1a

{ CCB, CBCA, ADA }
1 2 3

$A → 3
$C → 1,2
AD → 3
BC → 2
CA → 2
CB → 1,2
CC → 1
DA → 3

1b

Q = BCCB

$B → ∅
BC → 2
CB → 1,2
CC → 1

$\geq |Q| - e \cdot k = 4 - 1 \cdot 2 = 2$ OF THE K-GRAMS MUST MATCH

SO THE CANDIDATES ARE CCB, CBCA

2a

CLIENT — SERVER

HOW_MUCH_IS_GOOD$$ $\xrightarrow{h_1, \dots, h_6}$ HOW_MUCH_ARE_GOOD$$

h_1 h_2 h_3 h_4 h_5 h_6 — h_1 h_2 h_3 ARE_ h_5 h_6

SO THE SERVER SENDS GZIP($h_1 h_2 h_3$ ARE_ $h_5 h_6$) I.E.

$\langle 0,0,h_1\rangle \langle 0,0,h_2\rangle \langle 0,0,h_3\rangle \langle 0,0,A\rangle \langle 0,0,R\rangle \langle 0,0,E\rangle \langle 0,0,\_\rangle$
$\langle 0,0,h_5\rangle \langle 0,0,h_6\rangle$

2b

SERVER — CLIENT

HOW_MUCH_ARE_GOOD$ $\xrightarrow{h_1, \dots, h_6}$ HOW_MUCH_IS_GOOD$

h_1 h_2 h_3 h_4 h_5 h_6 — h_1 h_2 h_3 h_5 h_6

THEN THE CLIENT SENDS THE BITMAP 111011
AND THE SERVER REPLIES WITH:

GZIP($\underbrace{\text{HOW\_MUCH\_\_GOOD\$}}_{\text{KNOWN BY THE CLIENT}}$ | $\underbrace{\text{ARE}}_{\text{NEW}}$) = $\langle 0,0,A\rangle \langle 0,0,R\rangle \langle 0,0,E\rangle$

3a

$t_1 \to 2, 5, 6, \boxed{8}, 10, 11, 13$

$t_4 \to 3, 5, \boxed{8}, 11, 13, 19, 22$

$t_3 \to 5, 6, 7, \boxed{8}, 10, 12, 13, 21$

$t_2 \to \boxed{8}, 11, 12, 13, 15, 17, 19, 21, 25$

$$\text{UBs} \quad \left.\begin{bmatrix} 0.5 \\ 1 \\ 0.8 \\ 0.7 \end{bmatrix}\right\} \text{SUM TO } 3 > \theta = 2.5$$

THE PIVOT IS 8. THE SUM OF THE UBs OF LISTS CONTAINING THE PIVOT IS $3 > \theta$ SO WE COMPUTE THE FULL SCORE OF THE PIVOT

3b

$t_1 \to \overbrace{2, 5, 6, \boxed{8}, 10}^{0.5}, 11, 13$

$t_4 \to \overbrace{3, 5, \boxed{8}, 11, 13}^{0.8}, 19, 22$

$t_3 \to \overbrace{5, 6, 7, \boxed{8}, 10}^{0.4}, 12, 13, 21$

$t_2 \to \overbrace{\boxed{8}, 11, 12, 13, 15}^{0.5}, 17, 19, 21, 25$

$$\text{UBs} \quad \left.\begin{bmatrix} 0.5 \\ 1 \\ 0.8 \\ 0.7 \end{bmatrix}\right\} \text{SUM TO } 3 > \theta = 2.5$$

THE PIVOT IS STILL 8, BUT THIS TIME WE DO NOT COMPUTE ITS FULL SCORE BECAUSE THE SUM OF THE LOCAL UBs IS $2.2 < \theta$

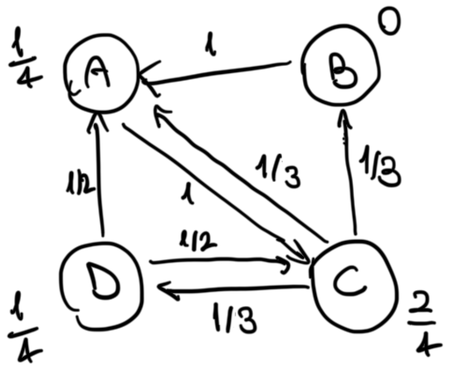
3c

WE SKIP BOTH BLOCKS IN t_1 AND t_3 BECAUSE THEIR RIGHTMOST DOCID (10) IS THE SMALLEST RIGHTMOST DOCID ACROSS ALL BLOCKS.

3d

NO, THE VALUE OF θ REMAINS UNCHANGED BECAUSE THE PIVOT 8 IS NOT FULLY SCORED IN THIS BLOCKED-WAND STEP, AND THEREFORE THE HEAP OF TOP-k DOCUMENTS (AND IN TURN θ) DOES NOT CHANGE.

4



$$r(A) = \frac{2}{3}\left(0 \cdot 1 + \frac{2}{4}\frac{1}{3} + \frac{1}{4}\frac{1}{2}\right) + \overset{1-\alpha}{\frac{1}{3}} \cdot \overset{1/N}{\frac{1}{4}} = \frac{2}{3} \cdot \frac{7}{24} + \frac{1}{12} = \frac{7}{36} + \frac{1}{12} = \frac{10}{36}$$

$$r(B) = \frac{2}{3}\left(\frac{2}{4} \cdot \frac{1}{3}\right) + \frac{1}{12} = \frac{1}{9} + \frac{1}{12} = \frac{7}{36}$$

$$r(C) = \frac{2}{3}\left(\frac{1}{4} \cdot 1 + \frac{1}{4} \cdot \frac{1}{2}\right) + \frac{1}{12} = \frac{2}{3} \cdot \frac{3}{8} + \frac{1}{12} = \frac{4}{12} = \frac{12}{36}$$

$$r(D) = \frac{2}{3}\left(\frac{2}{4} \cdot \frac{1}{3}\right) + \frac{1}{12} = r(B) = \frac{7}{36}$$