§ **27.** *Procedure* 2 *applied:* The isolating of equivalent morphemes requires some knowledge of the morphology of the languages studied. The isolating of the equivalent Ixcatec and Mazatec morphemes has been done by the author largely on the basis of knowledge beyond what is included in the data here. (See Pike 1948: 95-165 for Mazatec morphology.) In § **28** the equivalent morphemes in each example are printed in italics. The following paragraphs indicate the kinds of morphemes that are eliminated, but no attempt is made to explain the reasons for all of the decisions made. (See § **48-49** for a discussion of the degree of skewing resulting from inability to accurately identify the morphemes.)

Initial verbal items of vague general meaning were eliminated in both the Ixcatec and Mazatec words. Note for example: the Ixcatec ba^2- in examples 13, 25, 37, 54, 89, 105, 136, 151, 156, and 177; The Ixcatec $ʔu^2$- in examples 16, 112, 135, 180; the Mazatec va^3- in examples 25, 89, 151, 156, and 180; and the Mazatec si^1- in examples 76, 82, and 112.

Nominalizing and class marking items were eliminated from the nouns. See for example: The Ixcatec $ʔu^2$- 'animal' in examples 12, 30, 93, and 152; the Mazatec na^4- or na^3 in examples 53, 125, 131, and 181.

Certain other elements were also eliminated. Among these are: the Ixcatec, third person possessive $-e^1$ as in examples 68, 77, 172, and 190; the Mazatec third person possessive $-le^4$ as in examples 77 and 190; the Ixcatec third person subject $-ʔe^2$ as in examples 13 and 69; and the Mazatec third person subject $-le^4$ as in example 13.

In other cases different kinds of morphemes were eliminated as irrelevant to the comparison as: the morpheme $r̃ha^3$ 'hand' from the Ixcatec word 'hit' (example 74); the combining form $r̃a^2$- 'skin' from the Ixcatec word 'ear' (example 35) etc.

§ **28.** *Procedure* 3 *applied:* The criteria of procedure 3 are here applied to each pair of Ixcatec Mazatec words in turn. At the beginning of each example the meaning in English, the Ixcatec form, and the Mazatec form are given in that order. The equivalent morphemes are in italics. Tone is ignored in the comparisons.

1. 'all' $ka^2a^2{:}nka^3yi^3he^{34}$, probable noncognates: there are no agreements.
2. 'and' $ku^2{:}kao^4$, probable cognates: *k:k* agree, identical (criterion a); *u:ao* agree, regularly corresponding (criterion d) see examples 38, 154, 176.
3. 'animal' $ʔu^2cį^3į^3{:}čo^4$, probable noncognates: *ʔ:č* do not agree; *u:o* agree, phonetically similar (criterion b). (Although this pair of morphemes is registered as probable noncognates by the criteria used here, it is probable that careful reconstruction by comparative techniques would prove it cognate.)
4. 'ashes' $nda^2su^2{:}čao^3lʔi^{13}$, probable noncognates: there are no agreements.
5. 'at' ——: $ha^4lʔa^{43}$, not included in the comparison: the Ixcatec form is lacking.
6. 'back' $čwe^3e^3{:}ya^1cʔį^4$, probable noncognates: *č:c* agree, phonetic similarity (criterion b); *w:ʔ* and *e:į* do not agree.
7. 'bad' $ʔi^1ña^3ʔa^3{:}cʔę^4$, probable noncognates: there are no agreements.
8. 'bark' $r̃a^2ya^3a^3{:}čhoa^3$-$le^4\ ya^{13}$, probable cognates: *r̃:č* agree, regularly corresponding (criterion d) see example 187; (*h* in the Mazatec form is not accounted for); *a:a, y:y, a:a* agree, identical (criterion a); (The *o* in the Mazatec form may be explained by comparison with example 137. $r̃a^2$- is a combining form of the Ixcatec $r̃u^2wa^3$ 'skin'. Both $r̃a^2ya^3a^3$ and $čhoa^3$-$le^4\ ya^{13}$ are literally 'skin of the tree').
9. 'because' $he^2ra^2{:}nka^3$, probable noncognates: only the morpheme final *a:a* may be considered as agreeing.
10. 'belly' $ce^2ʔe^3{:}cʔoa^4$, probable noncognates: only *c:cʔ* agree. (Although this pair of morphemes is found probably noncognate by the criteria used here, it is probable that careful reconstruction by comparative techniques would prove it cognate.)
11. 'big' $šhe^1{:}he^3$, probable cognates: *šh:h* agree, regularly corresponding (criterion d) see example 19 for *šC:C* (further examples are found in $šte^1{:}nča^4ti^{13}$ 'comb' and $šką^1{:}ką^{43}$ 'twenty', Fernández 1951: examples 46, 124); *e:e* agree, identical, (criterion a).
12. 'bird' $ʔu^2ndɤu^2še^2{:}ni^4se^{34}$, Probable cognates: *š:s* agree, phonetically similar (criterion b) and also regularly corresponding (criterion d) see $nči^2ša^2{:}ni^3sa^3$ 'water jug' (Fernández 1951: example 18); *e:e* agree, identical (criterion a).
13. 'bite' $ba^2ne^2ʔe^2{:}khi^3ne^3$-le^4, probable cognates: *n:n, e:e* agree, identical (criterion a).
14. 'black' $ti^1ye^1{:}hma^2$, probable noncognates: there are no agreements.

15. 'blood' $\imath h \underline{i}^3{:}nh \underline{i}^{13}$, probable noncognates: $t{:}n$ do not agree; $h{:}h$ and $\underline{i}{:}\underline{i}$ agree, identical (criterion a). (It is probable that careful reconstruction would prove this pair cognate.)

