



Computer Systems Department

BUIC III PROGRAMMING MATHEMATICS
AND LOGIC EXERCISES

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Designed For ATC Course Use

This workbook provides the student with practice problems in the areas of computer mathematics and logic that have been covered in block I of course 20SR0123-3. These problems will be assigned by the instructor for class work as well as homework, and should only be attempted by the student after the area has been explained in class. Once the area has been explained the student is encouraged to work all the problems in that area even if it has not been assigned.

Students of ATC Course 20SR0123-3 are authorized to retain this publication after graduation, and may write in it as necessary. However, due to the rapid advancements in the computer field the student is cautioned not to use it for reference in preference to Technical Orders or other authoritative documents.

BUIC III PROGRAMMING MATHEMATICS

AND LOGIC EXERCISES

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NOTES

BINARY ADDITION

Solve the following binary addition problems:

1.
$$\begin{array}{r} 101101 \\ \underline{10110} \end{array}$$

6.
$$\begin{array}{r} 10011110 \\ \underline{10110110} \end{array}$$

2.
$$\begin{array}{r} 110110 \\ \underline{10110} \end{array}$$

7.
$$\begin{array}{r} 101101 \\ \underline{10101} \end{array}$$

3.
$$\begin{array}{r} 101011 \\ \underline{10101} \end{array}$$

8.
$$\begin{array}{r} 101011 \\ 10101 \\ \underline{10111} \end{array}$$

4.
$$\begin{array}{r} 100101 \\ \underline{10110} \end{array}$$

9.
$$\begin{array}{r} 1010110 \\ 101101 \\ \underline{1011110} \end{array}$$

5.
$$\begin{array}{r} 1010111 \\ \underline{101101} \end{array}$$

10.
$$\begin{array}{r} 11010 \\ 1010 \\ 10110 \\ \underline{1011} \end{array}$$

BINARY SUBTRACTION

Solve the following binary subtraction problems using the ordinary borrow method:

$$\begin{array}{r} 11. \ 101101 \\ \quad -10101 \\ \hline \end{array}$$

$$\begin{array}{r} 14. \ 101101 \\ \quad -11010 \\ \hline \end{array}$$

$$\begin{array}{r} 12. \ 101101 \\ \quad -10110 \\ \hline \end{array}$$

$$\begin{array}{r} 15. \ 11010 \\ \quad -1101 \\ \hline \end{array}$$

$$\begin{array}{r} 13. \ 1110110 \\ \quad -110111 \\ \hline \end{array}$$

$$\begin{array}{r} 16. \ 100000 \\ \quad \quad -1 \\ \hline \end{array}$$

RADIX-MINUS-ONE COMPLEMENT

Find the Radix-minus-one complement of the following:

17. $46_{10} = \underline{\hspace{2cm}}$ 22. $11011000_2 = \underline{\hspace{2cm}}$

18. $258_{10} = \underline{\hspace{2cm}}$ 23. $101011010_2 = \underline{\hspace{2cm}}$

19. $69453_{10} = \underline{\hspace{2cm}}$ 24. $1011010110_2 = \underline{\hspace{2cm}}$

20. $101101011_2 = \underline{\hspace{2cm}}$ 25. $10111101_2 = \underline{\hspace{2cm}}$

21. $110101101_2 = \underline{\hspace{2cm}}$ 26. $111100000_2 = \underline{\hspace{2cm}}$

RULES FOR D-825 BAD AND BSU INSTRUCTIONS

BAD - binary add

1. Like signs add and keep the sign.
 - a. End carry indicates POV set.
 - b. No end carry indicates correct answer.
2. Unlike signs complement the augend, add, and keep the sign.
 - a. End carry indicates correct answer.
 - b. No end carry indicates the need to complement for the correct answer.

BSU - binary subtract

1. Like signs complement the subtrahend, add and keep the sign of the minuend.
 - a. End carry indicates correct answer.
 - b. No end carry indicates the need to complement for the correct answer.
2. Unlike signs add and keep the sign of the minuend.
 - a. End carry indicates POV set.
 - b. No end carry indicates correct answer.

When complementing a value, complement all bits including all leading zeros, trailing zeros, and the sign bit. When adding, add all magnitude bits but do not add the sign bits.

D-825 ADDITION (BINARY)

Using the D-825 rules for the BAD instruction, perform the following additions. Indicate overflow where it occurs.

$$\begin{array}{r} 27. \ 1,100010 \\ \quad \underline{0,011000} \end{array}$$

$$\begin{array}{r} 31. \ 1,101111010 \\ \quad \underline{0,011100110} \end{array}$$

$$\begin{array}{r} 28. \ 0,011000 \\ \quad \underline{1,100010} \end{array}$$

$$\begin{array}{r} 32. \ 0,011100101 \\ \quad \underline{1,011100101} \end{array}$$

$$\begin{array}{r} 29. \ 0,100001 \\ \quad \underline{0,011111} \end{array}$$

$$\begin{array}{r} 33. \ 1,111101111 \\ \quad \underline{0,111101110} \end{array}$$

$$\begin{array}{r} 30. \ 1,000101 \\ \quad \underline{1,101100} \end{array}$$

$$\begin{array}{r} 34. \ 0,000000111 \\ \quad \underline{1,000000110} \end{array}$$

Using the D-825 rules for the BAD instruction, perform the following additions. Indicate overflow where it occurs. Assume a 12-bit computer word, including the sign bit.

$$\begin{array}{r} 35. \ 101110 \\ \quad \underline{-101} \end{array}$$

$$\begin{array}{r} 38. \ 111101 \\ \quad \underline{-111110} \end{array}$$

$$\begin{array}{r} 36. \ \quad 110 \\ \quad \underline{-111001} \end{array}$$

$$\begin{array}{r} 39. \ 101111100101 \\ \quad \underline{\quad \quad -11111} \end{array}$$

$$\begin{array}{r} 37. \ -101110 \\ \quad \underline{10101} \end{array}$$

$$\begin{array}{r} 40. \ \quad -10111 \\ \quad \underline{-1110111} \end{array}$$

D-825 SUBTRACTION (BINARY)

Using the D-825 rules for the BSU instruction, perform the following subtractions. Indicate overflow where it occurs.

41.
$$\begin{array}{r} 1.111101100 \text{ minuend} \\ 0.000010110 \text{ subtrahend} \\ \hline +1 \\ \hline 1.000000011 \text{ POV set} \end{array}$$

42.
$$\begin{array}{r} 1.101000111 \\ \hline 1.000111100 \end{array}$$

43.
$$\begin{array}{r} 0.100001111 \\ \hline 1.010110110 \end{array}$$

44.
$$\begin{array}{r} 0.000011111 \\ \hline 0.100110010 \end{array}$$

45.
$$\begin{array}{r} 1.000101111 \\ \hline 0.011010010 \end{array}$$

46.
$$\begin{array}{r} 0.000010111 \\ \hline 1.111110111 \end{array}$$

47.
$$\begin{array}{r} 0.000000001 \\ \hline 1.111111111 \end{array}$$

48.
$$\begin{array}{r} 0.111111111 \\ \hline 1.111111111 \end{array}$$

49.
$$\begin{array}{r} 1.101110111 \\ \hline 1.010111011 \end{array}$$

50.
$$\begin{array}{r} 0.101001110 \\ \hline 0.101011011 \end{array}$$

RADIX COMPLEMENT

Find the radix complement of the following values:

51. 43_{10} = _____

52. 627_{10} = _____

53. 52480_{10} = _____

54. 101101011_2 = _____

55. 1011001000_2 = _____

56. 10101101101_2 = _____

57. 101101010_2 = _____

58. 11110000_2 = _____

59. 1001110010_2 = _____

60. 110011001100_2 = _____

BINARY MULTIPLICATION AND DIVISION

Perform the indicated multiplication and division of the following binary values:

61. 101×1101

67. $101 \overline{) 10010.11}_2$

62. 110×10110

68. $1111 \overline{) 110000110}_2$

63. 10.1×10.01

64. 111×100.11

69. $11001 \overline{) 1001110001}_2$

65. 10.10×10.010

66. $111 \overline{) 101010}$

70. $100 \overline{) 100100101}_2$

BINARY-OCTAL CONVERSIONS

Perform the following Binary-Octal Conversions:

