Prøvemidtveiseksamen STK1100 våren 2026

Matematisk institutt, Universitetet i Oslo

Prøvemidtveiseksamen **STK1100** – **Sannsynlighetsregning og statistisk modellering**

Dato: **Mars, 2026,**

Tid: 2 **timer**

Tillatte hjelpemidler: **Godkjent lommeregner og formelsamling for STK1100.**

Oppgave 1. Du ruller fire rettferdige sekskantede terninger. Hva er sannsynligheten for de viser tre, fire, fem, seks?

(a) $1/6^4$;
(b) $1/36$;
(c) $1/72$;
(d) $1/6$.

Oppgave 2. La $A_1, \ldots, A_k$ og $B_1, \ldots, B_n$ være hendelser. Da er hendelsen

$$\{\omega \colon \omega \in A_i \text{ for minst en } i \text{ og } \omega \in B_j \text{ for alle } j\},$$

lik

(a) $(\cup_{j=1}^k A_j) \cap (\cup_{i=1}^n B_i)$;
(b) $(\cap_{j=1}^k A_j) \cap (\cup_{i=1}^n B_i)$;
(c) $(\cup_{j=1}^k A_j) \cap (\cap_{i=1}^n B_i)$;
(d) $(\cap_{j=1}^k A_j) \cap (\cap_{i=1}^n B_i)$.

Oppgave 3. La A og B være to uavhengige hendelser. Hvilke av de følgende utsagnene er da alltid sant?

(a) $\Pr(A \cup B) = \Pr(A) + \Pr(B)$;
(b) $\Pr(B) + \Pr(A)\Pr(B^c) = \Pr(A) + \Pr(B)\Pr(A^c)$;
(c) $\Pr(A \cap B) = \Pr(A)$;
(d) $\Pr(A \setminus B) = \Pr(A) - \Pr(B)$.

Oppgave 4. La X være en tilfeldig variabel some tar verdiene $\{-2, -1, 0, 1, 2\}$ med samme sannsynlighet. Hva er variansen til X?

(a) 1;
(b) 2;
(c) 3;
(d) 4.

Oppgave 5. La X være en tilfeldig variabel med momentgenererende funksjon $\mathrm{E}\exp(tX) = \exp\{\theta(\exp(t)-1)\}$. Hva er forventningen til X?

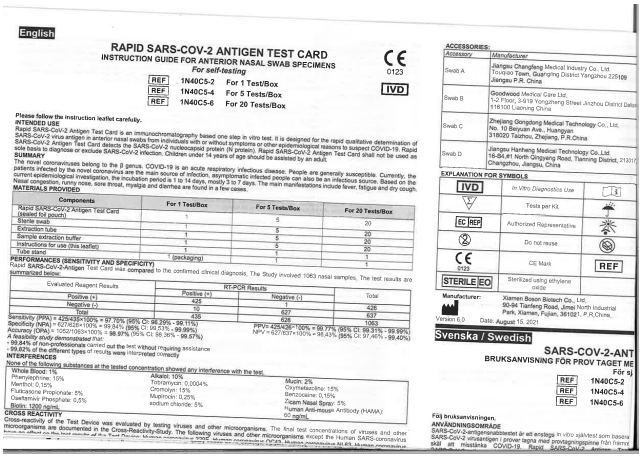
(a) $\exp(\theta)$;
(b) $\exp(\theta - 1)$;
(c) θ;
(d) $1/\theta$.

Oppgave 6. La X være en tilfeldig variabel med fordeling $\Pr(X = j) = (3/\pi^2)(1/j^2)$ for $j \in \mathbb{Z} \setminus \{0\}$. Forventningen til X

(a) er 0;
(b) er 1;
(c) er 2;
(d) finnes ikke.

Oppgave 7. (En utdatert oppgave, heldigvis). Du føler deg helt fin og det irriterer deg at konserten du vil på krever en negativ covid test. Faktisk føler du deg så fin at du tenker det er en en-i-tusen sjanse for at du har covid. Du blir tvunget til å ta covid testen hvis bruksanvisning er under. Uheldigvis så tester du positivt for covid. Hva er sannsynligheten din for at du har covid?

(a) 0.9770;
(b) 0.9897;
(c) 0.5876;
(d) 0.3794.



English

RAPID SARS-COV-2 ANTIGEN TEST CARD
INSTRUCTION GUIDE FOR ANTERIOR NASAL SWAB SPECIMENS
For self-testing

REF 1N40C5-2 For 1 Test/Box
REF 1N40C5-4 For 5 Tests/Box
REF 1N40C5-6 For 20 Tests/Box

CE 0123
IVD

Please follow the instruction leaflet carefully.

INTENDED USE
Rapid SARS-CoV-2 Antigen Test Card is an immunochromatography based one step in vitro test. It is designed for the rapid qualitative determination of SARS-CoV-2 virus antigen in anterior nasal swabs from individuals with or without symptoms or other epidemiological reasons to suspect COVID-19. Rapid SARS-CoV-2 Antigen Test Card detects the SARS-CoV-2 nucleocapsid protein (N protein). Rapid SARS-CoV-2 Antigen Test Card shall not be used as sole basis to diagnose or exclude SARS-CoV-2 infection. Children under 14 years of age should be assisted by an adult.

