Eksamen

– *bag kulisserne*

Gerth Stølting Brodal, Late Night Study Café, Institut for Datalogi, Aarhus Universitet, 19. november 2019

Præstation $\Rightarrow$ Karakter

(i forhold til fagets mål)

Bekendtgørelse om eksamen og

retsinformation.dk/

Bekendtgørelse om karakterskala

Bacheloruddannelsen i datalogi

eddiprod.au.dk/ED

STUDIEORDNIN
I DATALOGI (20

Udgave:
2019

Udarbejdet af:
Studienævn for

Ikrafttrædelsesdato:
01-09-2019

Godkendt af:
Dekanen for Sci

Normering:
180 ECTS

Indhold

1. Om uddannelsen
2. Uddannelsens struktur
3. Generelle regler
4. Ændringer til studieordningen

Algoritmer og datastrukturer

kursuskatalog.au.dk/da/course/94324/Algoritmer-og-datastrukturer

STUDERENDE.AU.DK

AU KURSUSKATALOG

English

Du er her: AU » Uddannelse » Kursuskatalog » Algoritmer og datastrukturer

← Tilbage til oversigt

★ Gem kursus

Algoritmer og datastrukt

Kvalifikationsbeskrivelse

Formål:

Deltagerne vil efter kurset have indsigt i algoritmer som
sekventielle beregningsprocesser og som grundlag for fo
korrekthedsbeviser og analyse af ressourceforbrug af be
have detaljeret viden om flere konkrete implementeringe
grundlæggende datastrukturer, graf algoritmer og anven
algoritme-design-paradigmer. Deltagerne vil også have e
at implementere og evaluere algoritmers ydeevne på sim
algoritmiske problemer.

I slutningen af kurset vil deltagerne kunne:

Eksamens-oplysninger

SKRIFTLIG

Eksamenstid:	2 time(r)
Hjælpemidler:	Ingen
Bedømmelse:	7-trinsskala
Censurform:	intern censur

Forudsætninger for prøvedeltagelse
Aflevering af 13 ugentlige obligatoriske opgaver.

Bemærkninger
Skriftlig prøve (multiple choice).

Karakteren afspejler en samlet vurdering af obligatoriske opgaver og den skriftlige prøve.

2019

studieordning

x 2 timer/uge

Eksamensformer (ifølge studieordningen)

1. Skriftlig eksamen
2. Mundtlig eksamen
3. Hjemmeopgave(r) (skriftlig prøve)
4. Multiple Choice (skriftlig prøve)
5. Godkendelse af obligatoriske opgaver og/eller rapporter
6. Aktiv deltagelse i kurset. Aktiv deltagelse kan f.eks. defineres som fremmøde og aktiv medvirken til min. 80 % af obligatoriske timer, seminarindlæg, aflevering (og godkendelse) af obligatoriske opgaver etc.
7. Færdighedsprøve (praktisk prøve)
8. Kombinationer af 1 – 7

Karakter (karakterbekendtgørelsen)

§ 2. Karakteren **12** gives for den fremragende præstation, der demonstrerer udtømmende opfyldelse af fagets mål, med ingen eller få uvæsentlige mangler.

§ 3. Karakteren **10** gives for den fortrinlige præstation, der demonstrerer omfattende opfyldelse af fagets mål, med nogle mindre væsentlige mangler.

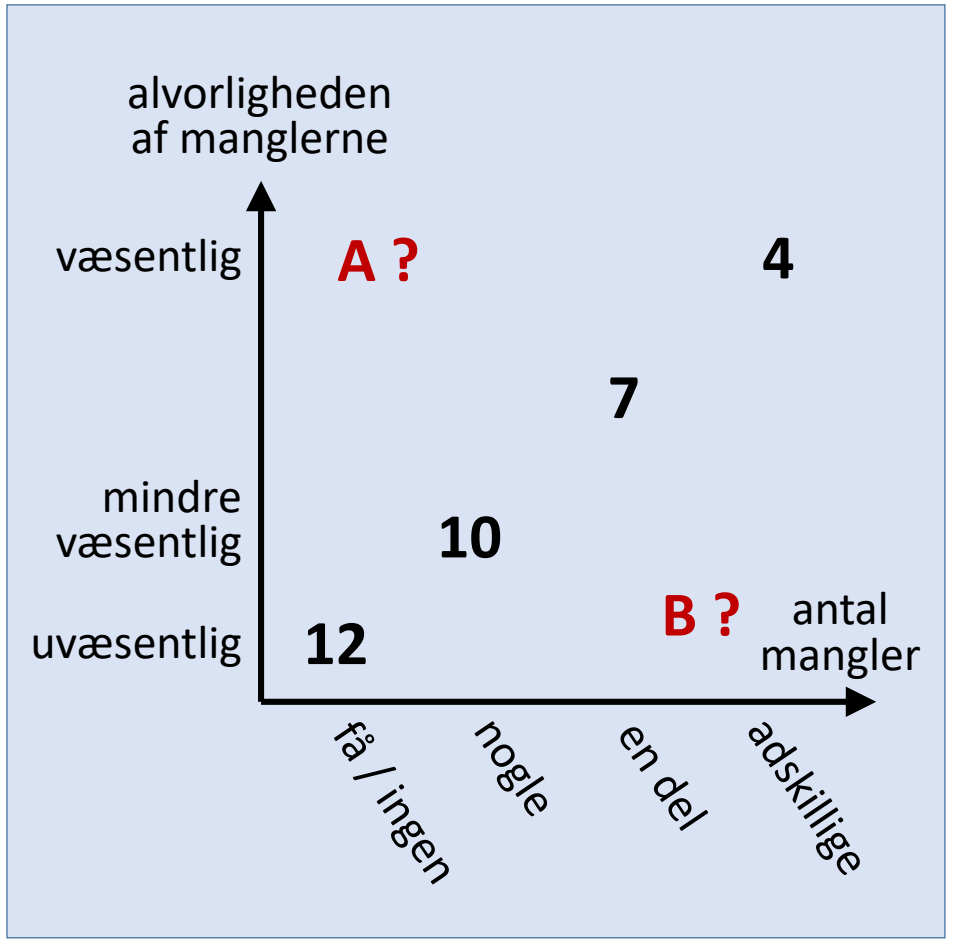
§ 4. Karakteren **7** gives for den gode præstation, der demonstrerer opfyldelse af fagets mål, med en del mangler.

§ 5. Karakteren **4** gives for den jævne præstation, der demonstrerer en mindre grad af opfyldelse af fagets mål, med adskillige væsentlige mangler.

§ 6. Karakteren **02** gives for den tilstrækkelige præstation, der demonstrerer den minimalt acceptable grad af opfyldelse af fagets mål.

§ 7. Karakteren **00** gives for den utilstrækkelige præstation, der ikke demonstrerer en acceptabel grad af opfyldelse af fagets mål.

§ 8. Karakteren **-3** gives for den helt uacceptable præstation.



Karakterbekendtgørelsen, kapitel 2: *Bedømmelse m.v.*

”§ 9. Bedømmelse af præstationer skal ske på grundlag af de faglige mål, der er opstillet for det pågældende fag, fag- eller uddannelseselement (**absolut karaktergivning**). Der må ikke tilstræbes nogen bestemt fordeling af karaktererne (relativ karaktergivning).”

Undervisningsministeriet: Anvendelse af 7-trins-skalaen

Når man sammenligner ECTS-skalaens karakterfordeling for beståede præstationer med 7-trins-skalaen, forventes det, at af de eksaminander, der på landsplan og over tid består en given prøve, får:

10 procent karakteren 12

25 procent karakteren 10

30 procent karakteren 7

25 procent karakteren 4

10 procent karakteren 02

www.uvm.dk/uddannelsessystemet/7-trins-skalaen/anvendelse-af-7-trins-skalaen

Mundtlig Eksamen

Spørgsmål 1 : ...

Spørgsmål 2 : ...

Spørgsmål 3 : ...

Spørgsmål 4 : ...

Spørgsmål 5 : ...

Spørgsmål 6 : ...

Mundtlig Eksamen (Ivan Damgård)

Spørgsmål 1 : ...

Spørgsmål 2 : ...

Spørgsmål 3 : ...

Spørgsmål 4 : ...

Spørgsmål 5 : ...

Spørgsmål 6 : ...

Lad eksaminanden kaste en terning

Mundtlig Eksamen (Kasper Green Larsen)

Spørgsmål 1 : ...

Spørgsmål 2 : ...

Spørgsmål 3 : ...

Spørgsmål 4 : ...

Spørgsmål 5 : ...

Spørgsmål 6 : ...

Spørgsmål 7 : ...

Spørgsmål 8 : ...

Spørgsmål 9 : ...

RANDOM.ORG

Eksaminanden siger et tal $x = 1 .. n$

Random.org genererer et tal $y = 1 .. n$

Spørgsmål $1 + ((x + y) \bmod n)$

Mundtlig Eksamen (Kurt Jensen)

Spørgsmål 1 : ...

Spørgsmål 2 : ...

Spørgsmål 3 : ...

Spørgsmål 4 : ...

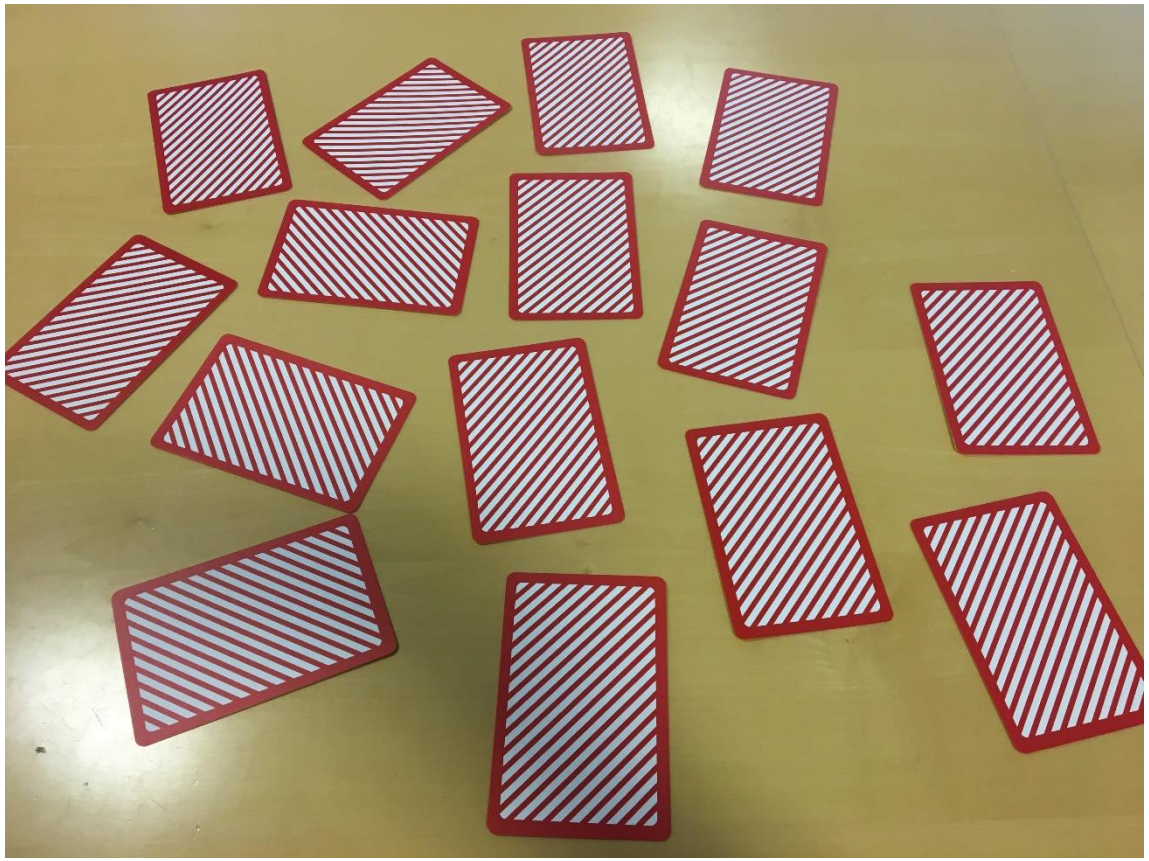
Spørgsmål 5 : ...

