

Velkommen!

Statistikk for ingeniører

Digital plenumstime UKE 6

Vi starter klokka 15:15

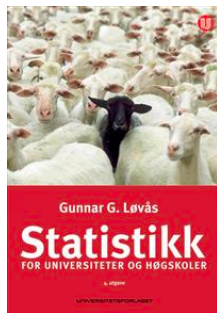
Du kan skrive inn spørsmål direkte til oss i chat!

Vi skal også bruke studentresponssystemet **Mentimeter** i dag.

Det blir gjort opptak av denne timen :)

Thea Bjørnland, Institutt for matematisk fag, NTNU (Trondheim)

Uke 6: Normalfordelingen og sentralgrenseteoremet



**Pensum i
læreboka:
Kapittel 5.7
og 5.8**

Mandag
15.15-16.00

temavideoer
(ca 3 x 15 min)

digital
plenumstime

campus-
forelesning

STACK-øving

Normalfordelingen

Thea Bjørnland
Institutt for matematiske fag
NTNU

7:52

Lineærtransformasjoner og standard normalfordeling

Thea Bjørnland
Institutt for matematiske fag
NTNU

13:07

Lineærkombinasjoner og sentralgrenseteoremet

Thea Bjørnland
Institutt for matematiske fag
NTNU

9:28

Kritiske verdier i normalfordelingen

Thea Bjørnland
Institutt for matematiske fag
NTNU

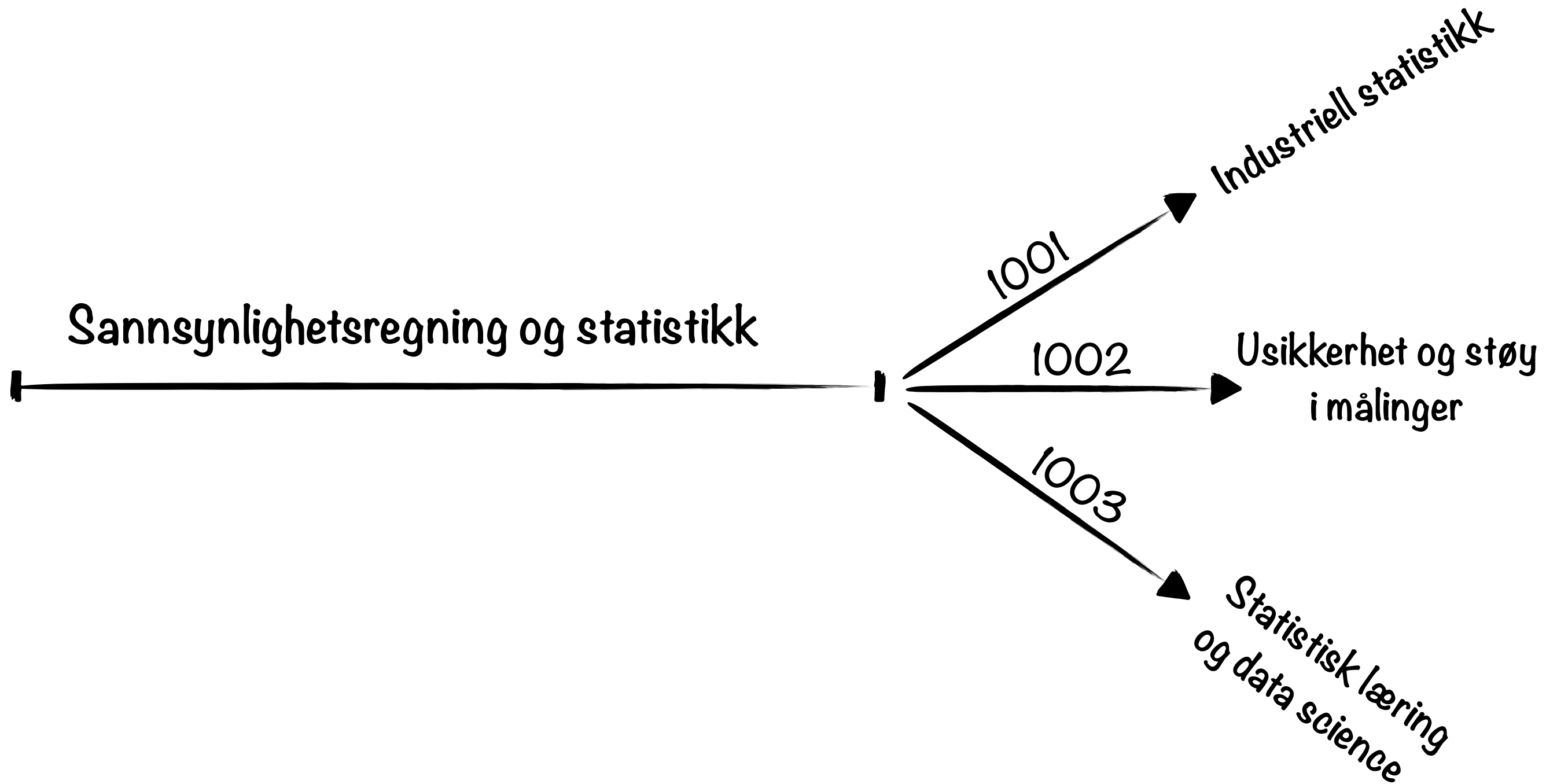
5:32

Hvor er vi nå? Og hvor skal vi?

