$

1. ε
2. aaa
3. cbad
4. cdbcc

Exercise 902.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes bd, aec, bca, bde, cae, cbc, dcb, ded, ecc, edc, cc\ltimes, c \ltimes \ltimes\}$

1. aaa
2. d
3. ε
4. aebdc

Exercise 903.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes ab, \rtimes \rtimes c\ltimes, \rtimes \rtimes bb, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes cc, \rtimes ccb, \rtimes bbb, \rtimes c \ltimes \ltimes, \rtimes ab\ltimes, \rtimes \ltimes \ltimes\ltimes, accb, bacc, cbac, cbcc, ccba, ccbc, bcc\ltimes, bbb\ltimes, ab \ltimes \ltimes, cc \ltimes \ltimes, bb \ltimes \ltimes, c \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. c
2. ε
3. cbacaacab
4. ab

Exercise 904.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes b, ab, ba, bb, a\ltimes\}$

1. a

2. aaabbabb
3. ε
4. bbbb

Exercise 905.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, addb, aeba, ddcc\}$

1. e
2. ε
3. b
4. a

Exercise 906.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes e, ae, ba, ce, de, eb, ec, ed, ee, c\ltimes, a\ltimes\}$

1. ε
2. bbadbed
3. a
4. beaadcec

Exercise 907.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes e, \rtimes \rtimes d, \rtimes de, \rtimes ee, \rtimes d\ltimes, adb, bdc, ceb, dbd, dce, dea, ead, eb\ltimes, ee\ltimes, b \ltimes \ltimes, e \ltimes \ltimes, d \ltimes \ltimes\}$

1. eec
2. bdcad
3. deddaaae
4. d

Exercise 908.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes b\ltimes, \rtimes bc, aaa, aab, aba, aca, bac, bca, caa, bc\ltimes, aa\ltimes, b\ltimes \ltimes, c \ltimes \ltimes, a \ltimes \ltimes\}$

1. ε

2. baaacabaac
3. b
4. bc

Exercise 909.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes d, \rtimes \rtimes bc, \rtimes \rtimes c\ltimes, \rtimes \rtimes da, \rtimes \rtimes ce, \rtimes ced, \rtimes c \ltimes \ltimes, \rtimes bc\ltimes, \rtimes dac, abcb, acdc, bcbd, cbdb, cdab, cdcd, dabc, dacd, dcda, ced\ltimes, bdb\ltimes, db\ltimes \ltimes, bc \ltimes \ltimes, ed \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. a
2. beeddbbaecb
3. dcc
4. bbcc

Exercise 910.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes d, \rtimes \rtimes \rtimes e, \rtimes \rtimes eb, \rtimes \rtimes dc, \rtimes \rtimes ed, \rtimes ebe, \rtimes dc\ltimes, \rtimes edd, bccd, bedb, ccdc, cdce, ceba, dbcc, dceb, ebed, edbc, eba\ltimes, edd\ltimes, dc\ltimes \ltimes, ba \ltimes \ltimes, dd \ltimes \ltimes, c \ltimes \ltimes\ltimes, d \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes\}$

1. adcaedeeea
2. dc
3. abbccb
4. edd

Exercise 911.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, bbcb, cacb, cbab, ccbb\}$

1. ca
2. ababcab
3. ε
4. b

Exercise 912.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:

G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes e, \rtimes \rtimes e\ltimes, \rtimes \rtimes eb, \rtimes \rtimes ec, \rtimes \rtimes cd, \rtimes eca, \rtimes cda, \rtimes e \ltimes \ltimes, \rtimes eb\ltimes, aede, cdae, daed, deae, eaed, edea, eca\ltimes, aed\ltimes, eb \ltimes \ltimes, ed \ltimes \ltimes, ca \ltimes \ltimes, d \ltimes \ltimes\ltimes, a \ltimes \ltimes\ltimes, e \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. cbcccbbba
2. ddaca
3. ε
4. eadab

Exercise 913.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aabd, abdc, acbb, acbc, adda, ddab\}$

1. baac
2. caaacdcbaba
3. cccbaac
4. ε

Exercise 914.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaca, abad, abca, bacd, daaa\}$

