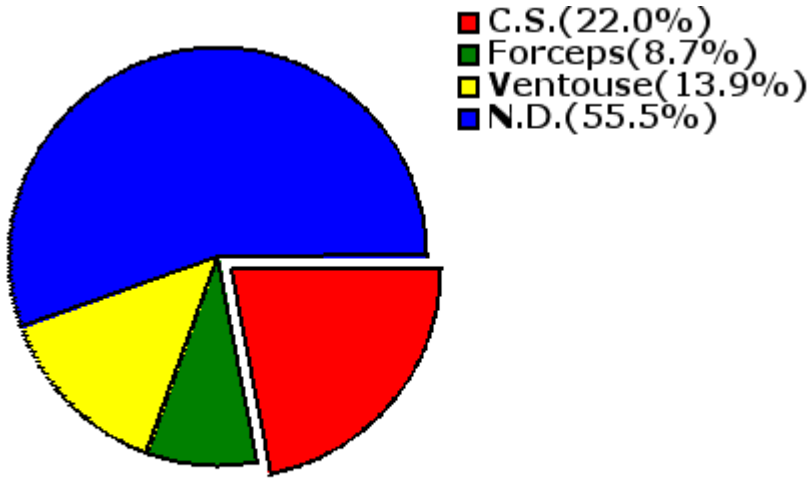
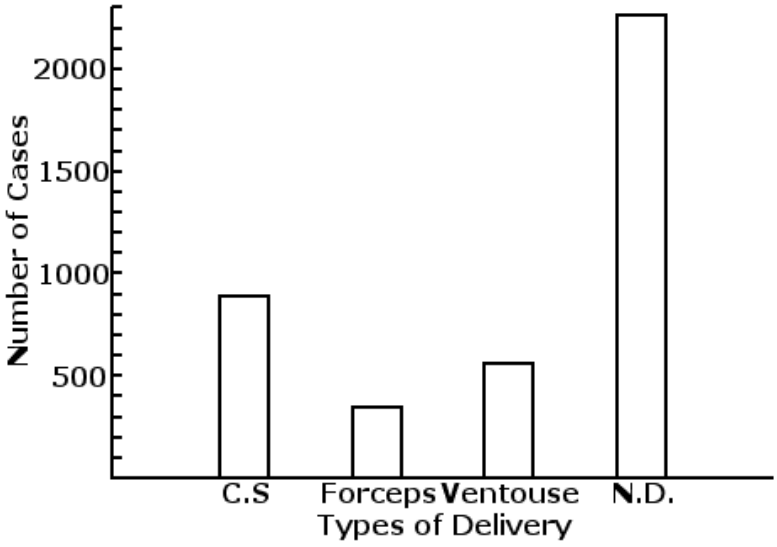
Example Answers for Assessment (Midwifery)

Question 1.1 : Pie Chart for Deliveries from Data in Worksheet A



Question 1.2 : Bar Chart for Deliveries from Data in Worksheet A



Question 1.3 : Sample Sizes and Precisions from Data in Worksheet A

Label	n	%	95%CI	ssiz ±1%	ssiz ±5%
Caesarean Section	899	21.9%	20.7% - 23.2%	6582	264
Forceps	355	8.7%	7.8% - 9.5%	3041	122
Ventouse	569	13.9%	12.8% - 15.0%	4596	184
Normal Delivery	2273	55.5%	54.0% - 57.0%	9489	380

Question 1.4 : Mean and SD of Maternal Height from Data in Worksheet B

n	49
mean	158.5
SD	2.4
df	48
SE	0.3
95%CI measurement	153.7 to 163.4
95%CI mean	157.8 to 159.2

Question 1.5 : Percentile Analysis of Maternal Height from Data in Worksheet B

Percentile	Value
5thPercentile	154.5
10thPercentile	155.4
25thPercentile	156.9
75thPercentile	160.2
90thPercentile	161.6
95thPercentile	162.6