Spørgsmål 6 : ...

Spørgsmål 7 : ...

Spørgsmål 8 : ...

Spørgsmål 9 : ...



Mundtlig Eksamen (Kurt Jensen)

Spørgsmål 1 : ...

Spørgsmål 2 : ...

Spørgsmål 3 : ...

Spørgsmål 4 : ...

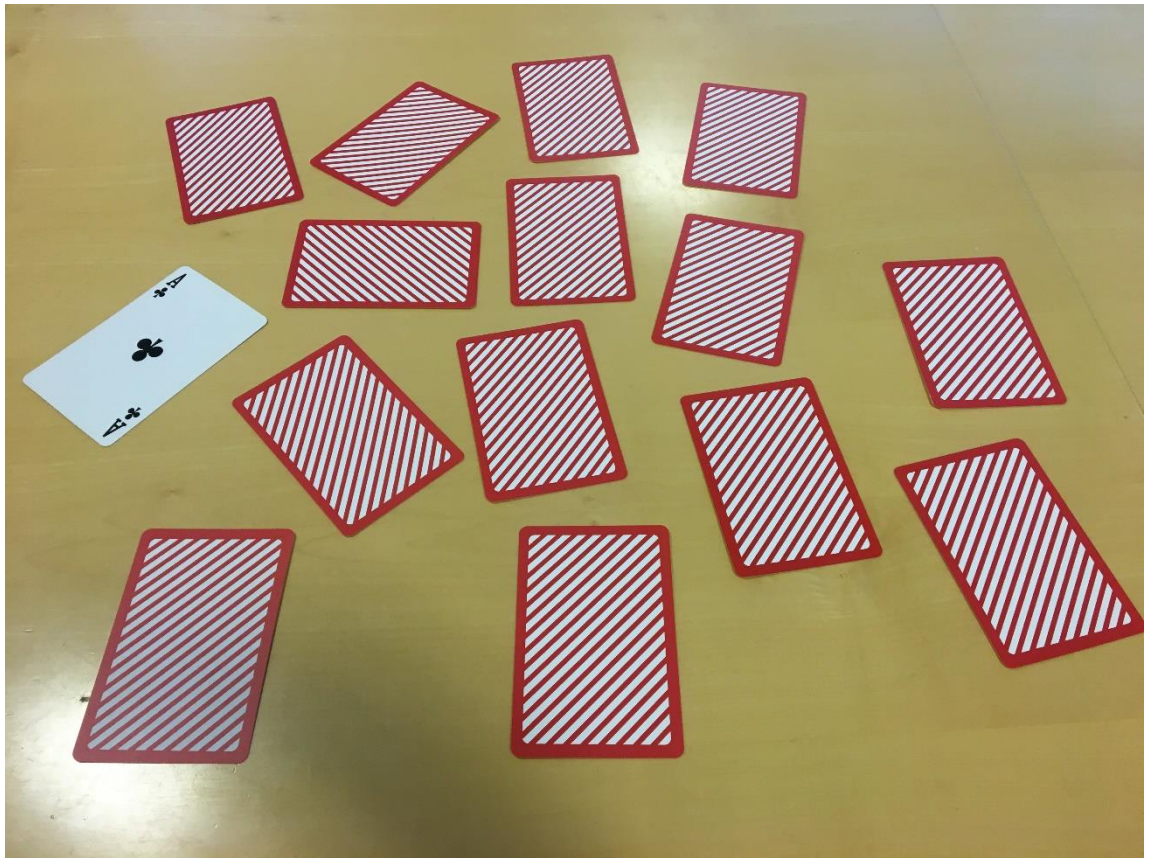
Spørgsmål 5 : ...

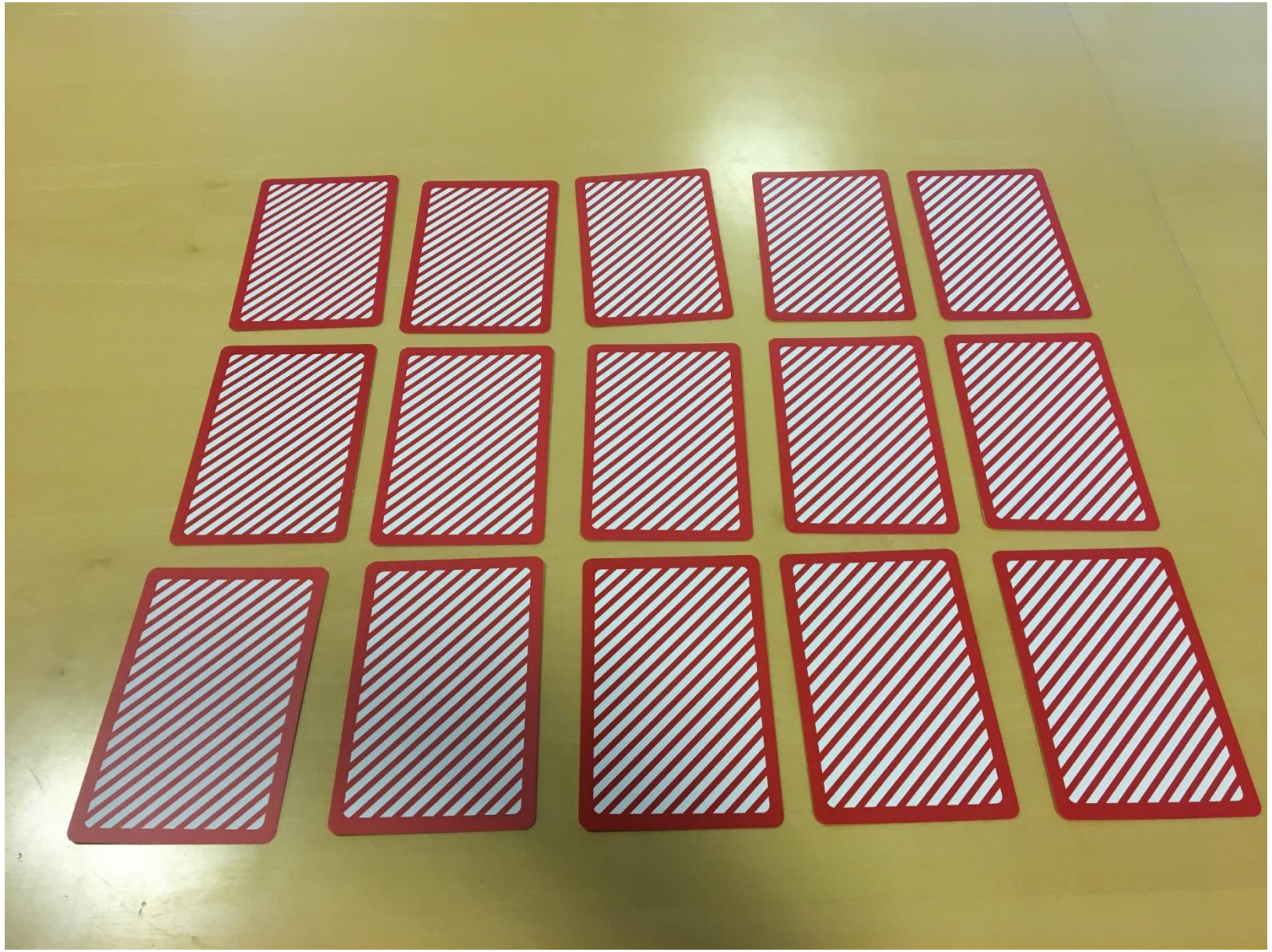
Spørgsmål 6 : ...

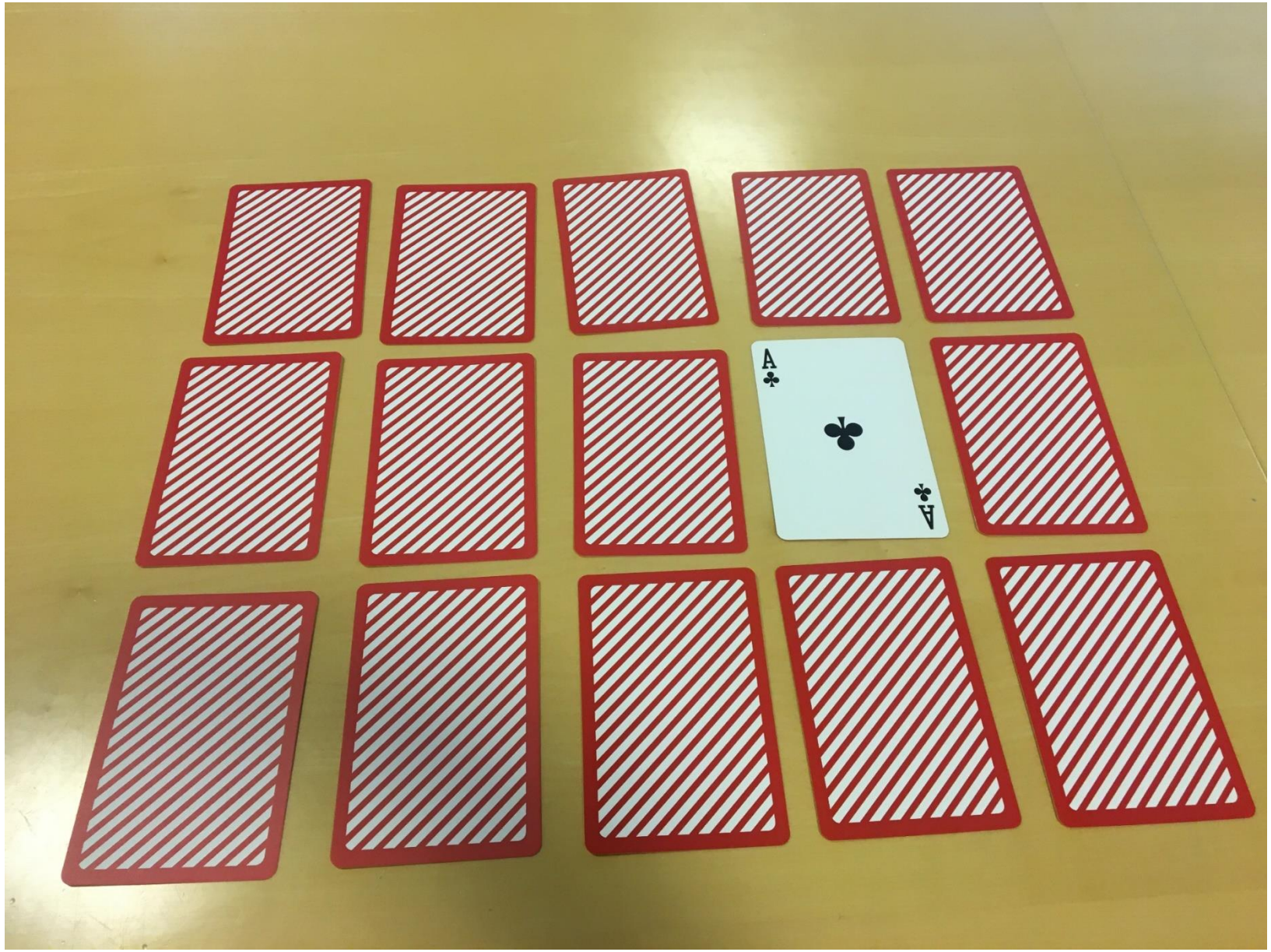
Spørgsmål 7 : ...