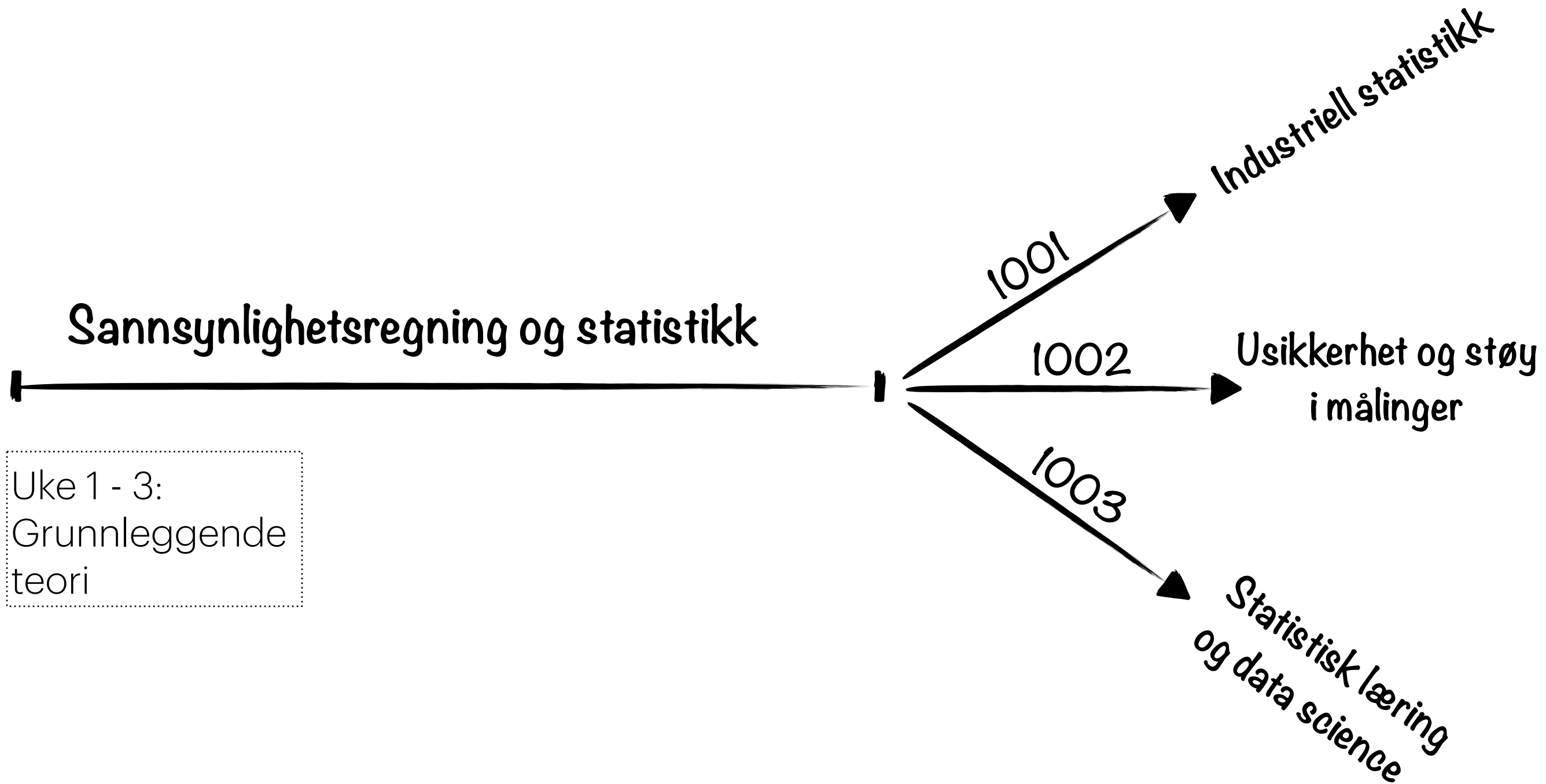
Sannsynlighetsregning og statistikk



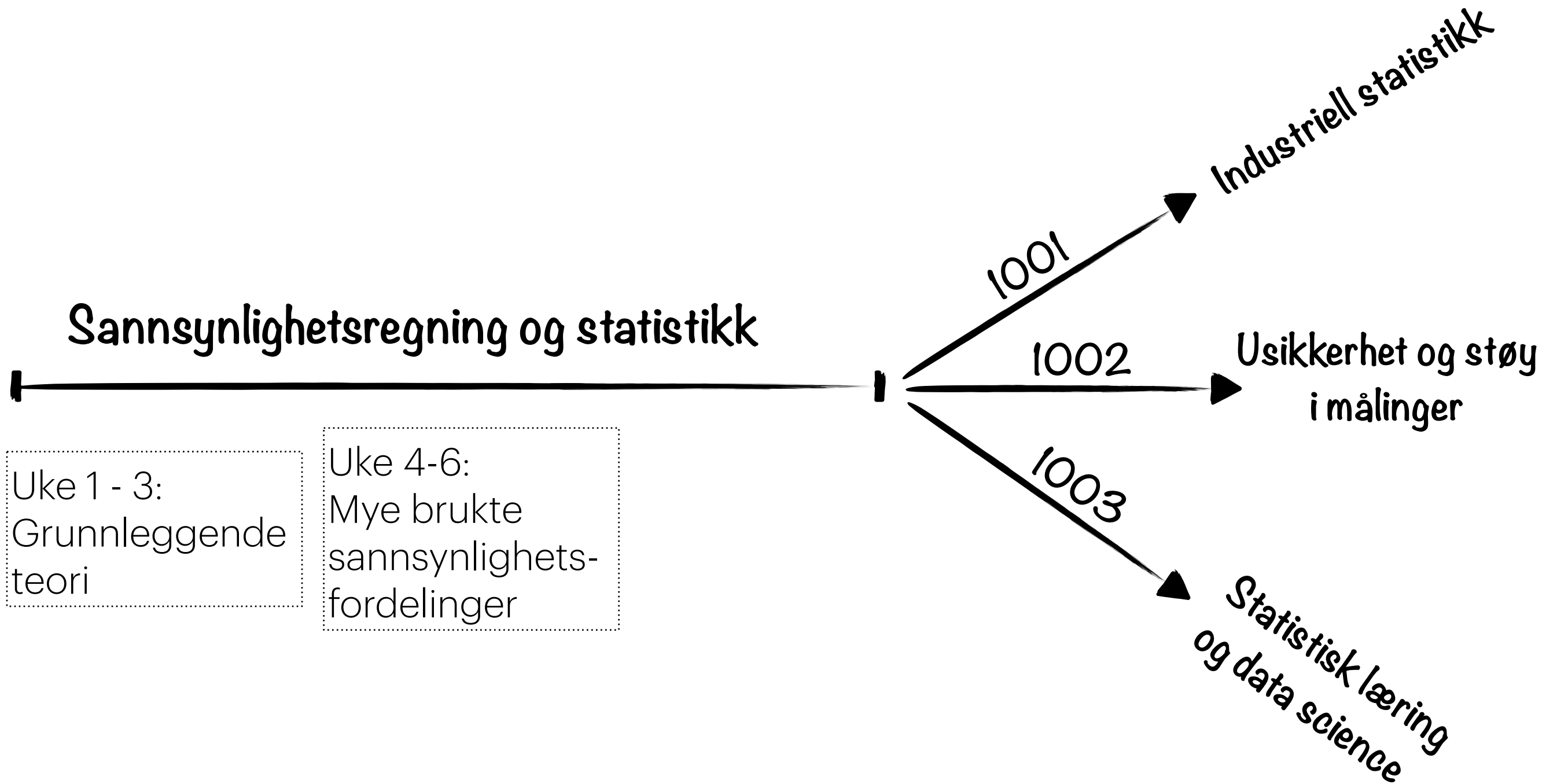
