

IT-understøttet færdighedstræning i matematikundervisningen

Bjørk Hammer

Institut for Fysik og Astronomi, AU

Baggrund:

På senere år i fysik- og nanoscience-uddannelserne ses de studerende at have “glemt” basale kundskaber fra gymnasiet og 1. årsundervisningen i matematik, “Calculus I og II”

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Baggrund:

Løs med hensyn til x ligningen:

$$\frac{a}{c} + \frac{b}{x} = 1$$

$$x = \frac{a}{c} + b$$
A photograph of a piece of paper with handwritten text. It shows the equation x = a/c + b. The fraction a/c is written with a horizontal line over 'a' and 'c' below it. There is a plus sign and the letter 'b'. To the right of the equation, there is a red curved line and a red comma.

Baggrund (Kvantemekanik 2013)



Gør opmærksom på problemet i uge 2

Kan ikke se at de studerende har forbedret sig i uge 7.

Manglende selvdisciplin eller værktøjer?

Baggrund – KU's analyse

POLITIKEN ≡ SEKTIONER | Q SØG | ♥ DIT POLITIKEN | MERE ▾

DANMARK

Samfund Politik Uddannelse Undervisningsprisen Skyggekabinetet

UDDANNELSE 9. JAN. 2014 KL. 09.51

Lektor: **Steen Laugesen Hansen** Universitetsstuderende kan ikke regne

Umotiverede studerende fylder op på universiteterne, mener lektor.



UD MED TREDJEDELEN - I omegnen af 33 procent af de unge der sluses ind på dyrlægestudiet, bør finde andre græsgange. Forældrene, skolen, internettet og universitetsledelsen deler ansvaret for deres akademiske dumpniveau.

Billede: Polfoto

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Træning

Hvis skulle løbe 10 km på 1 time...

- Få instruktion (rigtige sko, hæl/tå nedslag...)
- Gentage træningssessioner
- Differentieret tidsforbrug
 - god form = lille indsats
 - dårlig form = stor indsats
- Langtidsvirkning



Træning

Hvis skulle ~~løbe 10 km på 1 time...~~

blive god til matematik

- Få instruktion (~~rigtige sko, hæl/tå nedslag...~~)

videoforelæsninger

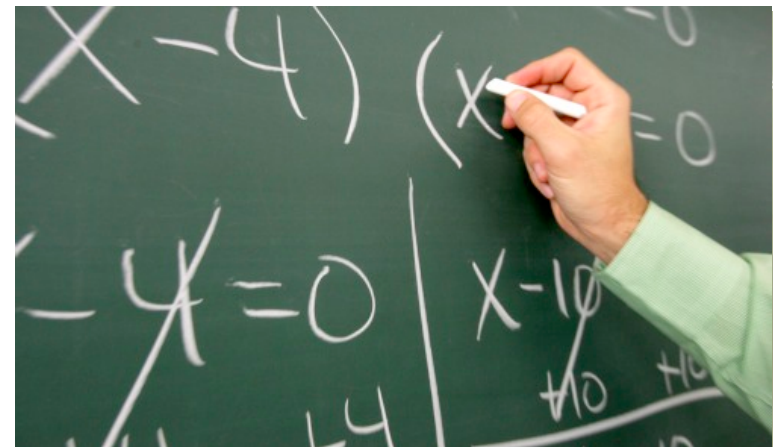
- Gentage træningssessioner

multiple-choice quizzes

- Differentieret tidsforbrug

- god ~~form~~ = lille indsats
 - dårlig ~~form~~ = stor indsats

- Langtidsvirkning



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Hvordan ser grafen for $f(x)$ ud?

$$f(x) = (-x - 4)(x - 4)$$

$f(x)$

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$f(x)$

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-1

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$f(x)$

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-3

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x

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Hvordan ser grafen for $f(x)$ ud?

$f(x) = -x(x + 2)$

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Hvordan ser grafen for $f(x)$ ud?

$$f(x) = -\frac{x^3}{2}$$

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Hvordan ser grafen for $f(x)$ ud?

$f(x) = x(x + 2)$

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may choose one or sometimes more answers