1. dadbdac
2. ε
3. b
4. cbcdc

Exercise 915.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, ae, cb, cc, ce, da\}$

1. cbae
2. bda
3. dcbbeea
4. dba

Exercise 916.
For each one of the strings below say whether it is generated by the following

positive 2-gram grammar:
G^+: $\{\rtimes b, bb, bc, cb, cc, c\ltimes\}$

1. bc
2. bbc
3. bca
4. c

Exercise 917.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes aa, \rtimes\rtimes ab, \rtimes aaa, \rtimes abc, aaac, aaca, acac, cacb, abc\ltimes, acb\ltimes, bc\ltimes \ltimes, cb \ltimes \ltimes, c \ltimes \ltimes\ltimes, b \ltimes \ltimes\ltimes\}$

1. aac
2. acac
3. cbc
4. abc

Exercise 918.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, \rtimes c, aa, ab, ac, ba, bc, ca, cb, a\ltimes, c\ltimes\}$

1. bcabc
2. ε
3. baaaa
4. ccaabc

Exercise 919.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaba, aabb, baba, bbba\}$

1. ab
2. bbaaab
3. b
4. ε

Exercise 920.
For each one of the strings below say whether it is generated by the following

positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes b, \rtimes ba, \rtimes ca, abb, aca, bbb, bbc, bcc, cab, cac, cca, bb\ltimes, ba\ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. bbcbaaa
2. bacbabaa
3. bbcc
4. baacabc

Exercise 921.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aba, baa, bab, bba, bbb\}$

1. aababaaba
2. bab
3. baab
4. ε

Exercise 922.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes c, aa, ab, ac, ba, ca, cb, b\ltimes\}$

1. cbbab
2. c
3. ε
4. a

Exercise 923.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes b, \rtimes \rtimes \ltimes, \rtimes \ltimes \ltimes, \rtimes ba, aaa, aab, aba, abb, baa, bab, bba, ab\ltimes, b \ltimes \ltimes\}$

1. abab
2. bbaaaaaba
3. ε
4. baabba

Exercise 924.
For each one of the strings below say whether it is generated by the following

positive 2-gram grammar:
G^+: $\{\rtimes a, aa, ab, ac, ba, bb, ca, cc, a\ltimes\}$

1. cacc
2. babb
3. acaacabba
4. cc

Exercise 925.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes a, \rtimes\rtimes\rtimes b, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes ba, \rtimes\rtimes b\ltimes, \rtimes\rtimes\ltimes\ltimes, \rtimes\rtimes aa, \rtimes aaa, \rtimes bab, \rtimes\ltimes\ltimes\ltimes, \rtimes b \ltimes \ltimes, aaab, aaba, abab, abba, baba, babb, bbab, bab\ltimes, abb\ltimes, ab \ltimes\ltimes, bb\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. ε
2. b
3. bab
4. bbaabab

Exercise 926.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ac, ba, bb, cc, cd, eb, ee\}$

1. dbaa
2. ε
3. dd
4. a

Exercise 927.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abaa, abba, acab, bccb, cbbb, cbcb, cccc\}$

1. bababc
2. baccacaab
3. ε
4. aaabbabcab

Exercise 928.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aba, abb, baa, bab, bba, bbb\}$

1. a
2. ε
3. abaaa
4. b

Exercise 929.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes ac, \rtimes ba, acb, adc, bca, cad, cbc, dc\ltimes, ba\ltimes, a\ltimes\ltimes, c\ltimes\ltimes\}$

1. cc
2. ba
3. dcacdbb
4. ε

Exercise 930.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes b, \rtimes\rtimes\rtimes\ltimes, \rtimes\rtimes\ltimes\ltimes, \rtimes\rtimes bb, \rtimes\rtimes ba, \rtimes\rtimes b\ltimes, \rtimes b\ltimes\ltimes, \rtimes bba, \rtimes bab, \rtimes\ltimes\ltimes\ltimes, abbb, babb, bbba, bba\ltimes, ba\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. b
2. bba
3. abbab
4. ε

Exercise 931.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes d, bb, bc, cd, db, dc, c\ltimes\}$

