

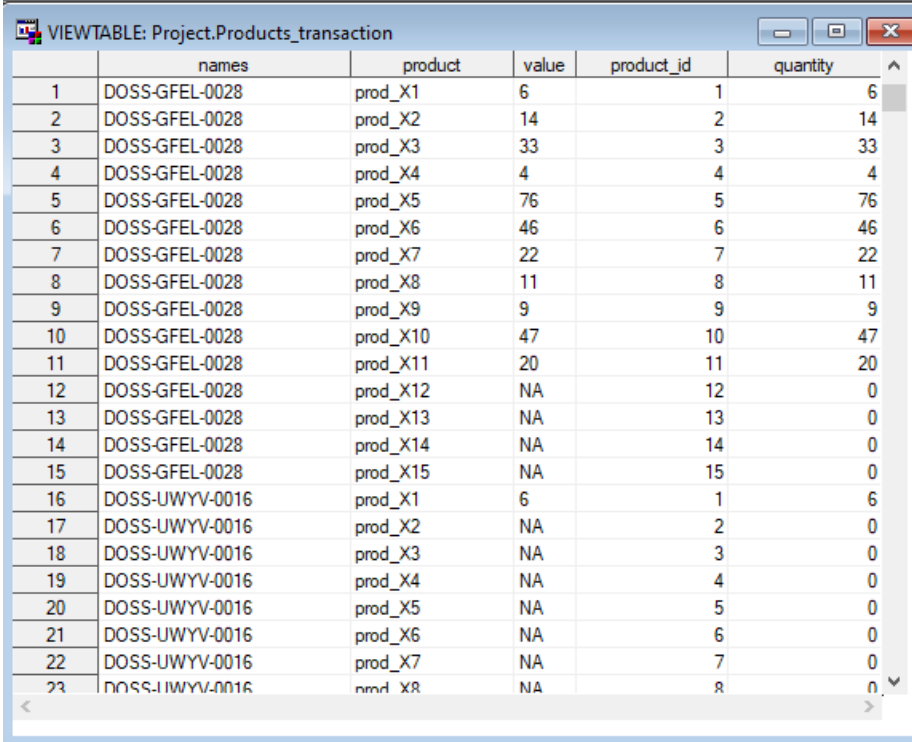
**PROJECT SAS-R – EVALUATION 3 DU 01 NOVEMBRE 2025**  
**DINH THI THAO NHUNG – NGUYEN LINH CHI**

```
/* Import data */
```

```
libname Project 'C:\Users\nguyli22\Downloads\data';  
proc import datafile= 'C:\Users\nguyli22\Downloads\data\transactions.csv'  
  out=Project.transaction  
  dbms=csv replace;  
  getnames=yes;  
run;  
  
proc import datafile= 'C:\Users\nguyli22\Downloads\data\customers.csv'  
  out=Project.customers  
  dbms=csv replace;  
  getnames=yes;  
run;  
  
proc import datafile= 'C:\Users\nguyli22\Downloads\data\products.csv'  
  out=Project.products  
  dbms=csv replace;  
  getnames=yes;  
run;  
  
proc import datafile= 'C:\Users\nguyli22\Downloads\data\products_transaction.csv'  
  out=Project.products_transaction  
  dbms=csv replace;  
  getnames=yes;  
run;
```

8.

```
data project.products_transaction;  
  set project.products_transaction;  
  /* Extract the part after 'prod_X' */  
  product_id = input(substr(product, 7), best12.);  
  /* Create a new numeric variable */  
  if value = 'NA' then quantity = 0;      /* replace NA by 0 */  
  else quantity = input(value, best12.);  /* convert text to numeric */  
run;
```



	names	product	value	product_id	quantity
1	DOSS-GFEL-0028	prod_X1	6	1	6
2	DOSS-GFEL-0028	prod_X2	14	2	14
3	DOSS-GFEL-0028	prod_X3	33	3	33
4	DOSS-GFEL-0028	prod_X4	4	4	4
5	DOSS-GFEL-0028	prod_X5	76	5	76
6	DOSS-GFEL-0028	prod_X6	46	6	46
7	DOSS-GFEL-0028	prod_X7	22	7	22
8	DOSS-GFEL-0028	prod_X8	11	8	11
9	DOSS-GFEL-0028	prod_X9	9	9	9
10	DOSS-GFEL-0028	prod_X10	47	10	47
11	DOSS-GFEL-0028	prod_X11	20	11	20
12	DOSS-GFEL-0028	prod_X12	NA	12	0
13	DOSS-GFEL-0028	prod_X13	NA	13	0
14	DOSS-GFEL-0028	prod_X14	NA	14	0
15	DOSS-GFEL-0028	prod_X15	NA	15	0
16	DOSS-UWYV-0016	prod_X1	6	1	6
17	DOSS-UWYV-0016	prod_X2	NA	2	0
18	DOSS-UWYV-0016	prod_X3	NA	3	0
19	DOSS-UWYV-0016	prod_X4	NA	4	0
20	DOSS-UWYV-0016	prod_X5	NA	5	0
21	DOSS-UWYV-0016	prod_X6	NA	6	0
22	DOSS-UWYV-0016	prod_X7	NA	7	0
23	DOSS-UWYV-0016	prod_X8	NA	8	0

```

proc sql;
  create table project.question8 as
  SELECT
    c.num_client,
    c.first,
    c.last,
    c.region,
    c.departement,
    c.fidelity_points,
    SUM(p.price * pt.quantity) AS total_amount
FROM project.customers AS c
JOIN project.transaction AS t
  ON c.num_client = t.num_client
JOIN project.products_transaction AS pt
  ON t.ref = pt.names
JOIN project.products AS p
  ON p.id = pt.product_id
GROUP BY
  c.num_client, c.first, c.last, c.region, c.departement, c.fidelity_points
HAVING
  c.fidelity_points > 700
  AND calculated total_amount > 1000;
quit;

```

VIEWTABLE: Project.Question8

	num_client	first	last	region	departement	fidelity_points	total_amount
1	1	Solomon	Heaney	Lorraine	Meuse	1654	33514
2	2	Kama	Williamson-Marquardt	NA	NA	3296	29568
3	4	Laken	McDemott	Limousin	Creuse	2174	29225
4	6	Clayton	Runoffsson	Mid-Pyrénées	Tarn	1336	17217
5	12	Lindsey	Hills	Limousin	Corrèze	1612	23043
6	14	Duncan	Stokes	Basse-Normandie	Manche	1807	17918
7	19	Dr.	CasimiroHodkiewiczJr.	Lorraine	Meurthe-et-Moselle	1075	18280
8	22	Theresia	Hermiston	Lorraine	Moselle	1920	31086
9	23	Wyman	Frami	Corse	Haute-Corse	1286	3256
10	24	Karan	O'Connell	Basse-Normandie	Orne	1913	18427
11	29	Dr.	MetaScharberger	Île-de-France	Val-de-Marne	1943	19241
12	30	Asbury	Cummings	Bretagne	NA	2352	22478
13	32	Bernie	Boyer	Picardie	Aisne	865	34518
14	37	Darwin	Kuphal	Languedoc-Roussillon	Gard	1264	25860
15	52	Jens	Pacocha	Corse	Haute-Corse	807	17724
16	60	Dr.	JerrellWeimannJr.	Lorraine	Meuse	1655	36081
17	62	Miss	LavonHegmannDDS	Pays de la Loire	Mayenne	2393	20133
18	66	Franklin	Mohr-Bartoletti	Provence-Alpes-Côte d	Var	2303	8692
19	69	Miss	LeannConn	Pays de la Loire	Vendée	1850	34949
20	74	Sasha	Armstrong	Pays de la Loire	Vendée	1735	40084
21	87	Jovani	Sipes	Auvergne	Allier	1312	33820
22	88	Britany	Predovic	Limousin	Haute-Vienne	1033	24312
23	100	Garfield	Wyman-Waters	Aquitaine	Lot-et-Garonne	1404	11671
24	102	Cade	Turcotte	Champagne-Ardenne	Aube	1536	34251
25	103	Coy	Weissnat	Lorraine	Meurthe-et-Moselle	970	46316
26	109	Caleigh	Blanda	Languedoc-Roussillon	Aude	978	7643
27	111	Edmonia	Mueller	NA	Haute-Corse	2085	32299
28	113	Mrs.	TariLegrosMD	Champagne-Ardenne	Marne	1209	2933
29	114	Jennette	Schumm	Île-de-France	Paris	2379	55431
30	115	Dr.	HazelleSatterfield	Île-de-France	NA	2720	22994
31	116	Ms.	JeanieHartmann	Provence-Alpes-Côte d	Hautes-Alpes	2162	22432
32	119	Ammon	Dickens	Pays de la Loire	Mayenne	1855	13167
33	120	Odell	Stokes	Corse	Corse-du-Sud	1325	33241
34	125	Cason	Bins	Champagne-Ardenne	Ardennes	807	43077
35	126	Mr.	NickEftertz	Bretagne	Morbihan	1944	36550
36	139	Zeno	Leuschke	NA	Hauts-de-Seine	2064	14202
37	141	Wilfrid	Harvey	Pays de la Loire	Mayenne	1804	25807
38	142	Mrs.	LavonneBreitenberg	Lorraine	Vosges	2504	41937
39	145	Dr.	JadeFraneckiIV	NA	Vaucluse	1704	8724
40	158	Denik	Rutherford	Bretagne	Morbihan	1739	54393
41	165	Mrs.	GiovannaRoobMD	Île-de-France	Hauts-de-Seine	1261	22762
42	168	Kareem	Koelpin-Gorczyany	Île-de-France	Val-de-Marne	885	1638
43	171	Jiles	Lehner	Pays de la Loire	NA	1672	29380
44	181	Mrs.	ItzelBartellMD	Lorraine	Vosges	776	5811
45	182	Addyson	Nienow	Lorraine	Meuse	2379	30788