16. 'blow' $'u^2\tilde{n}u^1 le^2 e^2{:}v'e^1 ce^3$, probable cognates: $t{:}c$ agree, phonetically similar (criterion b) and also regularly corresponding (criterion d) see example 115; $e{:}e$ agree, identical (criterion a).

17. 'bone' $'i^2 nd^y a^2{:}ni^3 n\l a^3$, probable cognates: $nd^y{:}n\l$ agree, phonetically similar (criterion b) and also regularly corresponding (criterion d) see example 106 for $\l^y{:}\l$ and examples 20, 29, 181 for n voiceless $C{:}n$ voiced C; $a{:}a$ agree, identical (criterion a).

18. 'breathe' $ki^1 ce^2 e^2 \tilde{r}e^2 spi^2 ra^1{:}kh\e^3 h\l a^3$, probable noncognates: there are no agreements. (The Ixcatec form is borrowed from Spanish *respirar*.)

19. 'burn' $ki^1 f'i^1 \check{s}\l e^1{:}\l i^2$, probable cognates: $\check{s}\l{:}\l$ agree, regularly corresponding (criterion d) see examples 11, 21, 50 for $\check{s}C{:}C$; $e{:}i$ agree, conditioned (criterion c) and also regularly corresponding (criterion d) see examples 20, 29, 32 for $e{:}i$ after palatal consonant.

20. 'child' $'n\check{y}e^1{:}'n\l i^1$-le^{42}, Probable cognates: $'{:}'$ and $n{:}n$ agree, identical (criterion a); $\check{y}{:}\l$ agree, regularly corresponding (criterion d) see examples 29, 142; $e{:}i$ agree, conditioned (criterion c) and also regularly corresponding (criterion d) see examples 19, 29, 32 for $e{:}i$ after palatal consonant.

21. 'cloud' $\check{s}hwi^3{:}yo^3 hvi^{34}$, probable cognates : $\check{s}h{:}h$ agree, regularly corresponding (criterion d) see examples 11, 19, 50 for $\check{s}C{:}C$; $w{:}v$ agree, phonetically similar (criterion b); $i{:}i$ agree, identical (criterion a).

22. 'cold' $k\underline{i}^3{:}n\check{c}'q^1$, probable noncognates: there are no agreements.

23. 'come' $\check{s}u^2 wa^2{:}n\check{c}oa^{21}$, probable cognates: $\check{s}{:}n\check{c}$ agree, $\check{s}{:}\check{c}$ phonetically similar (criterion b) and $C{:}nC$ regularly corresponding (criterion d) see Fernández 1951: example 36; *uwa:oa* agree, regularly corresponding (criterion d) see examples 137, 187.

24. 'count' $f'e^2 \check{s}kw\underline{i}^3{:}v'e^1 \check{s}ki^4$, probable cognates: $\check{s}{:}\check{s}$ agree, identical (criterion a); $kw{:}k$ agree, phonetically similar (criterion b) and also regularly corresponding (critérion d) see example 48 for $Cw{:}C$; $\underline{i}{:}i$ agree, phonetically similar (criterion b).

25. 'cut' $ba^2 \l e^1{:}va^3 \l e^3$, Probable cognates: $\l{:}\l$ and $e{:}e$ agree, identical (criterion a).

26. 'day' $\l h\underline{i}^2{:}ni^4 \check{c}h\underline{i}^{34}$, probable cognates: $\l h{:}\check{c}h$ agree, regularly corresponding (criterion d) see example 165; $\underline{i}{:}\underline{i}$ agree, identical (criterion a).

27. 'die' $'me^2{:}m'\e^3$, probable cognates: $'m{:}m'$ agree, regularly corresponding (criterion d) see examples 31, 122 for $'C{:}C'$; $e{:}\e$ agree, phonetically similar (criterion b).

28. 'dig' $'nge^1{:}kho^3 ne^2 ya^3$, probable noncognates: there are no agreements.

29. 'dirty' $hn\check{y}e^2{:}hn\l i^1$, probable cognates: $h{:}h$ and $n{:}n$ agree, identical (criterion a); $\check{y}{:}\l$ agree, regularly corresponding (criterion d) see examples 20, 142; $e{:}i$ agree, conditioned (criterion c) and also regularly corresponding (criterion d) see examples 19, 20, 32.

30. 'dog' $'u^2 ni^2 \tilde{n}a^3{:}nia^{21}$, probable cognates: $n{:}n$ agree, identical (criterion a); $i\tilde{n}a{:}ia$ agree, regularly corresponding (criterion d) see examples 34, 96, 120, 137, 187, 194 for $VCV{:}VV$, see also $ni^2 \tilde{n}u^2{:}nio^4$ 'tortilla' (Fernández 1951: example 61).

31. 'drink' $f'i^3{:}'vi^{43}$, probable cognates: $f'{:}'v$ agree, regularly corresponding (criterion d) see examples 27, 122 for $C'{:}'C$, see examples 139, 178 for $f{:}v$; $i{:}i$ agree, identical (criterion a).

32. 'dry' $ci^2 \check{s}e^1 hi^3{:}\check{s}i^2$, probable cognates: $\check{s}{:}\check{s}$ agree, identical (criterion a); $ehi{:}i$ agree, regularly corresponding (criterion d) see examples 34, 57, 96, 194 for $VCV{:}VV$, see examples 19, 20, 29 for $e{:}i$ after palatal consonant.

33. 'dull' $\l^y u^2{:}sk\o q^1$, probable noncognates: there are no agreements.