1. ca
2. dc
3. dbc
4. bcbbad

Exercise 932.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abac, abbb, acba, baba, babc, bcaa, ccab, ccac\}$

1. ε
2. ccabaac
3. b
4. a

Exercise 933.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{daca, dbeb, ebbc, ebed, ecda\}$

1. cebeee
2. abebdebe
3. eaadd
4. beeeccc

Exercise 934.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ba, bb, b\ltimes\}$

1. b
2. ε
3. aab
4. ab

Exercise 935.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ba, bc, ca, dd\}$

1. bbacacaba
2. cd
3. dcbbbdbbc
4. ε

Exercise 936.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, aa, ab, ba, bb, b\ltimes\}$

1. baa
2. aaaa
3. bbabaaaabaa
4. babaaa

Exercise 937.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes\ltimes, aa, ab, ba, bb, a\ltimes\}$

1. bbab
2. a
3. aa
4. ε

Exercise 938.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\rtimes\rtimes c, \rtimes\rtimes\rtimes b, \rtimes\rtimes cb, \rtimes\rtimes ba, \rtimes baa, \rtimes cbc, \rtimes ba\ltimes, aaab, aaba, abaa, baaa, bcaa, caaa, cbca, baa\ltimes, \ltimes, aa \ltimes \ltimes, a \ltimes \ltimes\ltimes\}$

1. baaa
2. baa
3. ba
4. aabb

Exercise 939.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes\ltimes, \rtimes \rtimes \ltimes\ltimes, \rtimes \rtimes a\ltimes, \rtimes \rtimes ba, \rtimes bab, \rtimes a \ltimes \ltimes, \rtimes \ltimes \ltimes\ltimes, abcb, babc, bacc, bcba, cbac, acc\ltimes, cc \ltimes \ltimes, a \ltimes \ltimes\ltimes, c \ltimes \ltimes\ltimes\}$

1. bcbc
2. ababcc
3. c
4. ε

Exercise 940.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, ab, ba, bb, b\ltimes\}$

1. baa
2. ab
3. babbbb
4. ε

Exercise 941.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes b\ltimes, \rtimes ba, \rtimes aa, aab, abb, baa, bab, bba, ab\ltimes, aa\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. bbabba
2. aab
3. b
4. aa

Exercise 942.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes c, \rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ ba, \rtimes\ \rtimes\ ca, \rtimes\ \rtimes\ b\ltimes, \rtimes cac, \rtimes bab, \rtimes ba\ltimes, \rtimes b\ \ltimes\ltimes, aaca, abaa, baac, baba, aca\ltimes, cac\ltimes, ba\ \ltimes\ltimes, ac\ \ltimes\ltimes, ca\ \ltimes\ltimes, c\ \ltimes\ltimes\ltimes, a\ \ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. b
2. acbc
3. caaca
4. bbac

Exercise 943.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes e, \rtimes\rtimes b, \rtimes e\ltimes, \rtimes bd, aad, aba, add, baa, bde, cda, dab, ddb, dec, ecd, db\ltimes, b\ltimes\ltimes, e\ltimes\ltimes\}$

1. a
2. e
3. ebecaeeedab

4. dceacaaaa

Exercise 944.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aca, bda, cbb, daa, dcb\}$

1. daa
2. ε
3. cbb
4. b

Exercise 945.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes b, aa, ac, ba, bb, bc, cb, cc, a\ltimes, b\ltimes\}$

1. bbccacabbb
2. cabba
3. bbca
4. ccb

Exercise 946.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes\ \rtimes\ \rtimes b, \rtimes\ \rtimes\ \rtimes\ltimes, \rtimes\ \rtimes\ \rtimes d, \rtimes\ \rtimes\ \rtimes e, \rtimes\ \rtimes\ bb, \rtimes\ \rtimes\ ed, \rtimes\ \rtimes\ d\ltimes, \rtimes\ \rtimes\ \ltimes\ltimes, \rtimes ed\ltimes, \rtimes d\ \ltimes\ \ltimes, \rtimes bbc, \rtimes\ \ltimes\ltimes\ltimes, addb, bbca, bcad, beea, cadd, dbee, ddbe, eea\ltimes, ea\ \ltimes\ \ltimes, ed\ \ltimes\ \ltimes, d\ \ltimes\ltimes\ltimes, a\ltimes\ltimes\ltimes\}$