Results Viewer - SAS Output

Le Système SAS

num_client	first	last	region	departement	fidelity_points	total_amount
1	Solomon	Heaney	Lorraine	Meuse	1654	33514
2	Kama	Williamson-Marquardt	NA	NA	3296	29568
4	Laken	McDemott	Limousin	Creuse	2174	29225
6	Clayton	Runoffsson	Mid-Pyrénées	Tarn	1336	17217
12	Lindsey	Hills	Limousin	Corrèze	1612	23043
14	Duncan	Stokes	Basse-Normandie	Manche	1807	17918
19	Dr.	CasimiroHodkiewiczJr.	Lorraine	Meurthe-et-Moselle	1075	18280
22	Theresia	Hermiston	Lorraine	Moselle	1920	31086
23	Wyman	Frami	Corse	Haute-Corse	1286	3256
24	Karan	O'Connell	Basse-Normandie	Orne	1913	18427
29	Dr.	MetaScharberger	Île-de-France	Val-de-Marne	1943	19241
30	Asbury	Cummings	Bretagne	NA	2352	22478
32	Bernie	Boyer	Picardie	Aisne	865	34518
37	Darwin	Kuphal	Languedoc-Roussillon	Gard	1264	25860
52	Jens	Pacocha	Corse	Haute-Corse	807	17724
60	Dr.	JerrellWeimannJr.	Lorraine	Meuse	1655	36081
62	Miss	LavonHegmannDDS	Pays de la Loire	Mayenne	2393	20133
66	Franklin	Mohr-Bartoletti	Provence-Alpes-Côte d	Var	2303	8692
69	Miss	LeannConn	Pays de la Loire	Vendée	1850	34949
74	Sasha	Armstrong	Pays de la Loire	Vendée	1735	40084
87	Jovani	Sipes	Auvergne	Allier	1312	33820
88	Britany	Predovic	Limousin	Haute-Vienne	1033	24312
100	Garfield	Wyman-Waters	Aquitaine	Lot-et-Garonne	1404	11671
102	Cade	Turcotte	Champagne-Ardenne	Aube	1536	34251
103	Coy	Weissnat	Lorraine	Meurthe-et-Moselle	970	46316
109	Caleigh	Blanda	Languedoc-Roussillon	Aude	978	7643
111	Edmonia	Mueller	NA	Haute-Corse	2085	32299
113	Mrs.	TariLegrosMD	Champagne-Ardenne	Marne	1209	2933
114	Jennette	Schumm	Île-de-France	Paris	2379	55431

9.

```
proc sql;
  create table project.question9 as
  select
    t.ref,
    t.timestamp,
    SUM(p.price * pt.quantity) AS transaction_amount
  from project.transaction as t
  inner join project.products_transaction as pt
    on t.ref = pt.names
  inner join project.products as p
    on p.id = pt.product_id
  where t.source_call = 'China'
  group by
    t.ref, t.timestamp
  having
    calculated transaction_amount > 100;
quit;
```

	ref	timestamp	transaction_amount
1	DOSS-BGKO-0035	2022-09-20	6634
2	DOSS-DKFC-0073	2020-08-25	21898
3	DOSS-DMIO-0050	2021-11-26	19079
4	DOSS-FYLN-0053	2022-06-01	39802
5	DOSS-GFEL-0028	2016-09-28	10381
6	DOSS-IGEN-0041	2022-09-24	578
7	DOSS-JOYV-0029	2020-12-26	4873
8	DOSS-JRZB-0089	2022-04-06	8803
9	DOSS-JYQC-0086	2022-02-07	24312
10	DOSS-KLVH-0049	2022-04-12	30112
11	DOSS-KQIA-0025	2022-06-22	32299
12	DOSS-LBDE-0098	2022-02-18	8794
13	DOSS-NCKM-0019	2022-11-16	22189
14	DOSS-PKVJ-0100	2022-10-27	4860
15	DOSS-PUDS-0039	2022-11-28	6961
16	DOSS-QFKT-0014	2022-03-29	11439
17	DOSS-QPDW-0023	2022-11-10	22994
18	DOSS-RJYW-0048	2022-12-09	16741
19	DOSS-SIKH-0061	2022-05-10	4661
20	DOSS-UIOZ-0085	2020-10-08	36954
21	DOSS-XSLF-0099	2022-03-16	1548
22	DOSS-YHFC-0087	2022-02-16	8893
23	DOSS-YQJR-0062	2022-09-16	36081

10.

```
proc sql; /* calculate the total value of each transaction */
  create table project.question10_1 as
  select
    t.ref,
    t.num_client,
    t.timestamp,
    sum(p.price * pt.quantity) as transaction_amount
  from project.transaction as t
  inner join project.products_transaction as pt
    on t.ref = pt.names
  inner join project.products as p
    on p.id = pt.product_id
  group by
    t.ref, t.num_client, t.timestamp;
quit;
```

VIEWTABLE: Project.Question10_1					VIEWTABLE: Project.Question10_1					VIEWTABLE: Project.Question10_1				
	ref	num_client	timestamp	transaction_amount		ref	num_client	timestamp	transaction_amount		ref	num_client	timestamp	transaction_amount
1	DOSS-ABPW-0017	66	2022-11-30	8632	31	DOSS-IJVG-0030	158	2022-11-25	29571	56	DOSS-PKVJ-0100	59	2022-10-27	4860
2	DOSS-AJFP-0045	195	2023-01-02	17418	32	DOSS-IMVX-0094	181	2023-01-02	5811	57	DOSS-POIE-0093	171	2022-09-24	17355
3	DOSS-ARES-0064	152	2022-07-27	30649	33	DOSS-INUG-0077	50	2021-07-11	11526	58	DOSS-PUDS-0039	178	2022-11-28	6961
4	DOSS-ASUL-0009	120	2022-02-15	5471	34	DOSS-ISHP-0071	74	2022-04-11	40084	59	DOSS-QEKT-0038	19	2021-07-17	18280
5	DOSS-BDGT-0076	32	2022-10-02	27226	35	DOSS-JGQX-0001	31	2021-02-05	7240	60	DOSS-QFKT-0014	36	2022-03-29	11439
6	DOSS-BGHO-0035	178	2022-09-20	6634	36	DOSS-JOYV-0029	37	2020-12-26	4873	61	DOSS-QFTS-0059	29	2022-07-26	16890
7	DOSS-CBLQ-0033	158	2022-08-02	5373	37	DOSS-JRZB-0089	94	2022-04-06	8803	62	DOSS-QPDW-0023	115	2022-11-10	22994
8	DOSS-CRIUE-0051	32	2022-06-25	5744	38	DOSS-JKPD-0005	118	2022-09-13	3039	63	DOSS-QZBJ-0082	33	2022-10-12	20271
9	DOSS-DFKC-0073	9	2020-08-25	21898	39	DOSS-JYQC-0086	88	2022-02-07	24312	64	DOSS-RCOD-0018	109	2022-02-14	7643
10	DOSS-DMIO-0050	57	2021-11-26	19079	40	DOSS-KLVH-0049	142	2022-04-12	30112	65	DOSS-RJYV-0048	180	2022-12-09	16741
11	DOSS-DSMI-0065	37	2020-11-05	20987	41	DOSS-KNRP-0052	100	2022-10-21	11671	66	DOSS-RSWJ-0040	52	2022-08-09	17724
12	DOSS-ECBG-0078	38	2022-03-26	16465	42	DOSS-KQIA-0025	111	2022-06-22	32299	67	DOSS-RWML-0008	182	2022-11-16	28535
13	DOSS-EFKS-0055	114	2021-12-19	55431	43	DOSS-LBDE-0098	91	2022-02-18	8794	68	DOSS-SAYJ-0047	8	2020-09-08	35792
14	DOSS-FCBH-0083	118	2021-12-28	23492	44	DOSS-MOPF-0070	182	2022-11-07	2253	69	DOSS-SIKH-0061	105	2022-05-10	4661
15	DOSS-FJZY-0096	4	2022-03-23	29225	45	DOSS-MUPB-0002	79	2021-09-14	37328	70	DOSS-SKLO-0075	87	2022-01-18	14815
16	DOSS-FMLU-0084	102	2022-12-28	34251	46	DOSS-MXCV-0058	116	2022-05-18	22432	71	DOSS-SNUF-0006	141	2022-04-24	3618
17	DOSS-FOGD-0037	126	2022-06-30	26217	47	DOSS-MYVG-0034	82	2022-09-26	8501	72	DOSS-SQCH-0042	165	2022-09-17	22582
18	DOSS-FYLN-0053	125	2022-06-01	39802	48	DOSS-NCKM-0019	141	2022-11-16	22189	73	DOSS-TANO-0091	158	2022-08-01	19449
19	DOSS-FZIH-0031	168	2022-11-11	1638	49	DOSS-NHFG-0036	12	2021-01-19	23043	74	DOSS-TBWS-0079	140	2022-07-12	17568
20	DOSS-GFEL-0028	1	2016-09-28	10381	50	DOSS-NLDY-0066	171	2022-11-25	12025	75	DOSS-TEKO-0088	51	2021-06-07	26607
21	DOSS-GKRE-0090	139	2022-07-19	14202	51	DOSS-NMIV-0074	113	2022-12-12	2933	76	DOSS-UIOZ-0085	10	2020-10-08	36954
22	DOSS-GSMZ-0080	30	2020-09-26	22478	52	DOSS-NWCZ-0068	42	2022-01-10	450	77	DOSS-UMBL-0007	65	2022-11-27	19419
23	DOSS-HIMYZ-0021	103	2022-10-21	40474	53	DOSS-OKEA-0097	192	2022-12-15	31722	78	DOSS-UYWY-0016	22	2020-07-21	108
24	DOSS-HPNY-0024	126	2022-11-19	1440	54	DOSS-ORVD-0022	22	2021-08-02	30978	79	DOSS-VFYJ-0057	142	2022-11-13	11825
25	DOSS-HRKV-0010	69	2021-09-03	34949	55	DOSS-OZBC-0011	103	2022-10-20	5842	80	DOSS-VGHZ-0092	79	2022-12-08	29560
26	DOSS-HUPY-0072	6	2021-03-26	5184	56	DOSS-PKVJ-0100	59	2022-10-27	4860	81	DOSS-VKZJ-0027	192	2022-12-24	9392
27	DOSS-ICRG-0003	77	2021-07-10	8872	57	DOSS-POIE-0093	171	2022-09-24	17355	82	DOSS-VQJM-0069	165	2022-12-26	180
28	DOSS-IGEN-0041	145	2022-09-24	578	58	DOSS-PUDS-0039	178	2022-11-28	6961	83	DOSS-VXEW-0020	120	2022-01-31	27770
29	DOSS-IGXB-0044	125	2022-12-17	3275	59	DOSS-QEKT-0038	19	2021-07-17	18280	84	DOSS-WPSG-0013	24	2022-01-02	18427
30	DOSS-IFJY-0026	2	2022-10-31	29568	60	DOSS-QFKT-0014	36	2022-03-29	11439	85	DOSS-WYBN-0081	119	2023-01-18	13167
31	DOSS-IJVG-0030	158	2022-11-25	29571	61	DOSS-QFTS-0059	29	2022-07-26	16890	86	DOSS-XDEO-0043	1	2021-01-22	23133
32	DOSS-IMVX-0094	181	2023-01-02	5811	62	DOSS-QPDW-0023	115	2022-11-10	22994	87	DOSS-XQPB-0054	23	2022-09-18	3256
33	DOSS-INUG-0077	50	2021-07-11	11526	63	DOSS-QZBJ-0082	33	2021-03-12	20271	88	DOSS-XSLF-0099	32	2022-03-16	1548
34	DOSS-ISHP-0071	74	2022-04-11	40084	64	DOSS-RCOD-0018	109	2022-02-14	7643	89	DOSS-XWJR-0004	59	2021-04-26	10600
35	DOSS-JGQX-0001	31	2021-02-05	7240	65	DOSS-RJYV-0048	180	2022-12-09	16741	90	DOSS-XWQV-0015	79	2021-08-22	31581
36	DOSS-JOYV-0029	37	2020-12-26	4873	66	DOSS-RSWJ-0040	52	2022-08-09	17724	91	DOSS-XYAC-0012	87	2022-10-15	19005
37	DOSS-JRZB-0089	94	2022-04-06	8803	67	DOSS-RWML-0008	182	2022-11-16	28535	92	DOSS-YDNM-0063	127	2022-06-08	32282
38	DOSS-JKPD-0005	118	2022-09-13	3039	68	DOSS-SAYJ-0047	8	2020-09-08	35792	93	DOSS-YHFC-0087	126	2022-02-16	8893
39	DOSS-JYQC-0086	88	2022-02-07	24312	69	DOSS-SIKH-0061	105	2022-05-10	4661	94	DOSS-YPUH-0056	118	2022-03-23	15242
40	DOSS-KLVH-0049	142	2022-04-12	30112	70	DOSS-SKLO-0075	87	2023-01-18	14815	95	DOSS-YQAL-0062	60	2022-09-16	36081
41	DOSS-KNRP-0052	100	2022-10-21	11671	71	DOSS-SNUF-0006	141	2022-04-24	3618	96	DOSS-YSLA-0032	62	2021-09-19	20133
42	DOSS-KQIA-0025	111	2022-06-22	32299	72	DOSS-SQCH-0042	165	2022-09-17	22582	97	DOSS-ZGBV-0095	145	2022-12-04	8146
43	DOSS-LBDE-0098	91	2022-02-18	8794	73	DOSS-TANO-0091	158	2022-08-01	19449	98	DOSS-ZLBY-0046	6	2021-12-10	12033
44	DOSS-MOPF-0070	182	2022-11-07	2253	74	DOSS-TBWS-0079	140	2022-07-12	17568	99	DOSS-ZPVB-0060	14	2022-02-08	17918
45	DOSS-MUPB-0002	79	2021-09-14	37328	75	DOSS-TEKO-0088	51	2021-06-07	26607	100	DOSS-ZPVN-0067	29	2021-12-23	2351
46	DOSS-MXCV-0058	116	2022-05-18	22432	76	DOSS-UIOZ-0085	10	2020-10-08	36954					
47	DOSS-MYVG-0034	82	2022-09-26	8501	77	DOSS-UMBL-0007	65	2022-11-27	19419					

```

proc sql; /* select the latest timestamp per customer */
create table project.question10_2 as
select
    num_client,
    max(timestamp) as latest_timestamp
from project.question10_1
group by num_client;
quit;