34. 'dust' $\check{c}a^2 hu^2{:}\check{c}ao^{34}$, probable cognates: $\check{c}{:}\check{c}$ agree, identical (criterion a); $ahu{:}ao$ agree, regularly corresponding (criterion d) see examples 96, 194 for $VCV{:}VV$.

35. 'ear' $\tilde{r}a^2 ch\underline{u}^3{:}\check{s}o^4 \tilde{n}o^3$, probable noncognates: $ch{:}\check{s}$ agree, regularly corresponding (criterion d) see example 53; $\underline{u}{:}o\tilde{n}o$ do not agree since this reverses the regular pattern as seen in example 30.

36. 'earth' $na^{3'} n\l e^2{:}'n\l e^{34}$, probable cognates: $'{:}'$, $n{:}n$, $\l{:}\l$, and $e{:}e$ agree, identical (criterion a).

37. 'eat' $ba^2 ne^2{:}khi^3 ne^3$, probable cognates: $n{:}n$ and $e{:}e$ agree, identical (criterion a).

38. 'egg' $\l^y u^2{:}\check{c}hao^{42}$, probable cognates: $\l^y{:}\check{c}h$ agree, phonetically similar (criterion b); $u{:}ao$ agree, regularly corresponding (criterion d) see examples 2, 154.

39. 'eye' $t^yu^2šku^2{:}šk\varrho^4$, probable cognates: $š{:}š$ and $k{:}k$ agree, identical (criterion a); $u{:}\varrho$ agree, phonetically similar (criterion b).

40. 'fall' $šti^1ka^2fha^2{:}ka^{43}$, probable cognates: $k{:}k$ and $a{:}a$ agree, identical (criterion a).

41. 'far' $hi^1{:}khi^3$, probable cognates: $h{:}kh$ agree, regularly corresponding (criterion d) see example 44; $i{:}i$ agree, identical (criterion a).

42. 'fat-grease' $ce^2čha^1ši^2ši^2ye^2{:}ši^1ne^1$, probable cognates: $š{:}š$ and $i{:}i$ agree, identical (criterion a); $y{:}n$ do not agree; $e{:}e$ agree, identical (criterion a).

43. 'father' $ta^lla^1{:}n^9ai^{43}$, probable noncognates: there are no agreements. (The Ixcatec form is the almost universal word for 'father' in Mexican Indian languages.)

44. 'fear' $šta^2hu^2{:}co^3kh\varrho^1$, probable cognates: $h{:}kh$ agree, regularly corresponding (criterion d) see example 41; $u{:}\varrho$ agree, phonetically similar (criterion b).

45. 'feather' $ci^2nga^2{:}ncha^4$, probable noncognates: $n{:}n$ agree, identical (criterion a); $g{:}ch$ do not agree; $a{:}a$ agree, identical (criterion a).

46. 'few' $yu^1wo^1{:}čoa^3$, probable noncognates: $y{:}č$ do not agree; $uwo{:}oa$ do not agree.

47. 'fight' $ma^2hu^2{:}kh\varrho^1$, probable noncognates: $h{:}kh$ agree, regularly corresponding (criterion d) see examples 41, 44; $u{:}\varrho$ do not agree. (It is probable that careful reconstruction would prove this pair cognate.)

48. 'fire' $š^9wi^2{:}l^9i^{13}$, probable cognates: $š{:}l$ agree, regularly corresponding (criterion d) see examples 62, 154; $^9w{:}^9$ agree, regularly corresponding (criterion d) see example 24 for $Cw{:}C$; $i{:}i$ agree, identical (criterion a).

49. 'fish' $^9u^2če^3e^3{:}hti^4$, probable cognates: $č{:}hł$ agree, regularly corresponding (criterion d) see $na^{29}a^2či^2i^1{:}$ $na^4hča^{13}$ 'old woman' (Fernández 1951: example 197) for $C{:}hC$, see examples 20, 29, 93, 142 for $č$ (or j): $ł$; $e{:}i$ agree, regularly corresponding (criterion d) see examples 19, 20, 29, 32 for $e{:}i$ after palatal consonant.

50. 'five' $š^9\varrho^1{:}^9q\varrho^2$, probable cognates: $š^9{:}^9$ agree, regularly corresponding (criterion d) see examples 11, 19, 21, for $šC{:}C$; $\varrho{:}q\varrho$ agree, regularly corresponding (criterion d) see $šh\varrho^3{:}hq\varrho^3$ 'six' (Fernández 1951: example 118).

51. 'float' $f^9a^2lq^2hu^1$ $^9i^2nda^3{:}vhai^3kao^4$, probable noncognates: there are no agreements.

52. 'flow' ma^3nga^3 $^9i^2nda^3{:}vhai^3$, Probable noncognates: there are no agreements.

53. 'flower' $chu^2{:}na^3šo^{13}$, probable noncognates: only morpheme final $u{:}o$ agree. (It is probable that careful reconstruction would prove this pair cognate.)

54. 'fly' $ba^2ka^2{:}vhi^2lhe^4$, probable noncognates: there are no agreements.

55. 'fog' $šwi^2ški^3{:}$ $yo^3hvi^3ša^4$, probable noncognates: there are no agreements. ($šwi^2$-:-hvi^3- are probable cognates — see example 21 — but the morphemes which distinguish 'fog' from 'cloud' are probably not cognate.)

56. 'foot' $si^1hi^3{:}nco^4ko^4$, probable noncognates: there are no agreements.

57. 'four' $ñu^1hu^1{:}ño^{43}$, probable cognates: $ñ{:}ñ$ agree, identical (criterion a); $uhu{:}o$ agree, regularly corresponding (criterion d) see examples 32, 34, 96, 194 for $VCV{:}V$, $u{:}o$ phonetically similar (criterion b).