Hvor er vi nå? Og hvor skal vi?



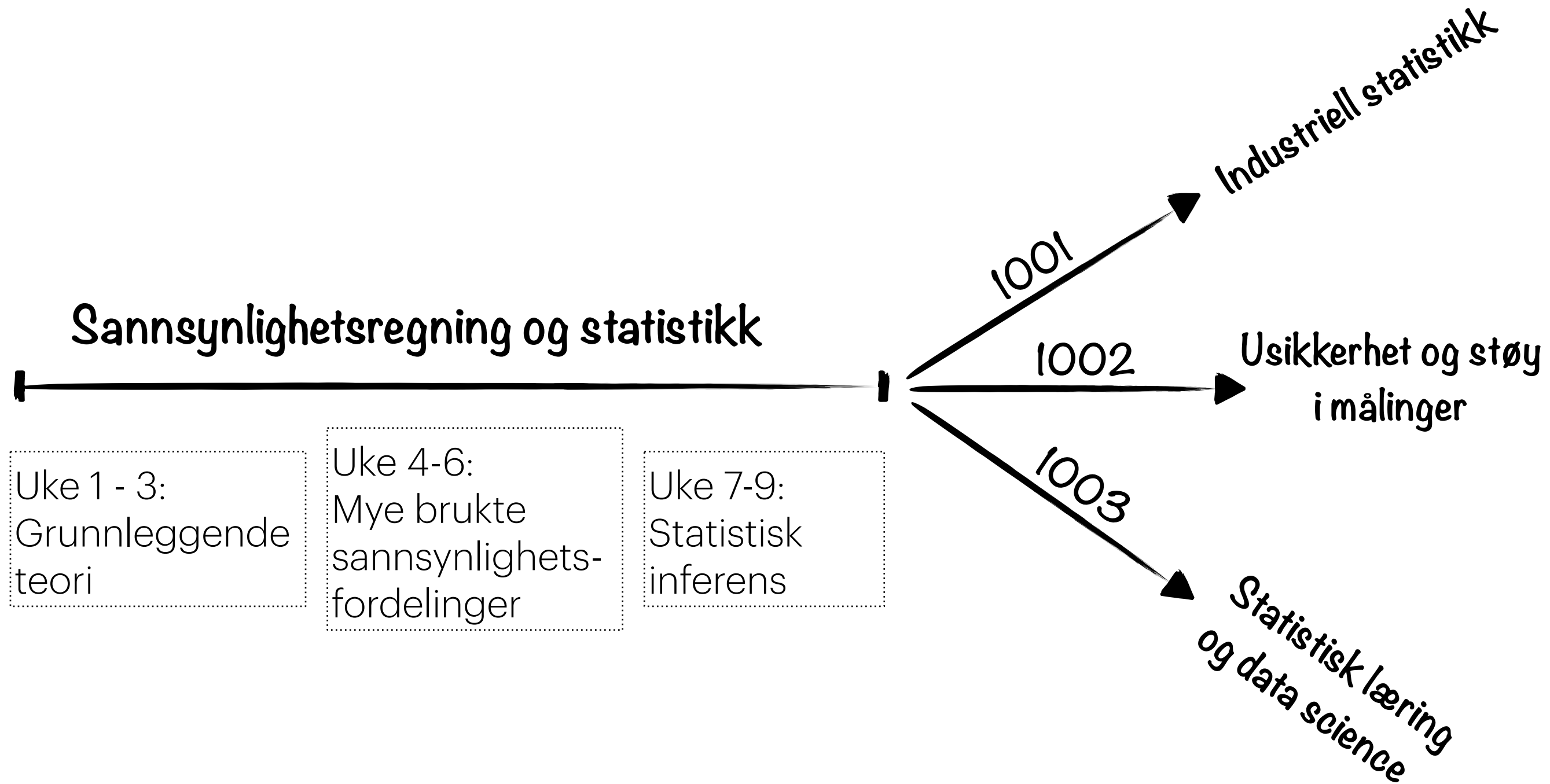
Hvor er vi nå? Og hvor skal vi?