```

VIEWTABLE: Project.Question10_2				
	num_client	latest_timestamp		
1	1	2021-01-22	34	77 2021-07-10
2	2	2022-10-31	35	79 2022-12-08
3	4	2022-03-23	36	82 2022-09-26
4	6	2021-12-10	37	87 2023-01-18
5	8	2020-09-08	38	88 2022-02-07
6	9	2020-08-25	39	91 2022-02-18
7	10	2020-10-08	40	94 2022-04-06
8	12	2021-01-19	41	100 2022-10-21
9	14	2022-02-08	42	102 2022-12-28
10	19	2021-07-17	43	103 2022-10-21
11	22	2021-08-02	44	105 2022-05-10
12	23	2022-09-18	45	109 2022-02-14
13	24	2021-01-02	46	111 2022-06-22
14	29	2022-07-26	47	113 2022-12-12
15	30	2020-09-26	48	114 2021-12-19
16	31	2021-02-05	49	115 2022-11-10
17	32	2022-10-02	50	116 2022-05-18
18	33	2021-03-12	51	118 2022-09-13
19	36	2022-03-29	52	119 2023-01-18
20	37	2020-12-26	53	120 2022-02-15
21	38	2022-03-26	54	125 2022-12-17
22	42	2022-01-10	55	126 2022-11-19
23	50	2021-07-11	56	127 2022-06-08
24	51	2021-06-07	57	139 2022-07-19
25	52	2022-08-09	58	140 2022-07-12
26	57	2021-11-26	59	141 2022-11-16
27	59	2022-10-27	60	142 2022-11-13
28	60	2022-09-16	61	145 2022-12-04
29	62	2021-09-19	62	152 2022-07-27
30	65	2022-11-27	63	158 2022-11-25
31	66	2022-11-30	64	165 2022-12-26
32	69	2021-09-03	65	168 2022-11-11
33	74	2022-04-11	66	171 2022-11-25
34	77	2021-07-10	67	178 2022-11-28
35	79	2022-12-08	68	180 2022-12-09
36	82	2022-09-26	69	181 2023-01-02
			70	182 2022-11-16
			71	192 2022-12-24
			72	195 2023-01-02

```
proc sql; /* Join both tables to get the most recent transaction + amount */
create table project.question10 as
select
    c.num_client,
    c.first,
    c.last,
    q101.ref,
    q101.timestamp,
    q101.transaction_amount
from project.customers as c
inner join project.question10_1 as q101
    on c.num_client = q101.num_client
inner join project.question10_2 as q102
    on q101.num_client = q102.num_client
    and q101.timestamp = q102.latest_timestamp;

quit;
```

11.

```
proc sql; /*Identify customers whose all transactions are below $50 */
create table project.question11_to_delete as
select
    num_client
from (
    /* Compute total amount per transaction */
    select
        c.num_client,
        t.ref,
        sum(p.price * pt.quantity) as transaction_amount
    from project.customers as c
    inner join project.transaction as t
        on c.num_client = t.num_client
    inner join project.products_transaction as pt
        on t.ref = pt.names
    inner join project.products as p
        on p.id = pt.product_id
    group by c.num_client, t.ref
) as per transaction
```

```

/* Find the highest transaction per customer */
group by num_client
having max(transaction_amount) < 50;
quit;

```

num_client
------------

Observation : The table is empty because all the transactions have a total above 50.

```

proc sql; /* Delete identified customers from the copy */
delete from project.question11
where num_client in (select num_client from project.question11_to_delete);
quit;