58. 'freeze' $ci^{19}nd^ya^1{:}ma^3nč^9q^1$, probable cognates: $^9CC{:}CC^9$ do not agree, there is no parallel evidence; $nd^y{:}nč$ agree, phonetically similar (criterion b); $a{:}q$ agree phonetically similar (criterion b).

59. 'fruit' $čhmi^1{:}to^3$, probable noncognates: there are no agreements.

60. 'give' $be^{29}e^2{:}choa^1$, probable noncognates: there are no agreements.

61. 'good' $^9i^1ña^3{:}nla^{43}$, probable noncognates: only morpheme final $a{:}a$ agree.

62. 'grass' $ši^2ka^3{:}li^4hi^4$, probable noncognates: $š{:}l$ agree, regularly corresponding (criterion d) see examples 48, 154; $i{:}ihi$ do not agree, since this reverses the regular pattern as seen in examples 32, 34, 57, 96, 194.

63. 'green' $yu^2wa^3{:}sa^4se^4$, probable noncognates: there are no agreements.

64. 'guts' $ã̃a^2yi^{29}e^3{:}n^9o^1y^9e^4$, Probable noncognates: there are no agreements. ($yi^{29}e^3{:}y^9e^4$ 'dung' are probable cognates, but the compound 'guts' is literally 'skin of dung' in Ixcatec and 'rope of dung' in Mazatec, so that the entire words are noncognate. This pair would have been registered as probable cognates if the equivalent morphemes had not been isolated.

65. 'hair' $ša^2{:}ncha^4$, probable noncognates: only morpheme final $a{:}a$ agree.

66. 'hand' *r̃ha²:ncha³*, probable noncognates: *r̃:nc* do not agree; *h:h* and *a:a* agree, identical (criterion a).

67. 'he' *su²wa³:he²*, probable noncognates: there are no agreements.

68. 'head' *ske¹e¹:hko⁴*, probable noncognates: *s:h* do not agree; *k:k* agree, identical (criterion a); *e:o* do not agree.

69. 'hear' *mi²ⁿe²:nč²oe¹*, probable noncognates: there are no agreements.

70. 'heart' *ʔa²ni¹me³e³:ni⁴ma⁴*, probable noncognates: both forms are borrowed from the Spanish *anima*.

71. 'heavy' *ʔi²ye²:ʔai²¹*, probable cognates: *ʔ:ʔ* agree, identical (criterion a); *iye:ai* agree, regularly corresponding (criterion d) see *ʔi²ya³:ma³ha̧i²* 'no' (Fernández 1951: example 234), see Fernández 1951: example 63 for *i:ai*.

72. 'here' *li²i²:ʔi⁴-vi⁴*, probable noncognates: only *i:i* agree.

73. 'hit' *ba²r̃ha³:v²e¹*, probable noncognates: only *b:v* agree.

74. 'hold-take' *ki¹a²r̃ha²:khoe²*, probable noncognates: only *k:kh* agree.

75. 'how' *nde¹de¹:ho¹*, probable noncognates: there are no agreements.

76. 'hunt' *ʔu¹ni¹:vhi²si¹k²e³*, probable noncognates: there are no agreements.

77. 'husband' *nda²be¹e¹:š²i̧⁴-le⁴*, probable noncognates: there are no agreements.

78. 'I' *ʔi²na³na³:ʔo̧³*, probable cognates: *na:o̧* agree, regularly corresponding (criterion d) see examples 100, 172 for *nasal + V:V*. (The ʔ occurs in Mazatec since initial *V* is nonpermitted.)

79. 'ice' *č²o̧³:——*, not included in the comparison: the Mazate form is lacking.

80. 'if' *ka²la²:ca²*, probable noncognates: only morpheme final *a:a* agree.

81. 'in' *——:ha⁴ya³*, not included in the comparison: the Ixcatec form is lacking.

82. 'kill' *ʔu¹ni¹:si¹k²e³*, probable noncognates: there are no agreements.

83. 'know' *ču²ši̧³:ve³*, probable noncognates: there are no agreements.

84. 'lake' *la²gu¹na¹:hnčo³*, probable noncognates: (the Ixcatec form is borrowed from Spanish *laguna*.)

85. 'laugh' *——:vi³hno²*, not included in the comparison: the Ixcatec form is lacking.

86. 'leaf' *ška³:ška⁴*, probable cognates: *š:š*, *k:k*, and *a:a* agree, identical (criterion a).

87. 'leftside' *ku²č²ȩ²:nka³ško̧¹*, probable noncognates: only *č:š* agree.

88. 'leg' *ca²ku²:nka³so³*, probable noncognates: *c:nk* do not agree; *a:a* agree, identical (criterion a); *k:s* do not agree; *u:o* agree, phonetically similar (criterion b).

89. 'lie' *ba²ca¹nga¹:va³hna³*, probable noncognates: only morpheme final *a:a* agree.

90. 'live' *ki¹ʔi³:ti¹hna³ko̧³*, probable noncognates: only morpheme initial *k:k* agree.

91. 'liver' *ʔa²ku̧²:čo⁴hnka⁴*, probable noncognates: there are no agreements.

92. 'long' *hi¹ni¹:nto⁴³*, probable noncognates: there are no agreements.

93. 'louse' *ʔu²če²:na³ti¹*, probable cognates: *č:t* agree, regularly corresponding (criterion d) see examples 20, 29, 49, 142 (Note that in these examples the correspondence is *ǰ:t*, since the correspondence is *n voiced consonant : n voiceless consonant*.); *e:i* agree, conditioned (criterion c) and also regularly corresponding (criterion d) see examples 19, 20, 29, 32 for *e:i* after palatal consonant.