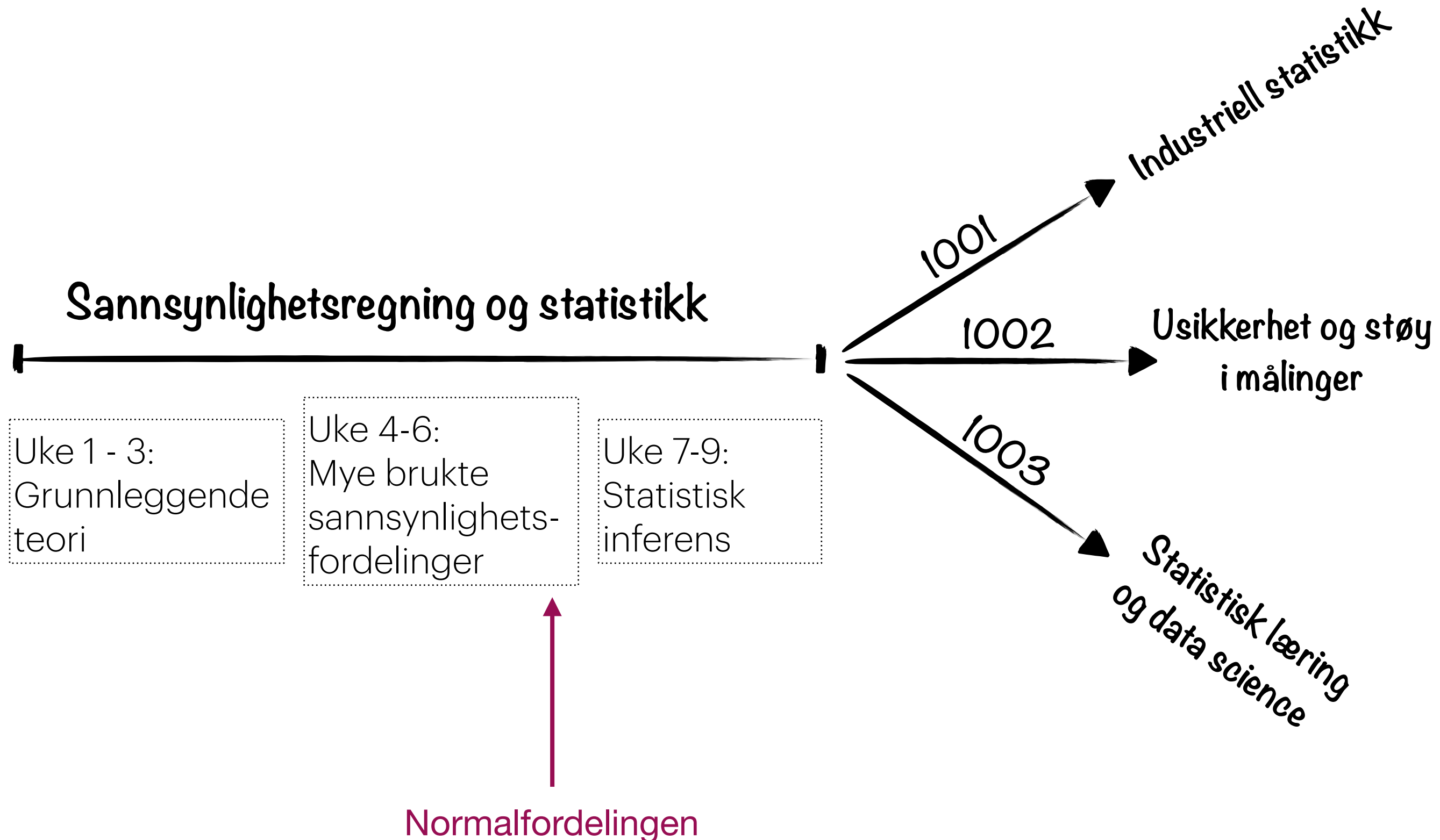
Hvor er vi nå? Og hvor skal vi?