```

VIEWTABLE: Project.Question11

	num_client	first	last	age	region	departement	cb_provider	entry_date	fidelity_points	priority
1	Solomon	Heaney	53	Lorraine	Meuse	Diners Club / Carte Blanche	2016-05-08 23:51:23	1554	Silver	
2	Kama	Williamson-Margaret	81	NA	VISA 13 digit	2018-01-23 00:51:06	3296	Platinum		
3	Press	Kulas	NA	Bretagne	Morbihan	NA	2018-05-26 16:56:08	2267	Silver	
4	Laken	McDemott	NA	Limousin	Creuse	NA	2018-07-31 08:13:01	2174	Gold	
5	Sydney	Jaskolski	30	Bretagne	Morbihan	NA	2018-08-23 07:44:08	343	Silver	
6	Clayton	Rundtson	NA	Mid-Pyrénées	Tarn	Diners Club / Carte Blanche	2018-09-23 15:59:52	1336	Silver	
7	Roberta	Purdy-Wyman	60	Languedoc-Roussillon	Gard	NA	2019-05-06 04:59:23	2193	Silver	
8	Dr.	RonaldMuller	30	Franch-Comté	Doubs	NA	2019-06-23 18:36:00	318	Bronze	
9	Mrs	AlondaWiza	18	Mid-Pyrénées	Tarn-et-Garonne	Diners Club / Carte Blanche	2019-07-18 08:37:33	26	Bronze	
10	Vernice	Ondricka-Keebler	19	NA	Somme	NA	2019-07-19 04:50:37	157	Bronze	
11	Martol	Schmeler	NA	Pays de la Loire	Loire-Atlantique	NA	2019-10-25 11:46:42	337	Bronze	
12	Lindsey	Hills	60	Limousin	Corrèze	VISA 16 digit	2019-11-10 04:46:51	1612	Silver	
13	Dioyle	Spencer	48	Lorraine	Moselle	Maestro	2019-11-14 15:56:16	1685	Silver	
14	Duncan	Stokes	68	Basse-Normandie	Manche	NA	2019-12-04 06:49:54	1807	Gold	
15	Davin	Lowie	NA	Lorraine	Meurthe-et-Moselle	JCB 15 digit	2019-12-16 09:01:46	106	Bronze	
16	Lilah	Leuschke	28	Champagne-Ardenne	Ardenne	NA	2020-01-11 07:06:59	464	Gold	
17	Demian	Guigley	70	Lorraine	Meuse	American Express	2020-01-15 12:56:37	2639	Platinum	
18	Dr.	AlSenger	26	Pays de la Loire	Vendée	NA	2020-02-20 07:09:03	794	Bronze	
19	Dr.	CasimiroHedkiewicz	48	Lorraine	Meurthe-et-Moselle	NA	2020-02-27 19:17:44	1075	Silver	
20	Dr.	TalanZemeMD	56	Limousin	Haute-Vienne	JCB 15 digit	2020-02-28 15:56:28	2807	Platinum	
21	Mr.	GroverHartmann	22	Poitou-Charentes	Charente-Maritime	Mastercard	2020-04-15 11:22:18	615	Bronze	
22	Theresa	Hemiston	49	Lorraine	Moselle	American Express	2020-04-29 07:16:08	1920	Gold	
23	Wyman	Fiani	NA	Corse	Haute-Corse	Discover	2020-05-05 13:47:54	1286	Gold	
24	Karan	O'Connell	43	Basse-Normandie	Orne	American Express	2020-05-10 03:00:08	1913	Gold	
25	Aime	Purdy	20	Mid-Pyrénées	Ariège	NA	2020-05-11 18:17:35	301	Silver	
26	Treyton	Zemann	37	Corse	NA	American Express	2020-05-17 02:55:22	786	Bronze	
27	Dorsey	Murray	30	NA	Gironde	NA	2020-05-21 03:15:01	776	Bronze	
28	Jayda	Howe	40	Provence-Alpes C&A d	Alpes-Maritimes	VISA 16 digit	2020-05-23 05:45:33	1415	Silver	
29	Dr.	MetaSchanberger	NA	Alsace	Val-de-Marne	Diners Club / Carte Blanche	2020-05-24 05:37:14	1943	Gold	
30	Anthony	Cummings	61	Bretagne	NA	Maestro	2020-06-13 02:25:55	2052	Gold	
31	Loren	Larson	NA	Pays de la Loire	Saône	VISA 13 digit	2020-06-20 01:54:46	203	Bronze	
32	Bernie	Boyer	53	Picardie	Aisne	JCB 16 digit	2020-06-24 16:19:59	865	Bronze	
33	Lydell	Emser	NA	Champagne-Ardenne	Aube	NA	2020-07-18 16:26:31	346	Silver	
34	Rowan	Mraz	24	Lorraine	Vosges	NA	2020-07-19 04:06:52	28	Bronze	
35	Olwen	Fest	18	Haute-Normandie	Seine-Maritime	NA	2020-07-19 07:42:09	126	Bronze	
36	Mr.	NicholasOm	NA	Provence-Alpes C&A d	Hautes-Alpes	NA	2020-07-22 07:55:43	114	Bronze	
37	Dewinn	Kuphal	32	Languedoc-Roussillon	Gard	JCB 15 digit	2020-08-15 09:43:22	1264	Silver	
38	Belva	Jast-Brown	NA	Franch-Comté	Haute-Saône	Diners Club / Carte Blanche	2020-08-15 18:58:14	579	Silver	
39	Wendell	Hettinger	38	Provence-Alpes C&A d	Alpes-Maritimes	Mastercard	2020-08-26 08:32:42	952	Silver	
40	Ms.	LucyLeuschke	25	Champagne-Ardenne	Marne	JCB 15 digit	2020-08-28 16:17:48	803	Bronze	
41	Chaim	Franeckiliv	31	Lorraine	Moselle	Discover	2020-09-15 16:25:07	588	Bronze	
42	Monte	Deneak	51	Lorraine	Moselle	JCB 16 digit	2020-09-17 16:18:55	1338	Bronze	
43	Natasha	Keebler-Koepf	NA	Lorraine	NA	NA	2020-09-18 18:09:39	1043	Gold	
44	Miss	FreedBlack	23	Corse	Corse-du-Sud	Maestro	2020-09-25 04:52:19	410	Bronze	
45	Vinton	Ryan	46	Picardie	NA	Diners Club / Carte Blanche	2020-10-03 00:45:33	1557	Bronze	
46	Mr.	LenaBoehm	20	Mid-Pyrénées	Tarn-et-Garonne	VISA 16 digit	2020-10-08 22:00:25	136	Bronze	
47	Vera	O'Reilly	68	Pays de la Loire	Maine-et-Loire	American Express	2020-10-13 17:31:27	2414	Gold	

154	Treyton	Reichert	21	Champagne-Ardenne	Haute-Marne	NA	2022-05-21 20:38:39	562	Silver
155	Dr.	ButchSengerDVM	NA	Alsace	Haute-Corse	VISA 16 digit	2022-05-23 03:43:37	632	Bronze
156	Leonora	Nolan	43	Bretagne	Morbihan	Voyager	2022-05-24 16:54:18	331	Bronze
157	Toccare	Weinart	26	Limousin	Corrèze	NA	2022-06-12 12:59:42	843	Bronze
158	Desk	Rutherford	41	Bretagne	Morbihan	Discover	2022-06-13 00:51:23	1739	Silver
159	Geman	Litel	55	Alsace	Essonne	Mastercard	2022-06-16 08:46:03	1097	Bronze
160	Mr.	WallaceKochIV	22	Pays de la Loire	Maine-et-Loire	Mastercard	2022-06-18 17:03:42	677	Bronze
161	Dr.	FredrickSchoenSr.	63	NA	Haute-de-Saône	Diners Club / Carte Blanche	2022-06-22 00:44:05	1526	Silver
162	Leercy	BeattyV	NA	Pays de la Loire	Mayenne	JCB 16 digit	2022-07-02 18:40:34	31	Bronze
163	Vicki	VandervotDDS	76	Languedoc-Roussillon	Pyrénées-Orientales	NA	2022-07-05 18:15:45	3205	Gold
164	Arnoldo	O'HaraMD	32	Bretagne	Morbihan	American Express	2022-07-06 09:24:47	555	Silver
165	Mrs.	GiovannaRoobMD	60	Alsace	Hauts-de-Seine	JCB 16 digit	2022-07-12 08:54:03	1261	Gold
166	Wes	Bartel	23	Haute-Normandie	Seine-Maritime	NA	2022-07-20 17:58:05	192	Silver
167	Massill	Lutigen	39	NA	Yvelines	NA	2022-07-22 01:55:38	960	Silver
168	Kaewem	Koeljn-Gorczyca	27	Alsace	Val-de-Marne	Mastercard	2022-07-28 13:51:41	885	Silver
169	Mrs.	LaurenSchanberger	53	Pays de la Loire	Vendée	NA	2022-07-28 16:41:51	1541	Silver
170	Lucius	KuphalV	18	Limousin	Haute-Vienne	Voyager	2022-07-31 21:48:08	282	Bronze
171	Illes	Lehner	41	Pays de la Loire	NA	American Express	2022-08-01 10:50:20	1672	Silver
172	Jeremiah	Rowe	26	Poitou-Charentes	Deux-Sèvres	Mastercard	2022-08-19 22:25:17	1160	Silver
173	Clémentin	Christiansen-Nienow	19	Mid-Pyrénées	Ariège	NA	2022-08-20 02:08:55	173	Bronze
174	Dr.	JanePredovicMD	22	Pays de la Loire	Vendée	Diners Club / Carte Blanche	2022-08-26 13:40:37	567	Bronze
175	Zhane	Swift	NA	Poitou-Charentes	Charente-Maritime	NA	2022-08-29 03:33:20	165	Silver
176	Mr.	PatricLarsonSr.	22	Pays de la Loire	Maine-et-Loire	NA	2022-09-06 13:54:18	280	Bronze
177	Kristen	Lind-Rutherford	19	Picardie	Oise	NA	2022-09-12 17:00:41	547	Bronze
178	Gustaf	Carter	NA	Champagne-Ardenne	Ardenne	Voyager	2022-09-15 08:09:42	614	Bronze
179	Dr.	LeonoreLauter	26	Provence-Alpes C&A d	Vaucluse	Diners Club / Carte Blanche	2022-09-16 11:01:39	344	Bronze
180	Hymen	Jacobs	23	Alsace	Seine-et-Marne	NA	2022-09-22 01:11:07	157	Bronze
181	Mrs.	IzzelBartelMD	52	Lorraine	Vosges	Mastercard	2022-10-07 20:26:50	776	Bronze
182	Addyson	Nenow	65	Lorraine	Meuse	Maestro	2022-10-10 09:53:15	2379	Gold
183	Chestina	Fel	32	Pays de la Loire	Mayenne	NA	2022-10-18 09:58:00	363	Silver
184	Mrs	CharlaOlsonMD	18	Languedoc-Roussillon	Aude	NA	2022-10-21 12:22:10	153	Bronze
185	Dr.	HanselKeeblerSr.	NA	Pays de la Loire	Maine-et-Loire	Maestro	2022-10-23 00:19:30	1200	Silver
186	Pais	West	NA	Corse	Haute-Corse	VISA 16 digit	2022-10-23 13:12:11	1881	Gold
187	Giancarlo	TillmanIII	40	Provence-Alpes C&A d	Hautes-Alpes	NA	2022-10-23 20:07:09	2052	Gold
188	Piyor	Labadie	29	Alsace	Val-de-Marne	JCB 16 digit	2022-10-29 04:18:08	428	Bronze
189	Mr.	AkonDungan	NA	Pays de la Loire	Vendée	NA	2022-10-29 06:48:35	164	Bronze
190	Wayne	Connall	20	Mid-Pyrénées	NA	NA	2022-11-17 10:28:59	537	Bronze
191	Mr.	AdelSchanberger	53	Languedoc-Roussillon	Aude	VISA 16 digit	2022-11-28 13:21:12	685	Silver
192	Drew	Lesch	18	Languedoc-Roussillon	Gard	VISA 16 digit	2022-12-08 09:04:04	120	Bronze
193	Madonna	VonRueden-Mills	18	Pays de la Loire	Loire-Atlantique	VISA 16 digit	2022-12-09 21:54:06	264	Bronze
194	Mrs.	KristalNaderPhD	NA	Alsace	Val-d'Oise	NA	2022-12-12 18:27:15	264	Bronze
195	Kerley	Wegner	NA	Languedoc-Roussillon	Aude	Maestro	2022-12-17 18:26:14	502	Bronze
196	Garry	Swartowski-Huels	NA	Pays de la Loire	Vendée	Mastercard	2022-12-21 13:29:43	185	Bronze
197	Agnes	VonRueden-Schneider	33	Champagne-Ardenne	Marne	VISA 16 digit	2023-01-03 13:16:40	333	Bronze
198	Adriane	Roob	67	Languedoc-Roussillon	Lozère	Maestro	2023-01-07 03:59:31	2522	Gold
199	Mrs	AnaliaHemistonDVM	NA	Haute-Normandie	Seine-Maritime	American Express	2023-01-13 04:22:36	649	Silver
200	Casey	O'Connell	74	Champagne-Ardenne	Marne	American Express	2023-01-16 23:19:01	2678	Platinum