94. 'man-male' *mi²nda²wa²:š²i̧⁴*, probable noncognates: there are no agreements.

95. 'many' *ʔu¹ča¹:nkhi̧²*, probable noncognates: there are no agreements.

96. 'meat-flesh' *ya²hu²:yao³⁴*, probable cognates: *y:y* agree, identical (criterion a); *ahu:ao* agree, regularly corresponding (criterion d) see examples 34, 194 for *VCV:VV*.

97. 'mother' *na²ⁿa²:na⁴*, probable noncognates: both forms are similar to the widespread form *nana* 'mother' and are probably not native words.

98. 'mountain' *hña³:ni³nto³⁴*, probable noncognates: there are no agreements.

99. 'mouth' *c²wa²:c²oa³*, probable cognates: *c:c* and *ʔ:ʔ* agree, identical (criterion a); *w:o* agree, phonetically similar (criterion b); *a:a* agree, identical (criterion a).

100. 'name' *ʔñe³e³:ha³ⁿo̧i¹³*, probable cognates: *ʔ:ʔ* agree, identical (criterion a); *ñe:o̧i* agree, regularly corresponding (criterion d) see examples 78, 172 for nasal *V:V*, see example 71 for *e:ai*.

101. 'narrow' *łhu̧^{1}nga^3:nč̓oe^1*, probable noncognates: there are no agreements.

102. 'near' *yo^{1}o^3:č̣i̧^{3}*, probable noncognates: there are no agreements.

103. 'neck' *ndʸa^{2}si^2:ya^{1}si̧^{1}*, probable cognates: *s:s* agree, identical (criterion a); *i:i̧* agree, phonetically similar (criterion b).

104. 'new' ——:*čo^{4}ce^4*, not included in the comparison: the Ixcatec form is lacking.

105. 'night' *ba^{2}cu^{2}ndu^2:ni^{4}the^4*, probable noncognates: there are no agreements.

106. 'nose' *či^{2}łʸhu̧^{2}:nti^{4}thǫ^4*, probable cognates: *łʸ:ł* agree, phonetically similar (criterion b) and also regularly corresponding (criterion d) see example 17; *h:h* agree, identical (criterion a); *u̧:ǫ* agree, phonetically similar (criterion b).

107. 'not' *ʼi^{2}ya^3:li^2..hi̧^{2}*, probable noncognates: only *i:i* agree.

108. 'old' *nda^{2}di̧^{3}i̧^{3}:hči^{1}nka^3*, probable noncognates: there are no agreements.

109. 'one' *hngu^2:hnko^3*, probable cognates: *h:h* and *n:n* agree, identical (criterion a) ; *g:k* agree, phonetically similar (criterion b), conditioned after *n* (criterion c), and also regularly corresponding (criterion d) see examples 17, 20, 29 for *n voiced C:n voiceless C*; *u:o* agree, phonetically similar (criterion b).

110. 'other' *či^{1}hngu^2:ši^{3}hnko^3*, probable cognates: *č:š* agree, phonetically similar (criterion b); *i:i* agree, identical (criterion a); *hngu:hnko* agree, see example 109.

111. 'person' *ča^{2}hmi^2:čo^{4}ła^4*, probable noncognates: only initial *č:č* agree.

112. 'play' *ʼu^{2}šła^{1}ma^1:si^{1}ska^1*, probable noncognates: *š:s* agree, phonetically similar (criterion b); *ł:k* do not agree; *a:a* agree, identical (criterion a).

113. 'pull' *ka^{2}de^{2}ngi^3:kho^{3ʼ}nło^1*, probable noncognates; only *k:kh* agree.

114. 'push' *ku^{2}łu^{1}ka^{1}a^2:chǫ^{1}ncha^3*, probable noncognates: there are no agreements.

115. 'rain' *tʸu^{2}šłi^2:hci^{13}*, probable cognates: *šł:hc* agree, regularly corresponding (criterion d) see examples 11, 19, 21, 50 for *šC:C*, see example 49 for *C:hC*, see example 16 for *ł:c* (here the assumption is that the *š* of the parent language lost in Mazatec before some Mazatec words, including this one, developed an initial *h*); *i:i* agree, identical (criterion a).

116. 'red' *ka^{1}ce^3:ni^2*, probable noncognates: there are no agreements.

117. 'right-correct' *ko^{2}r̃e^{1}kło^1:ki^{2}ši^4*, probable noncognates: only *k:k* agree. (The Ixcatec form is borrowed from Spanish *correcto.*)

118. 'rightside' *ndu^{1}wa^1:nka^{3}ki^{2}ši^4*, probable noncognates: there are no agreements.

119. 'river' *ʼi^{2}nda^2:nta^{1}he^4*, probable cognates: *n:n* agree, identical (criterion a); *d:t* agree, conditioned after *n* (criterion c); *a:a* agree, identical (criterion a).

120. 'road' *ndi^{2}ya^2:nłia^{42}*, probable cognates: *n:n* agree, identical (criterion a); *d:ł* agree, phonetically similar (criterion b), conditioned after *n* (criterion c), and also regularly corresponding (criterion d) see examples 17, 20, 29, 181; *iya:ia* agree, regularly corresponding (criterion d) see examples 23, 30, 34, 187 for *VCV:VV*.

121. 'root' *ña^{2}ma^2:ha^{4}ma^4*, probable cognates: *ñ:h* do not agree; *a :a*, *m :m*, and *a :a* agree, identical (criterion a).

122. 'rope' *ʼñu^3:n̓ǫ^{13}*, probable cognates: *ʼñ:n̓* agree, regularly corresponding (criterion d) see example 27 for *ʼ nasal:nasal ʼ*, *ñ:n* phonetically similar (criterion b); *u:ǫ* agree, phonetically similar (criterion b).