- 71. 1011011_2 = _____₈
- 72. 10101100_2 = _____₈
- 73. 11011010101_2 = _____₈
- 74. 0.101011_2 = _____₈
- 75. 0.1011010111_2 = _____₈
- 76. 0.11110001_2 = _____₈
- 77. 1010110.10110110011_2 = _____₈
- 78. 10101111.101110101_2 = _____₈
- 79. 101110.1011110101_2 = _____₈
- 80. 11100111.1011101101_2 = _____₈
- 81. 46_8 = _____₂
- 82. 75_8 = _____₂
- 83. 261_8 = _____₂
- 84. 0.35_8 = _____₂
- 85. 0.44_8 = _____₂
- 86. 0.56_8 = _____₂
- 87. 35.23_8 = _____₂
- 88. 75.436_8 = _____₂
- 89. 5603.72_8 = _____₂
- 90. 432.051_8 = _____₂

OCTAL-DECIMAL CONVERSIONS

Perform the following octal-decimal conversions:

- | | | | | | | | |
|------------------------|---|-------|----|---------------------------|---|-------|----|
| 91. 42_{10} | = | _____ | 8 | 111. 41_{10} | = | _____ | 8 |
| 92. 85_{10} | = | _____ | 8 | 112. 63_{10} | = | _____ | 8 |
| 93. 110_{10} | = | _____ | 8 | 113. 259_{10} | = | _____ | 8 |
| 94. 231_{10} | = | _____ | 8 | 114. 464_{10} | = | _____ | 8 |
| 95. 426_{10} | = | _____ | 8 | 115. 73_8 | = | _____ | 10 |
| 96. 17_8 | = | _____ | 10 | 116. 30_8 | = | _____ | 10 |
| 97. 54_8 | = | _____ | 10 | 117. 125_8 | = | _____ | 10 |
| 98. 100_8 | = | _____ | 10 | 118. 346_8 | = | _____ | 10 |
| 99. 151_8 | = | _____ | 10 | 119. 0.91875_{10} | = | _____ | 8 |
| 100. 230_8 | = | _____ | 10 | 120. 0.109375_{10} | = | _____ | 8 |
| 101. 0.625_{10} | = | _____ | 8 | 121. 0.427734375_{10} | = | _____ | 8 |
| 102. 0.6875_{10} | = | _____ | 8 | 122. 0.384765625_{10} | = | _____ | 8 |
| 103. 0.328125_{10} | = | _____ | 8 | 123. 43.546875_{10} | = | _____ | 8 |
| 104. 0.18359375_{10} | = | _____ | 8 | 124. 127.09375_{10} | = | _____ | 8 |
| 105. 0.1015625_{10} | = | _____ | 8 | 125. 633.2578125_{10} | = | _____ | 8 |
| 106. 0.6_8 | = | _____ | 10 | 126. 430.107421875_{10} | = | _____ | 8 |
| 107. 0.31_8 | = | _____ | 10 | 127. 32.52_8 | = | _____ | 10 |
| 108. 0.43_8 | = | _____ | 10 | 128. 70.07_8 | = | _____ | 10 |
| 109. 0.62_8 | = | _____ | 10 | 129. 135.501_8 | = | _____ | 10 |
| 110. 0.035_8 | = | _____ | 10 | 130. 1572.063_8 | = | _____ | 10 |

OCTAL ADDITION

Solve the following octal addition problems:

$$\begin{array}{r} 131. \quad 431 \\ \quad \underline{536} \end{array}$$

$$\begin{array}{r} 136. \quad 764216 \\ \quad \underline{775773} \end{array}$$

$$\begin{array}{r} 132. \quad 4651 \\ \quad \underline{3507} \end{array}$$

$$\begin{array}{r} 137. \quad 10415 \\ \quad \underline{54216} \end{array}$$

$$\begin{array}{r} 133. \quad 23570 \\ \quad \underline{60551} \end{array}$$

$$\begin{array}{r} 138. \quad 1041 \\ \quad 3266 \\ \quad \underline{7523} \end{array}$$

$$\begin{array}{r} 134. \quad 2346 \\ \quad \underline{5432} \end{array}$$

$$\begin{array}{r} 139. \quad 24456 \\ \quad 57265 \\ \quad \underline{73577} \end{array}$$

$$\begin{array}{r} 135. \quad 475734 \\ \quad \underline{264437} \end{array}$$

$$\begin{array}{r} 140. \quad 43210 \\ \quad 77654 \\ \quad 47332 \\ \quad \underline{17506} \end{array}$$

OCTAL SUBTRACTION

Use the direct method to solve the following octal subtraction problems:

$$141. \begin{array}{r} 463 \\ \underline{232} \end{array}$$

$$142. \begin{array}{r} 547 \\ \underline{165} \end{array}$$

$$143. \begin{array}{r} 2046 \\ \underline{1322} \end{array}$$

$$144. \begin{array}{r} 7307 \\ \underline{5661} \end{array}$$

$$145. \begin{array}{r} 12340 \\ \underline{5456} \end{array}$$

RADIX-MINUS-ONE COMPLEMENT (OCTAL)

Find the radix-minus-one complement of the following:

146. 57_8 = _____

147. 360_8 = _____

148. 62534_8 = _____

149. 553_8 = _____

150. 34621_8 = _____

151. 62010_8 = _____

152. 74352_8 = _____

153. 21005_8 = _____

154. 43201_8 = _____

155. 5040062_8 = _____

D-825 ADDITION (OCTAL)

Using the D-825 rules for the BAD instruction, perform the following additions. Indicate overflow where it occurs. Remember, the most significant octal digit contains the sign bit. Assume the computer uses a 24 bit word.

$$\begin{array}{r} 156. \quad 3547 \ 2205 \\ \quad \quad \underline{2222 \ 0000} \end{array}$$

$$\begin{array}{r} 161. \quad 7635 \ 4321 \\ \quad \quad \underline{6777 \ 3415} \end{array}$$

$$\begin{array}{r} 157. \quad 5236 \ 7200 \\ \quad \quad \underline{6131 \ 0576} \end{array}$$

$$\begin{array}{r} 162. \quad 4275 \ 3210 \\ \quad \quad \underline{4777 \ 3210} \end{array}$$

$$\begin{array}{r} 158. \quad 4000 \ 5236 \\ \quad \quad \underline{0000 \ 2122} \end{array}$$

$$\begin{array}{r} 163. \quad 2111 \ 1234 \\ \quad \quad \underline{4321 \ 4321} \end{array}$$

$$\begin{array}{r} 159. \quad 0000 \ 3412 \\ \quad \quad \underline{4000 \ 7230} \end{array}$$

$$\begin{array}{r} 164. \quad 6243 \ 7766 \\ \quad \quad \underline{0132 \ 2231} \end{array}$$

$$\begin{array}{r} 160. \quad 7000 \ 4320 \\ \quad \quad \underline{4236 \ 0000} \end{array}$$

$$\begin{array}{r} 165. \quad 2113 \ 1442 \\ \quad \quad \underline{5111 \ 2234} \end{array}$$

D-825 SUBTRACTION (OCTAL)

Using the D-825 rules for the BSU instruction, perform the following subtractions, indicating overflow where it occurs:

166. 7660 0052 minuend
0130 0025 subtrahend
 4010 0077
 +1 end carry
 4010 0100 POV set

171. 6323 4320
6755 0777

167. 4225 2525
5252 5253

172. 4000 0321
4000 0072

168. 2253 3325
1123 2231

173. 0000 0036
0000 0007

169. 5223 3452
3012 4322

174. 7777 5252
6233 3333

170. 4552 2432
2022 7677

175. 7773 2525
5773 2525

RADIX COMPLEMENT (OCTAL)

Find the radix complement of each octal number.