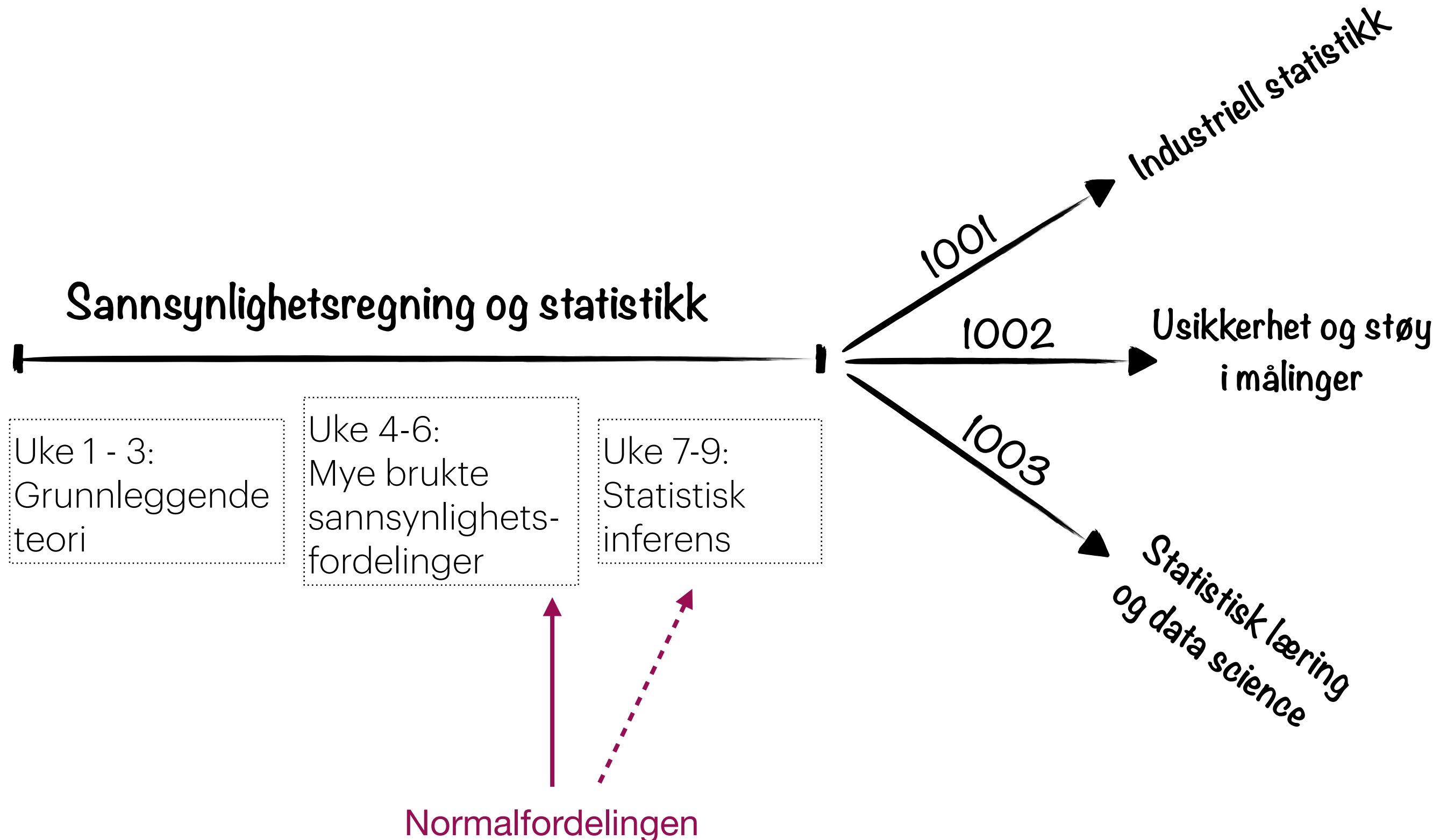
Hvor er vi nå? Og hvor skal vi?



