Q1. What is the mean birth weight for babies of non-smoking mothers?

The mean birth weight for babies of non-smoking mothers is 3.5095 (3.51)

Birthweight (kg)	Non–smoker	Mean		3.5095	.11594
		95% Confidence Interval for Mean	Lower Bound	3.2668	
			Upper Bound	3.7522	
		5% Trimmed Mean		3.4994	
		Median		3.3850	
		Variance		.269	
		Std. Deviation		.51849	
		Minimum		2.65	
		Maximum		4.55	
		Range		1.90	
		Interquartile Range		.82	
		Skewness		.361	.512
		Kurtosis		−.727	.992

Q2. What is the mean birth weight for babies of smoking mothers?

The mean birth weight for babies of smoking mothers is 3.13

	Smoker	Mean		3.1341	.13458
		95% Confidence Interval for Mean	Lower Bound	2.8542	
			Upper Bound	3.4140	
		5% Trimmed Mean		3.1246	
		Median		3.1850	
		Variance		.398	
		Std. Deviation		.63125	
		Minimum		1.92	
		Maximum		4.57	
		Range		2.65	
		Interquartile Range		.84	
		Skewness		.023	.491
		Kurtosis		.173	.953

Q3. What is the mean head circumference for babies of non-smoking mothers?

The mean head circumference for babies of non-smoking mothers is 35.05 cm of head circumference.

Head circumference (cm)	Non-smoker	Mean			35.05	.467
		95% Confidence Interval for Mean	Lower Bound		34.07	
			Upper Bound		36.03	
		5% Trimmed Mean			35.00	
		Median			34.50	
		Variance			4.366	
		Std. Deviation			2.089	
		Minimum			32	
		Maximum			39	
		Range			7	
		Interquartile Range			4	
		Skewness			.465	.512
		Kurtosis			−1.010	.992

An interesting point to highlight is that we see that the mean head circumference for babies of smoking mothers is 34.18 cm of head circumference, which is smaller than the mean head circumference for babies of non-smoking mothers.
Our hypothesis could be that the mother's smoking status determines the size of the head circumference of the baby.

	Smoker	Mean			34.18	.561
		95% Confidence Interval for Mean	Lower Bound		33.02	
			Upper Bound		35.35	
		5% Trimmed Mean			34.15	
		Median			34.00	
		Variance			6.918	
		Std. Deviation			2.630	
		Minimum			30	
		Maximum			39	
		Range			9	
		Interquartile Range			4	
		Skewness			.094	.491
		Kurtosis			−.718	.953

Q4. What is the mean gestational age at birth for babies of smoking mothers?

The mean gestational age at birth for babies of smoking mothers is 38.95 weeks

Smoker				
	Mean		38.95	.540
	95% Confidence Interval for Mean	Lower Bound	37.83	
		Upper Bound	40.08	
	5% Trimmed Mean		38.96	
	Median		39.00	
	Variance		6.426	
	Std. Deviation		2.535	
	Minimum		33	
	Maximum		45	
	Range		12	
	Interquartile Range		3	
	Skewness		−.291	.491
	Kurtosis		1.414	.953

I've also analyzed the mean gestational age at birth for babies of non-smoking mothers. As we see, the mean for non-smoking mothers is higher (39.45 weeks). We could think about the hypothesis that smoking might cause premature birth.

Gestational age at birth (weeks)	Non–smoker	Mean		39.45	.626
		95% Confidence Interval for Mean	Lower Bound	38.14	
			Upper Bound	40.76	
		5% Trimmed Mean		39.56	
		Median		40.00	
		Variance		7.839	
		Std. Deviation		2.800	
		Minimum		33	
		Maximum		44	
		Range		11	
		Interquartile Range		3	
		Skewness		−.597	.512
		Kurtosis		.723	.992

Q5. What is the maximum head circumference for babies of non-smoking mothers?

The maximum head circumference for babies of non-smoking mothers is 39 cm.

Head circumference (cm)	Non-smoker	Mean		35.05	.467
		95% Confidence Interval for Mean	Lower Bound	34.07	
			Upper Bound	36.03	
		5% Trimmed Mean		35.00	
		Median		34.50	
		Variance		4.366	
		Std. Deviation		2.089	
		Minimum		32	
		Maximum		39	
		Range		7	
		Interquartile Range		4	
		Skewness		.465	.512
		Kurtosis		−1.010	.992

Q6. What is the minimum gestational age at birth for babies of smoking mothers?