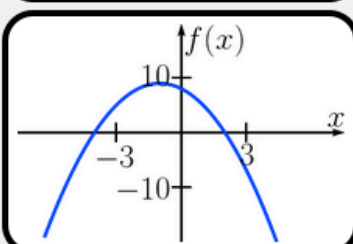
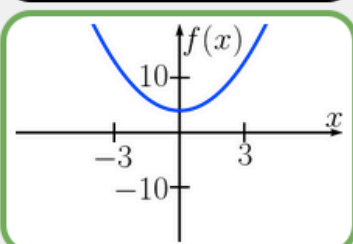
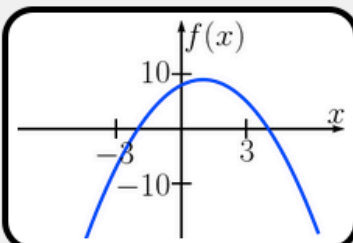
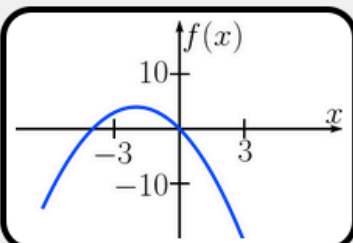
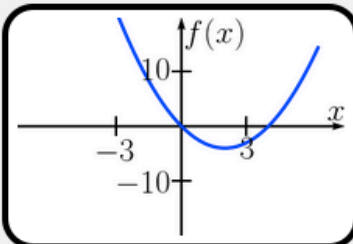
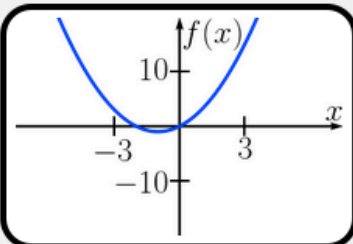
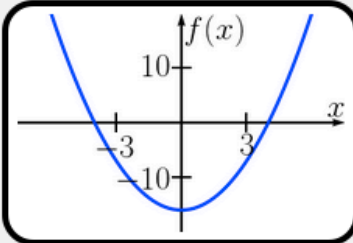
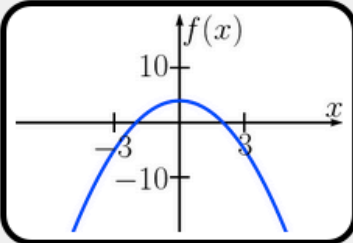
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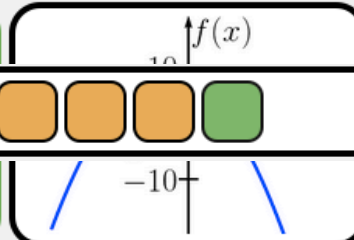
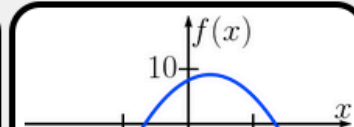
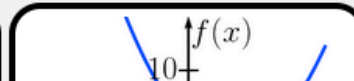
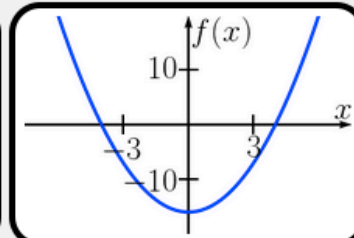
Hvordan ser grafen for $f(x)$ ud?

$$f(x) = x^2 + 4$$

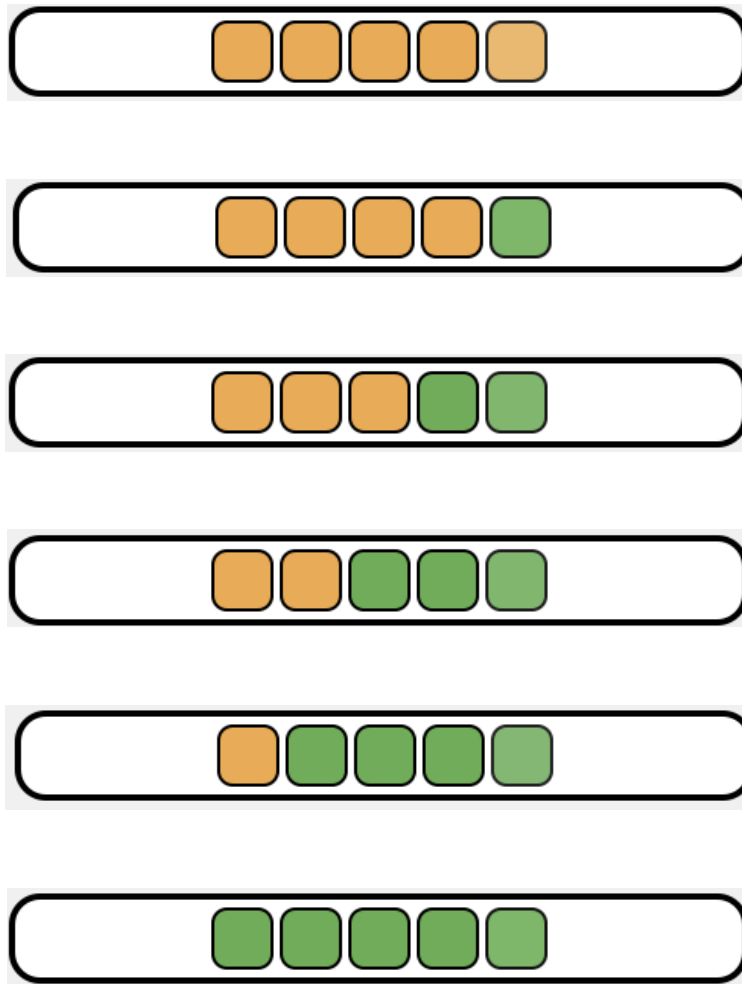


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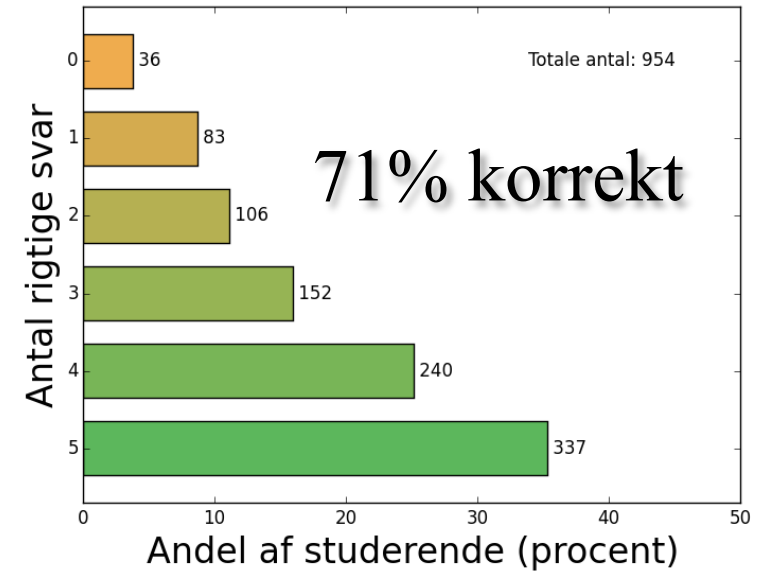
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$$f(x) = x^2 + 4$$


