1:

exec ops.go(ops.reduce\_ra('HERO', 'H1\_HERO\_ABBR=HERO\_ABBR', 'H1\_HERO\_NAME=HERO\_NAME,H1\_HERO\_GENDER=HERO\_GENDER', 'HW4\_HERO1'));

exec ops.go(ops.reduce\_ra('HERO', 'H2\_HERO\_ABBR=HERO\_ABBR', 'H2\_HERO\_NAME=HERO\_NAME,H2\_HERO\_GENDER=HERO\_GENDER', 'HW4\_HERO2'));

exec ops.go(ops.reduce\_ra('HERO', 'H3\_HERO\_ABBR=HERO\_ABBR', 'H3\_HERO\_NAME=HERO\_NAME,H3\_HERO\_GENDER=HERO\_GENDER', 'HW4\_HERO3'));

exec ops.go(ops.reduce\_ra('HERO', 'H4\_HERO\_ABBR=HERO\_ABBR', 'H4\_HERO\_NAME=HERO\_NAME,H4\_HERO\_GENDER=HERO\_GENDER', 'HW4\_HERO4'));

exec ops.go(ops.reduce\_ra('HERO', 'H5\_HERO\_ABBR=HERO\_ABBR', 'H5\_HERO\_NAME=HERO\_NAME,H5\_HERO\_GENDER=HERO\_GENDER', 'HW4\_HERO5'));

exec ops.go(ops.reduce\_ra('HERO', 'H6\_HERO\_ABBR=HERO\_ABBR', 'H6\_HERO\_NAME=HERO\_NAME,H6\_HERO\_GENDER=HERO\_GENDER', 'HW4\_HERO6'));

2-6:

exec ops.go(ops.cjoin\_ra('HW4\_HERO1', 'HW4\_HERO2', 'HW4\_HERO1.H1\_HERO\_ABBR<HW4\_HERO2.H2\_HERO\_ABBR', 'HW4\_HERO\_2\_TUPLE'));

exec ops.go(ops.cjoin\_ra('HW4\_HERO\_2\_TUPLE', 'HW4\_HERO3', 'HW4\_HERO\_2\_TUPLE.H2\_HERO\_ABBR<HW4\_HERO3.H3\_HERO\_ABBR', 'HW4\_HERO\_3\_TUPLE'));

exec ops.go(ops.cjoin\_ra('HW4\_HERO\_3\_TUPLE', 'HW4\_HERO4', 'HW4\_HERO\_3\_TUPLE.H3\_HERO\_ABBR<HW4\_HERO4.H4\_HERO\_ABBR', 'HW4\_HERO\_4\_TUPLE'));

exec ops.go(ops.cjoin\_ra('HW4\_HERO\_4\_TUPLE', 'HW4\_HERO5', 'HW4\_HERO\_4\_TUPLE.H4\_HERO\_ABBR<HW4\_HERO5.H5\_HERO\_ABBR', 'HW4\_HERO\_5\_TUPLE'));

exec ops.go(ops.cjoin\_ra('HW4\_HERO\_5\_TUPLE', 'HW4\_HERO6', 'HW4\_HERO\_5\_TUPLE.H5\_HERO\_ABBR<HW4\_HERO6.H6\_HERO\_ABBR', 'HW4\_HERO\_6\_TUPLE'));

7:

exec ops.go(ops.reduce\_ra('HW4\_HERO\_5\_TUPLE', 'COMBO\_ID=H1\_HERO\_ABBR||H2\_HERO\_ABBR||H3\_HERO\_ABBR||H4\_HERO\_ABBR||H5\_HERO\_ABBR||'' ''', ops.allcols('HW4\_HERO\_5\_TUPLE'), 'HW4\_HERO\_5\_TUPLE\_ENC\_ID'));

8-12:

exec ops.go(ops.reduce\_ra('HW4\_HERO\_5\_TUPLE\_ENC\_ID', 'COMBO\_ID,HERO\_ABBR=H1\_HERO\_ABBR', 'HERO\_NAME=H1\_HERO\_NAME,HERO\_GENDER=H1\_HERO\_GENDER', 'HW4\_HERO\_5COMBO\_H1'));

exec ops.go(ops.reduce\_ra('HW4\_HERO\_5\_TUPLE\_ENC\_ID', 'COMBO\_ID,HERO\_ABBR=H2\_HERO\_ABBR', 'HERO\_NAME=H2\_HERO\_NAME,HERO\_GENDER=H2\_HERO\_GENDER', 'HW4\_HERO\_5COMBO\_H2'));