The minimum gestational age at birth for babies of smoking mothers is 33 weeks.
An interesting aspect is that the minimum gestational age at birth for babies of non-smoking mothers is also 33 weeks.

Smoker	Mean		38.95	.540
	95% Confidence Interval for Mean	Lower Bound	37.83	
		Upper Bound	40.08	
	5% Trimmed Mean		38.96	
	Median		39.00	
	Variance		6.426	
	Std. Deviation		2.535	
	Minimum		33	
	Maximum		45	
	Range		12	
	Interquartile Range		3	
	Skewness		−.291	.491
	Kurtosis		1.414	.953

Q7. Based on the dataset you have, out of the two, which one would be a better bet:
- **Pregnancy period in smoking mothers is shorter**
- **Pregnancy period in non-smoking mothers is shorter**

The pregnancy period in smoking mothers is shorter, this is the best bet.

Q8. Justify the above choice in a few words.

The mean calculated for gestational age at birth for babies of smoking mothers is 38.95 weeks, and the median is 39.
In comparison, the mean calculated for gestational age at birth for babies of non-smoking mothers is 39.45 weeks, and the median is 40 weeks.
These values indicate that smoking mothers have shorter gestation periods.

Q9. What is the baby birth weight range for babies of smoking mothers?

The baby birth weight range for babies of smoking mothers is 2.65.
The range is the calculation of the Maximum (4.57) - the Minimum (1.92).

Smoker				
Mean			3.1341	.13458
95% Confidence Interval for Mean	Lower Bound		2.8542	
	Upper Bound		3.4140	
5% Trimmed Mean			3.1246	
Median			3.1850	
Variance			.398	
Std. Deviation			.63125	
Minimum			1.92	
Maximum			4.57	
Range			2.65	
Interquartile Range			.84	
Skewness			.023	.491
Kurtosis			.173	.953

In comparison, the baby birth weight range for babies of non-smoking mothers is 1.90

Birthweight (kg)	Non–smoker	Mean			3.5095	.11594
		95% Confidence Interval for Mean	Lower Bound		3.2668	
			Upper Bound		3.7522	
		5% Trimmed Mean			3.4994	
		Median			3.3850	
		Variance			.269	
		Std. Deviation			.51849	
		Minimum			2.65	
		Maximum			4.55	
		Range			1.90	
		Interquartile Range			.82	
		Skewness			.361	.512
		Kurtosis			−.727	.992

Q10. In your own words describe what the value of the above range for baby's birthweight tells us about smoking versus non-smoking mothers?

The minimum value for the birth weight of the smoking mothers is much lower (1.92) compared to the minimum value for birth weight of the non-smoking mothers (2.65). The smoking mothers have lower minimum values in birth weight than the non-smoking mothers.
We could elaborate an hypothesis and indicate that the lower birth weight is related to the number of gestation weeks.
Hence smoking mothers have shorter pregnancy periods, and the birth weight is also lower compared with the values of non-smoking mothers. The mean birth weight for smoking mothers is lower (3.13) compared with the mean birth weight for non-smoking mothers (3.51).

Q11. Are head circumference data for babies of smoking mothers normally distributed?

We do a normality test.

Tests of Normality

	smoker	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Head circumference (cm)	Non–smoker	.192	20	.051	.917	20	.085
	Smoker	.128	22	.200[*]	.954	22	.372

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

I analyze the values obtained, and according to the significance value in Shapiro Wilk (.372) the head circumference data for babies of smoking mothers is normally distributed.
Data are normally distributed if the significance in Shapiro Wilk is larger than 0.05

Q12. What is the significance value for the above on the Shapiro-Wilk test?

The significance value for the above on the Shapiro-Wilk test is .372

Q13. What is the standard score (Z-score) for head circumference of 35.05 (X=35.05) in non-smoking mothers?

The Z-score for head circumference of 35.05 in non-smoking mothers is 0.
This means that 35.05 is 0 standard deviations from the mean, which makes sense, because the mean value is 35.05.

The probability (from the Z score table) is 0.50. This means how much data you have covered up to this point (50% of data).

Q14. How are birth weight data of non-smoking mothers skewed?