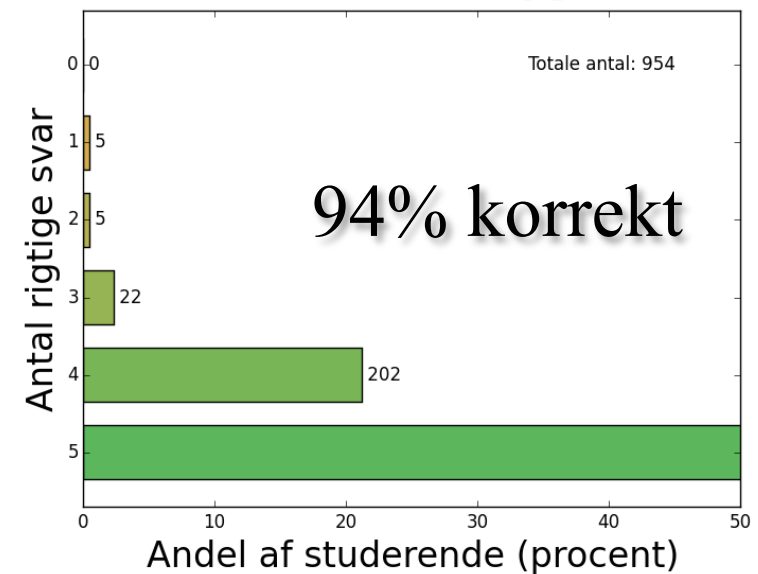
1. undervisningsuge/Calculus I



Første sådanne 5 opgaver

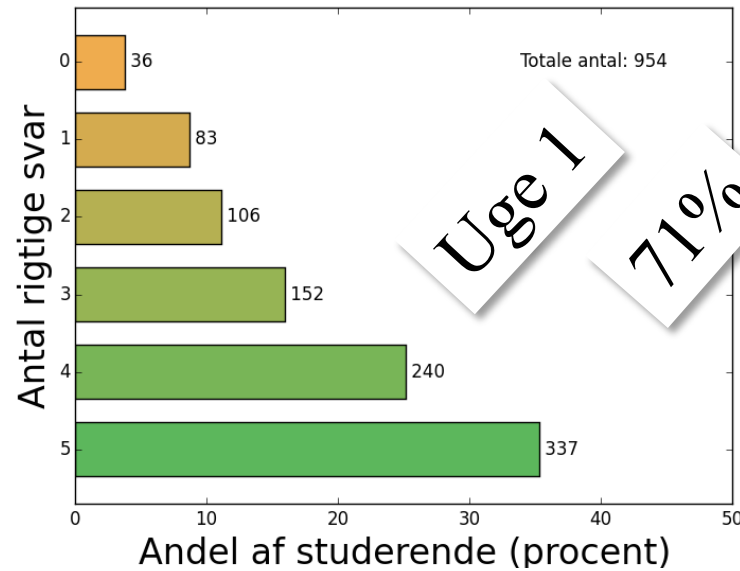


Sidste sådanne 5 opgaver

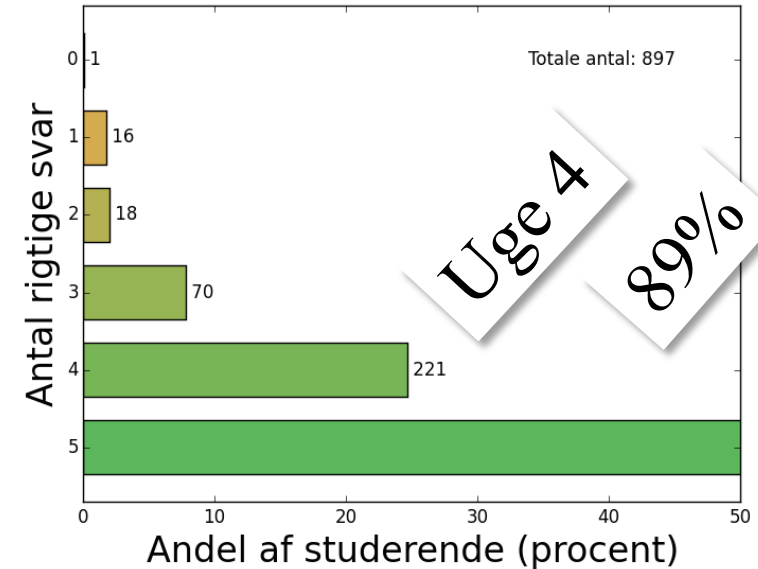


1. og 4. undervisningsuge/Calculus I

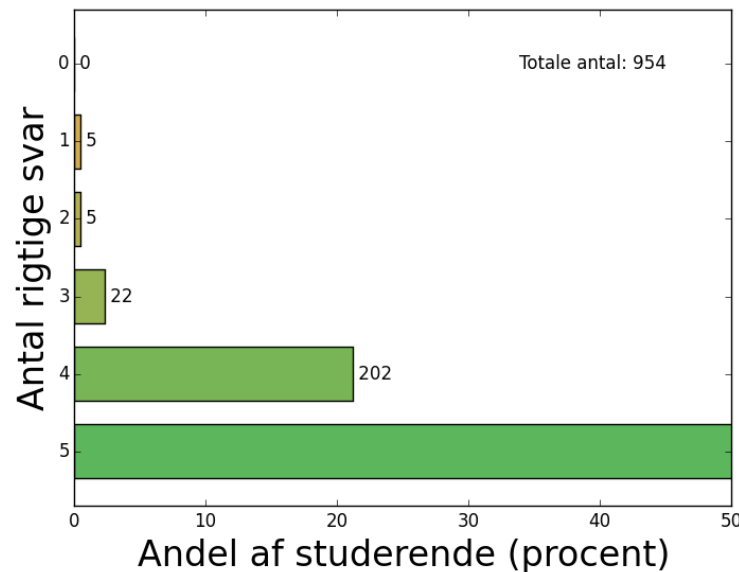
