Name: Student number:

Question 1 (total score 8 points)

Researchers investigated to what extent a chatbot that mimics non-verbal behavior of humans (Mimicry) makes participants smile (Smiling).

a) On the next page, you find the JASP output of a regression analysis for this study. How do you interpret the Coefficients Table in the JASP output? Did a mimicking chatbot make the participants smile? Motivate your answer [open question; **3 points**].

- No.
- $t(63) = -2.650$, $p = .010$ --> this test result is negative (**1 point**) and significant (**1 point**) , meaning that the mimicking chatbot made participants smile less (**1 point**).

b) The researchers also posited that Smiling was influenced by the participant's amount of Self-Control. How do you interpret the Coefficients Table in the JASP output? Did the participants smile depend on Self-Control? Motivate your answer [open question; **3 points**].

- Yes and no.
- $t(63) = -1.449$, $p < .153$ --> this test result is negative (**1 point**) and ns. (**1 point**), meaning that participant's Smile did NOT depend on Self-Control (**1 point**)
- Kudos if the student points to the significant interaction term, which may suggest that it does, and explains that t-test instead.

c) From a theory point of view, what role does the regression line play in the statistical technique called regression, and which form does the equation usually have? [open question; **2 points**].

- It is the best-fitting straight line for a set of data / it best represents the relationships between the variables under study --> [**1.0 point** for correct answer].
- $Y = ax + b + e$ --> [**1.0 point** for correct answer].

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JASP Outputs for Question 1

Linear Regression

Model Summary – Smiling

Model	R	R^2	Adjusted R^2	RMSE
H_0	0.000	0.000	0.000	31.26
H_1	0.326	0.106	0.062	30.28

ANOVA

Model		Sum of Squares	df	Mean Square	F	p
H_1	Regression	6549	3	2183.1	2.381	0.078
	Residual	55005	60	916.8		
	Total	61555	63			

Note. The intercept model is omitted, as no meaningful information can be shown.

Coefficients

Model		Unstandardized	Standard Error	Standardized[a]	t	p
H_0	(Intercept)	44.318	3.907		11.342	< .001
H_1	(Intercept)	89.382	30.318		2.948	0.005
	Self Control	−1.085	0.749	−0.235	−1.449	0.153
	Mimicry (mimic)	−122.178	46.107		−2.650	0.010
	Self Control ∗ Mimicry (mimic)	2.958	1.136		2.604	0.012

[a] Standardized coefficients can only be computed for continuous predictors.

Name: Student number:

Question 2 (total of 6 points)

a) Discuss how the chi-square goodness-of-fit test differs from the chi-square test of independence? Also discuss how the chi-square goodness-of-fit test differs from t-tests in general? [open question; **2.0 points**].

- Used for one vs. two / multiple nominal / categorical variables
- Nonparametric distribution vs. standard normal curve)

  (**1.0 points for each**)

b) A local country is considering a budget proposal that would allocate extra funding towards the renovation of city parks. A survey assesses the public opinion concerning the proposal. A total of 300 individuals respond to the survey: 100 who live within the city limits and 200 from the surrounding suburbs. Formulate the null and alternate hypothesis for this study [open question; **2.0 points**].

- Ha: There is a significant difference in the distribution of opinions (on renovation of city parks) between city residents and those in the suburbs (there is diff) --> **1 point** for this.
- H0: there is no difference --> **1 point** for this.

c) From the city residents, 70 are in favor, but 30 oppose the renovation. From the suburban residents, 110 are in favor, but 90 oppose the renovation. Is there a significant difference in the distribution of opinions for city residents compared to suburban residents? Test at the .05 level of significance [open question; **2.0 point**].

- chi-squared = 6.25, thus reject H null --> **1 point** for this.
- Opinions differ on this topic --> **1 point** for this.

Name: Student number:

Question 3 (total of 8 points)

a) Discuss the theoretical and practical link between probability and the standard normal curve [open question; **2.66 points**].