176. 35_8 = _____

177. 206_8 = _____

178. 4375_8 = _____

179. 62574_8 = _____

180. 45760_8 = _____

181. 3571_8 = _____

182. 176432_8 = _____

183. 457400_8 = _____

184. 205077_8 = _____

185. 6055410_8 = _____

OCTAL MULTIPLICATION AND DIVISION

Solve each of the following octal multiplication and division problems:

186. $35_8 \times 27_8$

191. $16_8 \overline{) 374_8}$

187. $153_8 \times 26_8$

192. $24_8 \overline{) 12,574_8}$

188. $435_8 \times 23_8$

193. $346_8 \overline{) 22,674_8}$

189. $6732_8 \times 125_8$

194. $627_8 \overline{) 266,023_8}$

190. $45072_8 \times 2065_8$

195. $64213_8 \overline{) 11,325,177_8}$

ABSOLUTE ARITHMETIC

Find the answer for each of the following problems:

196. $16_{10} + \left| -45_{10} \right| =$ _____

197. $16_{10} - \left| -45_{10} \right| =$ _____

198. $-16_{10} - \left| -45_{10} \right| =$ _____

199. $\left| -16_{10} \right| - 45_{10} =$ _____

200. $-16_{10} + \left| -45_{10} \right| =$ _____

201. $4_8 - \left| 13_8 - 7_8 + 10_8 - 15_8 \right| + 10_8 =$ _____

202. $27_8 + 16_8 - \left| -13_8 + 25_8 + 46_8 \right| =$ _____

203. $\left| 16_8 - 25_8 + 3 \right| - 12_8 =$ _____

204. $-203_8 + \left| -605_8 + 333_8 + 472_8 \right| =$ _____

205. $1046_8 - \left| -763_8 - 207_8 + 1004_8 \right| - 1245_8 =$ _____

BINARY CODED DECIMAL

Write the BCD form of each number.

- | | | |
|---------------------|---|--|
| 206. 26_{10} | = | |
| 207. 342_{10} | = | |
| 208. 8643_{10} | = | |
| 209. 9078_{10} | = | |
| 210. 3462_{10} | = | |
| 211. 8079652_{10} | = | |
| 212. 1011010110_2 | = | |
| 213. 10101101_2 | = | |
| 214. 376_8 | = | |
| 215. 4765_8 | = | |

Convert each BCD coded number to its equivalent decimal, octal, or binary as indicated by the subscript associated with each answer blank.

- | | | | |
|---|---|--|----|
| 216. 0011 0100 BCD | = | | 10 |
| 217. 0001 0011 0111 BCD | = | | 10 |
| 218. 1001 0010 0110 0000 BCD | = | | 10 |
| 219. 1000 0111 0110 0101 BCD | = | | 10 |
| 220. 0001 0000 0100 1001 BCD | = | | 10 |
| 221. 1000 0011 0001 0010 0101 0000 0111 BCD | = | | 10 |
| 222. 0011 0100 0010 BCD | = | | 2 |
| 223. 1000 0000 BCD | = | | 2 |
| 224. 0101 1001 0011 BCD | = | | 8 |
| 225. 0011 0111 0110 BCD | = | | 8 |

HOLLERITH CODING

Code the following statement in 6-bit Hollerith code for a 48 bit computer word:

226. UNITED STATES AIR FORCE

Decode the following messages which are coded in 6-bit Hollerith:

227. 6330316260316260

2664456060302133

228. 6247254331452760

2646452563314243

7060606060606060

DECIMAL SCALING

Express in scientific notation:

- | | | | | | | | |
|------|---------|---|-------|------|----------|---|-------|
| 229. | 25 | = | _____ | 234. | 10457 | = | _____ |
| 230. | 643 | = | _____ | 235. | 0.000042 | = | _____ |
| 231. | 0.0054 | = | _____ | 236. | 62.256 | = | _____ |
| 232. | 0.00063 | = | _____ | 237. | 200.003 | = | _____ |
| 233. | 5622 | = | _____ | 238. | 6.143 | = | _____ |

Normalize:

- | | | | | |
|------|-----------|--|------|------------|
| 239. | 443 | | 244. | 23406 |
| 240. | 70305 | | 245. | 0.00000444 |
| 241. | 0.00601 | | 246. | 25.623 |
| 242. | 0.0000563 | | 247. | 2234.5 |
| 243. | 7531 | | 248. | 0.4325 |

Express as a value between 100 and 1000:

- | | | | | |
|------|------------|--|------|---------|
| 249. | 825076 | | 254. | 52431 |
| 250. | 342051 | | 255. | 0.03 |
| 251. | 0.00432106 | | 256. | 5.625 |
| 252. | 0.000032 | | 257. | 6.000 |
| 253. | 76 | | 258. | 432.053 |

Scale to value where the radix point is to the right of the LSD:

- | | | | | | | | |
|------|--------|---|-------|------|-----------|---|-------|
| 259. | 2.9 | = | _____ | 264. | 1.035764 | = | _____ |
| 260. | .435 | = | _____ | 265. | 0.0000062 | = | _____ |
| 261. | .06241 | = | _____ | 266. | 0.721421 | = | _____ |
| 262. | .00052 | = | _____ | 267. | 98.2356 | = | _____ |
| 263. | 64.23 | = | _____ | 268. | 7463 | = | _____ |

BINARY SCALING

Scale to value where radix point is to the right of the LSD:

- | | | | | | | | |
|------|--------------|---|-------|------|-------------|---|-------|
| 269. | 1011.101 | = | _____ | 274. | 1011.000111 | = | _____ |
| 270. | 101.11101 | = | _____ | 275. | 0.01001 | = | _____ |
| 271. | .01101 | = | _____ | 276. | 0.00001 | = | _____ |
| 272. | 101101.10111 | = | _____ | 277. | 1011.001 | = | _____ |
| 273. | 0.0011 | = | _____ | 278. | 100101 | = | _____ |

Express as a value between 8_{10} and 16_{10} :

- | | | | | | | | |
|------|-------------|---|-------|------|-------------|---|-------|
| 279. | 110.1101 | = | _____ | 284. | 10110.00111 | = | _____ |
| 280. | 101101.0110 | = | _____ | 285. | 10.101 | = | _____ |
| 281. | 1011001.0 | = | _____ | 286. | 10010100101 | = | _____ |
| 282. | .000100110 | = | _____ | 287. | .000001001 | = | _____ |
| 283. | 0.0101 | = | _____ | 288. | 1001 | = | _____ |

Normalize the following binary values:

- | | | | | | | | |
|------|--------------|---|-------|------|------------------|---|-------|
| 289. | 101101 | = | _____ | 294. | 1011011.01101 | = | _____ |
| 290. | 100.001 | = | _____ | 295. | 1011010111.01001 | = | _____ |
| 291. | 11001.01101 | = | _____ | 296. | 1011000 | = | _____ |
| 292. | 0.000101101 | = | _____ | 297. | .00001001001 | = | _____ |
| 293. | 10111001.101 | = | _____ | 298. | .001101010 | = | _____ |

OCTAL SCALING

Scale to value where radix point is to the right of the LSD:

- | | |
|-----------------------|------------------------|
| 299. 4.52 = _____ | 304. 725.54 = _____ |
| 300. 654.325 = _____ | 305. 6.257304 = _____ |
| 301. 476.1 = _____ | 306. 0.0056 = _____ |
| 302. 0.003544 = _____ | 307. 103400000 = _____ |
| 303. 4634000 = _____ | 308. 2574 = _____ |

Express as a value between 10_8 and 100_8 :

- | | |
|------------------------------|-------------------------------|
| 309. $643.7_{(8)}$ = _____ | 314. $1653.12_{(8)}$ = _____ |
| 310. $2.4367_{(8)}$ = _____ | 315. $0.000432_{(8)}$ = _____ |
| 311. $0.00434_{(8)}$ = _____ | 316. $1265431_{(8)}$ = _____ |
| 312. $0.00005_{(8)}$ = _____ | 317. $475.206_{(8)}$ = _____ |
| 313. $6034.7_{(8)}$ = _____ | 318. $27.641_{(8)}$ = _____ |

Normalize:

- | | |
|--------------------------------|-----------------------------|
| 319. $265_{(8)}$ = _____ | 324. $475.43_{(8)}$ = _____ |
| 320. $427.31_{(8)}$ = _____ | 325. $676031_{(8)}$ = _____ |
| 321. $7643.2_{(8)}$ = _____ | 326. $27.43_{(8)}$ = _____ |
| 322. $0.00543_{(8)}$ = _____ | 327. $0.0543_{(8)}$ = _____ |
| 323. $0.0000673_{(8)}$ = _____ | 328. $0.6734_{(8)}$ = _____ |

FLOATING POINT

Place the following binary values in floating point format using the bases indicated:

329. $B = 11001000$; 10110110.101 _____
330. $B = 11001000$; 0.000001011 _____
331. $B = 10010110$; 1101101 _____
332. $B = 10010110$; 0.0011011 _____
333. $B = 1100100$; 11010.01101 _____
334. $B = 1100100$; 0.000111 _____
335. $B = 110010$; 0.000101 _____
336. $B = 110010$; 1110101101.01 _____
337. $B = 11001$; 1100101.101101 _____
338. $B = 11001$; 0.110101 _____

Place the following values in floating point format using the bases indicated. Normalize all values.