Første sådanne 5 opgaver



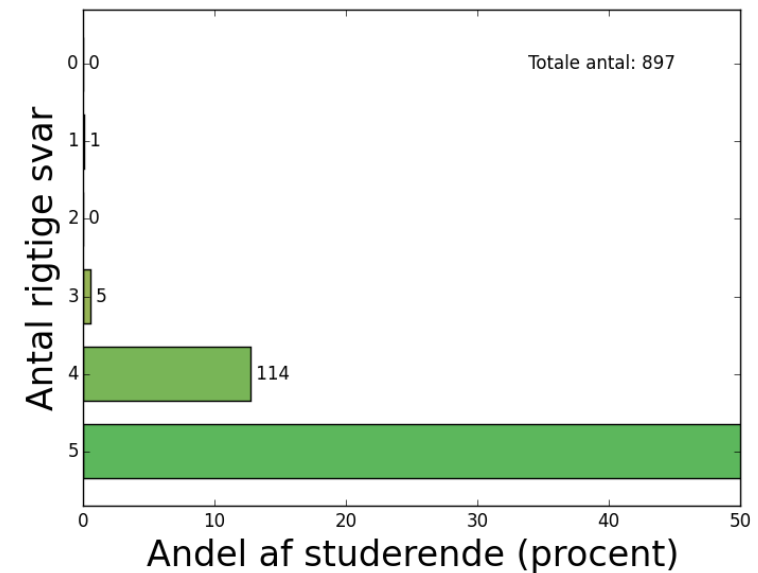
Første sådanne 5 opgaver



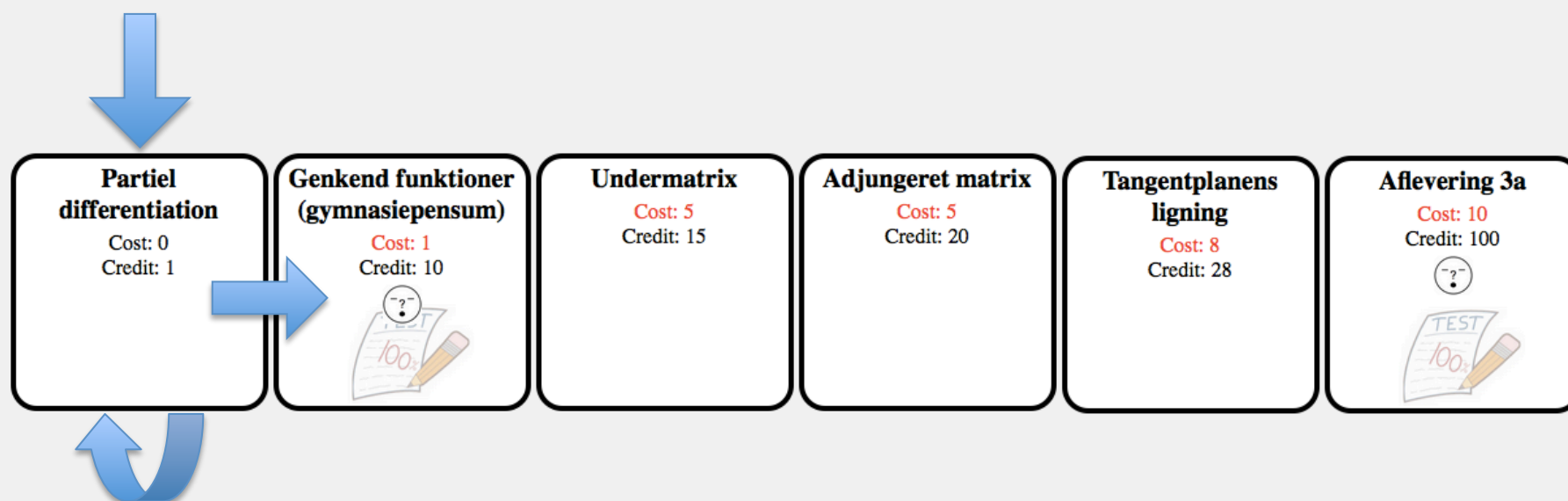
Sidste sådanne 5 opgaver



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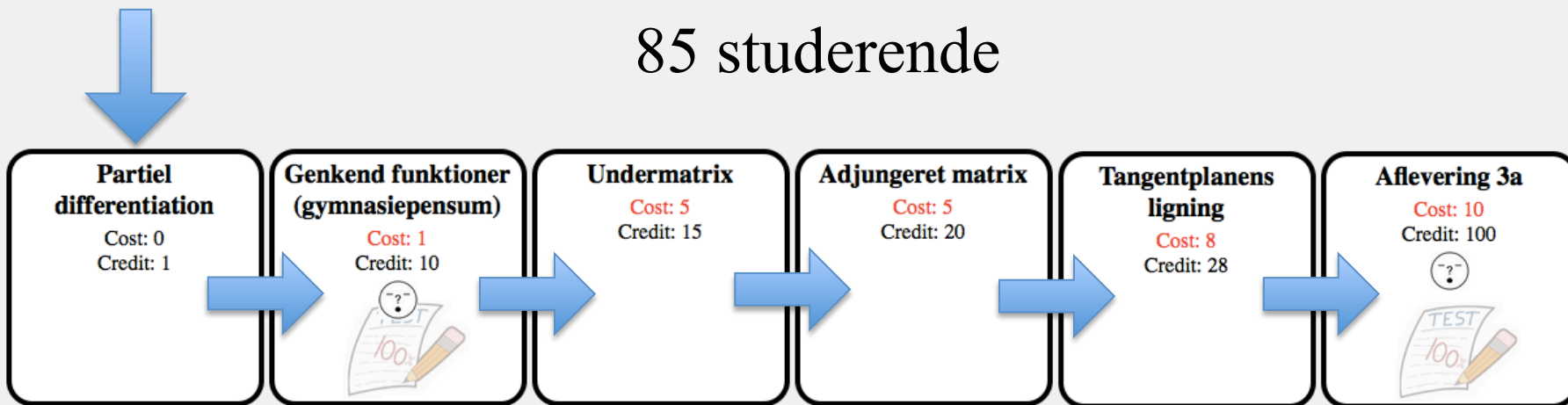