- We can use the areas under the standard curve to determine the probability that an observation falls within a certain area under the curve (**1 point** for this theoretical point)
- We convert a person's test score into a *z*-score using the formula, and read the associated proportion (the area under the curve) from a table --> (**1 point** for this practical point)

b) Describe the addition rule and provide a simple example of this rule [open question; **2.66 points**]:

- Addition rule (the "OR" rule) = the probability of one outcome or another outcome occurring on a particular trial is the sum of their individual probabilities, when the outcomes are mutually exclusive (**1 point** for this)
- E.g., drawing either "clubs" or "hearts" from a deck of cards (**1 point** for this)

c) Information from the Department of Motor Vehicles indicates that the average age of licensed drivers is $\mu = 39.7$ years, with a standard deviation of $\sigma = 12.5$ years. Assuming that the distribution of drivers' ages is approximately normal, calculate the *z*-scores that correspond with the proportion of licensed drivers that are more than 50 years old [open question; **1.33 points**] as well as the proportion of licensed drivers that are less than 30 years old [open question; **1.33 points**].

A: $z = 0.82$ (**1 point**); B: $z = -0.78$ (**1 point**)

Note: This question adds up to 8 points. Although in Mobius, the question text mentions max 2 points per sub-question, the Mobius system weighs each sub-question to max 2.66 points.

For instance, if you got half the points for sub-question c, you receive 1.33 points for that sub-question.

Name: Student number:

Question 4 (total of 8 points)

a) What is your formal interpretation of the Shapiro-Wilk test for the BIS and BAS variables summarized in the JASP output? [open question; **2.0 points**].

The formal interpretation of the S-W test is: If not significant ($p > .05$), the distribution is probably normal; if significant ($p < .05$) the distribution is probably non-normal.

- For BIS: S-W test = 0.9754, p = .017 (= signif. --> **BIS is probably non-normal)** --> **1.0 point** (for correctly labelling the variable "non-normal". This label (non-normal) should explicitly be mentioned.
- For BAS: S-W test = 0.9842, p < .137 (= nonsignif. --> **BAS is probably normal)** --> **1.0 point** (for correctly labelling the variable "normal". This label ("normal" should explicitly be mentioned**)**

b) A researcher also visually inspects the (Q-Q) residual plots for the BIS and BAS variables summarized in the JASP output. Please indicate for each of the provided residual plots (A and B), which variable (BIS or BAS) the plot depicts. Motivate your answer [open question; **2.0 points**]?

- Plot A = BAS (on the line = normal = SW confirmed) (**1 point**)
- Plot B = BIS (not on the line = non-normal = SW confirmed) (**1 point**)

c) Theoretically, what is the major distinction between Kendall tau-b and Spearman correlations? [open question; **2.0 points**]?

- Tau-b = bivariate associations between ordinal variables with tied ranks (**1 point**)
- Spearman = bivariate associations between ordinal variables (**1 point**)

d) Based on the minimal-maximum range values, which correlation coefficient should be used to compare the gender and BIS variables in the JASP output, and why? Motivate your answer [open question; **2.0 points**]?

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- Gender = categorical (acc. to min/max range values) + BIS = interval/ratio (acc. to min/max range values) (**1.0 point**)
- This requires point-biserial correlation (**1.0 point**)

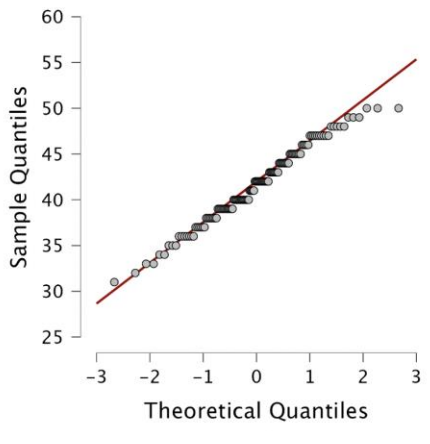
JASP Outputs for Question 4

Descriptive Statistics ▼

Descriptive Statistics

	gender	BIS	BAS
Valid	134	132	130
Missing	1	3	5
Mean	1.418	19.14	41.58
Std. Deviation	0.4951	3.983	4.242
Skewness	0.3367	−0.01385	−0.06149
Std. Error of Skewness	0.2093	0.2108	0.2124
Shapiro-Wilk	0.6265	0.9754	0.9842
P-value of Shapiro-Wilk	< .001	0.017	0.137
Minimum	1.000	10.00	31.00
Maximum	2.000	27.00	50.00

Plot A



Plot B