123. 'rotten' *ci^{1}šłe^{1ʼ}e^2:ʼnło^3*, probable noncognates: there are no agreements.

124. 'rub' *hu^{2}nga^{2}ši^2*:——, not used in the comparison: the Mazatec form is lacking.

125. 'salt' *ndʸu^{2}ša^3:na^{4}ša^4*, probable cognates: *š:š* and *a:a* agree, identical (criterion a).

126. 'sand' *nǰa^{2}se^2:co^{4}mi^1*, probable noncognates: there are no agreements.

127. 'say' *cu^2:co^2*, probable cognates: *c:c* agree, identical (criterion a); *u:o* agree, phonetically similar (criterion b).

128. 'scratch' *he^{2}nga^3:si^{1}khe^3*, probable noncognates: there are no agreements.

129. 'sea' *mar^1:nła^{1}či^{3}kǫ^3*, probable noncognates: there are no agreements. (The Ixcatec form is borrowed from Spanish *mar.*)

130. 'see' *fʼi^{2}šku̧^{2}:ve^3*, probable noncognates: the only agreement is *f:v.*

131. 'seed' *nde^{2}he^3:na^{4}ši^4*, probable noncognates: only *e:i* might be considered as agreeing.

132. 'sew' ʔu^{1}łu^3:khǫ^{3}ya^3, probable noncognates: there are no agreements.
133. 'sharp' šli^1:yao^3, probable noncognates: there are no agreements.
134. 'short' łу̨ʔu^{2}ʔyǫ^1:hłoa^3, probable noncognates: there are no agreements.
135. 'sing' ʔu^{2}se^2:se^{43}, probable cognates: *s:s* and *e:e* agree, identical (criterion a).
136. 'sit' ba^{2}ʔi^{2}či^{2}ndye^{1}e^1:va^{1}hna^3, probable noncognates: there are no agreements.
137. 'skin' r̃u^{2}wa^3:čhoa^4, probable cognates: *r̃:čh* agree, regularly corresponding (criterion d) see r̃ha^2 'hand': čha^3 'arm'; *uwa:oa* agree, regularly corresponding (criterion d) see example 187.
138. 'sky' nga^{2}r̃hmi^1:nkʔa^{2}hmi^3, probable cognates: *n:n* agree, identical (criterion a); *g:k* agree, phonetically similar (criterion b) and conditioned after *n* (criterion c); *a:a, h:h, m:m,* and *i:i* agree, identical (criterion a); (*r̃* in Ixcatec and *ʔ* in Mazatec are not accounted for, but the evidence is sufficient to call the pair probable cognates.)
139. 'sleep' fʔa^{2}fhe^2:va^{1}hna^{3}vhe^2, probable cognates: *f:v* agree, phonetically similar (criterion b) and also regularly corresponding (criterion d) see examples 31, 178; *h:h* and *e:e* agree, identical (criterion a).
140. 'small' ʔi̧^{1}:ʔnłi^1, probable noncognates: *ʔ:ʔnł* do not agree; *i̧:i̧* agree, phonetically similar (criterion b).
141. 'smell' šte^{1}hi̧^{1}:ko^{3}nhę^4, probable cognates: *h:nh* agree, regularly corresponding (criterion d) see example 178 for *h:nasal h*; *i̧:ę* agree, regularly corresponding (criterion d) see example 178.
142. 'smoke' ʔnǰi^2:ni^{4}ʔnłi^4, probable cognates: *ʔnǰ:ʔnł* agree, regularly corresponding (criterion d) see examples 20, 29; *i:i* agree identical (criterion a).
143. 'smooth' ki^{1}łe^3:čha^{3}ʔai^3, probable noncognates: there are no agreements.
144. 'snake' ʔu^{2}ye^{3}e^3:ye^4, probable cognates: *y:y* and *e:e* agree, identical (criterion a).
145. 'snow' nye^{1}be^1:nčʔo̧^{13}, probable noncognates : there are no agreements. (The Ixcatec form is borrowed from Spanish *nieve*.)
146. 'some' ka^{2}ši^2:——, not used in the comparison: the Mazatec form is lacking.

147. 'spit' ndуa^{2}łya^3:nta^{1}ča^1, probable cognates: *łу:č* agree, phonetically similar (criterion b); *a:a* agree, identical (criterion a).
148. 'split' kwa^{2}ndуu^{1}čhe^{1}nga^3:si^{1}hao^{2}ya^3, probable noncognates: there are no agreements.
149. 'squeeze' ʔu^{2}nga^{2}łe^{3}e^3:vʔe^{1}cʔi̧o̧^{3}, probable noncognates: there are no agreements.
150. 'stab-pierce' —:vʔe^{1}ki^{4}ča^4, not used in the comparison; the Ixcatec form is lacking.
151. 'stand' ba^{2}si^{2}ka^{1}a^3:va^{3}sę^{2}nło^{43}, probable noncognates: only *s:s* agree. (If the relevant morphemes in this pair had not been isolated, it would have been registered as probable cognates.)
152. 'star' ʔu^{2}ce^1:ni^{3}r̃o^{34}, probable noncognates: there are no agreements.
153. 'stick' ce^{2}e^{2}kla^{2}be^{2}łуa^1:va^{3}łʔa^{43}, probable noncognates: only final *a:a* agree. (The Ixcatec form is borrowed from Spanish *clavar*.)
154. 'stone' šu^3:lao^4, probable cognates: *š:l* agree, regularly corresponding (criterion d) see example 48; *u:ao* agree, regularly corresponding (criterion d) see examples 2, 176.
155. 'straight' ndu^{1}wa^1:ki^{2}ši^4, probable noncognates: there are no agreements.
156. 'suck' ba^{2}łu^{2}chę^3:va^{3}ki^3, probable noncognates: there are no agreements.
157. 'sun' ča^{2}ku^3:cʔoi^{13}, probable noncognates: there are no agreements.
158. 'swell' si^{1}ski^1:vi^{3}łho^{3}ya^3, probable noncognates: there are no agreements.
159. 'swim' he^{2}ngi^2 ʔi^{2}nda^3:co^{3}va^{2}hi̧^{43}, probable noncognates: only the morpheme final *i:i̧* agree.
160. 'tail' ndуa^{2}r̃e^{1}e^{1}ba^1:nti^{3}cʔi̧^{3}, probable noncognates: there are no agreements.
161. 'that' ra^{2}a^2:he^2-ve^4, probable noncognates: there are no agreements.
162. 'there' la^{2}a^2:ya^4-ve^4, probable noncognates: only *a:a* agree.
163. 'they' su^{2}wa^{1}ma^3:he^2, probable noncognates: there are no agreements.
164. 'thick' še^1:łhǫi̧^{3}, probable noncognates: only *h:h* agree.
165. 'thin' łhu̧^{1}:čhoe^3, probable cognates: *th:čh* agree, regularly corresponding (criterion d) see example 26; *u̧:o* agree, phonetically similar (criterion b); (Mazatec *e* is not accounted for.)