1. ε
2. eabecdd
3. cacba
4. dddaa

Exercise 947.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, aba, acb, bba, cbb\}$

1. cca
2. aabba

3. ε
4. a

Exercise 948.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, aaba, aabb, abba, baab, baba, bbab, bbbb\}$

1. bbabb
2. bbaa
3. bbbbbb
4. a

Exercise 949.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ac, bb, ca, cc, cd\}$

1. cddcbccddd
2. ab
3. bdc
4. bdcbacbacdc

Exercise 950.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, accb, baca, bcba, caca, cacc, ccbc\}$

1. bc
2. ε
3. cac
4. b

Exercise 951.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes a, \rtimes \rtimes b, \rtimes \rtimes \ltimes, \rtimes c \ltimes, \rtimes \ltimes \ltimes, \rtimes bb, \rtimes aa, aab, abb, baa, bba, bb\ltimes, aa\ltimes, b \ltimes \ltimes, a \ltimes \ltimes, c \ltimes \ltimes\}$

1. abbb
2. ε
3. ab

4. babcc

Exercise 952.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes c, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes cc, \rtimes \rtimes ba, \rtimes baa, \rtimes cc \ltimes, \rtimes \ltimes \ltimes \ltimes, aacc, abbc, acca, baac, bbca, bcaa, cabb, ccab, caa \ltimes, cc \ltimes \ltimes, aa \ltimes \ltimes, c \ltimes \ltimes \ltimes, a \ltimes \ltimes \ltimes\}$

1. ε
2. b
3. cbbc
4. abbbaaaa

Exercise 953.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aabb, abaa, abab, abba, baaa, baab, babb\}$

1. aaaba
2. b
3. aaababb
4. baba

Exercise 954.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{adc, bdc, ccb, dbd\}$

1. ε
2. abdab
3. cdcdb
4. dcadacad

Exercise 955.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{ab, bb, bc, ca, cb, da, dd\}$

1. cbbbbd
2. b
3. dbac

4. ε

Exercise 956.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aac, abb, abc, aca, acb, bca, cca\}$

1. ε
2. cc
3. bbaaabcb
4. bbcabbcc

Exercise 957.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{bd, ca, cb, cc, da\}$

1. b
2. ac
3. ε
4. cbc

Exercise 958.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ac, ba, bb, ca, cc\}$

1. ε
2. cc
3. c
4. b

Exercise 959.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes d, aa, ac, ad, ae, ca, ce, da, dc, ed, e\ltimes\}$

1. cddecac
2. aeaccccedbda
3. ddcedbaceae
4. ebedbdcceadc

Exercise 960.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aed, bce, cea, ced\}$

1. e
2. eabddb
3. eeae
4. ε

Exercise 961.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, bba, bbc, bca, bcb, cba, cbc\}$

1. ccc
2. aa
3. ccbbaccaa
4. cb

Exercise 962.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes e, \rtimes \rtimes c, \rtimes cb, \rtimes ee, adb, dad, eda, eed, db\ltimes, cb\ltimes, b \ltimes \ltimes\}$

1. cc
2. ε
3. ee
4. bd

Exercise 963.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ba, bc, bd, cd, db\}$

1. cadccd
2. cdcbdcadb
3. b
4. ε

Exercise 964.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaab, aaba, abab, baab\}$

1. aaab
2. a
3. b
4. ε

Exercise 965.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes c, \rtimes\rtimes\ltimes, \rtimes c\ltimes, \rtimes\ltimes\ltimes, \rtimes ac, \rtimes ab, aca, acb, bca, cab, cac, cbc, ab\ltimes, b\ltimes\ltimes, c\ltimes\ltimes\}$

1. cc
2. bb
3. cabac
4. abbcb

Exercise 966.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ad, bc, bd, da, db, dd\}$

1. b
2. ε
3. ccd
4. a

Exercise 967.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aec, cac, cce, dad\}$