Differentieret undervisning

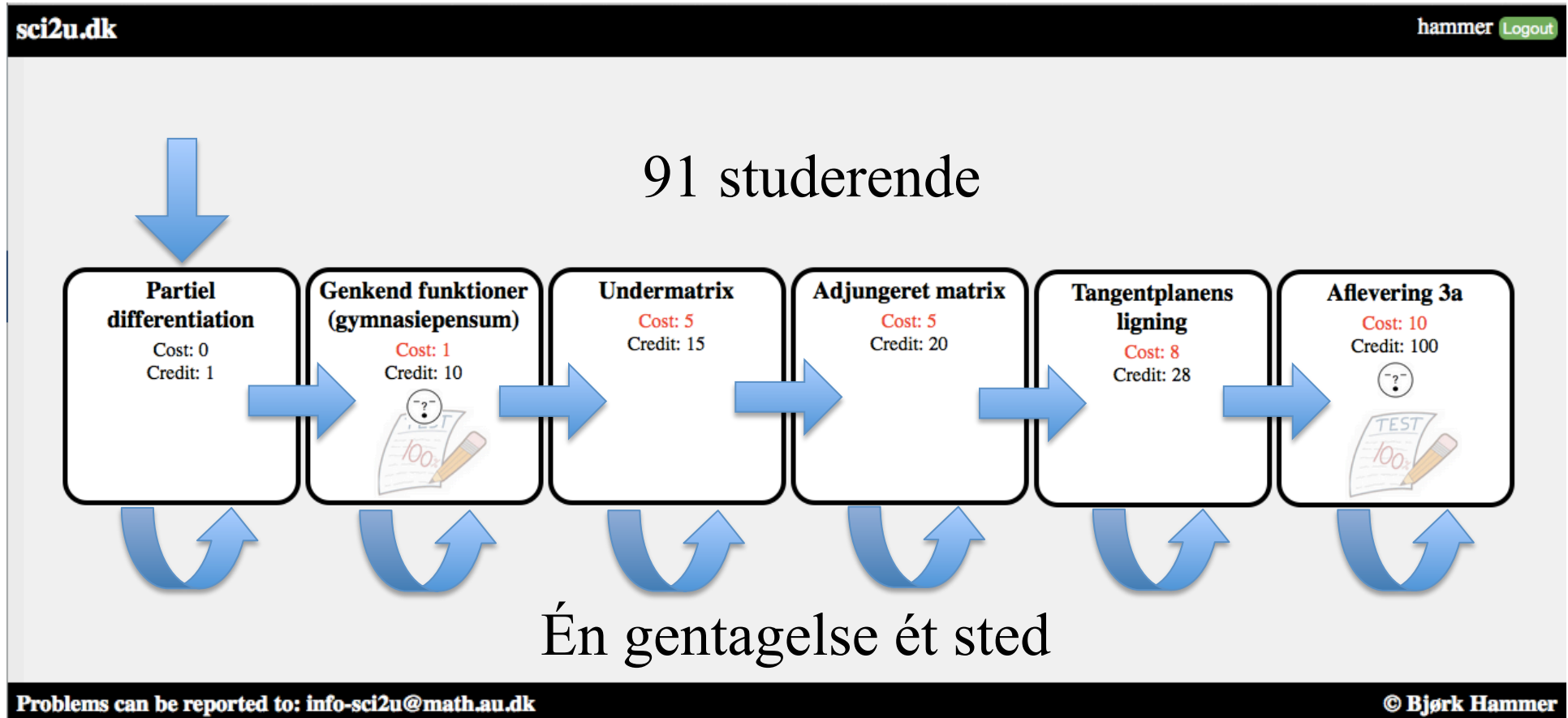


Differentieret undervisning for 911 studerende