339. $B = 300_8$; 63.5_8 _____
340. $B = 300_8$; 0.32_8 _____
341. $B = 300_8$; 367.1_8 _____
342. $B = 300_8$; 0.00474_8 _____
343. $B = 226_8$; 5437_8 _____
344. $B = 226_8$; 0.00035_8 _____
345. $B = 226_8$; 275.4_8 _____
346. $B = 226_8$; 0.0251_8 _____
347. $B = 144_8$; 10.101_8 _____
348. $B = 144_8$; 0.011_8 _____
349. $B = 144_8$; 746.3_8 _____
350. $B = 144_8$; 322.5_8 _____
351. $B = 100_8$; 0.0035_8 _____

352. $B = 100_8; 0.0062_8$

353. $B = 100_8; 10054_8$

Give the value (in octal) of the following D-825 computer words. The values are stored in D-825 floating point format. If a number is not in normalized format, normalize it.

354. 4001 2341 0000 0000

355. 0005 1321 0000 0000

356. 4002 6310 4000 0000

357. 0003 1121 0000 0000

358. 0001 7717 0000 0000

359. 4003 2213 3000 0000

360. 4005 7310 0000 0000

361. 4003 0110 0000 0000

362. 0004 1001 0000 0000

363. 0001 1101 0000 0000

364. 4002 3333 0000 0000

365. 4002 4002 0000 0000

366. 0002 0020 0000 0000

367. 0004 6032 0000 0000

368. 4003 7120 0000 0000

369. 0015 0000 0000 0065

370. 4010 4007 6321 0000

371. 4013 5654 7000 0000

372. 0031 4000 0000 5012

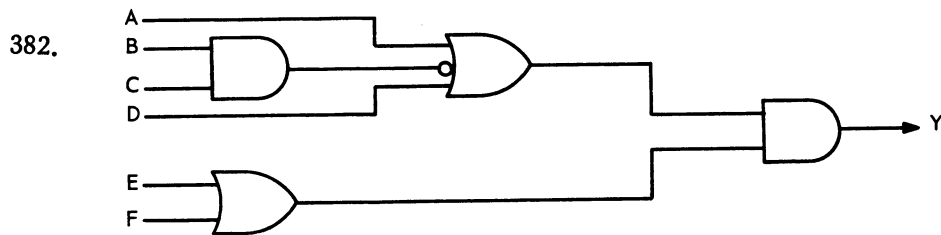
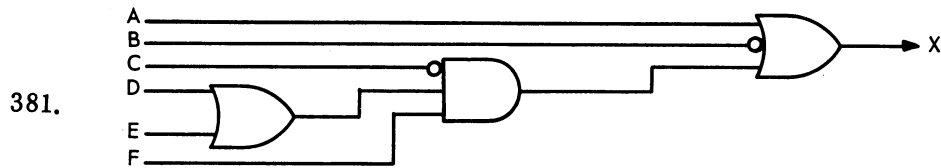
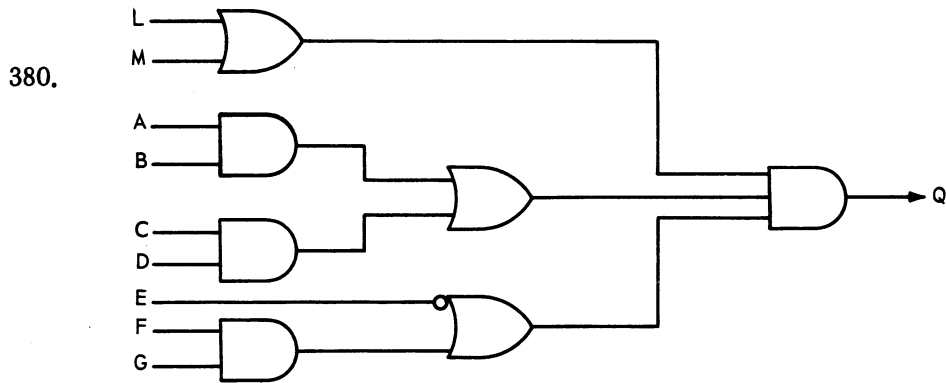
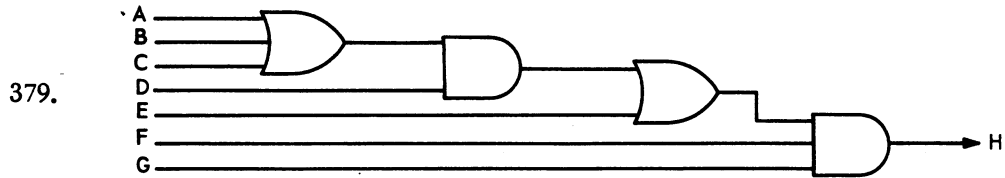
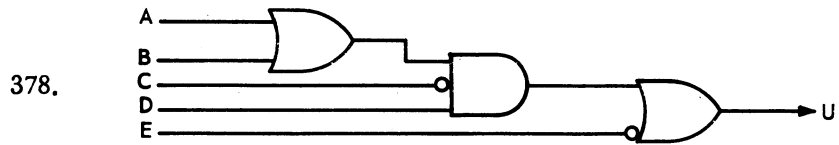
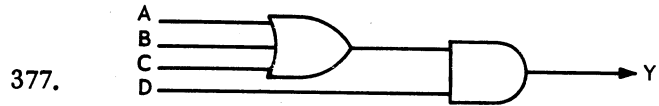
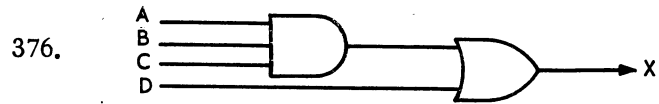
373. 0043 3620 0000 0000