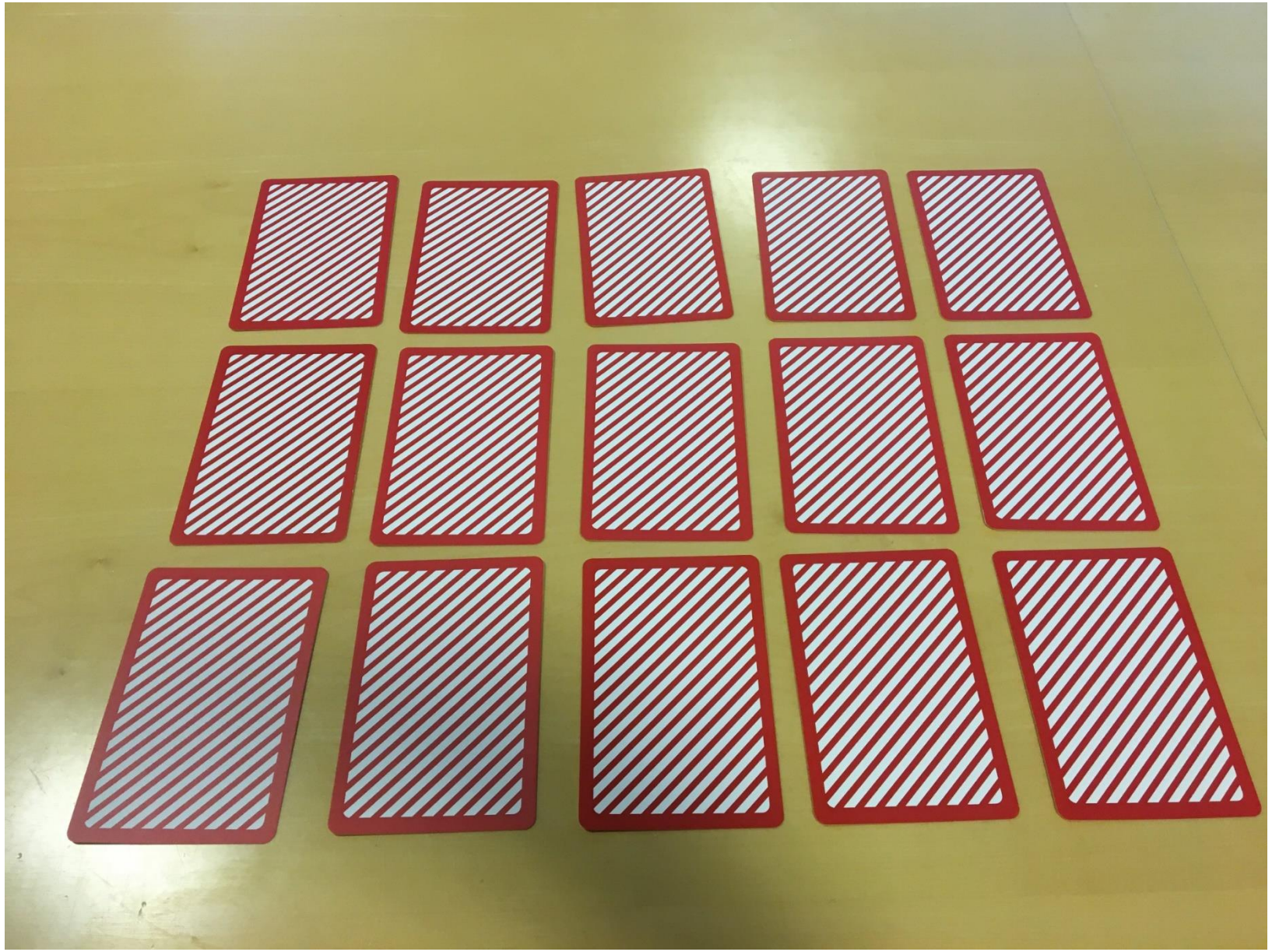
Spørgsmål 8 : ...

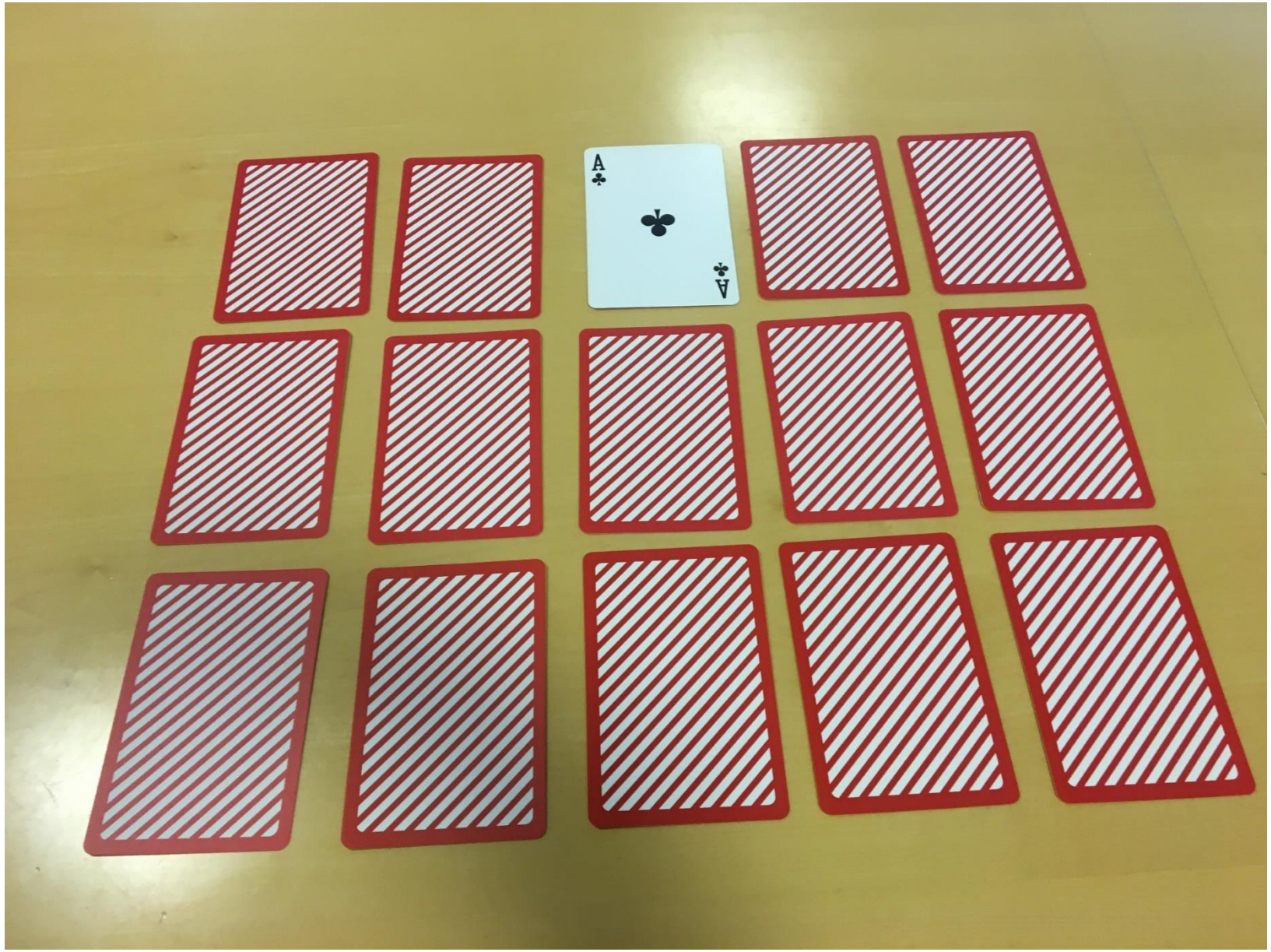
Spørgsmål 9 : ...

