

Q1: (a) 9 (b) 5 c) 8

Q2: a) $\frac{1}{2}$ b) $\frac{21}{32}$ c) $\frac{7}{4}$

Q3: a) (0,3), (1,4), (2,5), (3,6), (4,7)

b) (0,5), (0,7), (1,6), (2,7)

c) Any even-length path, e.g. (0,2)

Q4: a) 10,000 b) 50,000 c) 193,750 d) triangular array. Only half the buckets are not frequent.
e) 0.

Q5: a) he b) 2 c) 3

Q6: a) $\frac{1}{2}$ min and 3 max. b) $w = (2, -2)$, $b = 3$, margin = $\sqrt{2}/4$.

Q7: Note * = "anything is OK." a) (v,*) b) (v, [* ,..., *]) c) (*,v)

Q8: F, AE, BE, CE, DE, ABD, ACD, BCD

Q9: a) 0 b) 48 c) 144

Q10: a) 25 b) (4,5) c) 9 d) (0,1) and (8,9) e) 1

Q11: a) 512 b) 256 c) two of each power of 2 up to 256. (Other answers in which up to 22 total is omitted are also correct).

Q12: a) 10 b) 8 c) 385 d) 385

Q13: a) ABCABC b) and c) have many solutions, but the thing to look for in (b) is that the last query is bid upon by only bidders with 0 budget left, e.g., PRPRQQ yields ABCBA-.

Q14: a) (.3, .7, .7399, .1719) b) (.3, .7, .8281, .2601)

Q15: a) circle (ii) and (iv) only b) circle (ii) and (iv) only

Q16: a) 3 b) 5

Q17: a) {1,2,3,4} and {5,6,7} probabilities $\frac{2}{3}$ and 1.

b) add {4,5} with probability 1.

c) each edge is its own community with probability 1. Alternative: {5,6,7} can be one community, with the same result.

Q18: a)

0 0 0 0 .5

.5 0 0 0 0

.5 1 0 0 0

0 0 1 0 .5

0 0 0 1 0

b) $[\frac{1}{2}, \frac{1}{2}, \frac{3}{2}, \frac{3}{2}, 1]$ and $[\frac{1}{2}, \frac{1}{4}, \frac{3}{4}, 2, \frac{3}{2}]$

c) A, B, and C.

Q19: (1,2,3,1,2), (5,1,2,7,4), (1,9,16,4,12)

Q20: 1: T, 2: F, 3: T, 4: F, 5: F, 6: T

Q21:

a) $[1-(1-1/m)^N](1-1/m)^M$

b) $[p + (1-p)(1-(1-1/m)^N)](1-1/m)^M$ an alternative solution is $[1-(1-1/m)^N](1-1/m)^M + p[(1-1/m)^{N+M}]$

c) i: T, ii: T, iii: T, iv: F

Q22: a) 1 b) k/N c) $13/19$ and "unchanged."

Q23: a) 2.5 b) users 2 and 3 c) $\frac{2}{3}$ and 1.

Q24: a) -1 b) 0 c) $\sqrt{5}/2 - 3/2$ or -0.382