166. 'think' bi²šya³ku³:si¹kha³ʾai³chę⁴³, probable noncognates: there are no agreements.
167. 'this' ri²i²:he²-vi⁴, probable noncognates: only *i:i* agree.
168. 'thou' ʾi²la³-:hi³, probable noncognates: there are no agreements. (If the equivalent morphemes had not been isolated *ʾi:hi* might possibly have been registered as probable cognates.)
169. 'three' nį¹hę³:hą², probable noncognates: only *h:h* agree. (Careful reconstruction might prove this pair cognate.)
170. 'throw' be²ya²:va³sę¹, probable noncognates: there are no agreements.
171. 'tie' be¹ʾu¹:vˀe¹htia¹, probable noncognates: there are no agreements.
172. 'tongue' ni²hñe¹e¹:ni⁴hę⁴, probable cognates: *h:h* agree, identical (criterion a); *ñe:ę* agree, regularly corresponding (criterion d) see examples 78, 100 for nasal *V:V*.
173. 'tooth' na²ʾñu²:ni⁴ʾño⁴, probable cognates: *ʾ:ʾ* and *ñ:ñ* agree, identical (criterion a); *u:o* agree, phonetically similar (criterion b).
174. 'tree' ya³a³:ya¹³, probable cognates: *y:y* and *a:a* agree, identical (criterion a).
175. 'turn' ma²nga²de³ngi¹:va³nthai², probable noncognates: there are no agreements.
176. 'two' yu¹hu²:hao², probable cognates: *h:h* agree, identical (criterion a); *uhu:ao* agree, regularly corresponding (criterion d) see examples 2, 154.
177. 'vomit' ba²hme³:vi³so², probable noncognates: there are no agreements.
178. 'walk' fˀa²hi²:vˀa³mhę⁴³, probable cognates: *f:v* agree, phonetically similar (criterion b); *ʾ:ʾ* and *a:a* agree, identical (criterion a) ; *h:mh* agree, regularly corresponding (criterion d) see example 141 for *h:nasal h*; *i:e* agree, regularly corresponding (criterion d) see example 141.
179. 'warm' su¹wa³:so⁴³, probable cognates: *s:s* agree, identical (criterion a); *u:o* agree, phonetically similar (criterion b). (It is possible that this pair is not truly cognate. The -wa³ of the Ixcatec form is not accounted for in this comparison, and it is probable that the Ixcatec form is a true cognate of the Mazatec word soe²∿shoe² 'hot'.)
180. 'wash' ʾu²hme³:va³ne¹, probable noncognates: only morpheme final *e:e* agree.
181. 'water' ʾi²nda³:na³nta¹³, probable cognates: *n:n* agree,

identical (criterion a); *d:l* agree, conditioned after *n* (criterion c); *a:a* agree, identical (criterion a).
182. 'we' ʾi²ni¹:ña¹, probable noncognates: only *n:ñ* might be considered as agreeing.
183. 'wet' cˀe¹:ʾnči⁴, probable noncognates: only *e:i* agree.
184. 'what?' nda¹ra²:hme¹-ni³, probable noncognates: there are no agreements.
185. 'when?' ndi²sa¹:kˀia¹, probable noncognates: only final *a:a* agree.
186. ' where?' ndi²ra²:ʾña¹, probable noncognates: only *a:a* agree.
187. 'white' ru¹wa¹:čoa³, probable cognates: *r:č* agree, regularly corresponding (criterion d) see example 137 (In the example cited the correspondence is *r̃:č* rather than *r:č* but there still seems strong probability that this pair agree.); *uwa:oa* agree, regularly corresponding (criterion d) see examples 137, 23.
188. 'who?' nda¹ra²:ʾya¹, probable noncognates: only *a:a* agree.
189. 'wide' le²ya²:te³ya⁴³, probable cognates: *l:l*, *e:e*, *y:y*, *a:a* agree, identical (criterion a).
190. 'wife' kˀwe¹e¹:čhǫ⁴²-le⁴, probable noncognates: there are no agreements.
191. 'wind' ci²ndʸu³:nthao⁴, probable cognates: *n:n* agree, identical (criterion a); *dʸ:l* agree, phonetically similar (criterion b) and conditioned after *n* (criterion c); *u:ao* agree, regularly corresponding (criterion d) see examples 2, 38, 154, 176; the *h* in Mazatec is not accounted for. (It seems possible to the author that this is not a true cognate.)
192. 'wing' ndʸa²čǫ²ʾǫ²ba²:hnka³, probable noncognates: only final *ǫ:a* agree.
193. 'wipe' ki¹hu¹nga²ši²:si¹ča³hǫ³, probable noncognates: there are no agreements.
194. 'with' ka²hu²:kao⁴, probable cognates: *k:k* agree, identical (criterion a); *ahu:ao* agree, regularly corresponding (criterion d) see examples 32, 34, 96.
195. 'woman' mi²čˀa²:čhǫ⁴², probable noncognates: only *č:č* agree.
196. 'woods' ya³a³:nki³ya¹thąį³, probable cognates: *y:y* and *a:a* agree, identical (criterion a).
197. 'worm' ʾu²ca²ndu²:čo⁴nto⁴³, probable cognates: *c:č* agree, phonetically similar (criterion b); *n:n* agree, identical (criterion a); *d:l* agree, conditioned (criterion c); *u:o* agree, phonetically similar (criterion b).