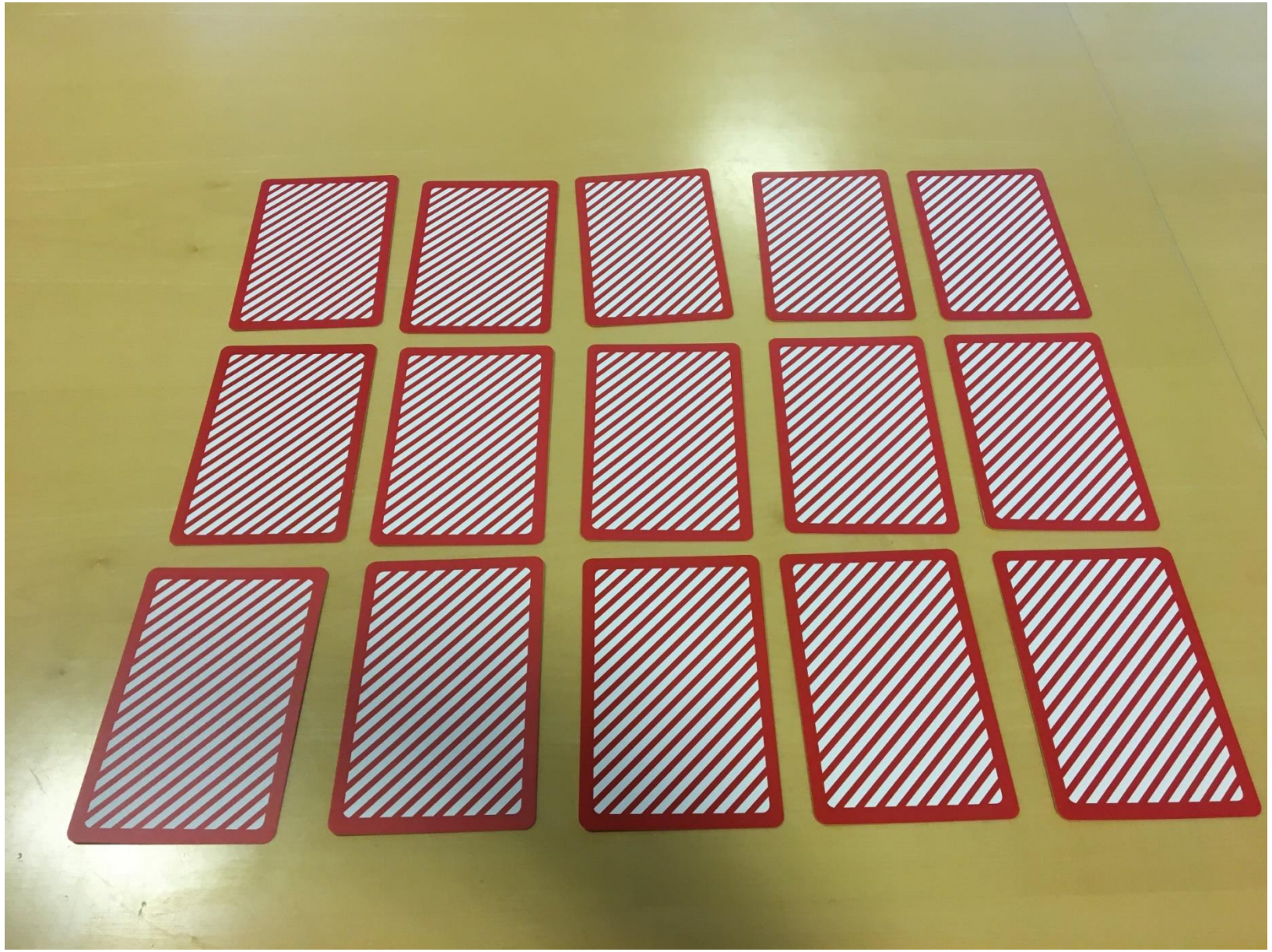


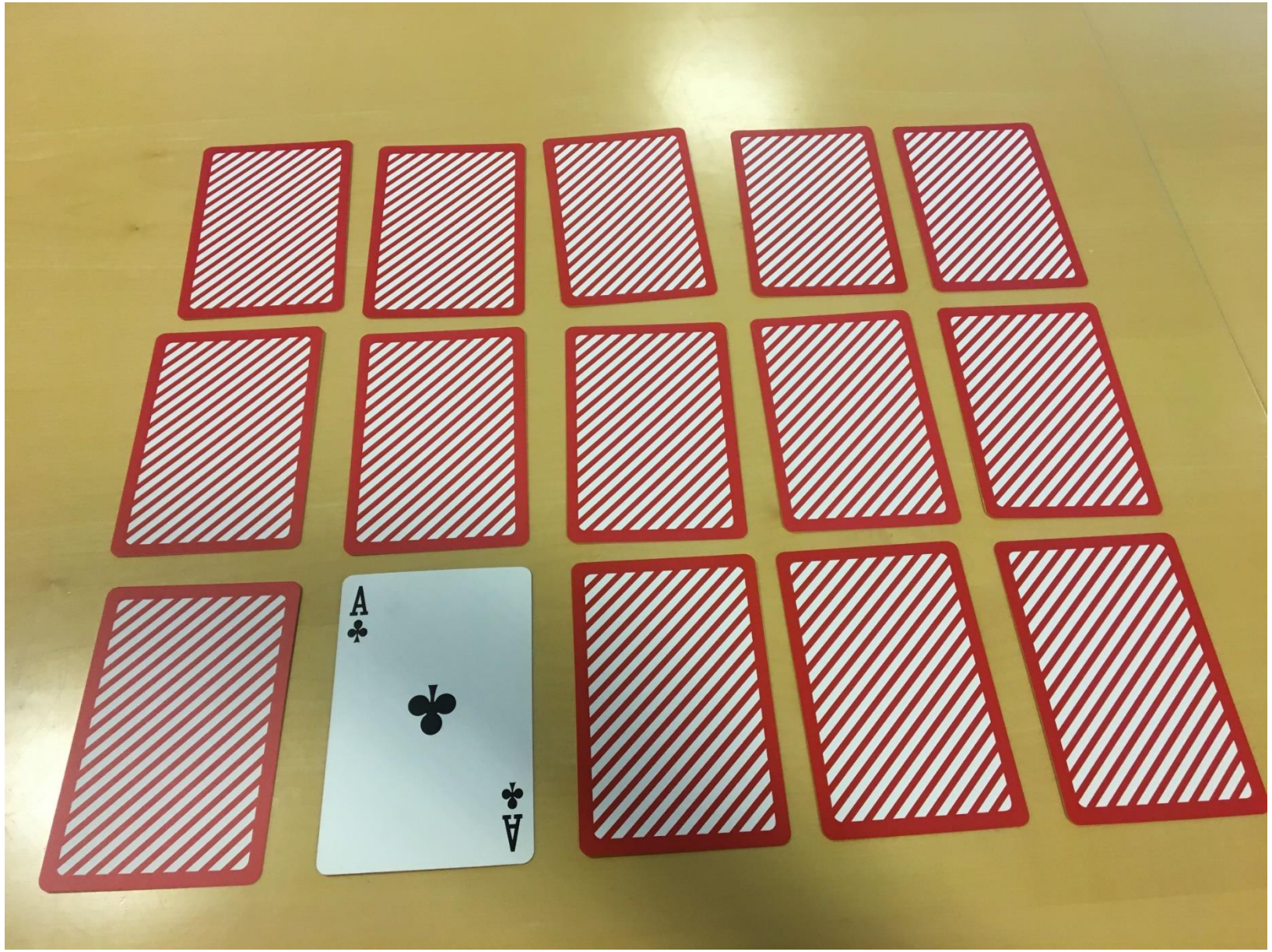



A
A

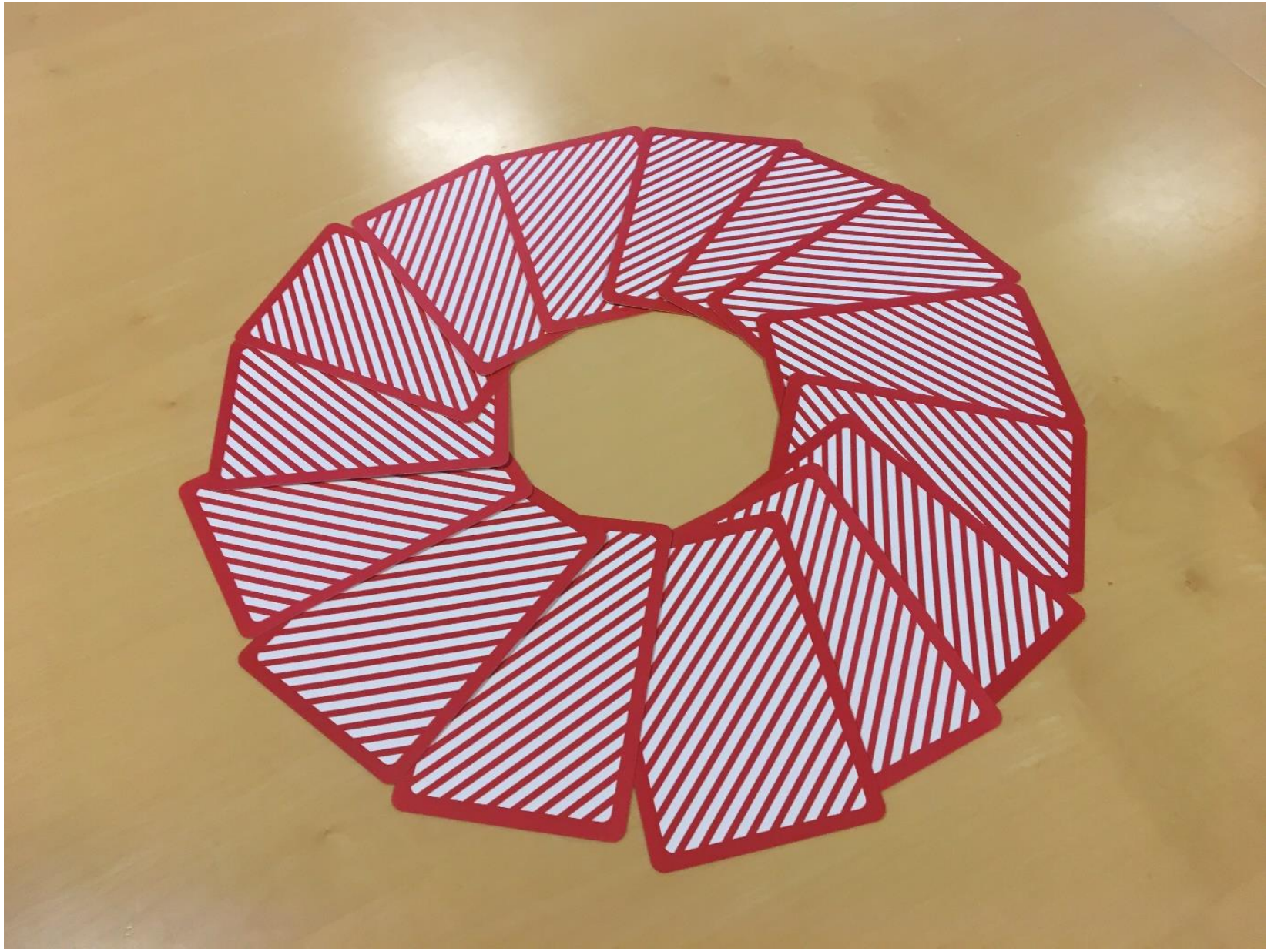


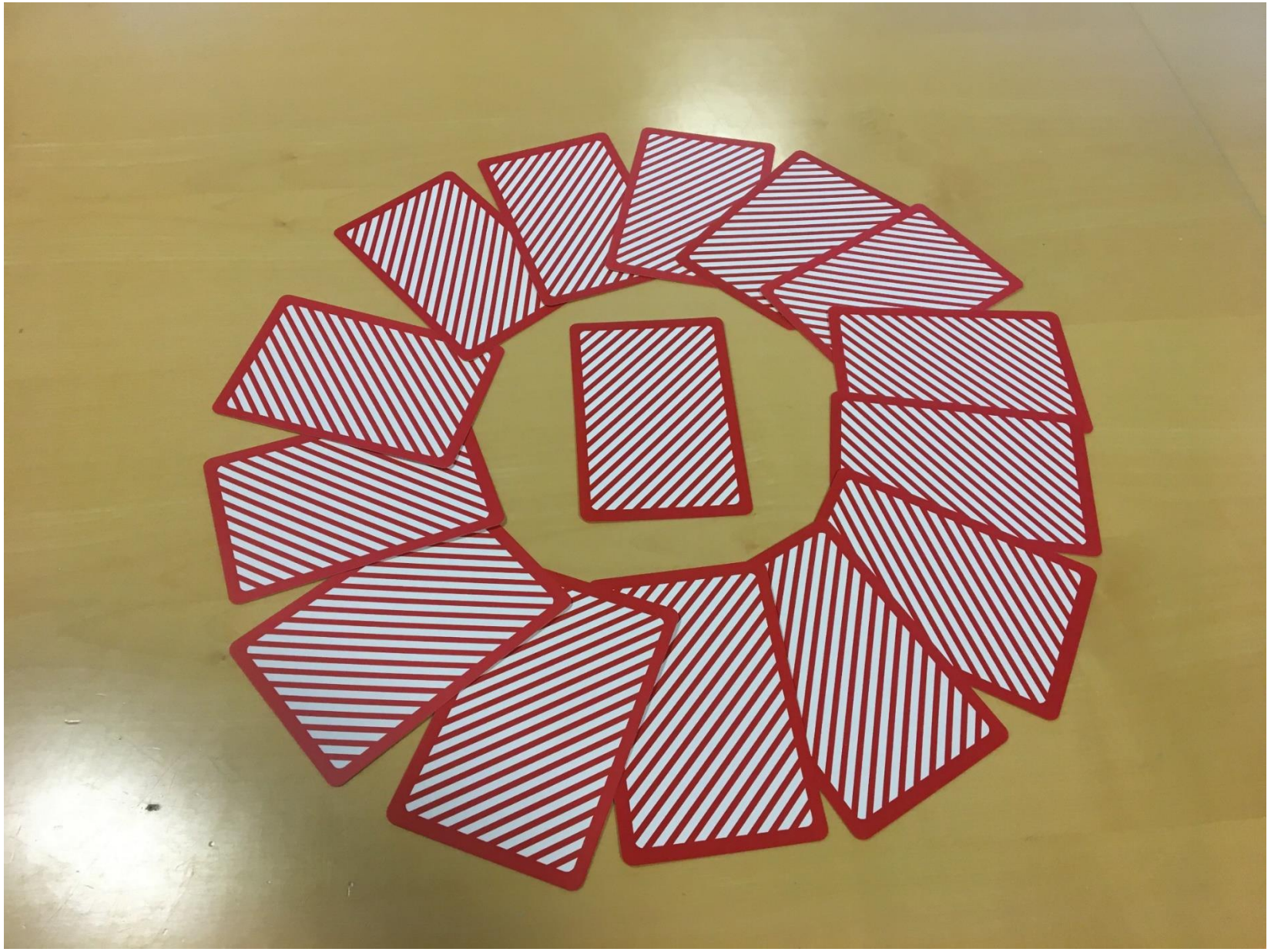

A
A

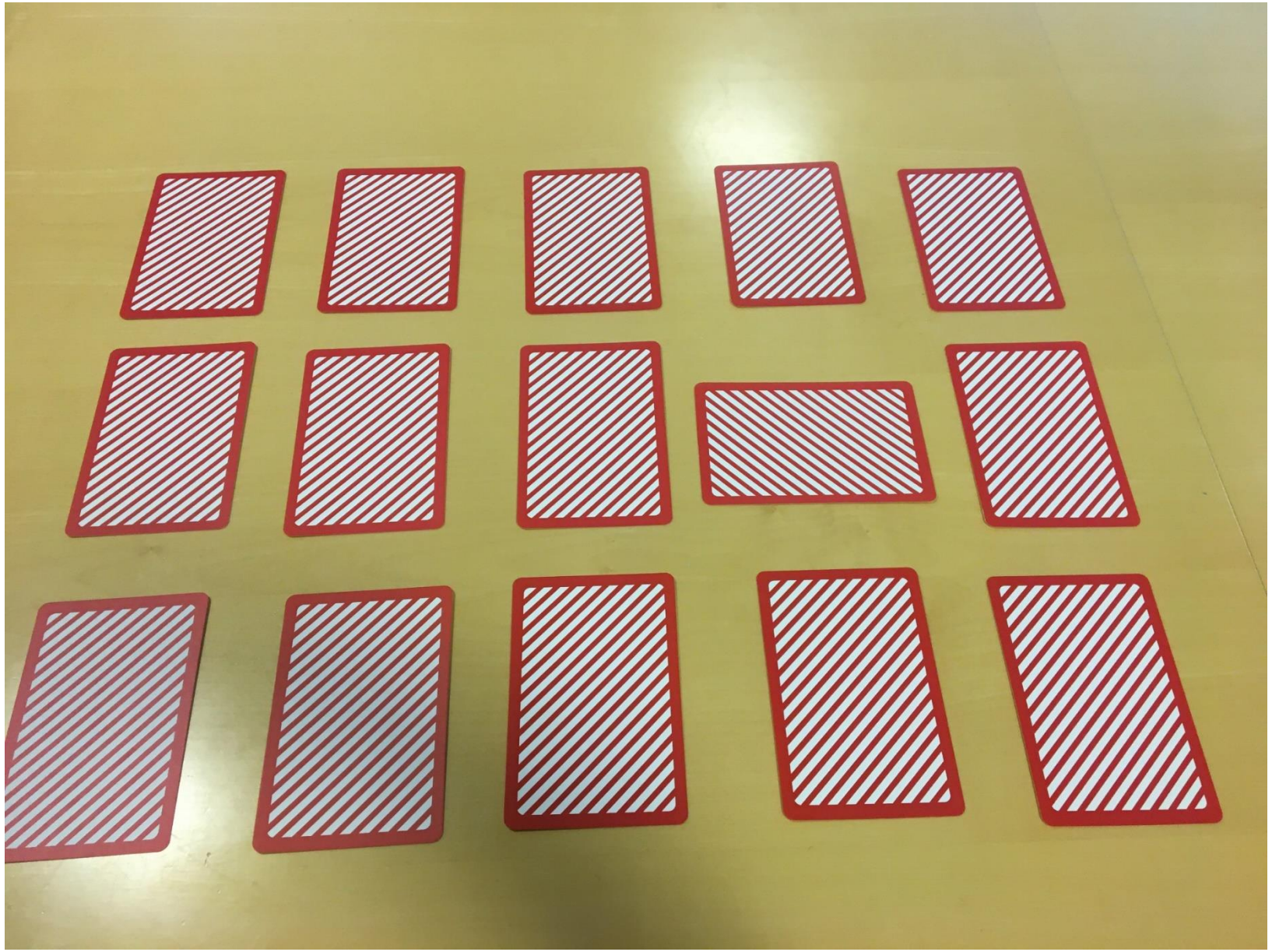




... ofte begrænset tilbagelægning af kort, så man ikke skal høre det samme spørgsmål igen-og-igen







ACM SIGCSE Bulletin, 38(4):34-38, December 2006

A Singular Choice for Multiple Choice

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ABSTRACT

How should multiple choice tests be scored and graded, in particular when students are allowed to check several boxes to convey partial knowledge? Many strategies may seem reasonable, but we demonstrate that five self-evident axioms are sufficient to determine completely the correct strategy. We also discuss how to measure robustness of the obtained grades. Our results have practical advantages and also suggest criteria for designing multiple choice questions.

Keywords

Multiple choice, scoring strategies, grading scales, theory.

1. INTRODUCTION

Multiple choice tests have recently been coming into favor as a useful evaluation tool at the university level [3, 10, 8], in contrast to the earlier view that they only support superficial learning [2]. While a new consensus thus seems to be forming about the use of multiple choice tests, there is no corresponding agreement on how answers to such tests should be evaluated. Most authors suggest different scoring strategies that are usually justified by intuition or by ad-hoc adjustments based on experiments. In this work we analyze the concept of scoring strategies and propose five axioms that in our view must be self-evident properties of any correct strategy, and we demonstrate that only a single such strategy satisfies all of these axioms. Importantly, our strategy is sufficiently general to handle *partial* knowledge. We also discuss the step from scoring to grading of tests, which is not trivial, and we provide a model for measuring the robustness of the obtained grades. Through examples we show that this robustness is highly dependent on the exact structure of the test.

the form

$$(k_i, a_i, c_i)$$

where k_i is the number of possible options, a_i is the number of checked options, and c_i is a boolean indicating whether one of the checked options is the correct one.

As an example, consider the following test with two questions:

What is a newt?

- a [ ] A small animal
- b [×] A unit of gravity

What is the correct URL encoding of "100% pure"?

- a [ ] 100%+pure
- b [×] 100+%+pure
- c [×] 100%25+pure

For this example, the two given answers are described as (2,1,0) and (3,2,1).

When *scoring* a test, the objective is to assign a numeric score to each student. This score can then be further mapped to a grading scale, which we consider as a secondary stage.