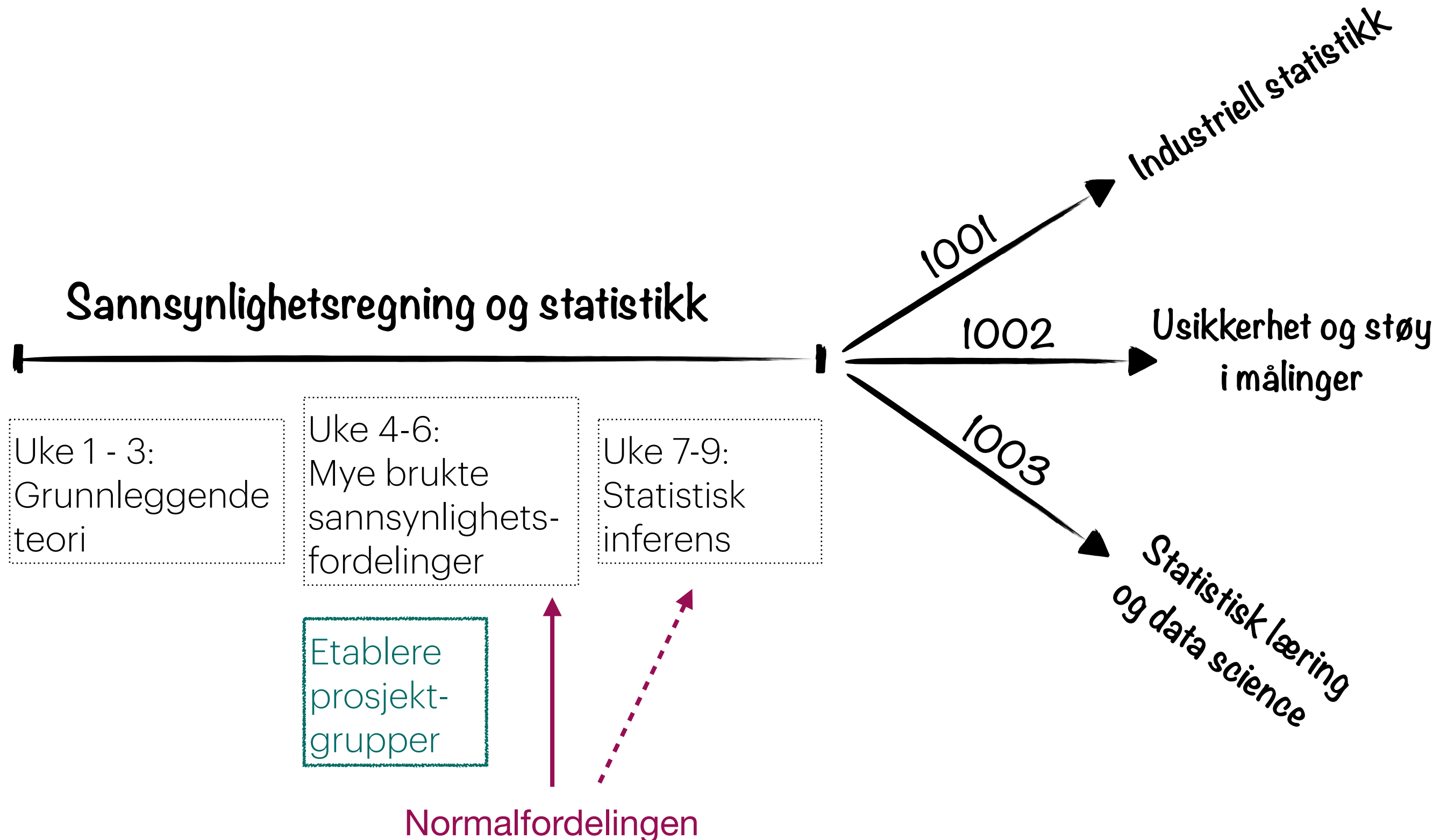
Hvor er vi nå? Og hvor skal vi?



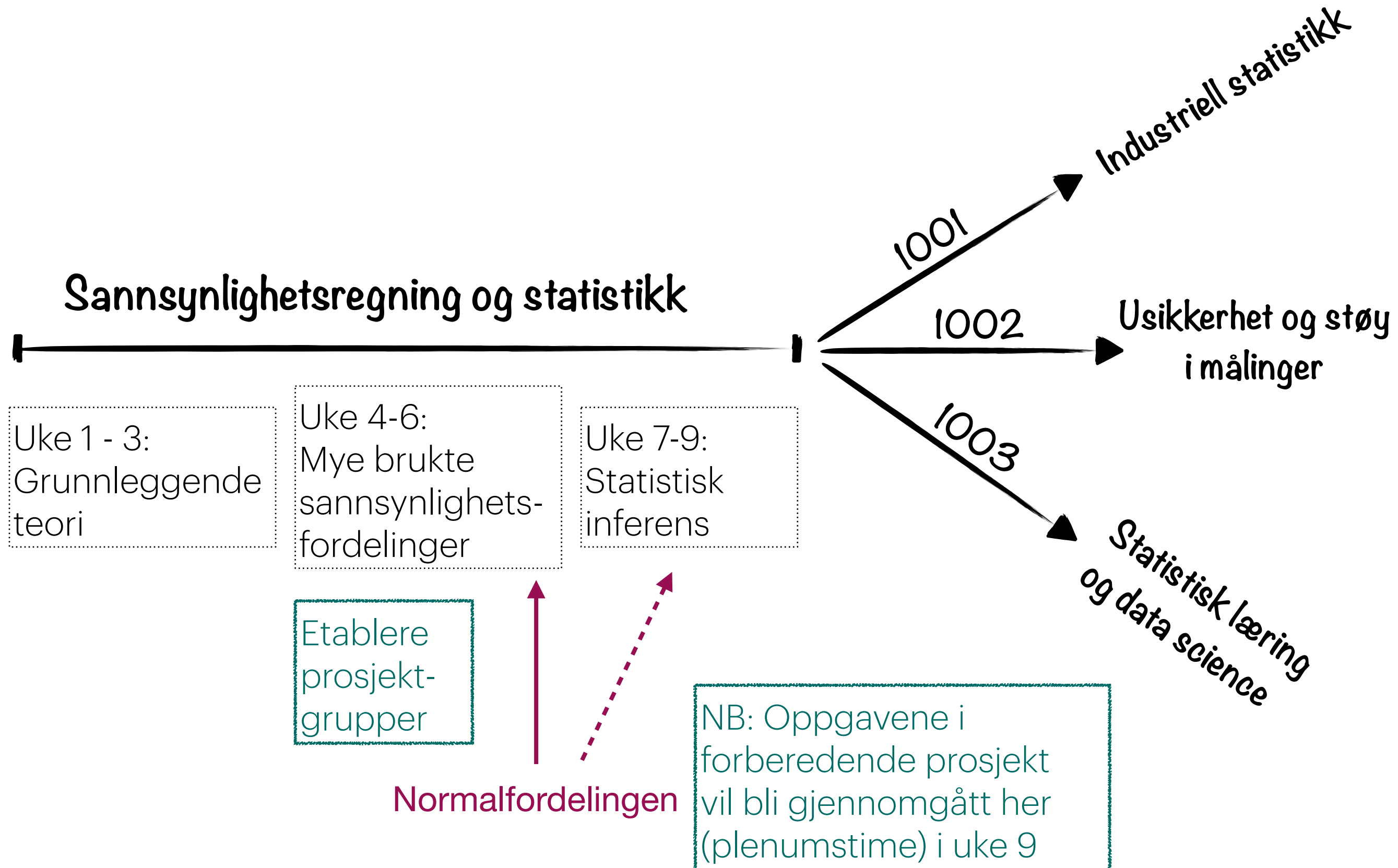
Hvor er vi nå? Og hvor skal vi?