Birthweight (kg)	Non-smoker	Mean		3.5095	.11594
		95% Confidence Interval for Mean	Lower Bound	3.2668	
			Upper Bound	3.7522	
		5% Trimmed Mean		3.4994	
		Median		3.3850	
		Variance		.269	
		Std. Deviation		.51849	
		Minimum		2.65	
		Maximum		4.55	
		Range		1.90	
		Interquartile Range		.82	
		Skewness		.361	.512
		Kurtosis		-.727	.992

Skewness value is .361, which is not a very high value.
I analyze the values obtained, and according to the significance value in Shapiro Wilk (.696) the birth weight data for babies of non-smoking mothers is normally distributed, because the value is larger than 0.05, which makes sense with the obtained Skewness value.

Tests of Normality

	smoker	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Birthweight (kg)	Non-smoker	.128	20	.200*	.967	20	.696
	Smoker	.095	22	.200*	.982	22	.949

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Q15. Are birth weight data for babies of smoking mothers normally distributed?

Yes, the birth weight data for babies of smoking mothers are normally distributed. Moreover, the values are even more normally distributed for the birth weight for smoking mothers than the values for the birth weight for non-smoking mothers. Because the significance value for birth weight and smoking mothers in Shapiro-Wilk is higher (.949). The larger the number in significance, the more sure we are.
The values for the Skewness (.023) and Kurtosis (.173) are lower for the birth weight data for babies of smoking mothers than the Skewness (.361) and Kurtosis (-.727) for the birth weight data for babies of non-smoking mothers.

Smoker				
	Mean		3.1341	.13458
	95% Confidence Interval for Mean	Lower Bound	2.8542	
		Upper Bound	3.4140	
	5% Trimmed Mean		3.1246	
	Median		3.1850	
	Variance		.398	
	Std. Deviation		.63125	
	Minimum		1.92	
	Maximum		4.57	
	Range		2.65	
	Interquartile Range		.84	
	Skewness		.023	.491
	Kurtosis		.173	.953

Q16. What is the significance value for the above on the Shapiro-Wilk test?

The significance value for the birth weight data for babies of smoking mothers is .949

Q17. Based on the dataset you have, how confident can you be in saying that a baby's birth weight will be +/- 1 standard deviation from the mean?

The significance value in Shapiro-Wilk is .97, meaning that the birth weight data is normally distributed. Hence the baby's birth weight will have 68.27% chance of being anywhere between +/- 1SD away from the mean.

Tests of Normality

	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Birthweight (kg)	.059	42	.200*	.990	42	.968

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Q18. Based on the dataset you have, what is the probability that the birth weight for a baby of a smoking mother will be less than 4.2 kg?

The probability that the birth weight for a baby of a smoking mother will be less than 4.2 kg is 95.44% , this value means how much data is covered up to this point.
Hence the p-value is 0.95.
The Z score is 1.69, which means that 4.2 is 1.69 standard deviations above the mean.

Q19. Are data for length of baby of non-smoking mothers normally distributed?

I analyze the values obtained, and according to the significance value in Shapiro Wilk (.070) the length of baby of non-smoking mothers is normally distributed.
Data are normally distributed if the significance in Shapiro Wilk is larger than 0.05

Tests of Normality

	smoker	Kolmogorov–Smirnov[a]			Shapiro–Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Length of baby (cm)	Non–smoker	.194	20	.047	.912	20	.070
	Smoker	.167	22	.114	.942	22	.215

a. Lilliefors Significance Correction

Q20. What is the significance value for the above on the Shapiro-Wilk test?

The significance value in Shapiro Wilk test is .070

Q21. What is the standard score for the length of a baby of 48.5cm for non-smoking mothers?

The standard score is -1.014, meaning that 48.5 is -1.014 standard deviations below the mean. The probability (from the Z score table) is 0.15625, we've covered up 16% of data up to this point.

Length of baby (cm)	Non–smoker	Mean		51.80	.728
		95% Confidence Interval for Mean	Lower Bound	50.28	
			Upper Bound	53.32	
		5% Trimmed Mean		51.94	
		Median		53.00	
		Variance		10.589	
		Std. Deviation		3.254	
		Minimum		43	
		Maximum		58	
		Range		15	
		Interquartile Range		3	
		Skewness		−.861	.512
		Kurtosis		1.926	.992

Q22. Based on the dataset you have, what is the probability that the length of baby for non-smoking mothers will be more than 55 cm?

The probability that the length of baby for non-smoking mothers will be more than 55 cm is 0.16. Hence 16% of the data is above the value of 55 cm.