3. AXIOMS FOR SCORING STRATEGIES

Numerous different scoring strategies are employed for multiple choice tests, and many of them seem reasonable at a first glance. Since the questions are assumed to be in-

- Anvendes ofte ved CS@AU
- Kan angive flere svar
- Negativ ved forkert svar
- Scoringsstrategi

$$S_{axioms}(k,a,c) = \begin{cases} 0 & \text{if } a=0 \lor a=k \\ \log(\frac{k}{a}) & \text{if } a>0 \land c=1 \\ -\frac{a}{k-a}\log(\frac{k}{a}) & \text{if } a>0 \land c=0 \end{cases}$$

- Software
  - XML → individual LaTeX
  - permuterer opgaver
  - permuterer svarmuligheder
  - effektiv indtasting
  - beregner samlet score

www.brics.dk/Multiple

Algoritmer og Datastrukturer – gennem tiderne

ADS

- 1991 - 2003 Skriftlig

ADS 1

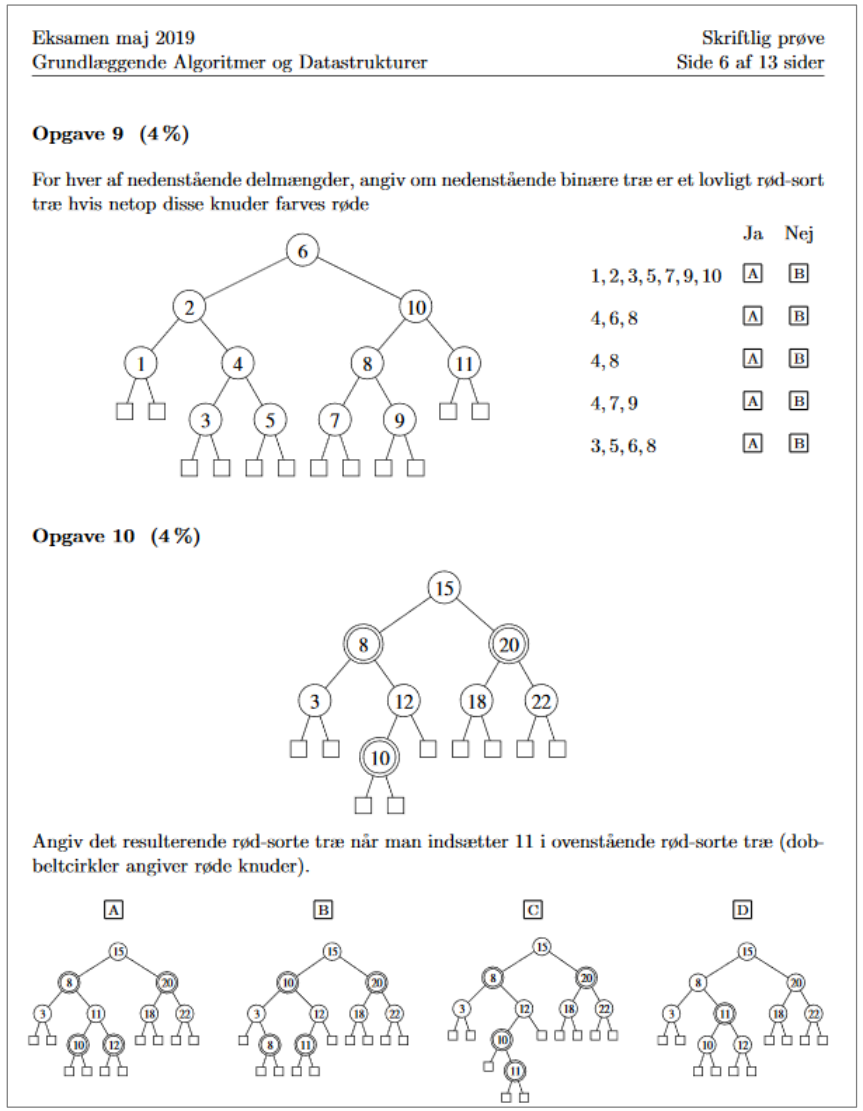
- 2004 - 2014 Multiple choice + korte svar
- 2015 - 2017 Multiple choice

ADS 2

- 2004 - 2017 Skriftlig

ADS

- 2017 Multiple choice + skriftlig opgave
- 2018 - Multiple choice



Eksamen maj 2019 — Skriftlig prøve
Grundlæggende Algoritmer og Datastrukturer — Side 6 af 13 sider

Opgave 9 (4 %)

For hver af nedenstående delmængder, angiv om nedenstående binære træ er et lovligt rød-sort træ hvis netop disse knuder farves røde

	Ja	Nej
1, 2, 3, 5, 7, 9, 10	A	B
4, 6, 8	A	B
4, 8	A	B
4, 7, 9	A	B
3, 5, 6, 8	A	B

Opgave 10 (4 %)

Angiv det resulterende rød-sorte træ når man indsætter 11 i ovenstående rød-sorte træ (dobbeltcirkler angiver røde knuder).

A B C D

Opgaverne gennem tiden lavet i LaTeX + xfig

emacs@D22689

```
\hfill\mbox{}
\\[1ex]

\question{4}

%{pdftex} red-black-tree-insert
%{pdftex} rb-insert-answer1 0.55
%{pdftex} rb-insert-answer2 0.55
%{pdftex} rb-insert-answer3 0.55
%{pdftex} rb-insert-answer4 0.55

\vspace{-2ex}
\centerline{\input{red-black-tree-insert}}

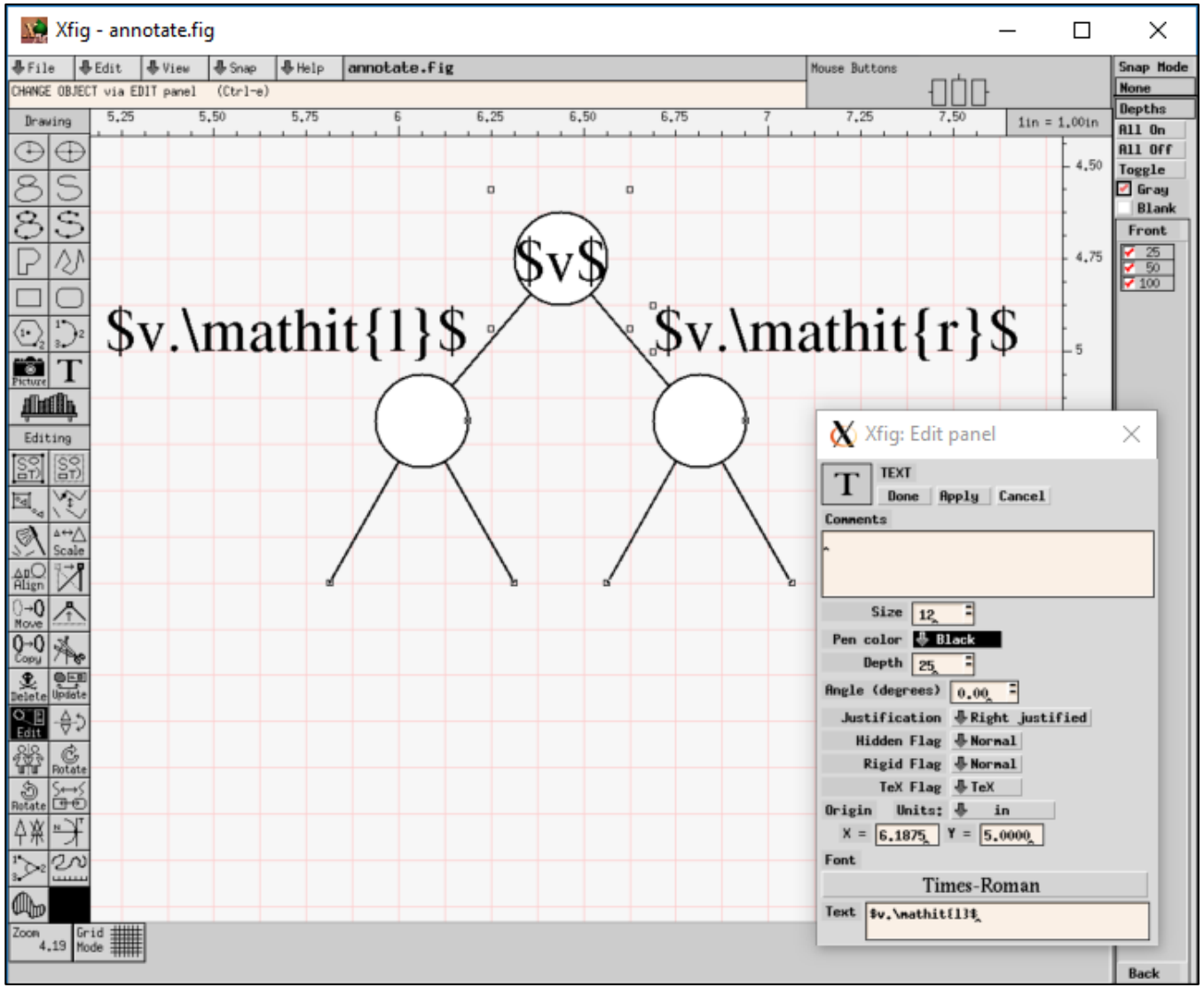
\vspace{3ex}
Angiv det resulterende rød-sorte træ når man indsætter 13 i
ovenstående rød-sorte træ (dobbeltcirkler angiver røde knuder
).

\begin{center}
\makebox[0pt]{%
\begin{tabular}{cccc}
\CBox & \Cbox & \Cbox & \CboX \\[1ex]
\input{rb-insert-answer1} &
\raisebox{3.1ex}{\input{rb-insert-answer2}} &
\input{rb-insert-answer3} &
\input{rb-insert-answer4}
\end{tabular}}
\end{center}

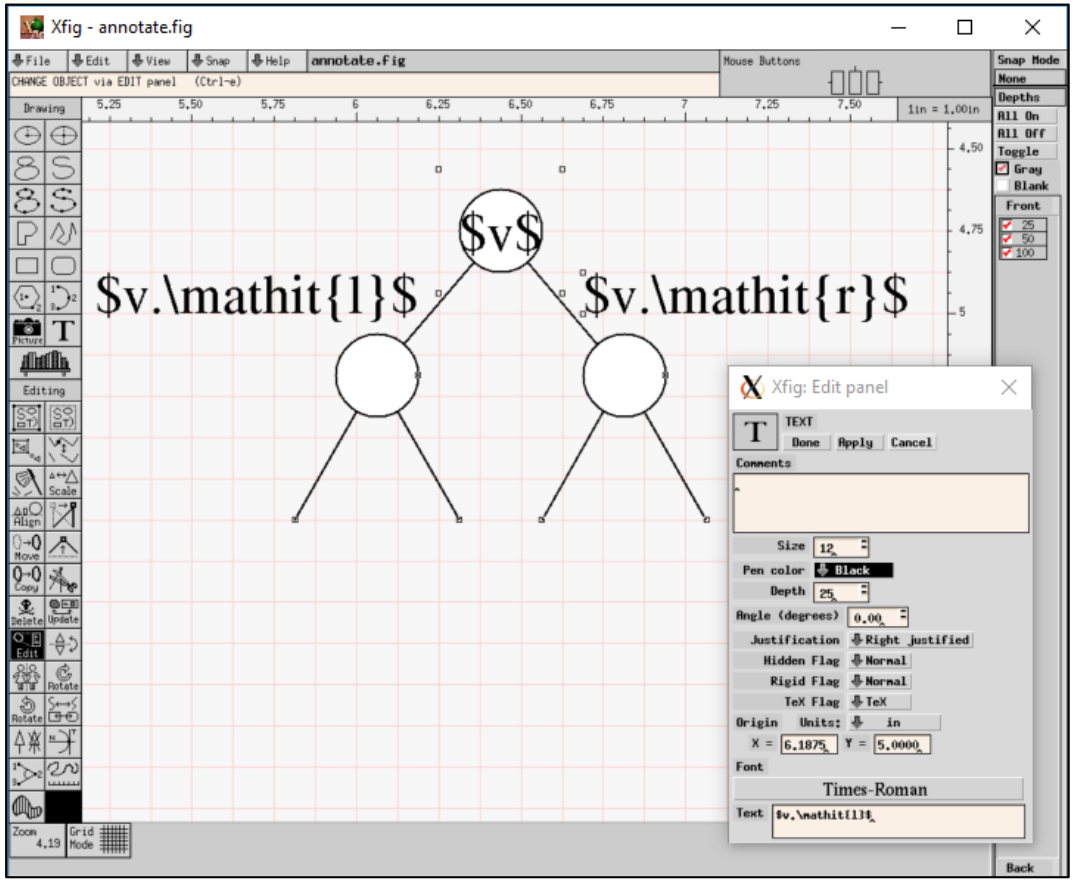
\newpage

\question{4}

%{pdftex} union-find-answer1
%{pdftex} union-find-answer2
%{pdftex} union-find-answer3
%{pdftex} union-find-answer4
U\---  fads18.tex     45% (417,0)     (LaTeX) 11:00 0.36
```