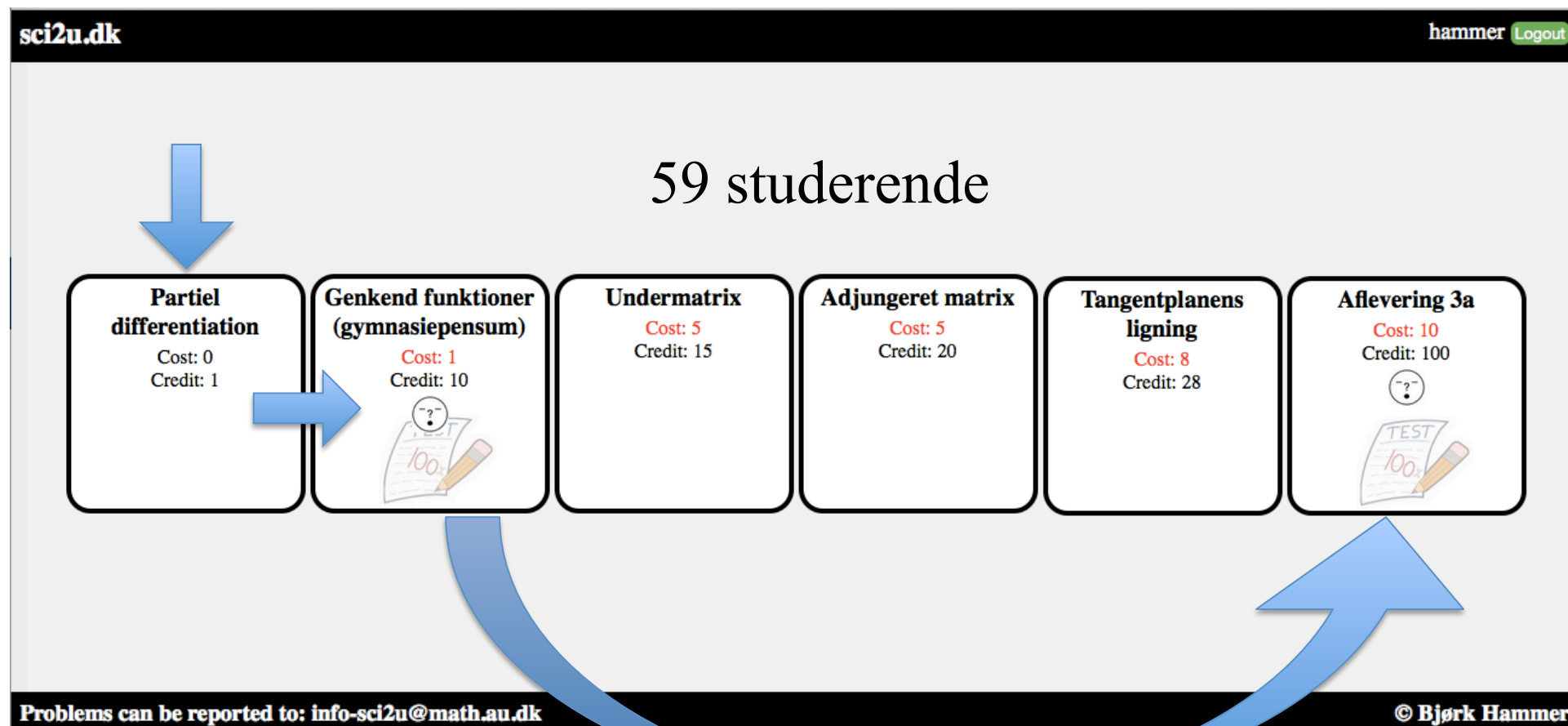
85 studerende



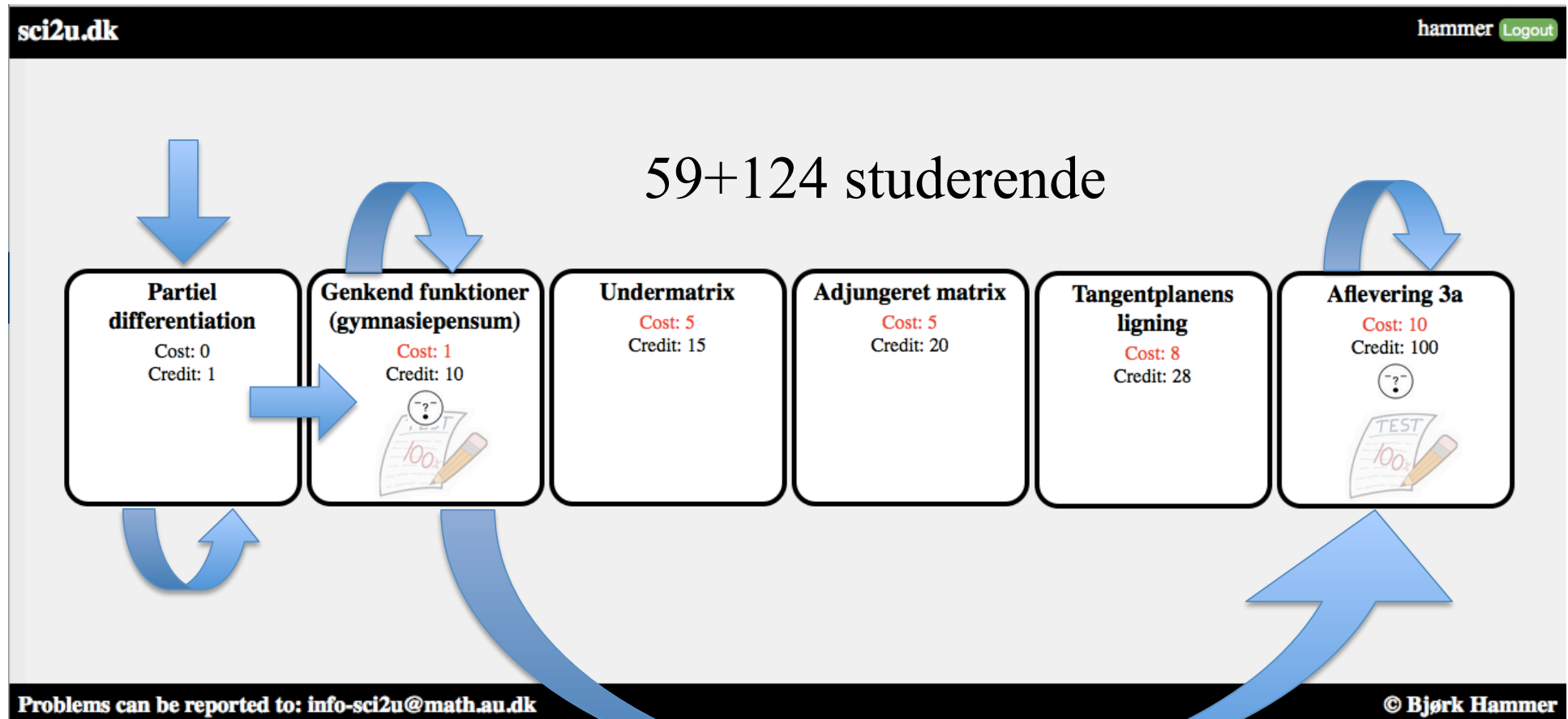
Differentieret undervisning for 911 studerende