Question 1.6 : Sample Size for Maternal Height from Results in Q1.4

±95% Error of mean	Sample Size
0.3	248
0.7	48
1.4	14

Question 1.7 : t and Percentile for Maternal Height data from Data in Worksheet B

value	t	Percentile
158	-0.22	41
156	-1.05	15
154	-1.89	3
158	-0.22	41
155	-1.47	7
157	-0.64	26

159	0.20	58
155	-1.47	7
159	0.20	58
158	-0.22	41
161	1.03	85
159	0.20	58
159	0.20	58
160	0.61	73
159	0.20	58
163	1.86	97
159	0.20	58
157	-0.64	26
163	1.86	97
160	0.61	73
157	-0.64	26
164	2.28	99
160	0.61	73
156	-1.05	15
159	0.20	58
157	-0.64	26
161	1.03	85
159	0.20	58
154	-1.89	3
159	0.20	58
159	0.20	58
162	1.45	92
160	0.61	73
157	-0.64	26
157	-0.64	26
154	-1.89	3
155	-1.47	7
162	1.45	92
158	-0.22	41
159	0.20	58
157	-0.64	26
163	1.86	97
158	-0.22	41
159	0.20	58
158	-0.22	41

159	0.20	58
158	-0.22	41
161	1.03	85
157	-0.64	26

Question 1.8 : Parametric Correlation (Pearson) Between Gestation and Birth Weight from Data in Worksheet C

n	52
Pearson's Correlation Coefficient (ρ)	0.5622
Fisher's Z	0.636
Standard Error of Z	0.1429
95% CI ρ (One tail)	>0.3802
95% CI ρ (Two tail)	0.3417 to 0.724

The 95% confidence interval (one tail, right) does not overlap the null value (0), so it is statistically significant. Gestation and birth weight are significantly correlated.

Question 1.9 : Sample Size for Parametric Correlation

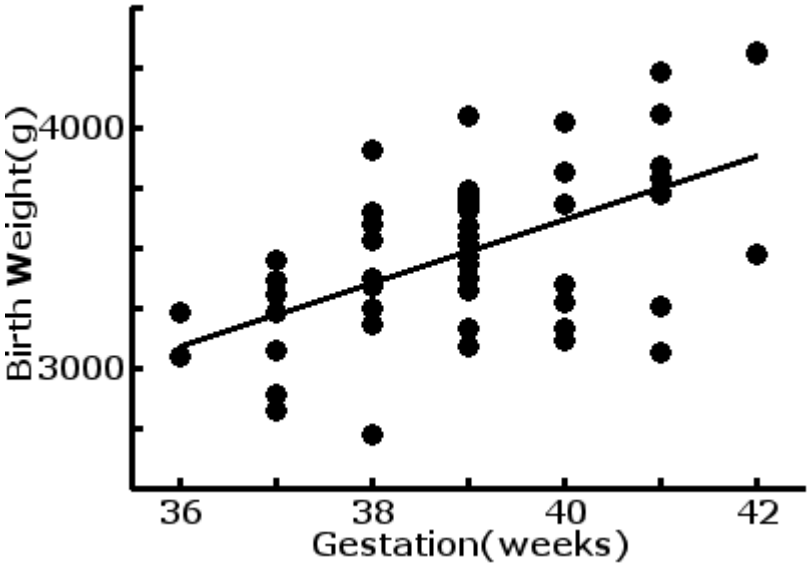
ρ	Sample size for 1 tail model	Sample size for 2 tail model
0.5622	18	22
0.2811	77	97
0.1874	174	221

Question 1.10 : Regression Analysis Between Gestation and Birth Weight from Data in Worksheet C

Birth Weight in grams = -1670.1199 + 132.1612(Gestation in weeks)

Gestation (weeks)	Expected Birth Weight (g)
36	3088
37	3220
38	3352
39	3484
40	3616
41	3748
42	3881

Question 1.11 : Scatter Plot Between Gestation and Birth Weight from Data in Worksheet C



Question 1.12 : Nonparametric Correlation of Likert Scales Data in Worksheet D

	1(SD)	2(D)	3(N)	4(A)	5(SA)
1(SD)	0	1	1	3	0
2(D)	1	3	2	5	2
3(N)	0	3	1	5	0
4(A)	4	2	5	1	1
5(SA)	1	0	1	2	0

Rows are Likert 1, Columns are Likert 2, cells are number of cases

Spearman Correlation Coefficient $\rho = -0.2485$, n=44, results not statistically significant

The hypothesis that a correlation exists between the perception of pain and quality of care in labour is not supported by this set of data and results.