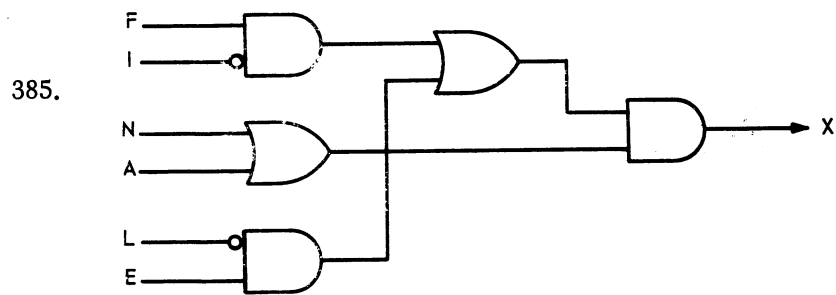
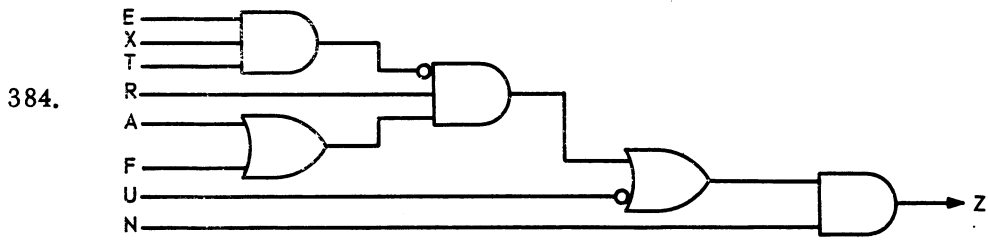
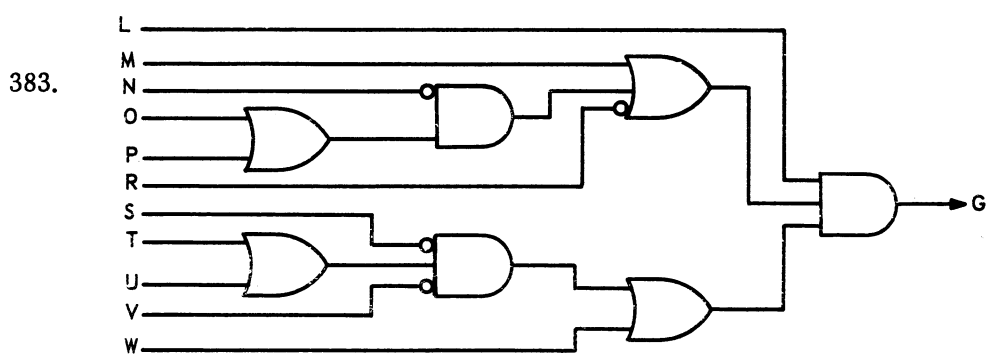
374. 0006 4525 2520 0000

375. 0020 4320 1000 0000

BOOLEAN ALGEBRA

Express as equations:





Draw the Boolean diagrams which express the following equations:

386. $X = A + BC + D$

387. $Y = A(B + C) + D$

388. $J = \overline{MN} + S(\overline{T} + \overline{U})$

389. $R = AB + C(D + E) + FG$

390. $Z = A\overline{B}(D + C + E)F$

391. $K = B + \overline{L}(O + (N + E)Y)$

392. $P = Q(R + \overline{S})(T + \overline{U}(\overline{V}\overline{W}))$

393. $R = S + \overline{T}(UV)W + (\overline{X} + (Y + Z))$

394. $A = J(K + L(M + N + (O(P(Q + R) + S))))$

395. $B = \overline{L} + \overline{M}(N + \overline{OP})R + (S + \overline{TU} + V)\overline{W}$

USE THIS SPACE FOR DIAGRAMS

Invert:

396. $R = AB + CD$

397. $S = ABC + D + E$

398. $P = (F + \overline{G})(\overline{H} + I)$

399. $B = R + \overline{ST} + U + \overline{VW}$

400. $X = (A + \overline{B})C + (\overline{D} + E)F$

401. $T = R + \overline{S}(X + (\overline{M} + N)P)$

402. $W = A(\overline{B} + C(\overline{D} + E)F + \overline{G})$

403. $Y = H(I + (J + K + L)\overline{M} + N)$

404. $K = P(\overline{Q} + R)(\overline{S} + T)\overline{U} + V + \overline{W}(X + \overline{Y}) + Z$

405. $G = L(M + \overline{N}(O + P) + \overline{R})(\overline{S}(T + U)\overline{V} + W)$

LOGICAL ADDITION AND MULTIPLICATION

Perform logical addition.

$$\begin{array}{r} 406. \quad 1 \ 101 \ 100 \\ \quad \quad \underline{0 \ 101 \ 011} \end{array}$$

$$\begin{array}{r} 407. \quad 110 \ 100 \ 111 \\ \quad \quad \underline{111 \ 010 \ 010} \end{array}$$

$$\begin{array}{r} 408. \quad 101 \ 100 \ 000 \\ \quad \quad \underline{011 \ 110 \ 101} \end{array}$$

$$\begin{array}{r} 409. \quad 125_8 \\ \quad \quad \underline{137_8} \end{array}$$

$$\begin{array}{r} 410. \quad 557_8 \\ \quad \quad \underline{256_8} \end{array}$$

Perform logical multiplication.

$$\begin{array}{r} 411. \quad 101 \ 001 \\ \quad \quad \underline{101 \ 101} \end{array}$$

$$\begin{array}{r} 413. \quad 10 \ 100 \ 111 \\ \quad \quad \underline{11 \ 100 \ 101} \end{array}$$

$$\begin{array}{r} 412. \quad 110 \ 110 \ 111 \\ \quad \quad \underline{011 \ 001 \ 101} \end{array}$$

$$\begin{array}{r} 414. \quad 307_8 \\ \quad \quad \underline{132_8} \end{array}$$

MASKS AND LOGICAL OPERATIONS

Create the correct mask and perform the correct logical operations to accomplish the following: (Label the operations performed: LAN, LOR, etc.)

415. Save the last five bits of: 110 101 100 110 111

416. Save bits 2-7 (inclusive) of: 110 101 111 100 101

417. Save all data EXCEPT bits 6-13 (inclusive) of: 111 110 101 111 101 110

418. Save all data EXCEPT bits 6-20 (inclusive) of: 6321 5477 3216 5217

419. Save bits 1-7 (inclusive) of: 4376 2341 4567 7722

420. Save bits 4-10, 13-15, and 35-47 of: 3772 2206 5321 7621

421. Save all data EXCEPT bits 11-23, 29-34 and 36-43 of: 4776 0152 7766 6320

422. Store bits 1-9 of word 1 and bits 40-48 of word 2 in one computer word.

word 1 5730 0000 0000 0000

word 2 0000 0000 0000 0531

423. Store bits 5-17 of word 1 in bits 5-17 of word 2 without disturbing any other data in word 2.

word 1 3427 6325 7213 7777

word 2 7667 5677 7276 6377

424. Store bits 1-12 of word 1 and bits 37-48 of word 2 in computer word 3. Destroy only those bits necessary for this operation.

word 1 6321 5476 2523 6601

word 2 3412 6701 3257 6723

word 3 2205 6677 3342 1276

425. Word 1 below is coded in 6-bit hollerith, and contains an error. Correct it by using logical operations. Create any masks or other computer words necessary. Do not disturb any values that are already correct. (Label your operations.)

word 1 2364 4447 6463 2551

426. The logical exclusive or gate (LXR instruction) can be effectively used in the computer as demonstrated below. Combine the values in word 1 and word 2 using exclusive or logic.

word 1 5276 3140 6312 4576

word 2 7777 7777 7777 7777

427. What has happened to word 1 in problem 426?

428. If a binary counter has a capability of 12 bit positions what is the highest number (in decimal) it will count before re-setting to zero? _____

429. How many different values (in decimal) can be stored in a 16 bit computer register?

430. If you need to store the value $1,254,389_{(10)}$, how many bit positions must the storage device contain? _____

431. How many bit positions would it take to store the value $134,217,728_{(10)}$? _____

GENERAL CONVERSIONS

For practice perform the following conversions. It is not necessary to carry a fraction more than six places.