12.

```
proc sql; /* Keep only purchased products per transaction */
create table project.q12_products_bought as
select *
from project.products_transaction
where quantity > 0;
quit;
```

VIEWTABLE: Project.Q12\_products\_bought

	names	product	value	product_id	quantity
1	DOSS-GFEL-0028	prod_X1	6	1	6
2	DOSS-GFEL-0028	prod_X2	14	2	14
3	DOSS-GFEL-0028	prod_X3	33	3	33
4	DOSS-GFEL-0028	prod_X4	4	4	4
5	DOSS-GFEL-0028	prod_X5	76	5	76
6	DOSS-GFEL-0028	prod_X6	46	6	46
7	DOSS-GFEL-0028	prod_X7	22	7	22
8	DOSS-GFEL-0028	prod_X8	11	8	11
9	DOSS-GFEL-0028	prod_X9	9	9	9
10	DOSS-GFEL-0028	prod_X10	47	10	47
11	DOSS-GFEL-0028	prod_X11	20	11	20
12	DOSS-UWYV-0016	prod_X1	6	1	6
13	DOSS-DKFC-0073	prod_X1	73	1	73
14	DOSS-DKFC-0073	prod_X2	38	2	38
15	DOSS-DKFC-0073	prod_X3	61	3	61
16	DOSS-DKFC-0073	prod_X4	2	4	2
17	DOSS-DKFC-0073	prod_X5	15	5	15

```
proc sql; /* Get prices and names */
create table project.q12_products_bought_details as
select
    pt.names as transaction_ref,
    p.id as product_id,
    p.name as product_name,
    p.price
from project.q12_products_bought as pt
inner join project.products as p
on pt.product_id = p.id;
quit;
```

VIEWTABLE: Project.Q12\_products\_bought\_details

	transaction_ref	product_id	product_name	price
1	DOSS-GFEL-0028	1	Step and Distance Pedometer TL Pro	18
2	DOSS-GFEL-0028	2	Biking Tracker U Pro with MP3 Player	35
3	DOSS-GFEL-0028	3	Wearable Transmitter KR	42
4	DOSS-GFEL-0028	4	Multifunction Tracker MG Pro with heart rate sensor	60
5	DOSS-GFEL-0028	5	Action Camera Pro	16
6	DOSS-GFEL-0028	6	Strapless Heart Rate Monitor	23
7	DOSS-GFEL-0028	7	Action Camera RE Pro with Wi-Fi and GPS	69
8	DOSS-GFEL-0028	8	Microcontroller ES	49
9	DOSS-GFEL-0028	9	Microcontroller OGBE with Wi-Fi and GPS	82
10	DOSS-GFEL-0028	10	Wearable AUSG with Calorie Counter	24
11	DOSS-GFEL-0028	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
12	DOSS-UWYV-0016	1	Step and Distance Pedometer TL Pro	18
13	DOSS-DKFC-0073	1	Step and Distance Pedometer TL Pro	18
14	DOSS-DKFC-0073	2	Biking Tracker U Pro with MP3 Player	35

```

proc sql; /*Find cheapest product per transaction*/
create table project.q12_cheapest_products as
select transaction_ref,
       product_id as cheapest_product_id,
       product_name as cheapest_product_name,
       price as cheapest_product_price
from project.q12_products_bought_details as t1
where price = (select min(price)
               from project.q12_products_bought_details as t2
               where t2.transaction_ref = t1.transaction_ref);

quit;

```

VIEWTABLE: Project.Q12\_cheapest\_products

	transaction_ref	cheapest_product_id	cheapest_product_name	cheapest_product_price
1	DOSS-GFEL-0028	5	Action Camera Pro	16
2	DOSS-UWYV-0016	1	Step and Distance Pedometer TL Pro	18
3	DOSS-DKFC-0073	5	Action Camera Pro	16
4	DOSS-SAYJ-0047	5	Action Camera Pro	16
5	DOSS-GSMZ-0080	5	Action Camera Pro	16
6	DOSS-UIOZ-0085	5	Action Camera Pro	16
7	DOSS-DSMI-0065	5	Action Camera Pro	16
8	DOSS-JOYV-0029	1	Step and Distance Pedometer TL Pro	18
9	DOSS-WPSG-0013	5	Action Camera Pro	16
10	DOSS-NHFG-0036	5	Action Camera Pro	16
11	DOSS-XDEO-0043	5	Action Camera Pro	16
12	DOSS-JGOX-0001	1	Step and Distance Pedometer TL Pro	18
13	DOSS-QZBJ-0082	5	Action Camera Pro	16
14	DOSS-HUPY-0072	1	Step and Distance Pedometer TL Pro	18
15	DOSS-XWJR-0004	1	Step and Distance Pedometer TL Pro	18
16	DOSS-TEKO-0088	5	Action Camera Pro	16
17	DOSS-ICRG-0003	5	Action Camera Pro	16

```

proc sql; /*Find most expensive product per transaction*/
create table project.q12_most_expensive_products as
select transaction_ref,
       product_id as most_expensive_product_id,
       product_name as most_expensive_product_name,
       price as most_expensive_product_price
from project.q12_products_bought_details as t1
where price = (select max(price)
               from project.q12_products_bought_details as t2
               where t2.transaction_ref = t1.transaction_ref);

quit;

```

VIEWTABLE: Project.Q12\_most\_expensive\_products

	transaction_ref	most_expensive_product_id	most_expensive_product_name	most_expensive_product_price
1	DOSS-GFEL-0028	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
2	DOSS-UWYV-0016	1	Step and Distance Pedometer TL Pro	18
3	DOSS-DKFC-0073	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
4	DOSS-SAYJ-0047	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
5	DOSS-GSMZ-0080	9	Microcontroller OGBE with Wi-Fi and GPS	82
6	DOSS-UIOZ-0085	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
7	DOSS-DSMI-0065	9	Microcontroller OGBE with Wi-Fi and GPS	82
8	DOSS-JOYV-0029	4	Multifunction Tracker MG Pro with heart rate sensor	60
9	DOSS-WPSG-0013	9	Microcontroller OGBE with Wi-Fi and GPS	82
10	DOSS-NHFG-0036	11	Biking Tracker V Pro with Activity/Sleep Tracking	98



```

proc sql; /* Select for each transaction the cheapest and the most expensive (in terms
of price) product */
create table project.question12 as
select
    c.transaction_ref,
    c.cheapest_product_id,
    c.cheapest_product_name,
    c.cheapest_product_price,
    m.most_expensive_product_id,
    m.most_expensive_product_name,
    m.most_expensive_product_price
from project.q12_cheapest_products as c
inner join project.q12_most_expensive_products as m
    on c.transaction_ref = m.transaction_ref;
quit;

```

	transaction_ref	cheapest_product_id	cheapest_product_name	cheapest_product_price	most_expensive_product_id	most_expensive_product_name	most_expensive_product_price
1	DOSS-GFEL-0028	5	Action Camera Pro	16	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
2	DOSS-UWVY-0016	1	Step and Distance Pedometer TL Pro	18	1	Step and Distance Pedometer TL Pro	18
3	DOSS-DKFC-0073	5	Action Camera Pro	16	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
4	DOSS-SAYJ-0047	5	Action Camera Pro	16	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
5	DOSS-GSMZ-0080	5	Action Camera Pro	16	9	Microcontroller OGBE with Wi-Fi and GPS	82
6	DOSS-UQOZ-0085	5	Action Camera Pro	16	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
7	DOSS-DSMI-0065	5	Action Camera Pro	16	9	Microcontroller OGBE with Wi-Fi and GPS	82
8	DOSS-JOYV-0029	1	Step and Distance Pedometer TL Pro	18	4	Multifunction Tracker MG Pro with heart rate sensor	60
9	DOSS-WPFG-0013	5	Action Camera Pro	16	9	Microcontroller OGBE with Wi-Fi and GPS	82
10	DOSS-NHPS-0036	5	Action Camera Pro	16	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
11	DOSS-XDEO-0043	5	Action Camera Pro	16	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
12	DOSS-GGOX-0001	1	Step and Distance Pedometer TL Pro	18	4	Multifunction Tracker MG Pro with heart rate sensor	60
13	DOSS-QZBJ-0082	5	Action Camera Pro	16	7	Action Camera RE Pro with Wi-Fi and GPS	69
14	DOSS-HUPY-0072	1	Step and Distance Pedometer TL Pro	18	3	Wearable Transmitter KR	42
15	DOSS-XWJR-0004	1	Step and Distance Pedometer TL Pro	18	4	Multifunction Tracker MG Pro with heart rate sensor	60
16	DOSS-TEKO-0088	5	Action Camera Pro	16	11	Biking Tracker V Pro with Activity/Sleep Tracking	98
17	DOSS-ICRG-0003	5	Action Camera Pro	16	4	Multifunction Tracker MG Pro with heart rate sensor	60