Question 1.13 : Difference in Birth Weight Between Boys and Girls Using Data in Worksheet E

	n	Mean(g)	Standard Deviation(g)
Boy	24	3679	322
Girl	23	3569	399

Difference ($mean_{boys}$ - $mean_{girls}$) = 110g

Two tail 95% CI : -103 to 323. Confidence interval overlaps the null (0) value, no significant difference detected

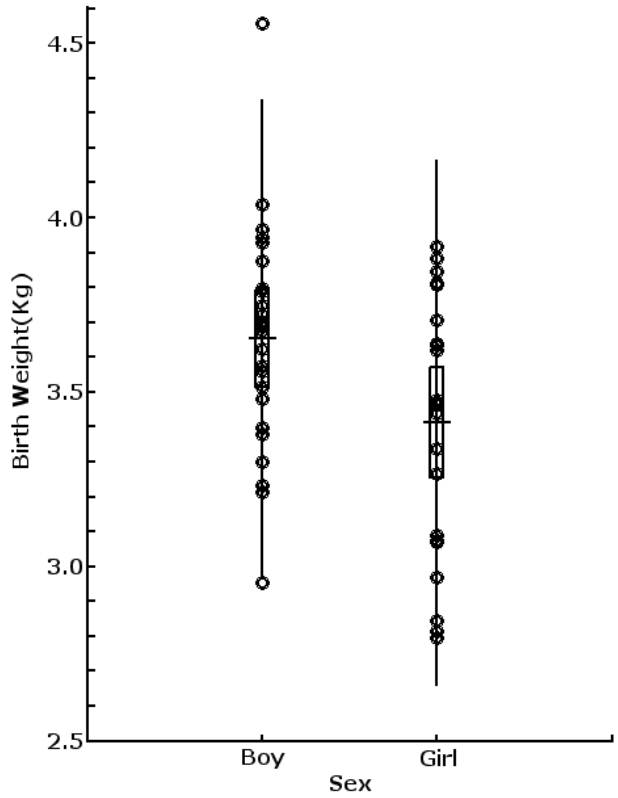
One tail 95% CI (right tail) : >=-67g. Confidence interval overlaps the null (0) value, Birth weight of boys are not significantly greater than those from girls

The research hypothesis, that boys weigh more than girls at birth, is not supported by this set of results.

Question 1.14 : Sample Size comparing Two Parametric Measurements Based on Results of Q1.14

Difference to detect	Expected SD	Sample size per group for 1 tail model	Sample size per group for 2 tail model
110	350	126	160
110	400	165	209
110	450	208	264

Question 1.15 : Difference in Birth Weight Between Boys and Girls Using Data in Worksheet E



The horizontal lines represents mean

The vertical lines represent 95% confidence interval of measurements

The boxes represents 95% confidence interval of the mean value

Question 1.16 : Comparison of Two Nonparametric Scales, Duration of Labour for Primips and Multips, Using Data from Worksheet F

	1.Primipara	2.Multipara	Row Total
1(<4hrs)	2(6.2%)	5(22.7%)	7(13.0%)
2(4-8hrs)	7(21.9%)	8(36.4%)	15(27.8%)
3(9-12hrs)	5(15.6%)	2(9.1%)	7(13.0%)
4(12-16hrs)	6(18.8%)	4(18.2%)	10(18.5%)
5(16-20hrs)	5(15.6%)	1(4.5%)	6(11.1%)
6(>20hrs)	7(21.9%)	2(9.1%)	9(16.7%)
Col Total	32(100.0%)	22(100.0%)	54(100.0%)

Mann-Whitney U Test : U = 2.4641 p=0.0069

U is a positive value, so Group 1 (Primips) ranks higher (longer labour) than group 2 (Multips)