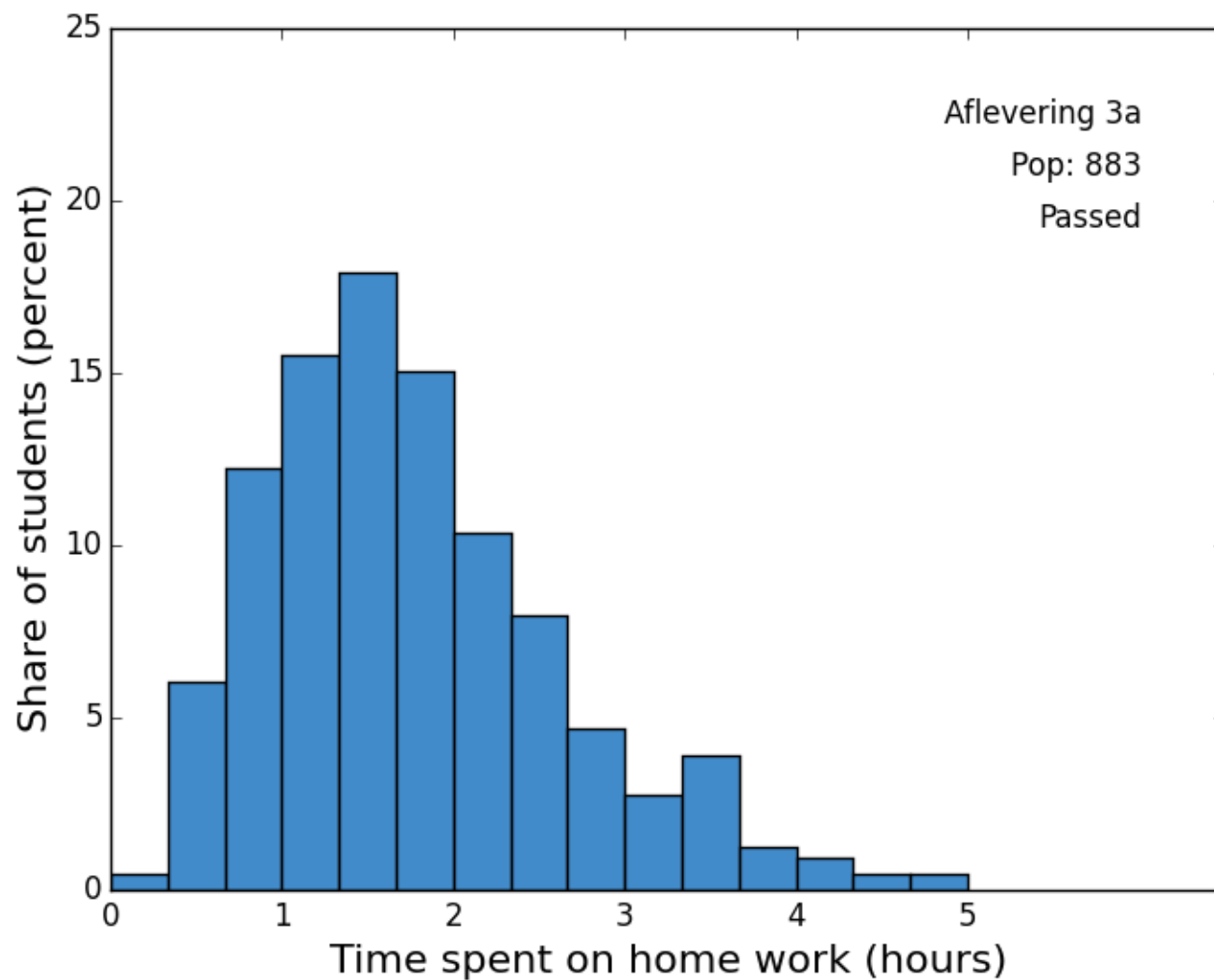
Differentieret undervisning for 911 studerende