13.

```

proc sql;
/* Step 1: Compute total transaction amount per customer */
create table project.q13_1 as
select
    t.num_client,
    sum(p.price * pt.quantity) as total_amount
from project.transaction as t
inner join project.products_transaction as pt
    on t.ref = pt.names
inner join project.products as p
    on pt.product_id = p.id
group by t.num_client;

/* Step 2: Join with customers to get fidelity_points */
create table project.q13_2 as
select
    c.num_client,
    c.fidelity_points,
    q131.total_amount
from project.customers as c
inner join project.q13_1 as q131
    on c.num_client = q131.num_client;
quit;

```

VIEWTABLE: Project.Q13_1		
	num_client	total_amount
1	1	33514
2	2	29568
3	4	29225
4	6	17217
5	8	35792
6	9	21898
7	10	36954
8	12	23043
9	14	17918
10	19	18280
11	22	31086
12	23	3256
13	24	18427
14	29	19241
15	30	22478
16	31	7240
17	32	34518
18	33	20271
19	36	11439
20	37	25860
21	38	16465
22	42	450
23	50	11526

VIEWTABLE: Project.Q13_1		
	num_client	total_amount
51	118	41773
52	119	13167
53	120	33241
54	125	43077
55	126	36550
56	127	32282
57	139	14202
58	140	17568
59	141	25807
60	142	41937
61	145	8724
62	152	30649
63	158	54393
64	165	22762
65	168	1638
66	171	29380
67	178	13595
68	180	16741
69	181	5811
70	182	30788
71	192	41114
72	195	17418

Step 2

VIEWTABLE: Project.Q13_2			
	num_client	fidelity_points	total_amount
1	1	1654	33514
2	2	3296	29568
3	4	2174	29225
4	6	1336	17217
5	8	318	35792
6	9	26	21898
7	10	157	36954
8	12	1612	23043
9	14	1807	17918
10	19	1075	18280
11	22	1920	31086
12	23	1286	3256
13	24	1913	18427
14	29	1943	19241
15	30	2352	22478
16	31	203	7240
17	32	865	34518
18	33	346	20271
19	36	114	11439
20	37	1264	25860
21	38	579	16465
22	42	1338	450
23	50	138	11526

VIEWTABLE: Project.Q13_2			
	num_client	fidelity_points	total_amount
51	118	38	41773
52	119	1855	13167
53	120	1325	33241
54	125	807	43077
55	126	1944	36550
56	127	645	32282
57	139	2064	14202
58	140	124	17568
59	141	1804	25807
60	142	2504	41937
61	145	1704	8724
62	152	692	30649
63	158	1739	54393
64	165	1261	22762
65	168	885	1638
66	171	1672	29380
67	178	614	13595
68	180	157	16741
69	181	776	5811
70	182	2379	30788
71	192	120	41114
72	195	502	17418

```
/* Step 3: Calculate correlation using PROC CORR */
proc corr data=project.q13_2;
  var fidelity_points total_amount;
run;
```

## Le Système SAS

### La procédure CORR

2 Variables : fidelity\_points total\_amount

Statistiques simples						
Variable	N	Moyenne	Ec-type	Somme	Minimum	Maximum
fidelity_points	72	1186	806.45370	85403	26.00000	3296
total_amount	72	24010	15490	1728713	450.00000	98469

Coefficients de corrélation de Pearson, N = 72  
Proba > |r| sous H0: Rho=0

	fidelity_points	total_amount
fidelity_points	1.00000	0.11420 0.3395
total_amount	0.11420 0.3395	1.00000

14.

```
proc sql;
  /* Step 1: Calculate the total for each transaction */
  create table project.q14_transaction_totals as
  select
    t.ref as transaction_ref,
    month(input(t.timestamp, yymmdd10.)) as month,
    sum(p.price * pt.quantity) as total_amount
  from project.transaction t
  inner join project.products_transaction pt
    on t.ref = pt.names
  inner join project.products p
    on pt.product_id = p.id
  group by t.ref, t.timestamp;
quit;
```

	transaction_ref	month	total_amount
1	DOSS-ABPW-0017	11	8692
2	DOSS-AJFP-0045	1	17418
3	DOSS-ARES-0064	7	30649
4	DOSS-ASUL-0009	2	5471
5	DOSS-BDGT-0076	10	27226
6	DOSS-BGKO-0035	9	6634
7	DOSS-CBQJ-0033	8	5373
8	DOSS-CRUE-0051	6	5744
9	DOSS-DKFC-0073	8	21898
10	DOSS-DMIO-0050	11	19079
11	DOSS-DSMI-0065	11	20987
12	DOSS-ECBG-0078	3	16465
13	DOSS-EFKS-0055	12	55431
14	DOSS-FCBH-0083	12	23492
15	DOSS-FJZV-0096	3	29225
16	DOSS-FMLI-0084	12	34251
17	DOSS-FOGD-0037	6	26217
18	DOSS-FYLN-0053	6	39802
19	DOSS-FZIH-0031	11	1638
20	DOSS-GFEL-0028	9	10381
21	DOSS-GKRE-0090	7	14202
22	DOSS-GSMZ-0080	9	22478
23	DOSS-HMYZ-0021	10	40474

	transaction_ref	month	total_amount
79	DOSS-VFYJ-0057	11	11825
80	DOSS-VGHZ-0092	12	29560
81	DOSS-VKZG-0027	12	9392
82	DOSS-VQJM-0069	12	180
83	DOSS-VXEW-0020	1	27770
84	DOSS-WPSG-0013	1	18427
85	DOSS-WYBN-0081	1	13167
86	DOSS-XDEO-0043	1	23133
87	DOSS-XQPB-0054	9	3256
88	DOSS-XSLF-0099	3	1548
89	DOSS-XWJR-0004	4	10600
90	DOSS-XWQV-0015	8	31581
91	DOSS-XYAC-0012	10	19005
92	DOSS-YDNM-0063	6	32282
93	DOSS-YHFC-0087	2	8893
94	DOSS-YPUH-0056	3	15242
95	DOSS-YQJR-0062	9	36081
96	DOSS-YSAL-0032	9	20133
97	DOSS-ZGBV-0095	12	8146
98	DOSS-ZLBY-0046	12	12033
99	DOSS-ZPVB-0060	2	17918
100	DOSS-ZPVN-0067	12	2351

```
proc sql;
  /* Step 2: Identify the largest transaction for each month */
  create table project.q14_max_transaction as
  select *
  from project.transaction_totals t1
  where total_amount = (
    select max(total_amount)
    from project.transaction_totals t2
    where t2.month = t1.month
  );
quit;
```

	transaction_ref	month	total_amount
1	DOSS-ARES-0064	7	30649
2	DOSS-EFKS-0055	12	55431
3	DOSS-FJZV-0096	3	29225
4	DOSS-FYLN-0053	6	39802
5	DOSS-HMYZ-0021	10	40474
6	DOSS-IJVQ-0030	11	29571
7	DOSS-ISHP-0071	4	40084
8	DOSS-JYQC-0086	2	24312
9	DOSS-MUPB-0002	9	37328
10	DOSS-MXCVC-0058	5	22432
11	DOSS-VXEW-0020	1	27770
12	DOSS-XWQV-0015	8	31581

```

proc sql;
/* Step 3: Identify the smallest transaction for each month */
create table project.q14_min_transaction as
select *
from project.transaction_totals t1
where total_amount = (
    select min(total_amount)
    from project.transaction_totals t2
    where t2.month = t1.month
);
quit;

```

	transaction_ref	month	total_amount
1	DOSS-ASUL-0009	2	5471
2	DOSS-CBQJ-0033	8	5373
3	DOSS-CRUE-0051	6	5744
4	DOSS-HPNY-0024	11	1440
5	DOSS-IGEN-0041	9	578
6	DOSS-NWCT-0068	1	450
7	DOSS-PKVJ-0100	10	4860
8	DOSS-SIKH-0061	5	4661
9	DOSS-SNUF-0006	4	3618
10	DOSS-UWYV-0016	7	108
11	DOSS-VQJM-0069	12	180
12	DOSS-XSLF-0099	3	1548

```

proc sql; /* Create a table listing all products purchased by month */
create table project.q14_monthly_products as
select
    month(input(t.timestamp, yymmdd10.)) as month,
    p.id as product_id,
    p.name as product_name,
    p.category,
    p.price as product_price,
    pt.quantity,
    pt.names as transaction_ref
from project.transaction t
inner join project.products_transaction pt
    on t.ref = pt.names
inner join project.products p
    on pt.product_id = p.id
where pt.quantity > 0
order by month, p.id;
quit;