The results support the hypothesis that primiparous mothers have longer labour than multiparous mothers

Question 1.17 : Risk Difference in Success Between Using Prostaglandins and Oxytocin to Induce Labour, Using Data from Worksheet G

	1(Prostaglandin)	2(Oxytocin)	Row Total
+(success)	19(70.4%)	14(48.3%)	33(58.9%)
-(Fail)	8(29.6%)	15(51.7%)	23(41.1%)
Col Total	27(100.0%)	29(100.0%)	56(100.0%)

$Risk_{Prostaglandin}$ = 70.4% $Risk_{oxytocin}$ = 48.3
Risk Difference = 22.1
One Tail 95% Confidence Interval of Difference = >1.1% or <43.1%
Two Tail 95% Confidence Interval of Difference = -3.0% to 47.1$
Number Needed to Treat (NNT) = 5

The 95% CI overlaps the null (0) value for the 2 tail, and both the left and right tail of the one tail model. The results are therefore not statistically significant.

The research hypothesis, that using prostaglandin to induce labour is more likely to be successful compared with using oxytocin, is not supported by these results.

Five (5) additional cases to use prostaglandins instead of oxytocin is required, to increase a single case of successful induction.

Question 1.18 : Odds Ratio to Analyse a Number of Retrospective Studies Linking Autism and, Using Data from Worksheet H

A+V+	A-V+	A+V-	A-V-	Odd(A+)	Odd(A-)	LOR	SE	OR	95%CI OR (1 tail)	95%CI OR (2 tail)	Support hypothesis
64	79	10	3	6.4000	26.3333	-1.4145	0.6794	0.2430	<0.7431	0.0642 to 0.9204	no
71	65	2	6	35.5000	10.8333	1.1869	0.8343	3.2769	>0.8307	0.6387 to 16.8136	no
53	57	6	2	8.8333	28.5000	-1.1714	0.8385	0.3099	<1.2310	0.0599 to 1.6033	no
197	207	26	4	7.5769	51.7500	-1.9213	0.5462	0.1464	<0.3596	0.0502 to 0.4271	no
192	186	24	4	8.0000	46.5000	-1.7600	0.5498	0.1720	<0.425	0.0586 to 0.5054	no
123	110	7	15	17.5714	7.3333	0.8738	0.4762	2.3961	>1.0948	0.9423 to 6.0929	yes
207	210	17	9	12.1765	23.3333	-0.6504	0.4237	0.5218	<1.0477	0.2275 to 1.1973	no
187	152	3	19	62.3333	8.0000	2.0531	0.6308	7.7917	>2.7607	2.2631 to 26.8259	yes
150	169	18	7	8.3333	24.1429	-1.0637	0.4593	0.3452	<0.7348	0.1403 to 0.8492	no
196	151	2	30	98.0000	5.0333	2.9689	0.7383	19.4702	>5.7807	4.5809 to 82.7548	yes
157	129	3	19	52.3333	6.7895	2.0423	0.6325	7.7080	>2.7233	2.2312 to 26.6284	yes

A+V+ = Autism and Vaccinated, A-V+ =No Autism and Vaccinated, A+V- = Autism and Not Vaccinated, A-V- = No Autism and Not Vaccinated

Odd(A+) = Odd of vaccination in autistic group = A+V+ / A+V-, Odd(A-) = Odd of vaccination in no autistic group = A-V+ / A-V-

Log(OR) = Log(Odds Ratio) = Log(Odd(A+) / Odd(A-)), SE = Standard Error of Log(Odds Ratio)

OR = Odds Ratio = Exp(Log(OR)) = Odd(A+) / Odd(A-)

95% CI OR = 95% confidence interval of Odds Ratio = Exp(Log(OR) +/- z(SE), where z=1.65 for one tail and 1.96 for two tail

Question 1.19 : Meta-analysis of Log(OR) and its SE in results from Q1.18

Heterogeneity : Q Test : Q=78.6278, p=<0.0001, I^2=87.3%, heterogeneity Suspected. From I^2, Heterogeneity can be considered Large, so the Random Effect Model should be used if the data is to be combined