432. $29_{(10)}$ = _____₍₃₎
433. $103_{(10)}$ = _____₍₆₎
434. $36_{(9)}$ = _____₍₁₀₎
435. $31_{(4)}$ = _____₍₁₀₎
436. $0.647_{(10)}$ = _____₍₇₎
437. $324_{(9)}$ = _____₍₂₎
438. $123_{(4)}$ = _____₍₅₎
439. $763_{(9)}$ = _____₍₃₎
440. $.325_{(10)}$ = _____₍₄₎
441. $.635_{(10)}$ = _____₍₃₎
442. $.6_{(8)}$ = _____₍₅₎
443. $12.12_{(8)}$ = _____₍₂₎
444. $124.5_{(5)}$ = _____₍₄₎
445. $12_{(10)}$ = _____₍₁₆₎
446. $15_{(10)}$ = _____₍₁₆₎
447. $1C_{(16)}$ = _____₍₁₀₎
448. $111101011001111_{(2)}$ = _____₍₁₆₎
449. $2A5D_{(16)}$ = _____₍₂₎
450. $5BC8_{(16)}$ = _____₍₁₀₎

ANSWERS

Binary Addition

1. $1\ 000\ 0\ 11_2$
2. $1\ 001\ 100_2$
3. 1000000_2
4. $111\ 011_2$
5. $10\ 000\ 100_2$
6. $101\ 010\ 100_2$
7. $1\ 000\ 010_2$
8. $1\ 010\ 111_2$
9. $11\ 100\ 001_2$
10. $1\ 000\ 101_2$

Binary Subtraction

11. 11000_2
12. 10111_2
13. $111\ 111_2$
14. 10011_2
15. 1101_2
16. 11111_2

Radix Minus-One Complement

17. 53_{10}
18. 74_{10}
19. 30546_{10}
20. 010010100_2
21. 001010010_2
22. 00100111_2
23. 010100101_2

24. 0100101001_2

25. 01000010_2

26. 000011111_2

D-825 Addition

27. 1.001010

28. 1.001010

29. $0.000001\ \text{POV}$

30. 1.110001

31. 1.010010100

32. 1.111111111

33. 1.000000001

34. 0.000000001

35. 0.000101001

36. 1.000110011

37. 1.000011001

38. 1.000000001

39. 0.101111000110

40. 1.010001110

D-825 Subtraction

41. $1.000000011\ \text{POV SET}$

42. 1.100001011

43. 0.111000101

44. 0.011101100

45. 1.100000001

46. $0.000001111\ \text{POV set}$

47. 0.000000001

48. 0.111111111 POV set

49. 1.010111100

50. 1.000001101

Radix Complement

51. 57_{10}

52. 373_{10}

53. 47520_{10}

54. 010010101

55. 0100111000

56. 01010010011

57. 010010110

58. 00010000

59. 0110001110

60. 001100110100

Binary Multiplication and Division

61. 1000001_2

62. 10000100_2

63. 101.101_2

64. 100001.01_2

65. 101.10100_2

66. 110_2

67. 11.11_2

68. 11010_2

69. 11001_2

70. 1001001.01_2

Binary-Octal Conversions

71. 133_8

72. 254_8

73. 3325_8

74. 0.53_8

75. 0.5534_8

76. 0.742_8

77. 126.5546_8

78. 257.565_8

79. 56.5724_8

80. 347.5655_8

81. 100110_2

82. 111101_2

83. 10110001_2

84. 0.011101_2

85. 0.1001_2

86. 0.10111_2

87. 11101.010011_2

88. 111101.100 011 11

89. 101110000011.11101

90. 100 011 010.000 101 001

Octal-Decimal Conversions

91. 52_8

93. 125_8

93. 156_8

94. 347_8

95. 652_8

96. 15_{10}

97. 44_{10}

98. 64_8
 99. 105_{10}
 100. 152_{10}
 101. 0.5_8
 102. 0.54_8
 103. 0.25_8
 104. 0.136_8
 105. 0.064_8
 106. 0.75_{10}
 107. 0.390625_{10}
 108. 0.546875_{10}
 109. 0.78125_{10}
 110. 0.056640625_{10}
 111. 51_8
 112. 77_8
 113. 403_8
 114. 720_8
 115. 59_{10}
 116. 24_{10}
 117. 85_{10}
 118. 230_{10}
 119. 2230_{10}
 120. 0.07_8
 121. 0.333_8
 122. 0.305_8
 123. 53.43_8
 124. 177.06_8

125. 1171.204_8
 126. 656.067_8
 127. 26.65625_{10}
 128. 56.109375_{10}
 129. 93.626953125_{10}
 130. 890.099609375_{10}

Octal Addition

131. $1,167_8$
 132. $10,360_8$
 133. $104,341_8$
 134. $10,000_8$
 135. $762,373_8$
 136. $1,762,211_8$
 137. $64,633_8$
 138. $14,052_8$
 139. $177,542_8$
 140. $232,124_8$

Octal Subtraction

141. 231_8
 142. 362_8
 143. 524_8
 144. 1426_8
 145. 4662_8

Radix Minus-One Complement (Octal)

146. 20_8
 147. 417_8
 148. 15243_8

149. 224_8

150. 43156_8

151. 15767_8

152. 03425_8

153. 56772_8

154. 34576_8

155. 2737715_8

D-825 Addition (Octal)

156. 1771 2206 POV set

157. 7367 7776

158. 4000 3114

159. 4000 3616

160. 7236 4320

161. 6634 7737 POV set

162. 5274 6420

163. 1567 4713

164. 6111 5535

165. 1001 7206

D-825 Subtraction (Octal)

166. 4010 0100 POV set

167. 1025 2526

168. 1130 1074

169. 4235 7775 POV set

170. 6575 2331

171. 0431 4477

172. 4000 0227

173. .0000 0027

174. 5544 1717

175. 6000 0000

Radix Complement (Octal)

176. 43

177. 572

178. 3403

179. 15204_8

180. 32020_8

181. 4207_8

182. 601346_8

183. 320400_8

184. 572701_8

185. 1722370_8

Octal Multiplication and Division

186. $1,233_8$

187. $4,462_8$

188. $12,447_8$

189. $1,114,542_8$

190. $116,043,002_8$

191. 22_8

192. 423_8

193. 52_8

194. 345_8

195. 134.1_8

Absolute Arithmetic

196. $+61_{10}$

197. -29_{10}

- 198. -61_{10}
- 199. -29_{10}
- 200. $+29_{10}$
- 201. $+13_8$
- 202. -13_8
- 203. -6_8
- 204. $+15_8$
- 205. -365_8

Binary Coded Decimal

- 206. $0010\ 0110_{BCD}$
- 207. $0011\ 0100\ 0010_{BCD}$
- 208. $1000\ 0110\ 0100\ 0011_{BCD}$
- 209. $1001\ 0000\ 0111\ 1000_{BCD}$
- 210. $0011\ 0100\ 0110\ 0010_{BCD}$
- 211. $1000\ 0000\ 0111\ 1001\ 0110\ 0101\ 0010_{BCD}$
- 212. $0111\ 0010\ 0110_{BCD}$
- 213. $0001\ 0111\ 0011_{BCD}$
- 214. $0010\ 0101\ 0100_{BCD}$
- 215. $0010\ 0101\ 0100\ 1001_{BCD}$
- 216. 34_{10}
- 217. 137_{10}
- 218. 9260_{10}
- 219. 8765_{10}
- 220. 1049_{10}
- 221. 8312507_{10}
- 222. $101\ 010\ 110_2$
- 223. 1010000_2

- 224. 1121_8
- 225. 570_8

Hollerith Coding

- 226. 64 45 31 63 25 24 60 62
63 21 63 25 62 60 21 31
51 60 26 46 51 23 25 60
- 227. THIS IS FUN HA.
- 228. SPELING FONETIKLY

Decimal Scaling

- 229. $2.5_{10} \times 10^1$
- 230. $6.43_{10} \times 10^2$
- 231. $5.4_{10} \times 10^{-3}$
- 232. $6.3_{10} \times 10^{-4}$
- 233. $5.622_{10} \times 10^3$
- 234. $1.0457_{10} \times 10^4$
- 235. $4.2_{10} \times 10^{-5}$
- 236. $6.2256_{10} \times 10^1$
- 237. $2.00003_{10} \times 10^2$
- 238. $6.143_{10} \times 10^0$
- 239. $0.443_{10} \times 10^3$
- 240. $0.70305_{10} \times 10^5$
- 241. $0.601_{10} \times 10^{-2}$
- 242. $0.563_{10} \times 10^{-4}$
- 243. $0.7531_{10} \times 10^4$
- 244. $0.23406_{10} \times 10^5$
- 245. $0.444_{10} \times 10^{-5}$
- 246. $0.25623_{10} \times 10^2$