exec ops.go(ops.reduce\_ra('HW4\_HERO\_5\_TUPLE\_ENC\_ID', 'COMBO\_ID,HERO\_ABBR=H3\_HERO\_ABBR', 'HERO\_NAME=H3\_HERO\_NAME,HERO\_GENDER=H3\_HERO\_GENDER', 'HW4\_HERO\_5COMBO\_H3'));

exec ops.go(ops.reduce\_ra('HW4\_HERO\_5\_TUPLE\_ENC\_ID', 'COMBO\_ID,HERO\_ABBR=H4\_HERO\_ABBR', 'HERO\_NAME=H4\_HERO\_NAME,HERO\_GENDER=H4\_HERO\_GENDER', 'HW4\_HERO\_5COMBO\_H4'));

exec ops.go(ops.reduce\_ra('HW4\_HERO\_5\_TUPLE\_ENC\_ID', 'COMBO\_ID,HERO\_ABBR=H5\_HERO\_ABBR', 'HERO\_NAME=H5\_HERO\_NAME,HERO\_GENDER=H5\_HERO\_GENDER', 'HW4\_HERO\_5COMBO\_H5'));

13-16:

exec ops.go(ops.union\_ra('HW4\_HERO\_5COMBO\_H1', 'HW4\_HERO\_5COMBO\_H2', 'HW4\_HERO\_5COMBO\_H12'));

exec ops.go(ops.union\_ra('HW4\_HERO\_5COMBO\_H12', 'HW4\_HERO\_5COMBO\_H3', 'HW4\_HERO\_5COMBO\_H123'));

exec ops.go(ops.union\_ra('HW4\_HERO\_5COMBO\_H123', 'HW4\_HERO\_5COMBO\_H4', 'HW4\_HERO\_5COMBO\_H1234'));

exec ops.go(ops.union\_ra('HW4\_HERO\_5COMBO\_H1234', 'HW4\_HERO\_5COMBO\_H5', 'HW4\_HERO\_5COMBO\_H12345'));

17:

exec ops.go(ops.reduce\_ra('HW4\_HERO\_6\_TUPLE', 'COMBO\_ID=H1\_HERO\_ABBR||H2\_HERO\_ABBR||H3\_HERO\_ABBR||H4\_HERO\_ABBR||H5\_HERO\_ABBR||H6\_HERO\_ABBR', ops.allcols('HW4\_HERO\_6\_TUPLE'), 'HW4\_HERO\_6\_TUPLE\_ENC\_ID'));

18-23:

exec ops.go(ops.reduce\_ra('HW4\_HERO\_6\_TUPLE\_ENC\_ID', 'COMBO\_ID,HERO\_ABBR=H1\_HERO\_ABBR', 'HERO\_NAME=H1\_HERO\_NAME,HERO\_GENDER=H1\_HERO\_GENDER', 'HW4\_HERO\_6COMBO\_H1'));

exec ops.go(ops.reduce\_ra('HW4\_HERO\_6\_TUPLE\_ENC\_ID', 'COMBO\_ID,HERO\_ABBR=H2\_HERO\_ABBR', 'HERO\_NAME=H2\_HERO\_NAME,HERO\_GENDER=H2\_HERO\_GENDER', 'HW4\_HERO\_6COMBO\_H2'));

exec ops.go(ops.reduce\_ra('HW4\_HERO\_6\_TUPLE\_ENC\_ID', 'COMBO\_ID,HERO\_ABBR=H3\_HERO\_ABBR', 'HERO\_NAME=H3\_HERO\_NAME,HERO\_GENDER=H3\_HERO\_GENDER', 'HW4\_HERO\_6COMBO\_H3'));

exec ops.go(ops.reduce\_ra('HW4\_HERO\_6\_TUPLE\_ENC\_ID', 'COMBO\_ID,HERO\_ABBR=H4\_HERO\_ABBR', 'HERO\_NAME=H4\_HERO\_NAME,HERO\_GENDER=H4\_HERO\_GENDER', 'HW4\_HERO\_6COMBO\_H4'));

exec ops.go(ops.reduce\_ra('HW4\_HERO\_6\_TUPLE\_ENC\_ID', 'COMBO\_ID,HERO\_ABBR=H5\_HERO\_ABBR', 'HERO\_NAME=H5\_HERO\_NAME,HERO\_GENDER=H5\_HERO\_GENDER', 'HW4\_HERO\_6COMBO\_H5'));

exec ops.go(ops.reduce\_ra('HW4\_HERO\_6\_TUPLE\_ENC\_ID', 'COMBO\_ID,HERO\_ABBR=H6\_HERO\_ABBR', 'HERO\_NAME=H6\_HERO\_NAME,HERO\_GENDER=H6\_HERO\_GENDER', 'HW4\_HERO\_6COMBO\_H6'));