Publication Bias : Rank Correlation z = 1.012, p = 0.1558, publication bias not sSuspected

Estimating Combined Summary Effect (Random Effect Model) :

Study	Log(OR)	SE(Log(OR))	95%CI(Log(OR))		95%CI(OR)	
1	-1.4145	0.6794	-2.7462	-0.0829	0.0642	0.9204
2	1.1869	0.8343	-0.4484	2.8222	0.6386	16.8138
3	-1.1714	0.8385	-2.8148	0.4721	0.0599	1.6034

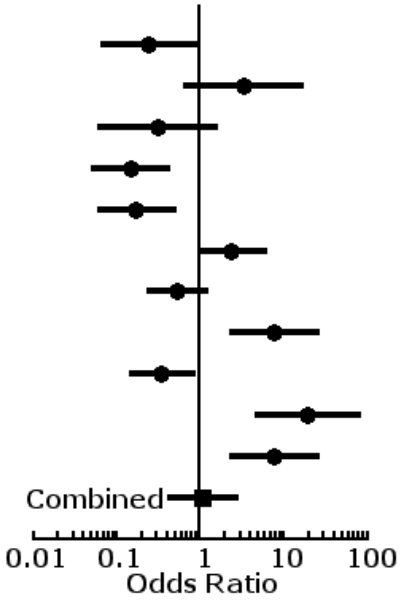
4	-1.9213	0.5462	-2.9919	-0.8507	0.0502	0.4271
5	-1.76	0.5498	-2.8376	-0.6825	0.0586	0.5054
6	0.8738	0.4762	-0.0595	1.8072	0.9422	6.0934
7	-0.6504	0.4237	-1.4808	0.1801	0.2275	1.1973
8	2.0531	0.6308	0.8167	3.2894	2.2630	26.8268
9	-1.0637	0.4593	-1.964	-0.1634	0.1403	0.8493
10	2.9689	0.7383	1.5219	4.4159	4.5809	82.7563
11	2.0423	0.6325	0.8025	3.282	2.2311	26.6290
Combined	0.0733	0.496	-0.8988	1.0454	0.4071	2.8445

The combined Summary Effect size (Random Effect Model) is Log(OR) = 0.0733, with 95% Confidence interval (two tail) of -0.8988 to 1.0454. The 95% confidence interval overlaps the null (0) value, so it is not statistically significant.

The conclusion is therefore that the results of the meta-analysis does not support the research hypothesis that autistic children are more likely to have been vaccinated.

The 95% confidence interval of Log(OR) is translated to 95% confidence interval of Odds Ratio, so that the o5% confidence interval of combined summary Odds Ratio is 0.4071 to 2.8445

Question 1.20 : Forest Plot of Meta-analysis Results Obtained in Q1.19



Question 1.21 : Quality of Prediction Using Data in Worksheet I

	Caesarean Section	Vaginal Delivery	Total
Unengaged Head	36(True Positive)	43(False Positive)	79(Test Positive)
Engaged Head	5(False Negative)	14(True Negative)	19(Test Negative)

Total	41(Outcome Positive)	57(Outcome Negative)	98

Results

Parameters	Values
True Positive Rate	87.8%
False Positive Rate	75.4%
False Negative Rate	12.2%
True Negative Rate	24.6%
Likelihood Ratio for Test Positive	1.1639
Likelihood Ratio for Test Negative	0.4965

Question 1.22 : Post-test Probability of Caesarean Section Based on Results in Q1.21

Pre-test Probability	Post-test Probability Unengaged Head+	Post-test Probability Unengaged Head-
25.0%	28.0%	14.2%
45.0%	48.8%	28.9%

Question 1.23 : Receiver Operator Characteristics for Maternal Height Predicting Caesarean Section Using Data in Worksheet J

