

MATHEMATICS & STATISTICS

Training Test

- 10 questions (real test: 20 questions)
- 0.5 pts. / question (real test: 0.25 pts.)
- 45 min. (real test: 90 min.)
- 4 options. Only 1 option is correct.
- Sign only the correct option.
- No option signed = 0 pts.
- Wrong option signed = -0.5 pts. (real test: -0.25 pts.)

1. $S: (p \wedge q) \rightarrow (\neg p \rightarrow \neg q)$

- a) S is a tautology
- b) $\neg p \rightarrow \neg q$ is always false
- c) S is a contradiction
- d) $\neg p \rightarrow \neg q$ is always true

2. In formal Logic:

- a) $p \wedge q = (\neg p \vee \neg q)$
- b) $p \leftrightarrow q = (p \rightarrow q) \vee (q \rightarrow p)$
- c) $p \rightarrow q = \neg p \vee q$
- d) $p \otimes q = (p \leftrightarrow q)$

3. In a genetic laboratory the -70°C fridge with the blood samples breaks down. The DNA in the blood samples starts degrading and will not cease except if the DNA of the sample is isolated after the blood melts down (30min) and cooled down at 5°C in less than 1 hour. The DNA can also be stabilized in a chemical solution after the blood melts down (30min) in less than 1 hour and kept at room temperature for a maximum period of 3 days, after that time the DNA should be isolated.

x: the -70°C fridge breaks down

q: the DNA degradation ceases.

r: the DNA is isolated after 30min

y: the DNA is isolated in less than 3 days

s: the DNA degradation lasts less than 1 hour.

t: the DNA is stabilized in a 5°C fridge .

p: the DNA is chemically stabilized after 30min at room temperature

o: the chemical stabilization lasts longer than 3 days.

- a) $(\neg s \wedge x \wedge t) \rightarrow q$
- b) $x \wedge (p \wedge y \wedge \neg o) \rightarrow \neg q$
- c) $x \wedge [(s \wedge t \wedge r) \vee (p \wedge y \wedge \neg o)] \rightarrow q$
- d) $(o \wedge x \wedge p \wedge \neg y) \rightarrow q$

4. In a genetic linkage analysis we consider 12 different SNPs, all in the same chromosome. How many different genotypes could we expect in each homologous chromosome?

- a) 12^2
- b) 2^{12}
- c) $12! / (12-2)!$
- d) $12! / (2! (12-2)!)$

5. In the parasitology department you test 100 subjects (A) for the presence of following parasites: malaria, bilharzia and tripanosoma. 50 are negative for all 3 parasites (B). 40 are positive for malaria (C), 10 are positive for bilharzia (D) and 5 are positive for tripanosoma (E). 7 are positive for malaria and bilharzia (F), 2 are positive for malaria and tripanosoma (G) and 1 is positive for malaria and bilharzia (H). How many people are positive simultaneously for malaria, bilharzia and tripanosoma? (assume 100% specificity and 100% sensitivity for the tests)

- a) 5
- b) $C + D + E - F - G - H$
- c) 2
- d) $A - B + C + D + E - F - G - H$

6. In a retrospective study with melanoma patients and controls:

SNP		Melanoma patients (n=110)	Adult controls (n=163)	OR; (95%CI)
Rs731236	AG	55 (50.0%)	76 (46.6%)	1.0
	AA	43 (39.1%)	73 (44.7%)	1.2; (0.7- 2.1)
	GG	12 (10.9%)	14 (8.6%)	0.8; (0.3- 2.2)

- a) relative risk (RR) should have used instead of odds ratio (OR) because the study is retrospective.
 - b) GG is the reference genotype
 - c) the genotype AA is more frequent among patients than among controls. The difference is statistically significant.
 - d) the genotype GG is less frequent among patients than among controls. The difference is not statistically significant.
7. You analyze the effect of a new drug on the blood pressure of 100 patients. You measure their blood pressure before and after administering the drug. The best way to analyse the data statistically is:
- a) McNemar test
 - b) Wilcoxon signed paired rank test
 - c) Fisher test
 - d) Mann-Whitney U-test

- a) The total time observed is 48 months x 9
- b) The incidence rate is 288 person-months
- c) The incidence rate is 7 cases/288 person-months = 0.024 cases/person-month
- d) The incidence rate is 5 cases/288 person-months = 0.017 cases/person-month

1a.2c.3c.4b.5a.6d.7b.8d.9b.10d