xfig

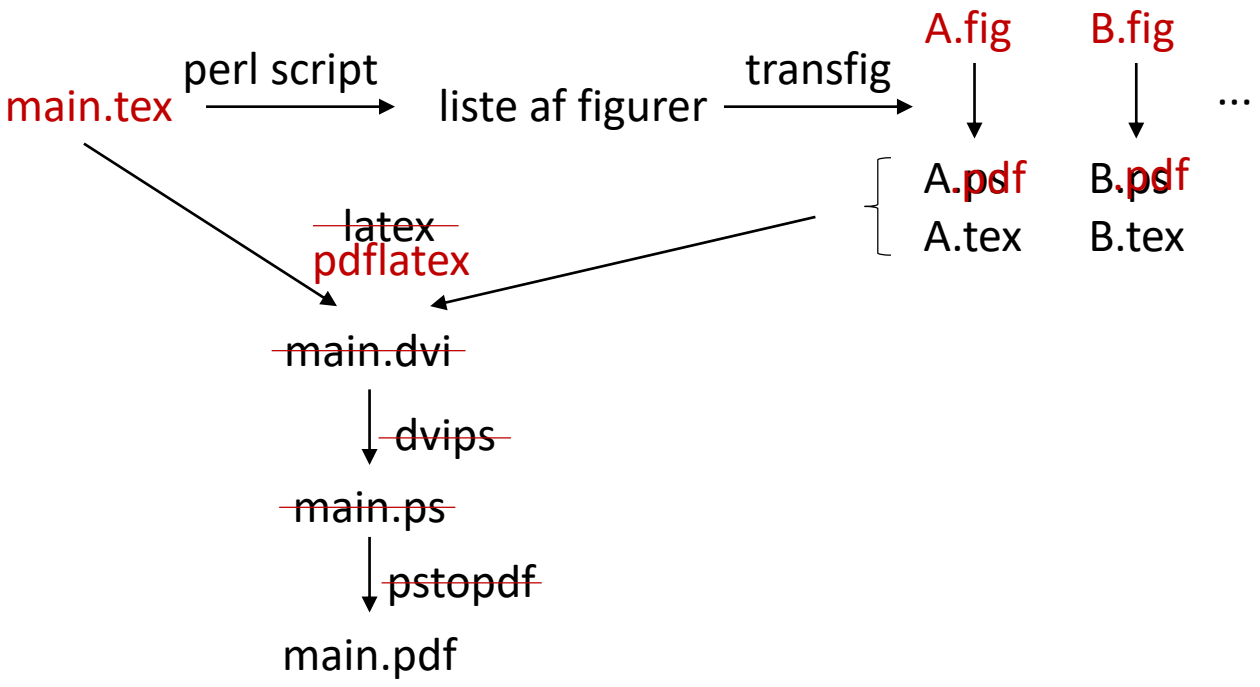


- Tegneprogram
- Første version 1985
- Udviklet til Unix, senere Linux
- Kan afvikles på Windows under Cygwin X-server
- Tillader LaTeX i tekstfelter

- Transfig: fig → PostScript / pdf
  +
  → latex (samme font i figurer + tekst)

- Pga. manglende udvikling skulle man i en periode taste tal ind baglæns, fx. “125” tastes ind som “5” “2” “1”

Oversættelse af LaTeX dokument – **perl** script

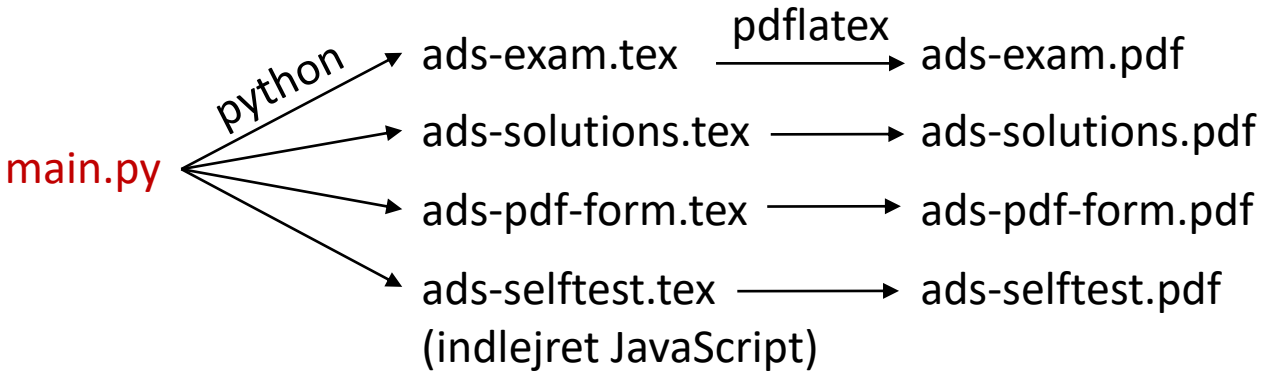


Efterår 2019

Kan man autogenerere ADS Eksamen ?

ADS

- Mange typeopgaver ("Hvad er output af algoritme X?")
- Status:
  - Kan pt autogenerere ca. 2/3 af et eksamenssæt
  - 3.000+ linjers Python kode



Generering af opgaver

- Generer tilfældigt input
- Kør korrekt algoritme
- Kør “oplagte forkerte” algoritmer

gentag hvis input “uinteressant”
eller to identiske svarmuligheder
eller to identiske delspørgsmål
eller ...

```
raise question.Retry('no valid coloring')
```

radix-sort

Retries: Q32:1 Q34:1 Q35:1 Q36:1 Q38:1 Q40:1 Q41:1 Q42:4 Q47:1 Q50:1 Q52:5 Q53:7 Q54:6 Q55:6 Q56:3 Q57:2 Q58:15 Q59:3 Q60:5 Q68:1 Q71:1115 Q72:4129 Q73:3772 Q74:240 Q75:589 Q76:1696 Q77:719 Q78:388 Q79:1030 Q80:407 Q81:40 Q82:19 Q83:34 Q84:69 Q85:7 Q86:24 Q87:38 Q88:16 Q89:11 Q90:5 Q91:4 Q92:10 Q93:15 Q94:4 Q95:15 Q96:6 Q97:2 Q98:9 Q99:6 Q100:6 Q101:5 Q102:13 Q103:5 Q104:22 Q105:22 Q106:16 Q107:5 Q108:15 Q109:18 Q110:17 Q111:17 Q112:3 Q113:43 Q114:20 Q115:4 Q116:25 Q118:8 Q119:13 Q120:28 Q121:34 Q122:29 Q123:29 Q124:12 Q125:35 Q126:20 Q127:6 Q128:13 Q129:24 Q130:3 Q131:2 Q132:22 Q133:151 Q134:33 Q135:13 Q136:38 Q137:9 Q138:39 Q139:80 Q140:6 Q143:1 Q144:1 Q148:1 Q150:1 Q151:22 Q152:12 Q154:12 Q155:2 Q156:5 Q159:9 Q160:7 Q161:1406 Q162:22 Q163:777 Q164:2807 Q165:2739 Q166:52 Q167:221 Q168:831 Q169:20 Q170:1921 Q171:3 Q172:4 Q174:2 Q175:2 Q176:3 Q177:1 Q180:2 Q181:25 Q182:36 Q183:165 Q184:42 Q185:3 Q186:15 Q187:104 Q188:9 Q189:3 Q190:30 Q191:380 Q192:92 Q193:172 Q194:21 Q195:82 Q196:16 Q197:58 Q198:19 Q199:55 Q200:127 Q201:2 Q203:7 Q204:1 Q205:2 Q206:4 Q208:1 Q209:3 Q210:1 Q219:1