Hvor er vi nå? Og hvor skal vi?

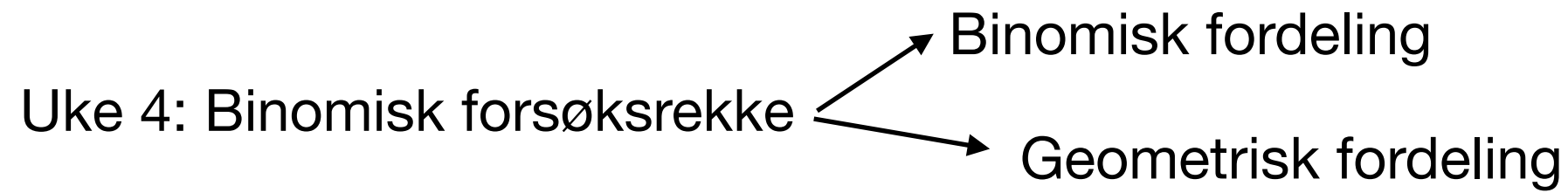


Hvor er vi nå? Og hvor skal vi?

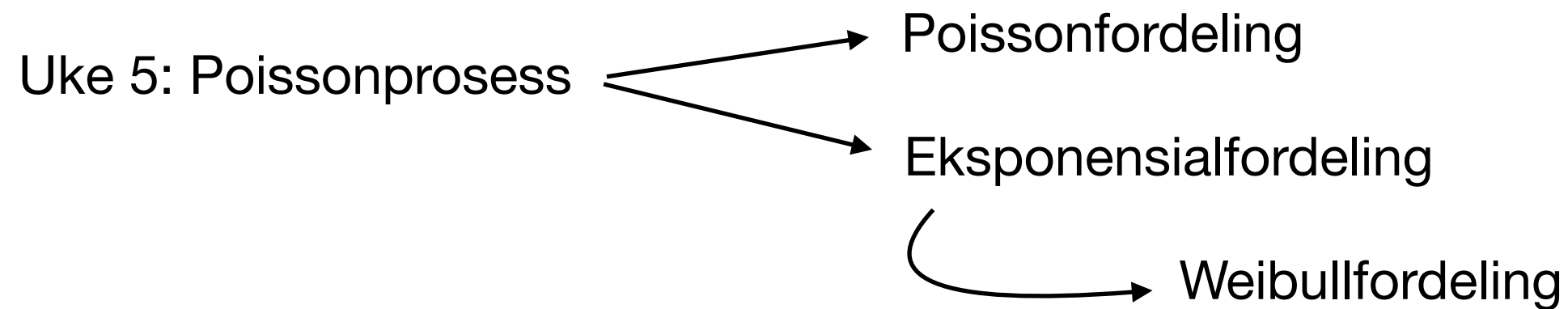
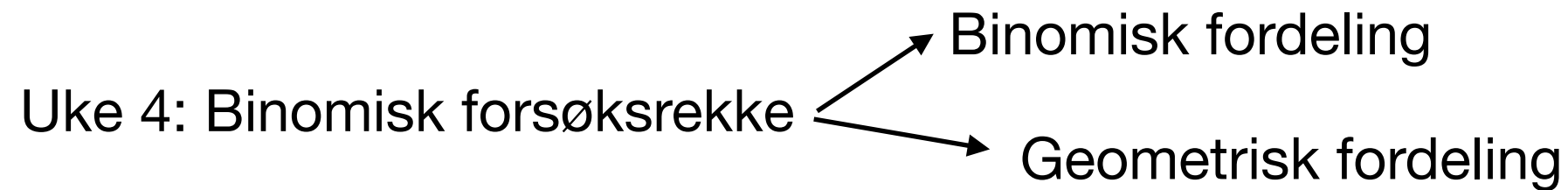