1. a
2. ε
3. d
4. b

Exercise 968.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aba, abb\}$

1. abbbbba
2. abbbaabbabba
3. aaaaabaabab
4. bbbaaabaa

Exercise 969.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes aa, \rtimes \rtimes ab, \rtimes \rtimes b\ltimes, \rtimes b \ltimes \ltimes, \rtimes aaa, \rtimes abb, aaaa, aaab, aaba, abb\ltimes, aba\ltimes, ba\ltimes\ltimes, bb\ltimes\ltimes, a\ltimes\ltimes\ltimes, b\ltimes\ltimes\ltimes\}$

1. bbaaba
2. b
3. ε
4. a

Exercise 970.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, bb, ca, cb\}$

1. cbcbb
2. ε
3. bb
4. abcab

Exercise 971.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aaa, aab, aca, acc, cab\}$

1. bac
2. ε
3. b
4. bc

Exercise 972.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{bbd, ccd, dcc, dda, ddb, ddc\}$

1. b
2. adcacab
3. abcbccb
4. ε

Exercise 973.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abcd, bbdd, bddc, ccac, ddbc\}$

1. bab
2. ccddbb
3. ε
4. dbacbaa

Exercise 974.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes b, \rtimes a \ltimes, \rtimes bb, acc, bac, bba, cab, cca, ab \ltimes, b \ltimes \ltimes, a \ltimes \ltimes\}$

1. cba
2. a
3. bcccbbb
4. bcaacba

Exercise 975.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, \rtimes \ltimes, ab, ac, bc, bd, cb, cd, da, db, dc, c \ltimes\}$

1. dbbaccbcbaac
2. cbcd
3. addaa
4. ccdbd

Exercise 976.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaaa, accc, babb, bbbc, bcab, cacc\}$

1. aac
2. cbcaac
3. abcaac
4. cb

Exercise 977.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, ac, ae, ba, bb, ca, ec, ee, c\ltimes\}$

1. bbac
2. bac
3. baec
4. d

Exercise 978.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes a, ab, ba, bb, a\ltimes\}$

1. abaab
2. b
3. aba
4. a

Exercise 979.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{aaed, adba, beae, ccdb, cddb, ceab\}$

1. d
2. eabcbdcbace
3. ddbceccce
4. ε

Exercise 980.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes\ltimes, \rtimes b, \rtimes c, aa, ac, ba, cb, c\ltimes, b\ltimes\}$

1. acac
2. ε
3. bbbb
4. cbba

Exercise 981.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes a, \rtimes \rtimes d, \rtimes dc, \rtimes ac, acb, bcb, bdc, cbc, cbd, dca, dc\ltimes, ca\ltimes, a \ltimes \ltimes, c \ltimes \ltimes\}$

1. cddaa
2. ba
3. ε
4. dabbbb

Exercise 982.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ac, bb, bc, cb, cc\}$

1. a
2. b
3. ε
4. abba

Exercise 983.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes a\ltimes, \rtimes \rtimes ad, \rtimes a \ltimes \ltimes, \rtimes ade, aade, adea, deaa, eaad, ade\ltimes, de \ltimes \ltimes, a \ltimes \ltimes\ltimes, e \ltimes \ltimes\ltimes\}$

1. ade
2. becccdc
3. a
4. cdee

Exercise 984.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes b, aa, ab, ba, bb, b\ltimes\}$

1. bab
2. ε
3. bb
4. b

Exercise 985.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes\ltimes\ltimes, \rtimes ba, \rtimes bb, aab, aba, abb, baa, bab, bba, bbb, bb\ltimes, aa\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. bbbbbbbb
2. b
3. bbaabaaaba
4. bbbbababaa

Exercise 986.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes\ltimes, \rtimes\rtimes a, \rtimes\rtimes b, \rtimes ac, \rtimes\ltimes\ltimes, \rtimes bc, abb, acb, baa, bab, bba, bbb, bca, cac, cba, aa\ltimes, ac\ltimes, c\ltimes\ltimes, a\ltimes\ltimes\}$