Area under ROC=0.7072, SE=0.0509, 95% CI = 0.6073 to 0.807

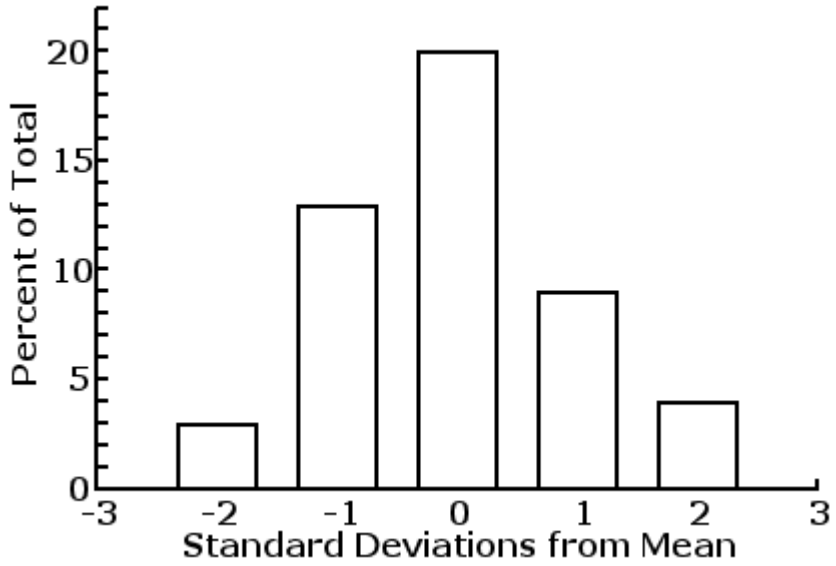
Height (cms)	False Positive Rate(FPR)	True Positive Rate(TPR)	True Negative Rate(TNR)	Youden Index	TPR/TNR	TNR/TPR	Likelihood Ratio Test +	Likelihood Ratio Text -
151.2	6.3%	30.9%	93.8%			3.0331	4.9455	0.7370
155.8	20.8%	58.2%	79.2%	0.3735			2.7927	0.5282
162.2	70.8%	87.3%	29.2%		2.9922		1.2321	0.4364

Maternal height of 162.2cms is where TPR/TNR=2.99, a cut-off value for early alert. A labour ward protocol can be that an experienced senior staff is consulted for a plan of labour if maternal height is below 162.2cm

Maternal height of 151.8cms is the most accurate cut-off value, and can be used to represent the quality of prediction for Caesarean Section using maternal height

Maternal height of 151.2cms is where TNR/TPR=3.03, a cut-off value for clinical action. A labour ward protocol can be that senior staff should seriously consider performing Caesarean Section if maternal height is below 151.2cms