Differentieret undervisning for 911 studerende

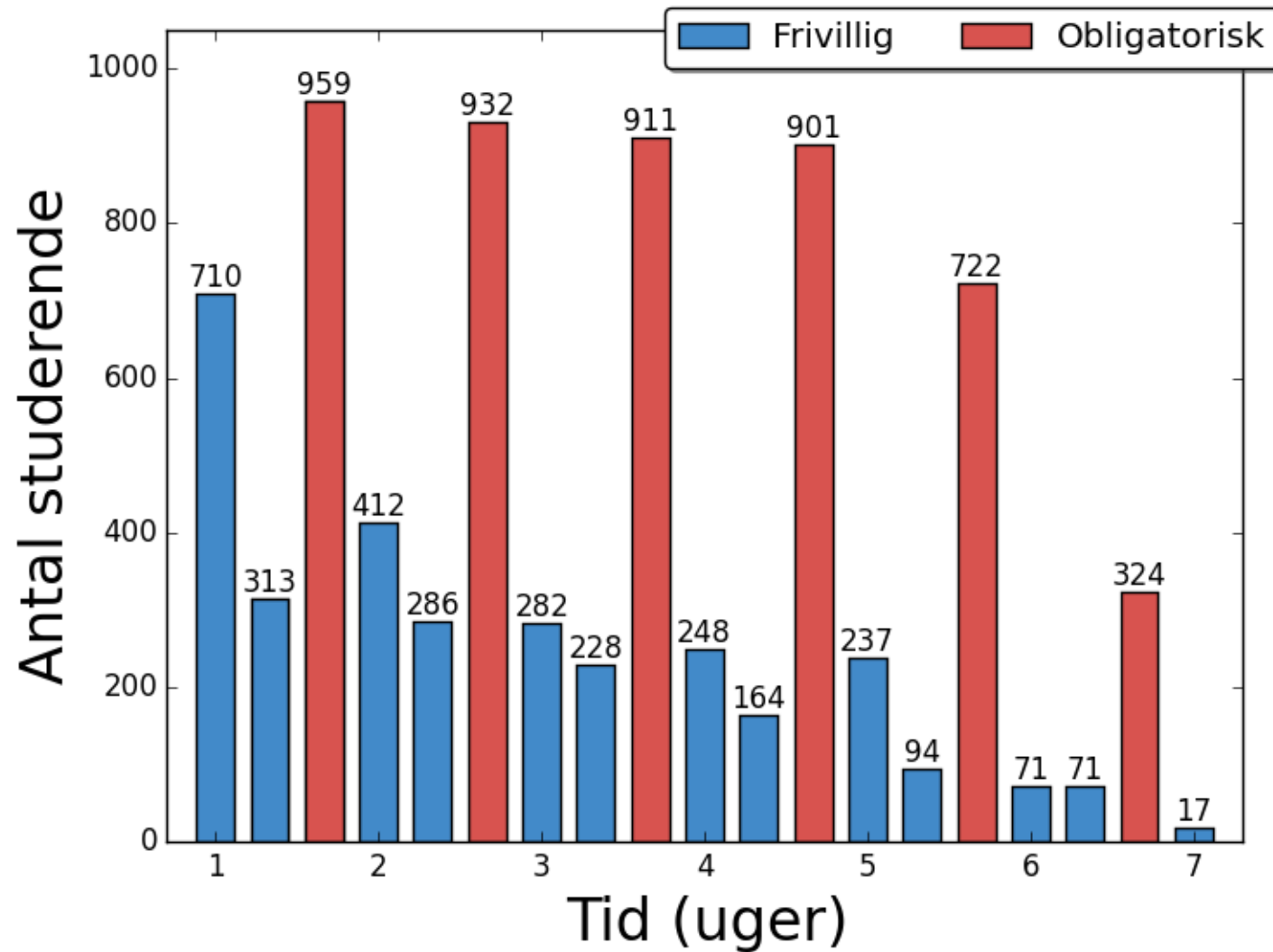


Tidsforbruget for obligatorisk opgave



Calculus I, efterår 2015: Fælles for alle ST uddannelsesret.

Skal være obligatorisk



Calculus I, efterår 2015: Fælles for alle ST uddannelsesret.

Konklusion

De studerende:

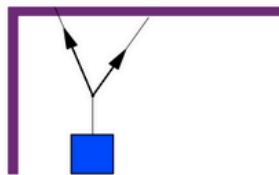
- mangler en del færdigheder
- kan “trænes” i det manglende
- forholder sig primært til obligatoriske undervisningselementer

Fremtidsplaner: mere indhold

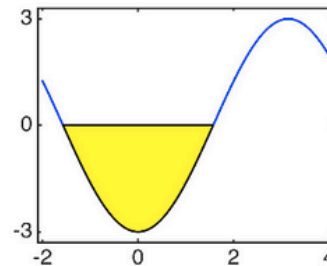
A box weighing 8 N is hanging in two ropes with tensions:

$$\vec{s}_1 = \begin{bmatrix} \gamma \text{ N} \\ 5 \text{ N} \end{bmatrix}, \vec{s}_2 = \begin{bmatrix} 2 \text{ N} \\ 3 \text{ N} \end{bmatrix}$$

Where γ assumes the value required for the box being at rest. What is γ (in N) ?



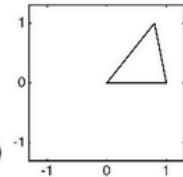
What code would you write to evaluate the area of the yellow object?



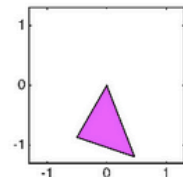
Given:

```
P=[0,1,0.8; 0,0,1];
```

```
fill(P(1,:),P(2,:), 'w')
```



ing at ?? to get this plot:



$\cos(t)$

the curve.

ite at ???

[9 m/

= 2 m t

time pas

```
f=@(t,y) 0.9*y^2*cos(t);
```

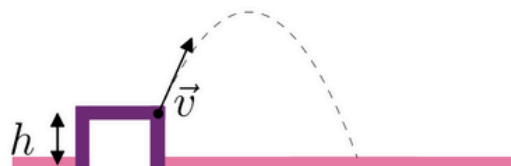
```
[t,y]=ode45(f,???)
```

```
plot(t,y,'- ',t(1),y(1),'g.')
```

```
hold on; plot(t(end),y(end),'r.')
```

before the projectile

ground ? Use $g = 10 \text{ m/s}^2$



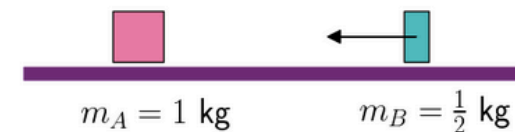
um conserva-

the relative

Use m/s for v 's.

$v_{Ai} = 0 \text{ m/s}$

$v_{Bi} = -3 \text{ m/s}$



$m_A = 1 \text{ kg}$

$m_B = \frac{1}{2} \text{ kg}$