247. $0.22345_{10} \times 10^4$
 248. $0.4325_{10} \times 10^0$
 249. $825.076_{10} \times 10^3$
 250. $342.051_{10} \times 10^3$
 251. $432.106_{10} \times 10^{-5}$
 252. $320_{10} \times 10^{-7}$
 253. $760_{10} \times 10^{-1}$
 254. $524.31_{10} \times 10^2$
 255. $300 \times 10_{10}^{-4}$
 256. $562.5_{10} \times 10^{-2}$
 257. $600_{10} \times 10^{-2}$
 258. $432.053_{10} \times 10^0$
 259. $29_{10} \times 10^{-1}$
 260. $435_{10} \times 10^{-3}$
 261. $6241_{10} \times 10^{-5}$
 262. $52_{10} \times 10^{-5}$
 263. $6423_{10} \times 10^{-2}$
 264. $1035764_{10} \times 10^{-6}$
 265. $62_{10} \times 10^{-7}$
 266. $721421_{10} \times 10^{-6}$
 267. $982356_{10} \times 10^{-4}$
 268. $7463_{10} \times 10^0$

Binary Scaling

269. $1011101_2 \times 2^{-3}$
 270. $10111101_2 \times 2^{-5}$
 271. $1101_2 \times 2^{-5}$
 272. $1011011011_2 \times 2^{-5}$

273. $11_2 \times 2^{-4}$
 274. $1011000111_2 \times 2^{-6}$
 275. $1001_2 \times 2^{-5}$
 276. $1_2 \times 2^{-5}$
 277. $1011001_2 \times 2^{-3}$
 278. $100101_2 \times 2^0$
 279. $1101.101_2 \times 2^{-1}$
 280. $1011.01011_2 \times 2^{+2}$
 281. $1011.001_2 \times 2^3$
 282. $1001.1_2 \times 2^{-7}$
 283. $1010_2 \times 2^{-5}$
 284. $1011.000111_2 \times 2^1$
 285. $1010.1_2 \times 2^{-2}$
 286. $1001.0100101_2 \times 2^7$
 287. $1000.1_2 \times 2^{-9}$
 288. $1001_2 \times 2^0$
 289. $0.101101_2 \times 2^6$
 290. $0.100001_2 \times 2^3$
 291. $0.1100101101_2 \times 2^5$
 292. $0.101101_2 \times 2^{-3}$
 293. $0.10111001101_2 \times 2^8$
 294. $0.101101101101_2 \times 2^7$
 295. $0.101101011101001_2 \times 2^{10}$
 296. $0.1011_2 \times 2^7$
 297. $0.1001001_2 \times 2^{-4}$
 298. $0.110101_2 \times 2^{-2}$

Octal Scaling

- 299. $452_8 \times 8^{-2}$
- 300. $654325_8 \times 8^{-3}$
- 301. $4761_8 \times 8^{-1}$
- 302. $3544_8 \times 8^{-6}$
- 303. $4634_8 \times 8^3$
- 304. $72554_8 \times 8^{-2}$
- 305. $6257304_8 \times 8^{-6}$
- 306. $56_8 \times 8^{-4}$
- 307. $1034_8 \times 8^5$
- 308. $2574_8 \times 8^0$
- 309. $64.37_8 \times 8^{+1}$
- 310. $24.367_8 \times 8^{-1}$
- 311. $43.4_8 \times 8^{-4}$
- 312. $50_8 \times 8^{-6}$
- 313. $60.347_8 \times 8^2$
- 314. $16.5312_8 \times 8^2$
- 315. $43.2_8 \times 8^{-5}$
- 316. $12.65431_8 \times 8^5$
- 317. $47.5206_8 \times 8^1$
- 318. $27.641_8 \times 8^0$
- 319. $0.265_8 \times 8^3$
- 320. $0.42731_8 \times 8^3$
- 321. $0.76432_8 \times 8^0$
- 322. $0.543_8 \times 8^{-2}$
- 323. $0.673_8 \times 8^{-4}$
- 324. $0.47543_8 \times 8^3$

325. $0.676031_8 \times 8^6$

326. $0.2743_8 \times 8^2$

327. $0.543_8 \times 8^{-1}$

328. $0.6734_8 \times 8^0$

Floating Point

329. 11010000.10110110101_2

330. 11000011.1011_2

331. 10011101.1101101_2

332. 10010100.11011_2

333. 1101001.1101001101_2

334. 1100001.111_2

335. 101111.101_2

336. 111100.111010110101_2

337. 100000.1100101101101_2

338. 11001.110101_2

339. 306.635_8

340. 277.64_8

341. 310.7562_8

342. 272.474_8

343. 242.5437_8

344. 214.72_8

345. 236.573_8

346. 222.522_8

347. 150.40404_8

348. 137.44_8

349. 155.7463_8

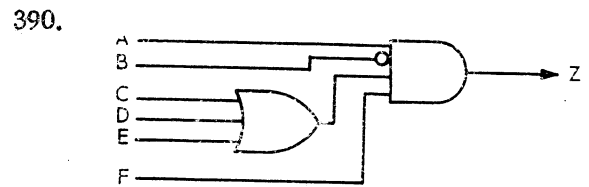
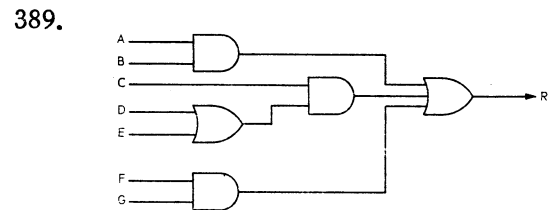
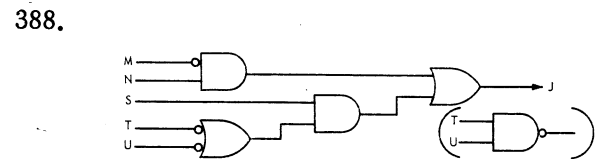
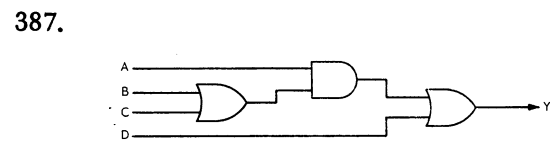
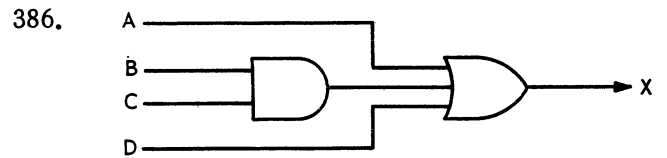
350. 154.6452_8

- 351. 71.72_8
- 352. 72.62_8
- 353. 115.4026_8
- 354. $+ .2341$
- 355. $+13.21, 0004\ 2642\ 0000\ 0000$
- 356. $- .11442$
- 357. $+2.242, 0002\ 2242\ 0000\ 0000$
- 358. -1.7474
- 359. $+ .044266$
- 360. $- .01544$
- 361. $+ .0022, 0001\ 2200\ 0000\ 0000$
- 362. $+4.004, 0003\ 4004\ 0000\ 0000$
- 363. $+ .4404, 0000\ 2202\ 0000\ 0000$
- 364. $+ .15554$
- 365. $- .0001, 4013\ 6000\ 0000\ 0000$
- 366. $+ .02\ 4004\ 2000\ 0000\ 0000$
- 367. -10.150
- 368. $- .0624$
- 369. $+ .00000324, 4020\ 3240\ 0000\ 0000$
- 370. $+ .00000371504, 4017\ 3715\ 0400\ 0000$
- 371. $- .000072634, 4014\ 7531\ 6000\ 0000$
- 372. $-2.405, 0002\ 6405\ 0000\ 0000$
- 373. $362000000000.$
- 374. $-12.52524, 0004\ 6525\ 2500\ 0000$
- 375. $-15004., 0015\ 7201\ 0000\ 0000$

