

## Exercises on optimization

### 1. Parameters

- (a)  $W(a, b)$ :  $T(W) = 100$ ,  $V(W, a) = 20$ ,  $V(W, b) = 60$
- (b)  $X(b, c)$ :  $T(X) = 200$ ,  $V(X, b) = 50$ ,  $V(X, c) = 100$
- (c)  $Y(c, d)$ :  $T(Y) = 300$ ,  $V(Y, c) = 50$ ,  $V(Y, d) = 50$
- (d)  $Z(d, e)$ :  $T(Z) = 400$ ,  $V(Z, d) = 40$ ,  $V(Z, e) = 100$

Estimate the size of

- (a)  $W \bowtie X \bowtie Y \bowtie Z$
- (b)  $\sigma_{a=10}(W)$
- (c)  $\sigma_{c=20}(Y)$
- (d)  $\sigma_{c=20}(Y) \bowtie Z$
- (e)  $W \times Y$
- (f)  $\sigma_{d>10}(Z)$
- (g)  $\sigma_{a=1 \text{ AND } b=2}(W)$
- (h)  $\sigma_{a=1 \text{ AND } b>2}(W)$
- (i) Determine the best way to compute  $W \bowtie X \bowtie Y \bowtie Z$

### 2. Estimate the size of $\bowtie(E, F, G, H)$ , where

- (a)  $E(a, b, c)$ :  $T(E) = 1.000$ ,  $V(E, a) = 1.000$ ,  $V(E, b) = 50$ ,  $V(E, c) = 20$
- (b)  $F(a, b, d)$ :  $T(F) = 2.000$ ,  $V(F, a) = 50$ ,  $V(F, b) = 100$ ,  $V(F, d) = 200$
- (c)  $G(a, c, d)$ :  $T(G) = 3.000$ ,  $V(G, a) = 50$ ,  $V(G, c) = 300$ ,  $V(G, d) = 500$
- (d)  $H(b, c, d)$ :  $T(H) = 4.000$ ,  $V(H, b) = 40$ ,  $V(H, c) = 100$ ,  $V(H, d) = 400$

3. Estimate the size of  $R(a, b) \bowtie S(b, c)$ , where  $V(R, b) = V(S, b) = 20$ , given the highest frequency histograms

- $R.b$ : 0 (5), 1 (4), 2 (10), 3 (5), others (36)
- $S.b$ : 0 (10), 1 (8), 2 (5), 4 (7), others (50)

Compare with the estimate without histograms