Question 2.1.: Distribution Plot of Birth Weight from Data in Worksheet C

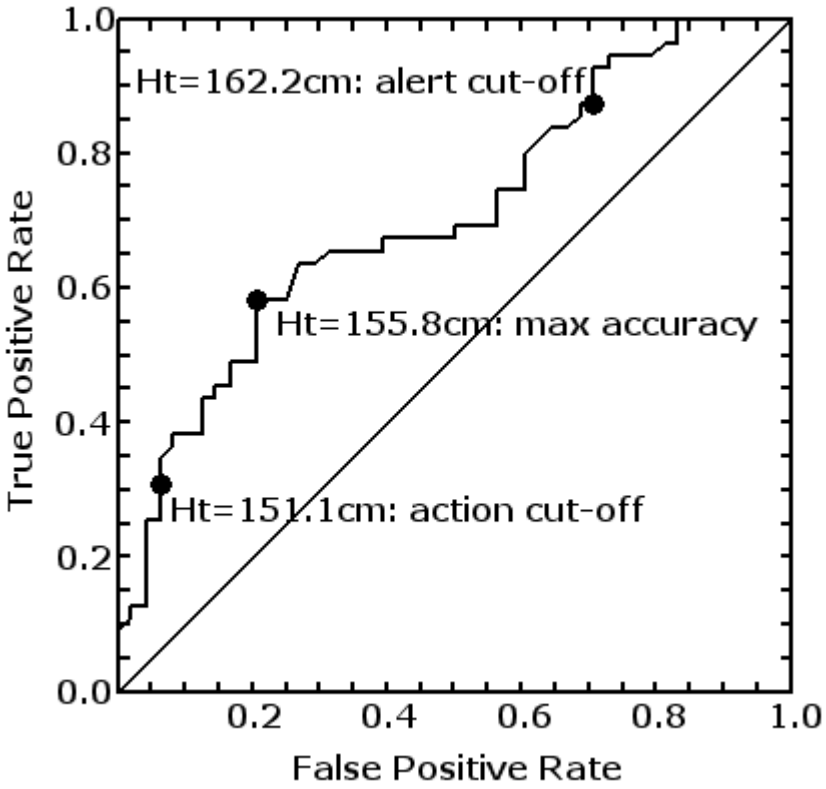


Question 2.2.: Paired Difference in Birth Weight of Twins in Worksheet L

Number of pairs	47
Mean of Paired Difference (Twin-1 - Twin_2)	100g
SD of Paired Difference	337.4g
SE of Paired Difference	49.7g
95% CI of Difference (one tail)	>184g
95% CI of Difference (two tail)	0.07g to 200g

The research hypothesis is that a difference in birth weight exists between the twins, in either direction, so the two tail model is appropriate. The difference (twin1 – twin2) is 100g, with the 95% confidence interval is 0.07g to 200g. As this interval does not overlap the null (0) value, it can be considered statistically significant. The hypothesis that birth order is related to birth weight is therefore supported by this set of results.

Question 2.3.: ROC Plot using Results Obtained in Q1.23



Question 2.4.: Complex Post-test Probability Using Results from Q1.22 and Q1.23

Tests		Post-test Probability for C.S.	
Fetal Head	Maternal Height	Pre-test Probability=25%	Pre-test Probability=45%
Unengaged	<151.2cm	65.80%	82.50%
Unengaged	>151.2cm	22.30%	41.30%
Engaged	<151.2cm	45.00%	66.80%
Engaged	>151.2cm	10.90%	23.10%
Unengaged	<155.8cm	52.10%	72.70%
Unengaged	>155.8cm	17.00%	33.50%
Engaged	<155.8cm	31.60%	53.20%
Engaged	>155.8cm	8.00%	17.70%
Unengaged	<162.2cm	32.40%	54.00%
Unengaged	>162.2cm	14.50%	29.40%
Engaged	<162.2cm	16.90%	33.40%
Engaged	>162.2cm	6.70%	15.10%

Question 2.5.: Covariance Analysis Comparing Birth Weight Between Boys and Girls, corrected by Gestational Age, Using Data in Worksheet K

	Boys	Girls
n	38	33
Mean Gestation (weeks)	39	39
Standard Deviation Gestation	1.8	1.9
Mean Birth Weight (g)	3581	3407
Standard Deviation Birth Weight	386.8	400.2
Slope b (g/week)	165.500	143.964
Constant a (g)	-2830	-2208

Difference between unadjusted mean birth weight

Difference (Boys - Girls) = 174g

Standard Error = 93.5

95% confidence interval (one tail) = greater than 18g

95% confidence interval (two tail) = -13g to +361g

Difference statistically significant in one tail model and not statistically significant in two tail model

Difference in slope

Difference (Boys-Girls) = -21.5g / week

Standard Error = 37.6

Statistical significance p=0.57. Difference in slopes not statistically significant

Adjusted difference in birth weight

Common slope (Boys and Girls) = 154.9g / week

Difference in birth weight, adjusted by common slope

Difference (Boys – Girls) = 215g

Standard Error = 66.6

95% CI of Difference (one tail) = more than 104g

95% CI of Difference (two tail) = 82g to 248g

Summary and Conclusions

Birth weights are 3581g for boys and 3407g for girls. The difference is 174g, statistically significant in the one tail model, but no in the two tail model

After adjustment by gestation, the difference is 215g. This is statistically significant in both one and two tail model.

The conclusion is that boys are heavier than girls, brought into much clearer focus when the influence of gestation on birth weight is taken into consideration.

\Question 2.6.: Covariance x/y Plot of Birth Weight, Sex, and Birth Weight, Using Data in Worksheet K