```
nodeID(25) FileScan parquet tpcds_100_parquet.customer_demographics[cd_demo_sk#41,cd_gender#42,cd_education_status#44,cd_dep_count#47]
                                                                                                                                                                                                                                                                                                     nodeID(24) Filter ((((isnotnull(cd_gender#42) AND isnotnull(cd_education_status#44)) AND (cd_gender#42 = F)) AND (cd_education_status#44 = Unknown)) AND isnotnull(cd_demo_sk#41))
nodeID(21) FileScan parquet tpcds_100_parquet.catalog_sales[cs_sold_date_sk#7,cs_bill_customer_sk#10,cs_bill_cdemo_sk#11,cs_item_sk#22,cs_quantity#25,cs_list_price#27,cs_sales_price#28,cs_coupon_amt#34,cs_net_profit#40]
                                                  nodeID(20) Filter (((isnotnull(cs_bill_cdemo_sk#11) AND isnotnull(cs_bill_cdemo_sk#50,c_current_addr_sk#54,c_birth_month#62,c_birth_year#63] nodeID(20) Filter (((isnotnull(cs_bill_cdemo_sk#11) AND isnotnull(cs_bill_cdemo_sk#50,c_current_addr_sk#54,c_birth_month#62,c_birth_year#63]
                                                                                                                                                                                                                                                                                                                                                       nodeID(19) BroadcastHashJoin [cs_bill_cdemo_sk#11], [cd_demo_sk#41], Inner, BuildRight, false
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               nodeID(29) Filter (((c_birth_month#62 IN (1,6,8,9,12,2) AND isnotnull(c_customer_sk#50)) AND isnotnull(c_current_cdemo_sk#52)) AND isnotnull(c_current_addr_sk#54))
                                                                                                                                                                                                                                                                                             nodeID(18) Project [cs_sold_date_sk#7, cs_bill_customer_sk#50, cs_current_cdemo_sk#52, cs_current_addr_sk#54, cs_birth_year#63] nodeID(28) Project [cs_sold_date_sk#7, cs_bill_customer_sk#50, cs_current_addr_sk#54, cs_birth_year#63]
                                                                                                                                                                                                                                                                                                                                                              nodeID(17) Exchange hashpartitioning(cs_bill_customer_sk#10, 200), ENSURE_REQUIREMENTS, [plan_id=142]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              nodeID(27) Exchange hashpartitioning(c_customer_sk#50, 200), ENSURE_REQUIREMENTS, [plan_id=143]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             nodeID(26) Sort [c_customer_sk#50 ASC NULLS FIRST], false, 0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           nodeID(33) FileScan parquet tpcds_100_parquet.customer_demographics[cd_demo_sk#131]
                                                                                                                                                                                                                                                                                                                                                                                                                       nodeID(16) Sort [cs_bill_customer_sk#10 ASC NULLS FIRST], false, 0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  nodeID(32) Filter isnotnull(cd_demo_sk#131)
                                                                                                                                                                                                                                                                                                                                                                                                                     nodeID(15) SortMergeJoin [cs_bill_customer_sk#10], [c_customer_sk#50], Inner
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          nodeID(36) FileScan parquet tpcds_100_parquet.customer_address[ca_address_sk#68,ca_county#75,ca_state#76,ca_country#78]
                                                                                                                                                                                                                                                                                                                               nodeID(14) Project [cs_sold_date_sk#7, cs_item_sk#22, cs_quantity#25, cs_list_price#27, cs_sales_price#28, cs_coupon_amt#34, cs_net_profit#40, cd_dep_count#47, c_current_addr_sk#54, c_birth_year#63]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  nodeID(13) BroadcastHashJoin [c_current_cdemo_sk#52], [cd_demo_sk#131], Inner, BuildRight, false