198. 'ye' $^9i^2la^3ri^2:ho^2$, probable noncognates: there are no agreements.
199. 'year' $\check{s}hnga^3:no^{13}$, probable noncognates: there are no agreements.
200. 'yellow' $sa^2ne^2:si^3ne^2$, probable cognates: $s:s$ agree, identical (criterion a); $a:i$ do not agree; $n:n$ and $e:e$ agree, identical (criterion a).

§ **29.** *In Summary:* A total of 192 pairs of words in Ixcatec and Mazatec were compared in § **28.** (Eight of the original list of words were lacking in one or the other of the languages, sees § **25**.)   Of these 192 pairs, the procedures of § **17-23** give a total of 74 probable cognates and 118 probable noncognates.   The time depth based on these figures is computed in § **34-36** ; the range of error of the time depth is computed in § **44-45**; the Ixcatec-Mazatec lexical relationship in dips is computed in § **50-51**.

§ **30.** A careful comparative study would probably result in an estimated 78 cognates and 114 noncognates, since in the author's opinion it is likely that two of the 74 pairs registered as probable cognates are not true cognates (examples 179 and 191), and it is also likely that six of the pairs registered as probable noncognates can be proved to be true cognates on the basis of reconstruction (examples 3, 10, 15, 47, 53, and 169).   On the other hand, an investigator completely unacquainted with both languages and unable to isolate the equivalent morphemes and without additional data beyond the 200 word list would be expected to arrive at a total of 72 probable cognates and 120 probable noncognates, since failure to isolate the equivalent morphemes would have resulted in registering four noncognates as probable cognates (examples 55, 64, 151, and 168) but lack of additional data would have resulted in registering as probable noncognates six pairs which may well be true cognates (examples 23, 49, 50, 71, 78, and 137 in which the decision to call the pairs probable cognates rests upon the use of criterion d on the basis of data not included in the 200 word list.)   See § **46-48** for a discussion of the degree to which the time depth estimate is skewed by such inaccurate registering of probable cognates.

Computation of Time Depth

§ **31.** For use in the time depth formula, the number of probable cognates ascertained by the techniques of § **17-23** must be converted to percent of cognates.   This is done by dividing the number of

probable cognates by the total number of pairs of words compared (Swadesh 1950: 158).

§ **32.** Time depth is computed by the formula $t = \dfrac{\log C}{2 \log r}$ (Lees 1953: 117).   In this formula t stands for indicated time depth in millenia; C stands for the percent of cognates (§ **31**) ; r stands for the "constant" (also called "index" in Swadesh 1955: 122), that is, the percent of cognates assumed to remain after a thousand years of diverging (§ **8**).   (In the illustrative material in this paper the value .805 has been used for r, following Lees 1953: 119.)   Log means 'logarithm of' so that log C means the logarithm of the percent of probable cognates registered, and 2 log r means twice the logarithm of the constant.

§ **33.** The formula is solved by the following steps: (a) The logarithm of C and the logarithm of r are ascertained from Table 1[5]. (b)   The logarithm of r is multiplied by two.   (c)   The product of the multiplication in (b) is divided into the logarithm of C. (d) The quotient of the division in (c) is the indicated time depth in millenia.   It may be changed to years by multiplying by 1,000.

Computation of Time Depth Illustrated

§ **34.** In the comparison of Ixcatec and Mazatec, 74 of the 192 pairs were registered as probable cognates (§ **29**).   Dividing 74 by 192 gives .385 (38.5 %).   This is the value to be used for C in the time depth formula.

§ **35.** The formula may now be filled in to read $t = \dfrac{\log .385}{2 \log .805}$. it is solved as follows: (a)   The logarithm of .385 is found from Table 1 to be .955.[5]   The logarithm of .805 is found to be .217. (b)   The product of 2 x .217 (that is 2 log r) is .434. (c)   The quotient of .434 (2 log r) divided into .955 (log. C) is 2.200; that is,

[5] For any who may be rusty on the use of logarithms, the following example is given.   The logarithm of .38 is .968; it is found at the point where a line from .3 on the vertical scale of Table 1 meets a line from .08 on the horizontal scale.   The logarithm of .39 is .942; it is found at the point where a line from .3 on the vertical scale of Table 1 meets a line from .09 on the horizontal scale.   The logarithm of .385 is halfway between these; half the difference between .968 and .942 subtracted from .968 gives .955 which is the logarithm of .385.   Table 1 has been included in the text as more convenient to use than a full logarithmic table; it contains only those values of N that are necessary for computing the time depth.