SUMMARY
The novel coronaviruses belong to the β genus. COVID-19 is an acute respiratory infectious disease. People are generally susceptible. Currently, the patients infected by the novel coronavirus are the main source of infection; asymptomatic infected people can also be an infectious source. Based on the current epidemiological investigation, the incubation period is 1 to 14 days, mostly 3 to 7 days. The main manifestations include fever, fatigue and dry cough. Nasal congestion, runny nose, sore throat, myalgia and diarrhea are found in a few cases.

MATERIALS PROVIDED

Components	For 1 Test/Box	For 5 Tests/Box	For 20 Tests/Box
Rapid SARS-CoV-2 Antigen Test Card (sealed foil pouch)	1	5	20
Sterile swab	1	5	20
Extraction tube	1	5	20
Sample extraction buffer	1	5	20
Instructions for use (this leaflet)	1	5	20
Tube stand	1 (packaging)	1	1

PERFORMANCES (SENSITIVITY AND SPECIFICITY)
Rapid SARS-CoV-2 Antigen Test Card was compared to the confirmed clinical diagnosis. The Study involved 1063 nasal samples. The test results are summarized below:

Evaluated Reagent Results	RT-PCR Results		
	Positive (+)	Negative (-)	Total
Positive (+)	426	1	427
Negative (-)	13	627	637
Total	439	628	1063

Sensitivity (PPA) = 426/439×100% = 97.70% (95% CI: 96.29% - 98.71%)
Specificity (NPA) = 627/628×100% = 99.84% (95% CI: 99.53% - 99.99%)
Accuracy (OPA) = 1053/1063×100% = 99.06% (95% CI: 98.36% - 99.47%)
• A sensitivity study demonstrated that
• 99.84% of non-professionals carried out the test without requiring assistance
• Three (3) different types of results were interpreted correctly

INTERFERENCES
None of the following substances at the tested concentration showed any interference with the test:

Whole Blood: 1%	Alkalol: 10%	Mucin: 2%
Phenylephrine: 10%	Tobramycin: 0.0004%	Oxymetazoline: 15%
Menthol: 0.15%	Cromolyn: 15%	Benzocaine: 0.15%
Fluticasone Phosphate: 5%	Mupirocin: 0.25%	Zicam Nasal Spray: 5%
Dexamethasone Phosphate: 0.5%	sodium chloride: 5%	Human Anti-mouse Antibody (HAMA): 50 ng/mL
Biotin: 1200 ng/mL		

CROSS REACTIVITY
Cross-reactivity of the Test Device was evaluated by testing viruses and other microorganisms. The final test concentrations of viruses and other microorganisms are documented in the Cross-Reactivity-Study. The following viruses and other microorganisms except the Human SARS-coronavirus

ACCESSORIES:

Accessory	Manufacturer
Swab A	Jiangsu Changfeng Medical Industry Co., Ltd. Tiyuxin Town, Guanghe District Yangzhou 225109 Jiangsu P.R. China
Swab B	Goodwood Medical Care Ltd. 1-2 Floor, 3-919 Yongsheng Street Jinzhou District Dalian 116100 Liaoning China
Swab C	Zhejiang Gongdong Medical Technology Co., Ltd. No. 10 Beiyuan Ave., Huangyan 318020 Taizhou, Zhejiang, P.R.China
Swab D	Jiangsu Hanfeng Medical Technology Co.,Ltd. 16-B4,#1 North Qingyang Road, Tianning District, 213017 Changzhou, Jiangsu, China

EXPLANATION FOR SYMBOLS

IVD	In Vitro Diagnostics Use		
	Tests per Kit		
EC REP	Authorized Representative		
	Do not reuse		
CE 0123	CE Mark	REF	
STERILE EO	Sterilized using ethylene oxide		

Manufacturer: Xiamen Boson Biotech Co., Ltd. 90-94 Tianfeng Road, Jimei North Industrial Park, Xiamen, Fujian, 361021, P.R.China.
Version 6.0 Date: August 15, 2021

Svenska / Swedish

SARS-COV-2-ANT
BRUKSANVISNING FÖR PROV TAGET ME
För sj

REF 1N40C5-2
REF 1N40C5-4
REF 1N40C5-6

Följ bruksanvisningen.
ANVÄNDNINGSOMRÅDE
SARS-CoV-2-antigensnabbtestet är ett enstegs in vitro sjukvtest som baseral SARS-CoV-2 virusantigen i prover tagna med provtagningspinne från främst

Oppgave 8. En familie har to (og bare to) barn. Du blir fortalt at det ene barnet er en jente født på en tirsdag før lunsj. Hva er sannsynligheten for at denne familien har to jenter?

(a) 1/3;
(b) 1/2;
(c) 13/27;
(d) 27/55.

Oppgave 9. La U være en tilfeldig variabel med pdf $f(x) = 1$ på $[0,1]$ og $f(x) = 0$ utenfor. La $X = U^{1/\theta}$ for en $\theta > 0$. Forventningen til X er

(a) θ;
(b) $\theta/(\theta+1)$;
(c) $1/2^{\theta}$;
(d) $1/(\theta+1)$.

Oppgave 10. La (X,Y) har simultan pdf $f(x,y) = (1/\log(\sqrt{2})(x/(y+1))$ for $0 \leq x, y \leq 1$ og $f(x,y) = 0$ ellers. Forventningen til X er

(a) $2/3$;
(b) $\log(2)/\log(\sqrt{2})$;
(c) 2;
(d) $2/\log(2)$.

Slutt