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    nodeID(35) Filter (ca_state#76 IN (MS,IN,ND,OK,NM,VA) AND isnotnull(ca_address_sk#68))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            nodeID(40) FileScan parquet tpcds_100_parquet.date_dim[d_date_sk#81,d_year#87]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         nodeID(12) Project [cs_sold_date_sk#7, cs_item_sk#22, cs_quantity#25, cs_list_price#27, cs_sales_price#28, cs_coupon_amt#34, cs_net_profit#40, cd_dep_count#47, c_current_addr_sk#54, c_birth_year#63] nodeID(34) BroadcastExchange HashedRelationBroadcastMode(List(cast(input[0, int, false] as bigint)),false), [plan_id=153]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            nodeID(39) Filter ((isnotnull(d_year#87) AND (d_year#87 = 1998)) AND isnotnull(d_date_sk#81))
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           nodeID(11) BroadcastHashJoin [c_current_addr_sk#54], [ca_address_sk#68], Inner, BuildRight, false
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         nodeID(43) FileScan parquet tpcds_100_parquet.item[i_item_sk#109,i_item_id#110]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     nodeID(10) Project [cs_sold_date_sk#7, cs_item_sk#22, cs_quantity#25, cs_list_price#27, cs_sales_price#28, cs_coupon_amt#34, cs_net_profit#40, cd_dep_count#47, c_birth_year#63, ca_country#75, ca_state#76, ca_country#78]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            nodeID(42) Filter isnotnull(i_item_sk#109)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               nodeID(9) BroadcastHashJoin [cs_sold_date_sk#7], [d_date_sk#81], Inner, BuildRight, false
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 nodeID(8) Project [cs_item_sk#22, cs_quantity#25, cs_list_price#27, cs_sales_price#28, cs_coupon_amt#34, cs_net_profit#40, cd_dep_count#47, c_birth_year#63, ca_country#78] nodeID(41) BroadcastExchange HashedRelationBroadcastMode(List(cast(input[0, int, false] as bigint)), false), [plan_id=161]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     nodeID(7) BroadcastHashJoin [cs_item_sk#22], [i_item_sk#109], Inner, BuildRight, false
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          nodeID(6) Project [cs_quantity#25, cs_list_price#27, cs_sales_price#28, cs_coupon_amt#34, cs_net_profit#40, cd_dep_count#47, c_birth_year#63, i_item_id#110, ca_country#78, ca_state#76, ca_country#75]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              nodeID(5) Expand [[cs_quantity#25, cs_list_price#27, cs_sales_price#28, cs_coupon_amt#34, cs_net_profit#40, cd_dep_count#47, c_birth_year#63, i_item_id#110, ca_country#78, cs_list_price#27, cs_sales_price#28, cs_coupon_amt#34, cs_net_profit#40, cd_dep_count#47, c_birth_year#63, i_item_id#159, ca_country#78, cs_list_price#27, cs_sales_price#28, cs_coupon_amt#34, cs_net_profit#40, cd_dep_count#47, c_birth_year#63, i_item_id#159, ca_country#78, ca_state#161, ca_country#78, cs_list_price#27, cs_sales_price#28, cs_coupon_amt#34, cs_net_profit#40, cd_dep_count#47, c_birth_year#63, i_item_id#159, ca_country#78, cs_list_price#28, cs_coupon_amt#34, cs_net_profit#40, cd_dep_count#47, c_birth_year#63, i_item_id#159, cs_list_price#28, cs_list_price#28, cs_list_price#28, cs_list_price#28, cs_list_price#28, cs_list_price#28, cs_list_price#28, cs_list_price#28, cs_list_price#28, cs_list_pri
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          nodeID(4) HashAggregate(keys=[i_item_id#159, ca_country#160, ca_state#161, ca_country#160, ca_st
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         nodeID(3) Exchange hashpartitioning(i_item_id#159, ca_country#160, ca_state#161, ca_county#162, spark_grouping_id#158L, 200), ENSURE_REQUIREMENTS, [plan_id=167]
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              nodeID(2) HashAggregate(keys=[i_item_id#159, ca_country#160, ca_state#161, ca_country#160, ca_state#161, ca_country#162, spark_grouping_id#158L], functions=[avg(cast(cs_list_price#27 as decimal(12,2))), avg(cast(cs_list_price#28 as decimal(12,2))), avg
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      nodeID(1) TakeOrderedAndProject(limit=100, orderBy=[ca_country#160 ASC NULLS FIRST,ca_state#161 ASC NULLS FIRST,i_item_id#159,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_country#160,ca_state#161,ca_state#161,ca_state#161,ca_state#161,ca_state#161,ca_state#161,ca_state#161,ca_state#161,ca_state#161,ca_state#161,ca_state#16
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