```

	month	product_id	product_name	category	product_price	quantity	transaction_ref
1	1	1	Step and Distance Pedometer TL Pro	Industrial	18	30	DOSS-WYBN-0081
2	1	1	Step and Distance Pedometer TL Pro	Industrial	18	87	DOSS-IMVX-0094
3	1	1	Step and Distance Pedometer TL Pro	Industrial	18	86	DOSS-WPSG-0013
4	1	1	Step and Distance Pedometer TL Pro	Industrial	18	51	DOSS-SKLO-0075
5	1	1	Step and Distance Pedometer TL Pro	Industrial	18	46	DOSS-NHFG-0036
6	1	1	Step and Distance Pedometer TL Pro	Industrial	18	24	DOSS-AJFP-0045
7	1	1	Step and Distance Pedometer TL Pro	Industrial	18	47	DOSS-XDEO-0043
8	1	1	Step and Distance Pedometer TL Pro	Industrial	18	72	DOSS-VXEW-0020
9	1	1	Step and Distance Pedometer TL Pro	Industrial	18	25	DOSS-NWCT-0068
10	1	2	Biking Tracker U Pro with MP3 Player	Entertainment	35	60	DOSS-VXEW-0020
11	1	2	Biking Tracker U Pro with MP3 Player	Entertainment	35	26	DOSS-AJFP-0045
12	1	2	Biking Tracker U Pro with MP3 Player	Entertainment	35	90	DOSS-XDEO-0043
13	1	2	Biking Tracker U Pro with MP3 Player	Entertainment	35	51	DOSS-WYBN-0081
14	1	2	Biking Tracker U Pro with MP3 Player	Entertainment	35	41	DOSS-IMVX-0094
15	1	2	Biking Tracker U Pro with MP3 Player	Entertainment	35	12	DOSS-NHFG-0036
16	1	2	Biking Tracker U Pro with MP3 Player	Entertainment	35	6	DOSS-SKLO-0075
17	1	2	Biking Tracker U Pro with MP3 Player	Entertainment	35	35	DOSS-IMVX-0094
18	1	3	Wearable Transmitter KR	Awesome	42	82	DOSS-AJFP-0045
19	1	3	Wearable Transmitter KR	Awesome	42	27	DOSS-XDEO-0043
20	1	3	Wearable Transmitter KR	Awesome	42	53	DOSS-WPSG-0013
21	1	3	Wearable Transmitter KR	Awesome	42	64	DOSS-VXEW-0020
22	1	3	Wearable Transmitter KR	Awesome	42	78	DOSS-WYBN-0081
23	1	3	Wearable Transmitter KR	Awesome	42	92	DOSS-SKLO-0075

```

proc sql;
create table project.q14_max_product as
select
    mp.month,
    mp.category
from project.q14_monthly_products mp
where mp.product_price = (
    select max(mp2.product_price)
    from project.q14_monthly_products mp2
    where mp2.month = mp.month
)
order by month;
quit;

data project.q14_max_product;
set project.q14_max_product;
by month;
if first.month; /* Keep only the first row for each month */
run;

```

	month	category
1	1	Gaming
2	2	Gaming
3	3	Gaming
4	4	Gaming
5	5	Gaming
6	6	Gaming
7	7	Gaming
8	8	Gaming
9	9	Gaming
10	10	Gaming
11	11	Gaming
12	12	Gaming

```

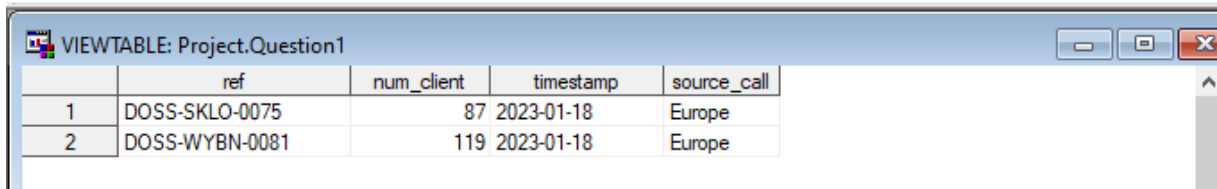
proc sql;
create table project.question14 as
select
    max.month,
    max.transaction_ref as max_transaction,
    min.transaction_ref as min_transaction,
    p.category
from project.q14_max_transaction max
inner join project.q14_min_transaction min
    on max.month = min.month
inner join project.Q14_max_product p
    on max.month = p.month
order by max.month;
quit;

```

	month	max_transaction	min_transaction	category
1	1	DOSS-VXEW-0020	DOSS-NWCT-0068	Gaming
2	2	DOSS-JYQC-0086	DOSS-ASUL-0009	Gaming
3	3	DOSS-FJZV-0096	DOSS-XSLF-0099	Gaming
4	4	DOSS-ISHP-0071	DOSS-SNUF-0006	Gaming
5	5	DOSS-MXCV-0058	DOSS-SIKH-0061	Gaming
6	6	DOSS-FYLN-0053	DOSS-CRUE-0051	Gaming
7	7	DOSS-ARES-0064	DOSS-UWYV-0016	Gaming
8	8	DOSS-XWQV-0015	DOSS-CBQJ-0033	Gaming
9	9	DOSS-MUPB-0002	DOSS-IGEN-0041	Gaming
10	10	DOSS-HMYZ-0021	DOSS-PKVJ-0100	Gaming
11	11	DOSS-JVQ-0030	DOSS-HPNY-0024	Gaming
12	12	DOSS-EFKS-0055	DOSS-VQJM-0069	Gaming

1.

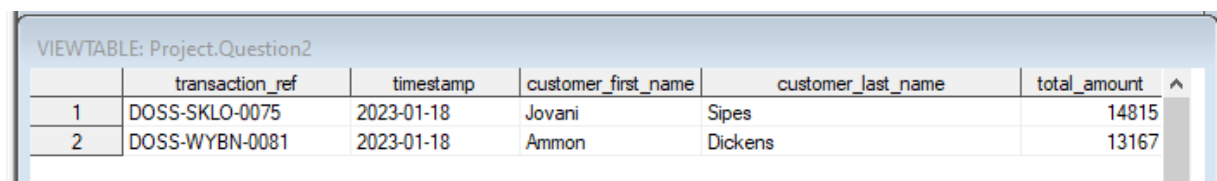
```
proc sql;
  create table project.question1 as
  select *
  from project.transaction
  where timestamp = (
    select max(timestamp)
    from project.transaction
  );
quit;
```



	ref	num_client	timestamp	source_call
1	DOSS-SKLO-0075	87	2023-01-18	Europe
2	DOSS-WYBN-0081	119	2023-01-18	Europe

2.

```
proc sql;
  create table project.question2 as
  select t.ref as transaction_ref,
         t.timestamp,
         c.first as customer_first_name,
         c.last as customer_last_name,
         sum(p.price * pt.quantity) as total_amount
  from project.transaction t
  inner join project.customers c
    on t.num_client = c.num_client
  inner join project.products_transaction pt
    on t.ref = pt.names
  inner join project.products p
    on pt.product_id = p.id
  inner join project.question1 q
    on t.ref=q.ref
  group by t.ref, t.timestamp, c.first, c.last
  order by t.timestamp desc;
quit;
```



	transaction_ref	timestamp	customer_first_name	customer_last_name	total_amount
1	DOSS-SKLO-0075	2023-01-18	Jovani	Sipes	14815
2	DOSS-WYBN-0081	2023-01-18	Ammon	Dickens	13167



3.

```
proc sql;
  create table project.q3_day as
  select
    input(timestamp, yymmdd10.) as transaction_date format=ddmmyy10.,
    count(*) as num_transactions
  from project.transaction
  group by calculated transaction_date
  order by transaction_date;
quit;
```

VIEWTABLE: Project.Q3_day			VIEWTABLE: Project.Q3_day		
	transaction_date	num_transactions		transaction_date	num_transactions
1	28/09/2016	1	47	18/05/2022	1
2	21/07/2020	1	48	01/06/2022	1
3	25/08/2020	1	49	08/06/2022	1
4	08/09/2020	1	50	22/06/2022	1
5	26/09/2020	1	51	25/06/2022	1
6	08/10/2020	1	52	30/06/2022	1
7	05/11/2020	1	53	12/07/2022	1
8	26/12/2020	1	54	19/07/2022	1
9	02/01/2021	1	55	26/07/2022	1
10	19/01/2021	1	56	27/07/2022	1
11	22/01/2021	1	57	01/08/2022	1
12	05/02/2021	1	58	02/08/2022	1
13	12/03/2021	1	59	09/08/2022	1
14	26/03/2021	1	60	13/09/2022	1
15	26/04/2021	1	61	16/09/2022	1
16	07/06/2021	1	62	17/09/2022	1
17	10/07/2021	1	63	18/09/2022	1
18	11/07/2021	1	64	20/09/2022	1
19	17/07/2021	1	65	24/09/2022	2
20	02/08/2021	1	66	26/09/2022	1
21	22/08/2021	1	67	02/10/2022	1
22	03/09/2021	1	68	15/10/2022	1
23	14/09/2021	1	69	20/10/2022	1
24	19/09/2021	1	70	21/10/2022	2
25	26/11/2021	1	71	27/10/2022	1
26	10/12/2021	1	72	31/10/2022	1
27	19/12/2021	1	73	07/11/2022	1
28	23/12/2021	1	74	10/11/2022	1
29	28/12/2021	1	75	11/11/2022	1
30	10/01/2022	1	76	13/11/2022	1
31	31/01/2022	1	77	16/11/2022	2
32	07/02/2022	1	78	19/11/2022	1
33	08/02/2022	1	79	25/11/2022	2
34	14/02/2022	1	80	27/11/2022	1
35	15/02/2022	1	81	28/11/2022	1
36	16/02/2022	1	82	30/11/2022	1
37	18/02/2022	1	83	04/12/2022	1
38	16/03/2022	1	84	08/12/2022	1
39	23/03/2022	2	85	09/12/2022	1
40	26/03/2022	1	86	12/12/2022	1
41	29/03/2022	1	87	15/12/2022	1
42	06/04/2022	1	88	17/12/2022	1
43	11/04/2022	1	89	24/12/2022	1
44	12/04/2022	1	90	26/12/2022	1
45	24/04/2022	1	91	28/12/2022	1
46	10/05/2022	1	92	02/01/2023	2
47	18/05/2022	1	93	18/01/2023	2

```

proc sql;
  create table project.q3_month as
  select
    year(input(timestamp, yymmdd10.)) as year,
    month(input(timestamp, yymmdd10.)) as month,
    count(*) as num_transactions
  from project.transaction
  group by calculated year, calculated month
  order by year, month;
quit;