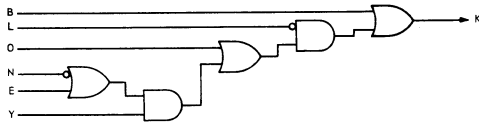
Boolean Algebra

376. $X = ABC + D$

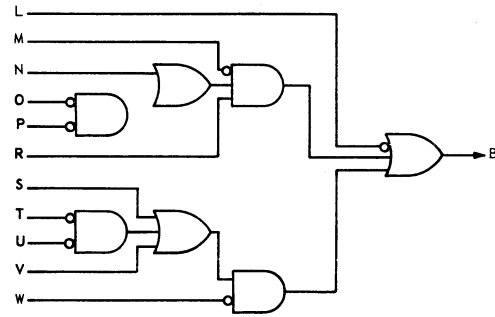
- 377. $Y = (A + B + C)D$
- 378. $U = (A + B)\overline{CD} + \overline{E}$
- 379. $H = ((A + B + C)D + E)FG$
- 380. $Q = (L + M)(AB + CD)(FG + \overline{E})$
- 381. $X = A + \overline{B} + \overline{C}(D + E)F$
- 382. $Y = (A + \overline{B} + \overline{C} + D)(E + F)$
- 383. $G = L(M + \overline{N}(O + P) + \overline{R})(\overline{S}(T + U)\overline{V} + W)$
- 384. $Z = ((\overline{E} + \overline{X} + \overline{T})R(A + F) + \overline{U})N$
- 385. $X = (\overline{F}\overline{I} + \overline{L}E)(N + A)$



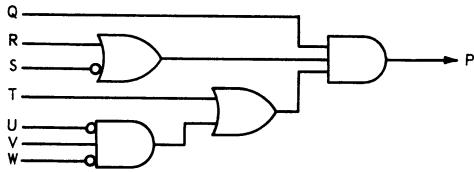
391.



395.



392.



Boolean Algebra

396. $\bar{R} = (\bar{A} + \bar{B})(\bar{C} + \bar{D})$

397. $\bar{S} = (\bar{A} + \bar{B} + \bar{C})\bar{D}\bar{E}$

398. $\bar{P} = \bar{F}G + H\bar{I}$

399. $\bar{B} = \bar{R}(\bar{S} + T)\bar{U}(\bar{V} + W)$

400. $\bar{X} = (\bar{A}B + \bar{C})(\bar{D}\bar{E} + \bar{F})$

401. $\bar{T} = \bar{R}(S + \bar{X}(MN + \bar{P}))$

402. $\bar{W} = \bar{A} + B(\bar{C} + \bar{D}\bar{E} + \bar{F})G$

403. $\bar{Y} = \bar{H} + \bar{I}(\bar{J}\bar{K}\bar{L} + M)\bar{N}$

404. $\bar{K} = (\bar{P} + Q\bar{R} + S\bar{T} + U)\bar{V}(W + \bar{X}Y)\bar{Z}$

405. $\bar{G} = \bar{L} + \bar{M}(N + \bar{O}\bar{P})R + (S + \bar{T}\bar{U} + V)\bar{W}$

Logical Addition and Multiplication

406. $1\ 101\ 111_2$

407. $111\ 110\ 111_2$

408. $111\ 110\ 101_2$

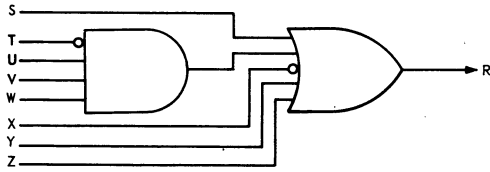
409. 137_8

410. 757_8

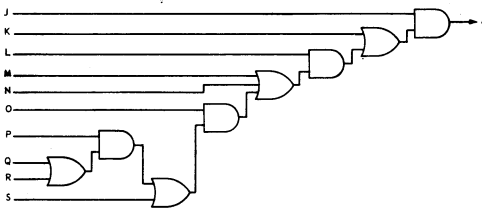
411. $101\ 001_2$

412. $010\ 000\ 101_2$

393.



394.



413. $10\ 100\ 101_2$

414. 102_8

Masks and Logical Operations

415. mask: 11111
operation: LAN

416. mask: 001 111 110 000 000
operation: LAN

417. mask: 111 110 000 000 011 111
operation: LAN

418. mask: 7600 0017 777 7777
operation: LAN

419. mask: 7740 0000 0000 0000
operation: LAN

420. mask: 0374 7000 0003 7776
operation: LAN

421. mask: 7774 0000 7402 0020
operation: LAN

422. LOR word.1 with word 2
gives: 5730 0000 0000 0537

423. LAN word 1 with mask 0377 7600 0000 0000 for image 1
LAN word 2 with mask 7400 0177 7777 7777 for image 2
LOR image 1 with image 2

424. LAN word 1 with mask 7777 0000 0000 0000 for image 1
LAN word 2 with mask 0000 0000 0000 7777 for image 2
LAN word 3 with mask 0000 7777 7777 0000 for image 3
LOR image 1, image 2 and image 3 together

425. LAN word 1 with mask 7700 7777 7777 7777 for image 1
Then LOR image 1 with RC word 0046 0000 0000 0000

426. 2501 4637 1465 3201

427. It has been complemented.

428. 4095

429. 65,536

430. 21 bit positions

431. 28 bit positions

General Conversions

432. $1002_{(3)}$

433. $251_{(6)}$

434. $33_{(10)}$

435. $13_{(10)}$

436. $0.43463_{(7)}$

437. $110\ 001\ 011_{(2)}$

438. $102_{(5)}$

439. $211100_{(3)}$

440. .11030303 . . .

441. .122010222 . . .

442. .3333 . . .

443. 1010,001010

444. 213,121030303 . . .

445. C

446. F

447. 28

448. 7ACF

449. 10 1010 0101 1101

450. 55710

SAVE A LIFE

If you observe an accident involving electrical shock,
DON'T JUST STAND THERE - DO SOMETHING!

RESCUE OF SHOCK VICTIM

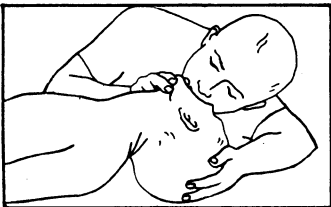
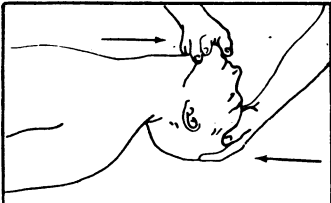
The victim of electrical shock is dependent upon you to give him prompt first aid. Observe these precautions:

1. Shut off the high voltage.
2. If the high voltage cannot be turned off without delay, free the victim from the live conductor. **REMEMBER:**
 - a. Protect yourself with dry insulating material.
 - b. Use a dry board, your belt, dry clothing, or other non-conducting material to free the victim. When possible **PUSH - DO NOT PULL** the victim free of the high voltage source.
 - c. **DO NOT** touch the victim with your bare hands until the high voltage circuit is broken.

FIRST AID

The two most likely results of electrical shock are: bodily injury from falling, and cessation of breathing. While doctors and pulmotors are being sent for, **DO THESE THINGS:**

1. Control bleeding by use of pressure or a tourniquet.
2. Begin **IMMEDIATELY** to use artificial respiration if the victim is not breathing or is breathing poorly:
 - a. Turn the victim on his back.
 - b. Clean the mouth, nose, and throat. (If they appear clean, start artificial respiration immediately. If foreign matter is present, wipe it away quickly with a cloth or your fingers).
 - c. Place the victim's head in the "sword-swallowing" position. (Place the head as far back as possible so that the front of the neck is stretched).
 - d. Hold the lower jaw up. (Insert your thumb between the victim's teeth at the midline - pull the lower jaw forcefully outward so that the lower teeth are further forward than the upper teeth. Hold the jaw in this position as long as the victim is unconscious).
 - e. Close the victim's nose. (Compress the nose between your thumb and forefinger).
 - f. Blow air into the victim's lungs. (Take a deep breath and cover the victim's open mouth with your open mouth, making the contact air-tight. Blow until the chest rises. If the chest does not rise when you blow, improve the position of the victim's air passageway, and blow more forcefully. Blow forcefully into adults, and gently into children.
 - g. Let air out of the victim's lungs. (After the chest rises, quickly separate lip contact with the victim allowing him to exhale).
 - h. Repeat steps f. and g. at the rate of 12 to 20 times per minute. Continue rhythmically without interruption until the victim starts breathing or is pronounced dead. (A smooth rhythm is desirable, but split-second timing is not essential).



DON'T JUST STAND THERE - DO SOMETHING!