24-28:

exec ops.go(ops.union\_ra('HW4\_HERO\_6COMBO\_H1', 'HW4\_HERO\_6COMBO\_H2', 'HW4\_HERO\_6COMBO\_H12'));

exec ops.go(ops.union\_ra('HW4\_HERO\_6COMBO\_H12', 'HW4\_HERO\_6COMBO\_H3', 'HW4\_HERO\_6COMBO\_H123'));

exec ops.go(ops.union\_ra('HW4\_HERO\_6COMBO\_H123', 'HW4\_HERO\_6COMBO\_H4', 'HW4\_HERO\_6COMBO\_H1234'));

exec ops.go(ops.union\_ra('HW4\_HERO\_6COMBO\_H1234', 'HW4\_HERO\_6COMBO\_H5', 'HW4\_HERO\_6COMBO\_H12345'));

exec ops.go(ops.union\_ra('HW4\_HERO\_6COMBO\_H12345', 'HW4\_HERO\_6COMBO\_H6', 'HW4\_HERO\_6COMBO\_H123456'));

29:

exec ops.go(ops.union\_ra('HW4\_HERO\_6COMBO\_H123456', 'HW4\_HERO\_5COMBO\_H12345', 'HW4\_HERO\_COMBO\_MEMBERSHIP'));

30:

ops.go(

ops.mjoin\_ra(

'HW4\_HERO\_COMBO\_MEMBERSHIP',

'HERO\_CARD',

'HERO\_NAME',

'HERO',

'HW4\_HERO\_COMBO\_CARD\_PAIR'));

31:

ops.go(

ops.group\_ra(

'HW4\_HERO\_COMBO\_CARD\_PAIR',

'COMBO\_ID',

'XMEN\_CARD\_TYPE\_COUNT = count(case when team = ''X-Men'' then 1 else null end),

AVENGERS\_CARD\_TYPE\_COUNT = count(case when team = ''Avengers'' then 1 else null end),

SPIDERFRIENDS\_CARD\_TYPE\_COUNT = count(case when team = ''Spider-Friends'' then 1 else null end),

SHIELD\_CARD\_TYPE\_COUNT = count(case when team = ''Shield'' then 1 else null end),

TEAMLESS\_CARD\_TYPE\_COUNT = count(case when team = null then 1 else null end),

RANGED\_CARD\_TYPE\_COUNT = count(case when class = ''Ranged'' then 1 else null end),

STRENGTH\_CARD\_TYPE\_COUNT = count(case when class = ''Strength'' then 1 else null end),

REFLEXES\_CARD\_TYPE\_COUNT = count(case when class = ''Reflexes'' then 1 else null end),

INTUITION\_CARD\_TYPE\_COUNT = count(case when class = ''Intuition'' then 1 else null end),

TECH\_CARD\_TYPE\_COUNT = count(case when class = ''Tech'' then 1 else null end),

RANGED\_CARD\_COUNT = sum(case when class = ''Ranged'' then COUNT else 0 end),

STRENGTH\_CARD\_COUNT = sum(case when class = ''Strength'' then COUNT else 0 end),

REFLEXES\_CARD\_COUNT = sum(case when class = ''Reflexes'' then COUNT else 0 end),

INTUITION\_CARD\_COUNT = sum(case when class = ''Intuition'' then COUNT else 0 end),

TECH\_CARD\_COUNT = sum(case when class = ''Tech'' then COUNT else 0 end)',

'HW4\_HERO\_COMBO\_ID\_W\_CLASS\_STAT'));

32:

ops.go(

ops.group\_ra(

'HW4\_HERO\_COMBO\_MEMBERSHIP',

'COMBO\_ID',

'HERO\_COUNT = count(\*),

MALE\_HERO\_COUNT = count(case when HERO\_GENDER = ''Male'' then 1 else null end),

FEMALE\_HERO\_COUNT = count(case when HERO\_GENDER = ''Female'' then 1 else null end)',

'HW4\_HERO\_COMBO\_ID\_W\_HERO\_STAT'));

33:

ops.go(

ops.mjoin\_ra(

'HW4\_HERO\_COMBO\_ID\_W\_CLASS\_STAT',

'HW4\_HERO\_COMBO\_ID\_W\_HERO\_STAT',

'COMBO\_ID',

'COMBO\_ID',

'HW4\_HERO\_COMBO\_W\_ALL\_STAT'));