```

	year	month	num_transactions
1	2016	9	1
2	2020	7	1
3	2020	8	1
4	2020	9	2
5	2020	10	1
6	2020	11	1
7	2020	12	1
8	2021	1	3
9	2021	2	1
10	2021	3	2
11	2021	4	1
12	2021	6	1
13	2021	7	3
14	2021	8	2
15	2021	9	3
16	2021	11	1
17	2021	12	4
18	2022	1	2
19	2022	2	6
20	2022	3	5
21	2022	4	4
22	2022	5	2
23	2022	6	5
24	2022	7	4
25	2022	8	3
26	2022	9	8
27	2022	10	7
28	2022	11	12
29	2022	12	9
30	2023	1	4

```

proc sql;
  create table project.q3_year as
  select
    year(input(timestamp, yymmdd10.)) as year,
    count(*) as num_transactions
  from project.transaction
  group by calculated year
  order by year;
quit;

```

	year	num_transactions
1	2016	1
2	2020	7
3	2021	21
4	2022	67
5	2023	4

```

4.
/* Step 1: Calculate the median of the fidelity_points */
proc sql ;
    select median(fidelity_points) into :med_fp
    from project.customers;
quit;

/* Step 1: Calculate the median of the fidelity_points */
proc sql;
    create table project.question4 as
    select first, last, num_client, fidelity_points
    from project.customers
    where fidelity_points = &med_fp.;
quit;

```

## Le Système SAS

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VIEWTABLE: Project.Question4				
	first	last	num_client	fidelity_points
1	Dorsey	Murray	27	776
2	Mrs.	ltzelBartellMD	181	776

```

5.
proc sql;
    create table project.question5 as
    select
        region,
        median(fidelity_points) as median_fidelity_points
    from project.customers
    group by region
    order by median_fidelity_points desc;
quit;

```

VIEWTABLE: Project.Question5		
	region	median_fidelity_points
1	Basse-Normandie	1860
2	Bourgogne	1593
3	Aquitaine	1404
4	Centre	1314
5	Auvergne	1312
6	Rhône-Alpes	1269
7	Bretagne	1147
8	Nord-Pas-de-Calais	1144
9	Provence-Alpes-Côte d	1106
10	Lorraine	1075
11	Languedoc-Roussillon	978
12	NA	960
13	Corse	918.5
14	Île-de-France	917.5
15	Limousin	764.5
16	Picardie	653
17	Pays de la Loire	645
18	Franche-Comté	596.5
19	Alsace	590
20	Champagne-Ardenne	499
21	Poitou-Charentes	395
22	Midi-Pyrénées	348
23	Haute-Normandie	192

**Observation :** There are formatting errors in the region fields. This issue originates from the original data source. We attempted to fix it, but have not succeeded so far.

6.

```
proc sql;
  create table project.question6 as
  select
    a.num_client,
    a.first,
    a.last,
    a.fidelity_points,
    /* Cumulative sum of points up to this customer */
    (select sum(b.fidelity_points)
     from project.customers b
     where b.num_client <= a.num_client) as cumulative_points
  from project.customers a
  order by cumulative_points;
quit;
```

	num_client	first	last	fidelity_points	cumulative_points
1	1	Solomon	Heaney	1654	1654
2	2	Kama	Williamson-Marquardt	3296	4950
3	3	Press	Kulas	2267	7217
4	4	Laken	McDemott	2174	9391
5	5	Sydney	Jaskolski	343	9734
6	6	Clayton	Runolfsson	1336	11070
7	7	Roberta	Purdy-Wyman	2193	13263
8	8	Dr.	RonaldMuller	318	13581
9	9	Miss	AlondraWiza	26	13607
10	10	Vernice	Ondricka-Keebler	157	13764
11	11	Marisol	Schmeler	337	14101
12	12	Lindsey	Hills	1612	15713
13	13	Doyle	Spencer	1685	17398
14	14	Duncan	Stokes	1807	19205
15	15	Davin	Lowe	106	19311
16	16	Lilah	Leuschke	464	19775
17	17	Demian	Quigley	2639	22414
18	18	Dr.	AbSenger	794	23208
19	19	Dr.	CasimiroHodkiewiczJr.	1075	24283
20	20	Dr.	TalanZemeMD	2807	27090
21	21	Mr.	GroverHartmann	615	27705
22	22	Theresia	Hemiston	1920	29625
23	23	Wyman	Frami	1286	30911
24	24	Karan	O'Connell	1913	32824
25	25	Alma	Purdy	301	33125
26	26	Treyton	Zemann	786	33911
27	27	Dorsey	Murray	776	34687
28	28	Jayda	Howe	1415	36102
29	29	Dr.	MetaSchamberger	1943	38045
30	30	Asbury	Cummings	2352	40397
31	31	Loren	Larson	203	40600
32	32	Bennie	Boyer	865	41465
33	33	Lydell	Emser	346	41811
34	34	Rowan	Mraz	28	41839
35	35	Owen	Feest	126	41965
36	36	Mr.	NicholasOm	114	42079
37	37	Derwin	Kuphal	1264	43343
38	38	Belva	Jast-Brown	579	43922
39	39	Wendell	Hettinger	952	44874
40	40	Ms.	LucyLeuschke	803	45677
41	41	Chaim	Franeckill	588	46265
42	42	Monte	Denesik	1338	47603
43	43	Natasha	Keebler-Koepp	1043	48646
44	44	Miss	FriedaBlick	410	49056
45	45	Vinton	Ryan	1557	50613
46	46	Mr.	LenaBoehm	136	50749
47	47	Vera	O'Reilly	2414	53163
154	154	Treyton	Reichert	562	159170
155	155	Dr.	ButchSengerDVM	632	159802
156	156	Leonora	Nolan	331	160133
157	157	Toccara	Weissnat	843	160976
158	158	Derk	Rutherford	1739	162715
159	159	German	Littel	1097	163812
160	160	Mr.	WallaceKochIV	677	164489
161	161	Dr.	FredrickSchoenSr.	1526	166015
162	162	Leeroy	BeattyV	31	166046
163	163	Vicki	VandervortDDS	3205	169251
164	164	Arnoldo	O'HaraMD	555	169806
165	165	Mrs.	GiovannaRoobMD	1261	171067
166	166	Wes	Bartell	192	171259
167	167	Maximili	Luetgen	960	172219
168	168	Kareem	Koelpin-Gorczy	885	173104
169	169	Ms.	LaurnSchamberger	1541	174645
170	170	Lucius	KuphalIV	282	174927
171	171	Jiles	Lehner	1672	176599
172	172	Jeremiah	Rowe	1160	177759
173	173	Clementin	Christiansen-Nienow	173	177932
174	174	Dr.	JanetPredovicMD	567	178499
175	175	Zhane	Swift	165	178664
176	176	Mr.	PatricLarsonSr.	280	178944
177	177	Kristen	Lind-Rutherford	547	179491
178	178	Gustaf	Carter	614	180105
179	179	Dr.	LeonceKautzer	344	180449
180	180	Hymen	Jacobs	157	180606
181	181	Mrs.	ItzelBartellMD	776	181382
182	182	Addyson	Nienow	2379	183761
183	183	Chestina	Feil	363	184124
184	184	Miss	ChantalOlsonMD	153	184277
185	185	Dr.	HanselKeelingSr.	1200	185477
186	186	Paris	West	1881	187358
187	187	Giancarlo	TillmanIII	2052	189410
188	188	Pryor	Labadie	428	189838
189	189	Mr.	AltonDurgan	164	190002
190	190	Dwayne	Cronall	537	190539
191	191	Mr.	AdrielSchamberger	685	191224
192	192	Drew	Lesch	120	191344
193	193	Madonna	VonRueden-Mills	264	191608
194	194	Mrs.	KristalNaderPhD	264	191872
195	195	Kerley	Wehner	502	192374
196	196	Garry	Swaniawski-Huels	185	192559
197	197	Agness	VonRueden-Schmeler	333	192892
198	198	Adriane	Roob	2522	195414
199	199	Mrs.	AnaliaHemistonDVM	649	196063
200	200	Casey	O'Connell	2678	198741

7.

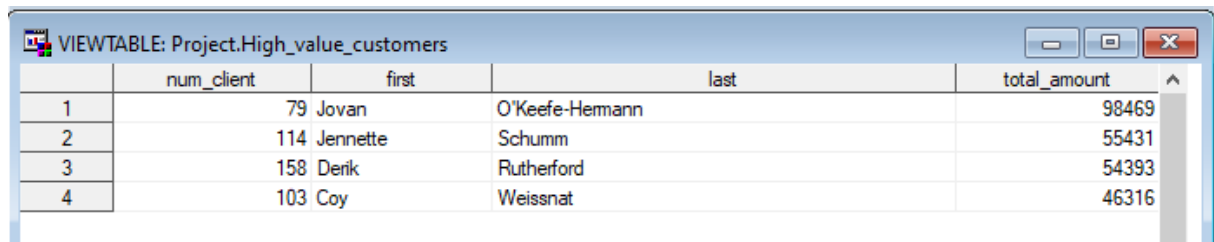
```
/* Step 1: Calculate the total amount spent by each customer */
proc sql;
  create table project.q7_total_per_customer as
  select
    c.num_client,
    c.first,
    c.last,
    sum(p.price * pt.quantity) as total_amount
  from project.customers c
  inner join project.transaction t
    on c.num_client = t.num_client
  inner join project.products_transaction pt
    on t.ref = pt.names
  inner join project.products p
    on pt.product_id = p.id
  group by c.num_client, c.first, c.last;
quit;
```

```

/* Step 2: Find the threshold for the top 5% */
proc univariate data=project.q7_total_per_customer noprint;
  var total_amount;
  output out=project.percentile_cutoff pctlpts=95 pctlpre=P_;
run;

/* Step 3: Select customers greater than or equal to the 95th percentile */
proc sql;
  create table project.high_value_customers as
  select *
  from project.q7_total_per_customer
  where total_amount >= (select P_95 from project.percentile_cutoff)
  order by total_amount desc;
quit;

```



	num_client	first	last	total_amount
1	79	Jovan	O'Keefe-Hermann	98469
2	114	Jennette	Schumm	55431
3	158	Derik	Rutherford	54393
4	103	Coy	Weissnat	46316