A conjoint study was undertaken by a detergent manufacturer. The attributes considered:

- **Brand (Complete, Smile, Wave)**
- **Scent (fresh, lemon, Unscented)**
- **Whether there was a softener or not (Y, N)**
- **Size of packet (32, 48, 64)**
- **Price (2.99, 3.99, 4.99)**

The preferences of five respondents s1, s2, s3, s4, s5 were obtained for some combination of attributes on a 1-9 point scale with 9 indicating a higher preference.

1. **Find the importance weights and part-worths for each respondent.**

The part-worths and importance weights for each respondent are listed out below:

1. Obs 1,2 and 3 are levels of Attribute -Brand
2. Obs 4,5 and 6 are levels of Attribute -Scent
3. Obs 7 and 8 are levels of Attribute – Softener or Not?
4. Obs 9,10 and 11 are levels of Attribute – Size
5. Obs 12,13 and 14 are levels of Attribute – Price
6. Obs 15 to 19, represents the difference between max and min values under each attribute for each respondent
7. Obs 20 – Sum of part-worths of all attributes for each respondent.
8. Obs 21 – 25, represents the relative importance of each attribute when compared to total

SAS OUTPUT:

Obs	VARIABLES	RESP1	RESP2	RESP3	RESP4	RESP5
1	wave	3.98920	-0.2346	0.11265	-0.25617	-0.11960
2	smile	-1.92863	0.5756	0.03742	0.26003	0.51640
3	compl	-2.06057	-0.3410	-0.15008	-0.00386	-0.39680
4	unscented	0.22762	0.2562	-0.55633	0.14660	1.89313
5	fresh	-0.43904	-0.5216	0.44367	-0.37191	0.50424
6	lemon	0.21142	0.2654	0.11265	0.22531	-2.39738
7	y	-0.07292	0.0417	-0.98958	-0.14583	-0.05729
8	n	0.07292	-0.0417	0.98958	0.14583	0.05729
9	ls	0.07137	-3.4799	-0.62924	-1.55478	-0.26138
10	ms	0.60610	1.0478	0.18326	-0.18904	-0.45235
11	hs	-0.67747	2.4321	0.44599	1.74383	0.71373
12	lp	0.67207	1.7006	0.22145	1.81327	1.17091
13	mp	-0.06867	0.3858	1.62886	1.03549	0.43017
14	hp	-0.60340	-2.0864	-1.85031	-2.84877	-1.60108
15	brmaxmin	6.04977	0.9167	0.26273	0.51620	0.91319
16	scmaxmin	0.66667	0.7870	1.00000	0.59722	4.29051
17	somaxmin	0.14583	0.0833	1.97917	0.29167	0.11458
18	simaxmin	1.28356	5.9120	1.07523	3.29861	1.16609
19	prmaxmin	1.27546	3.7870	3.47917	4.66204	2.77199
20	total	9.42130	11.4861	7.79630	9.36574	9.25637
21	ribrand	0.64214	0.0798	0.03370	0.05512	0.09866
22	riscent	0.07076	0.0685	0.12827	0.06377	0.46352
23	risoft	0.01548	0.0073	0.25386	0.03114	0.01238
24	risize	0.13624	0.5147	0.13792	0.35220	0.12598
25	riprice	0.13538	0.3297	0.44626	0.49778	0.29947

NOTE:
   1. **All values for observations 1 to 14 are their part-worths for each corresponding respondent.**
   2. **All values for observations 21 to 25 are importance weights of attributes for each corresponding respondent.**

LEGEND:

Variable Name	Description
wave	Wave under Brand Attribute
smile	Smile under Brand Attribute
compl	Complete under Brand Attribute
unscented	Unscented under Scent Attribute
fresh	Fresh under Scent Attribute
lemon	Lemon under Scent Attribute
y	Yes under Softener Y or No? Attribute
n	No under Softener Y or No? Attribute
ls	32 packet size
ms	48 packet size
hs	64 packet size
lp	2.99 packet price
mp	3.99 packet price
hp	4.99 packet price
brmaxmin	Difference between maximum and minimum utility values in Brand
scmaxmin	Difference between maximum and minimum utility values in Scent
somaxmin	Difference between maximum and minimum utility values in Softener
simaxmin	Difference between maximum and minimum utility values in Size
prmaxmin	Difference between maximum and minimum utility values in Price
total	Total of utility values of each attribute
ribrand	Relative Importance of Brand compared to Total
riscent	Relative Importance of Scent compared to Total
risoft	Relative Importance of Softener compared to Total
risize	Relative Importance of Size compared to Total
riprice	Relative Importance of Price compared to Total

Respondent-1:
It is observed that for the respondent-1 brand is the most important attribute for purchasing the detergent. The importance of attributes is in the order:

brand > size > price > scent > presence of fabric-softener

Respondent-2:
It is observed that for the respondent-2 size is the most important attribute for purchasing the detergent. The importance of attributes is in the order:

size > price > brand > scent > presence of fabric-softener

Respondent-3:

It is observed that for the respondent-3 price is the most important attribute for purchasing the detergent. The importance of attributes is in the order:

price > presence of fabric-softener > size > scent > brand

Respondent-4:

It is observed that for the respondent-4 price is the most important attribute for purchasing the detergent. The importance of attributes is in the order:

price > size > scent > brand > presence of fabric-softener

Respondent-5:

It is observed that for the respondent-5 scent is the most important attribute for purchasing the detergent. The importance of attributes is in the order:

scent > price > size > brand > presence of fabric-softener

2. **Predict the choice (using logit rule) for each respondent (s1-s5) for each of the following combinations using your estimates in question 1 above.**

To predict the choice for each respondent and to identify each combination of product levels, a unique number such as A, B, C and so on. The table below has ID column "id" which represents each combination of brand, scent, softener, size and price.

brand	scent	soft	oz	pr	id
complete	lemon	y	64	2.99	A
Smile	fresh	y	48	2.99	B
Smile	u	y	48	3.99	C
Wave	u	y	48	2.99	D
Smile	u	n	48	2.99	E

For Question 3.1, we have determined the part-worths and importance weights for each respondent based upon utility and relative importance values.
Using the utility values of each level across the attributes and summing them up will provide the predicted value for utility for that combination of attributes.

The table below lists out predicted utility values for each respondent:

Obs	UTILITY	RESP11	RESP21	RESP31	RESP41	RESP51
1	A	-1.92747	4.09877	-0.35957	3.63272	-0.96682
2	B	-1.16242	2.84414	-0.10378	1.36651	1.68191
3	C	-1.23650	2.30710	0.30363	1.10725	2.33005
4	D	5.42207	2.81173	-1.02855	1.36883	2.43480
5	E	-0.34992	3.53858	0.87539	2.17670	3.18538

LEGEND

Variable	Description
RESP11	Respondent1
RESP21	Respondent2
RESP31	Respondent3
RESP41	Respondent4
RESP51	Respondent5

Using the Logit Rule to determine the Choice of Detergent and Market Share, we perform the following calculation for each respondent for each attribute level of detergent

Probability of $A_{respondent1}$ = exp(Utility A)$_{respondent1}$ / (exp(A)$_{respondent1}$ + exp(B)$_{respondent1}$ + exp(C)$_{respondent1}$ + exp(D)$_{respondent1}$ + exp(E)$_{respondent1}$) ; performing the same for all respondents

Required calculations are performed in SAS; the table below lists out the Probabilities for each utility for each respondent and overall market share-MLOGIT for different detergent combinations.

Obs	UTILITY	RESP11	RESP21	RESP31	RESP41	RESP51	MS
1	PR_A	0.00064	0.43496	0.12221	0.65753	0.00737	0.24454
2	PR_B	0.00137	0.12404	0.15783	0.06819	0.10413	0.09111
3	PR_C	0.00127	0.07250	0.23720	0.05262	0.19910	0.11254
4	PR_D	0.99362	0.12009	0.06260	0.06835	0.22109	0.29315
5	PR_E	0.00309	0.24841	0.42017	0.15331	0.46831	0.25866

LEGEND

Variable	Description
PR_A	Probability of choosing A
PR_B	Probability of choosing B
PR_C	Probability of choosing C
PR_D	Probability of choosing D
PR_E	Probability of choosing E

Based on the logit rule and finding out the maximum probabilities among detergents A, B, C, D and E for each respondent the preferred choice of that respondent can be obtained. Below table lists out the choices of each respondent.

UTILITY	PR_A	PR_B	PR_C	PR_D	PR_E	MAXPROB	CHOICE
RESP11	.00064	.00137	.00127	.99362	.00309	.99362	D
RESP21	.43496	.12404	.07250	.12009	.24841	.43496	A
RESP31	.12221	.15783	.23720	.06260	.42017	.42017	E
RESP41	.65753	.06819	.05262	.06835	.15331	.65753	A
RESP51	.00737	.10413	.19910	.22109	.46831	.46831	E

From the table above, we can say that

1. Respondent 1 will most likely opt for detergent of "Wave" brand, unscented, having softeners, weighing around 48 and having price of $2.99.
2. Respondent 2 will most likely opt for detergent of "complete" brand, lemon scented, having softeners, weighing around 64 and having price of $2.99.
3. Respondent 3 will most likely opt for detergent of "Smile" brand, unscented, no softeners, weighing around 48 and having price of $2.99.
4. Respondent 4 will most likely opt for detergent of "complete" brand, lemon scented, having softeners, weighing around 64 and having price of $2.99.
5. Respondent 5 will most likely opt for detergent of "Smile" brand, unscented, no softeners, weighing around 48 and having price of $2.99.