Figurer – latex “tikz” og “tikz-qtree” pakkerne

emacs@D22689

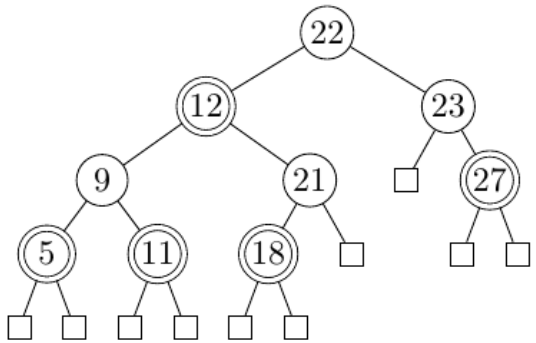
```
\question{Indsættelse i rød-sort træer, 4}

\begin{minipage}{\textwidth}
\begin{center}
\begin{tikzpicture}[baseline=(root.base)]
\Tree [.\node (root) {22}; [.\node[red]{12}; [.9 [.\node[red]{5}; {} {} ] [.\node[red
]{11}; {} {} ] ] [.21 [.\node[red]{18}; {} {} ] {} ] ] [.23 {} [.\node[red]{27}; {} {
} ] ] ]
\end{tikzpicture}%
\end{center}
Angiv det resulterende rød-sorte træ når man indsætter 13 i ovenstående rød-sorte træ
 (dobbeltcirkler angiver røde knuder).
\begin{center}
\begin{tabular}{t}{cccc}
\BOX & \bOx & \bOx & \bOx \\[0.5ex]
\scalebox{0.7}{%
{\tikzset{sibling distance=5pt,level distance=30pt}\begin{tikzpicture}[baseline=(root
.base)]
\Tree [.\node (root) {22}; [.\node[red]{12}; [.9 [.\node[red]{5}; {} {} ] [.\node[red
]{11}; {} {} ] ] [.18 [.\node[red]{13}; {} {} ] [.\node[red]{21}; {} {} ] ] ] [.23 {}
 [.\node[red]{27}; {} {} ] ] ]
\end{tikzpicture}%
}
}%
 & \scalebox{0.7}{%
{\tikzset{sibling distance=5pt,level distance=30pt}\begin{tikzpicture}[baseline=(root
.base)]
\Tree [.\node (root) {22}; [.\node[red]{12}; [.9 [.\node[red]{5}; {} {} ] [.\node[red
]{11}; {} {} ] ] [.21 [.\node[red]{18}; [.13 {} {} ] {} ] {} ] ] [.23 {} [.\node[red]
{27}; {} {} ] ] ]
\end{tikzpicture}%
}
}%
 & \scalebox{0.7}{%
{\tikzset{sibling distance=5pt,level distance=30pt}\begin{tikzpicture}[baseline=(root
.base)]
\Tree [.\node (root) {22}; [.\node[red]{12}; [.9 [.\node[red]{5}; {} {} ] [.\node[red
]{11}; {} {} ] ] [.21 [.\node[red]{18}; [.\node[red]{13}; {} {} ] {} ] {} ] ] [.23 {}
 [.\node[red]{27}; {} {} ] ] ]
\end{tikzpicture}%
}
}%
 & \scalebox{0.7}{%
{\tikzset{sibling distance=5pt,level distance=30pt}\begin{tikzpicture}[baseline=(root
.base)]
\Tree [.\node (root) {18}; [.\node[red]{9}; [.5 {} {} ] [.12 [.\node[red]{11}; {} {}
] [.\node[red]{13}; {} {} ] ] ] [.\node[red]{23}; [.22 [.\node[red]{21}; {} {} ] {} ]
 [.27 {} {} ] ] ]
\end{tikzpicture}%
}
}%

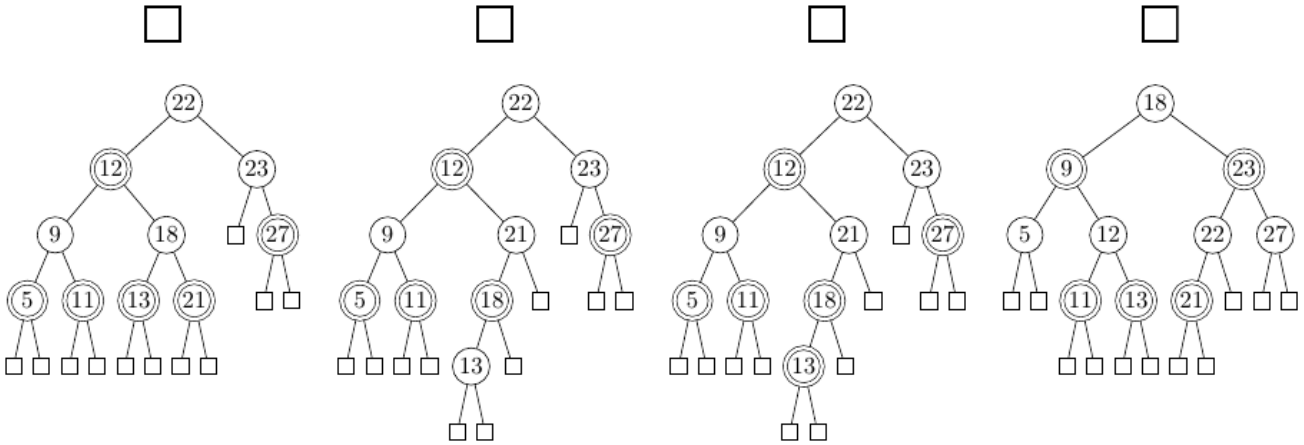
\end{tabular}%
\end{center}
\end{minipage}%
```

U\--- **ads20selftest.tex** 62% (4759,0) (LaTeX) 1:32 0.47

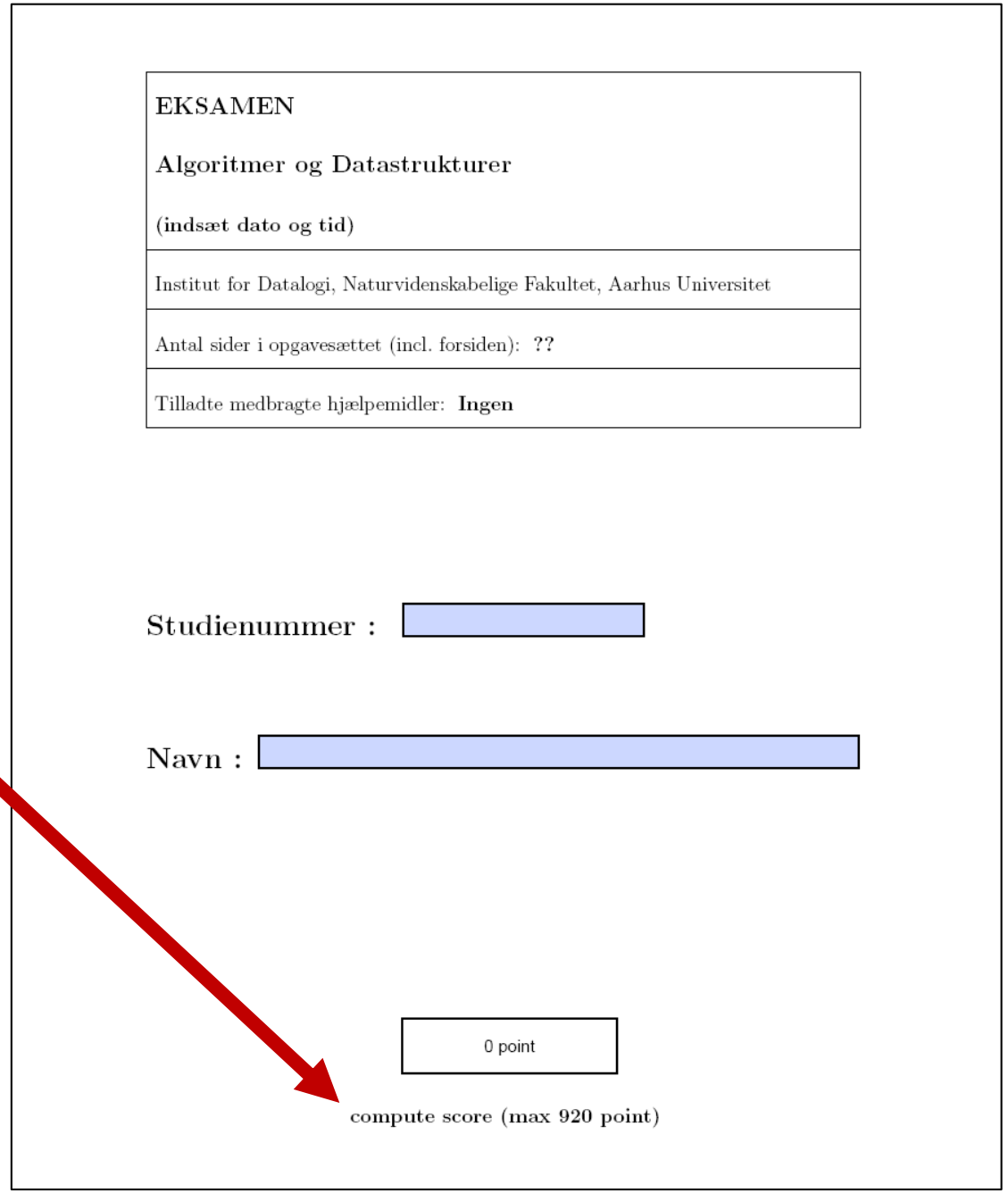
Opgave 121 (Indsættelse i rød-sort træer, 4 %)



Angiv det resulterende rød-sorte træ når man indsætter 13 i ovenstående rød-sorte træ (dobbeltcirkler angiver røde knuder).



PDF evaluering af point ?



EKSAMEN

Algoritmer og Datastrukturer

(indsæt dato og tid)

Institut for Datalogi, Naturvidenskabelige Fakultet, Aarhus Universitet

Antal sider i opgavesættet (incl. forsiden): ??

Tilladte medbragte hjælpemidler: **Ingen**

Studienummer :

Navn :

0 point

compute score (max 920 point)

emacs@D22689

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(Unix)--- **exam-questions-selftest-v0.1.pdf** Top (1,0) (Fundamental) 1:13

emacs@D22689

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" 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8,
.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8,
, 4.0, 4.0, 4.0, 4.0, 4.0, 4.0, 4.0, 4.0, 4.0, 4.0, 4.0, 4.0, 4.0, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8, 0.8,
0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0,
" 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0]; var options = "bbbb
```

emacs@D22689

```
var correct = "bababababbbaaaaabababbbabbaaaaababbbbabbbabbbbbbaababbabaaaaabbaaaabaababbaabbababaabbabbabbabababbbbabbb
abaaabaabababaebbacgahaaddebffehccfchcfbfdaghbhgbabbbfbadecgdeheechbccdhfgiaigcakfffdccjcfibcbhkhfgjhjacgbaegifkgghdcacci
jijbcdedaadbaedccebbebebbabdaeecbaaaaaaaaaaecbdeaabacdbbgicdcgcbeeigdaeaacgbbbccecfccjicaeacadhdaafcdhceidbebfddfkdhbeeeb
bfifdhhabkjabhahafjddegiihjfkdbgebdcdgeabahadjaaeebeeeiggcbfagbggdkdcbbgdhfkhjgjkaababaaabbbaababbaabbbabaaaababaabbaaaab
babbbaabbabaabccbcbcaacabddddaccdcfgeebcfbdegfbcefgfagcbdfageedbfefdeabcbeegfbgdgbdcdcbdbababaaaaaaabababaabaabbaaaabbaabba
aaabaabaabbaabbaaabbbbadcbbcdacadcbdbcadbcdabddcbadacbddcbadcadcbdbacdcbddacbaacbaccadcabcbabbbabbaabababbbababaabbabaaba
bbbbabbbabbaabababbbafbcehfdedbggggddhffhhhhhhhaaacggggbdddddddddddaaaaaaaabddddddddhbbbbbbbbbhhhhebbbb";
var score = 0;
var a = "a".charCodeAt(0);
for (var i = 0; i < exercises.length; i++) {
    var k = options.charCodeAt(i) - a + 1;
    var answer = exercises[i] + correct[i];
    var selected = [];
    for (var j = 0; j < k; j++) {
        var name = exercises[i] + String.fromCharCode(a + j);
        var box = this.getField(name);
        if (box.value == "Yes") selected.push(name);
        box.borderColor = ["RGB", 0, 0, 0];
        box.borderWidth = 1;
    }
    if (selected.length == 1) {
        var box = this.getField(selected[0]);
        box.borderWidth = 3;
        if (selected[0] == answer) {
            box.borderColor = ["RGB", 0.537, 0.776, 0];
            score += weight[i];
        } else {
            box.borderColor = ["RGB", 0.776, 0.230, 0];
            score -= weight[i] / (k - 1);
        }
    }
}
this.getField("score").value = String(Math.round(score * 100) / 100).concat("\ point");
```

1\--- **evaluation.js** Bot (4,0) (JavaScript) 1:22 0.76

Wrote c:/Users/au121/Desktop/ExamGenerator/evaluation.js

Efterår 2019

Kan man autogenerere en ADS Eksamen ?

Ja - delvis