1. bcac
2. ac
3. ε
4. bcbccabc

Exercise 987.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes c, \rtimes\rtimes a, \rtimes a\ltimes, \rtimes ca, ade, bbc, bcc, cad, ccb, dbb, ded, edb, cb\ltimes, b\ltimes\ltimes, a\ltimes\ltimes\}$

1. bb
2. eadda
3. a
4. aaaacd

Exercise 988.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes aa, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes bb, \rtimes aab, \rtimes \ltimes \ltimes \ltimes, \rtimes bb \ltimes, aaba, abaa, baab, aab \ltimes, ab \ltimes \ltimes, bb \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. bb
2. ε
3. aabaa
4. bbba

Exercise 989.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes a, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes \rtimes d, \rtimes \rtimes dd, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes a \ltimes, \rtimes a \ltimes \ltimes, \rtimes ddc, \rtimes \ltimes \ltimes \ltimes, bada, bddb, cbdd, ccbd, dbad, dccb, ddba, ddcc, ada \ltimes, da \ltimes \ltimes, a \ltimes \ltimes \ltimes\}$

1. abdcbbab
2. a
3. abcc
4. ε

Exercise 990.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{aab, abb, abc, acb, baa, bab, bcb, cba\}$

1. ε
2. aacba
3. b
4. ccba

Exercise 991.
For each one of the strings below say whether it is generated by the following negative 2-gram grammar:
G^-: $\{aa, ab, ba, bb\}$

1. babba
2. ab
3. ε
4. b

Exercise 992.
For each one of the strings below say whether it is generated by the following negative 3-gram grammar:
G^-: $\{abc, ace, ade, bee, eba, ecc\}$

1. ε
2. eedb
3. b
4. dcbdda

Exercise 993.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{babb, bacc, bbaa, bcab, bcbc, ccab\}$

1. b
2. ε
3. ab
4. a

Exercise 994.
For each one of the strings below say whether it is generated by the following positive 4-gram grammar:
G^+: $\{\rtimes \rtimes \rtimes b, \rtimes \rtimes \rtimes \ltimes, \rtimes \rtimes b \ltimes, \rtimes \rtimes \ltimes \ltimes, \rtimes \rtimes ba, \rtimes bab, \rtimes ba \ltimes, \rtimes \ltimes \ltimes \ltimes, \rtimes b \ltimes \ltimes, aaaa, abba, baaa, babb, bbaa, aaa \ltimes, ba \ltimes \ltimes, aa \ltimes \ltimes, a \ltimes \ltimes \ltimes, b \ltimes \ltimes \ltimes\}$

1. b
2. ba
3. bbba
4. a

Exercise 995.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes \rtimes c, \rtimes \rtimes b, \rtimes b \ltimes, \rtimes ca, aab, aba, bac, caa, ac \ltimes, ca \ltimes, b \ltimes \ltimes, a \ltimes \ltimes, c \ltimes \ltimes\}$

1. b
2. c
3. cabcbc
4. ca

Exercise 996.
For each one of the strings below say whether it is generated by the following positive 2-gram grammar:
G^+: $\{\rtimes d, ac, ad, bd, cb, da, db, dc, dd, c\ltimes\}$

1. dc
2. ddc
3. adcbdaacdc
4. dac

Exercise 997.
For each one of the strings below say whether it is generated by the following positive 3-gram grammar:
G^+: $\{\rtimes\rtimes a, \rtimes\rtimes b, \rtimes\rtimes\ltimes, \rtimes a\ltimes, \rtimes\ltimes\ltimes, \rtimes ba, \rtimes bb, aba, abb, baa, bab, bba, aa\ltimes, ba\ltimes, a\ltimes\ltimes\}$

1. bbbaaaa
2. aababb
3. bbbbbba
4. aaaab

Exercise 998.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{adaa, bceb, ccab, cebb\}$

1. ε
2. bcc
3. cbcdcbeac
4. addedb

Exercise 999.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abcc, adaa, cdcc, daad, dccd\}$

1. ε
2. cddbb
3. cadadaba
4. dbdbd

Exercise 1000.
For each one of the strings below say whether it is generated by the following negative 4-gram grammar:
G^-: $\{abbc, cbbb, cccc, cdba\}$

1. ca
2. dddd
3. bdcd
4. dbd