Uke 4-6: Fordelinger

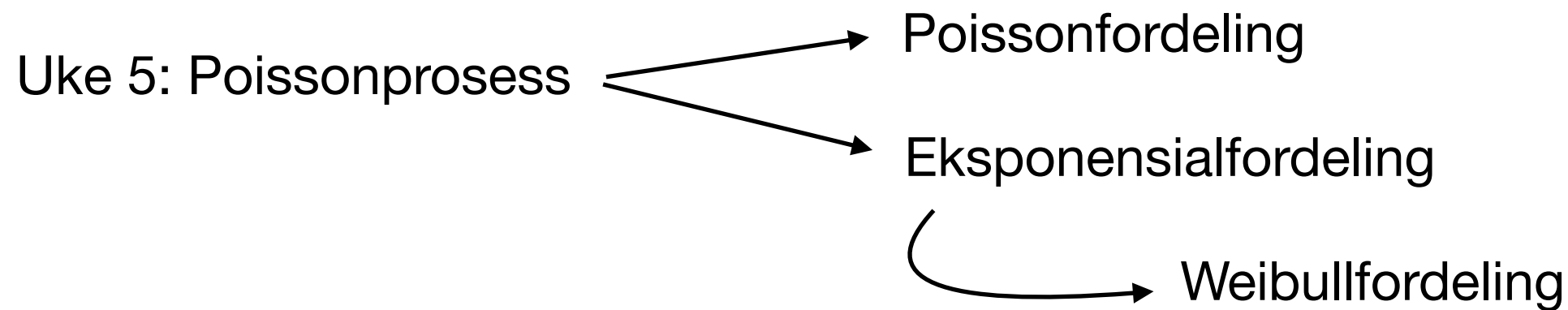
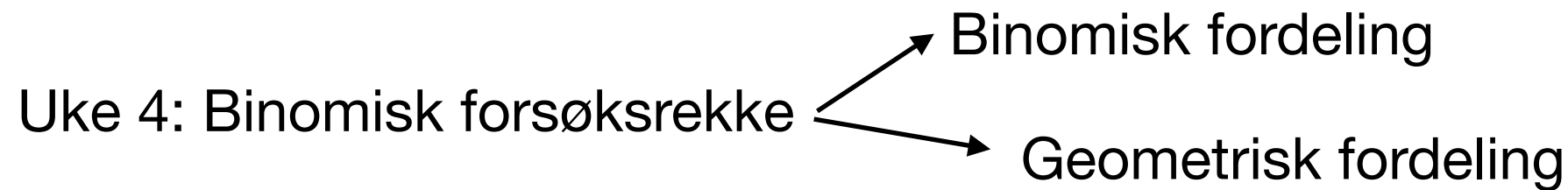
Uke 4-6: Fordelinger



Uke 4-6: Fordelinger

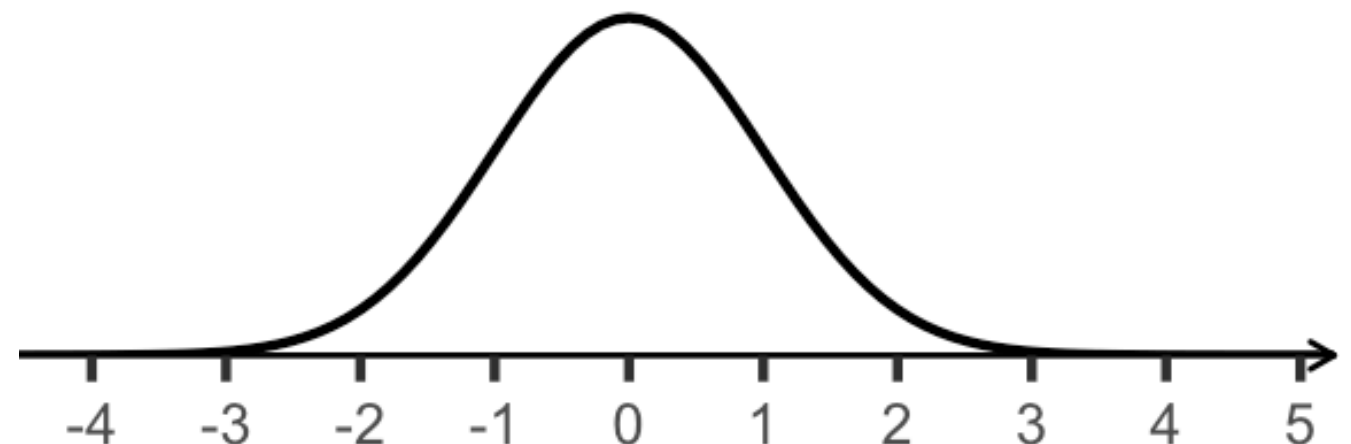


Uke 4-6: Fordelinger



Uke 6: Normalfordelingen

- Målefeil for et vanlig måleinstrument
- Fysiske størrelser (høyde, vekt, osv)
- Boligpriser til leiligheter
- osv osv



normalfordeling

[Store norske leksikon](#) / [Realfag](#) / [Matematikk](#) / [Sannsynlighet og statistikk](#) / [Sannsynlighetsteori](#)

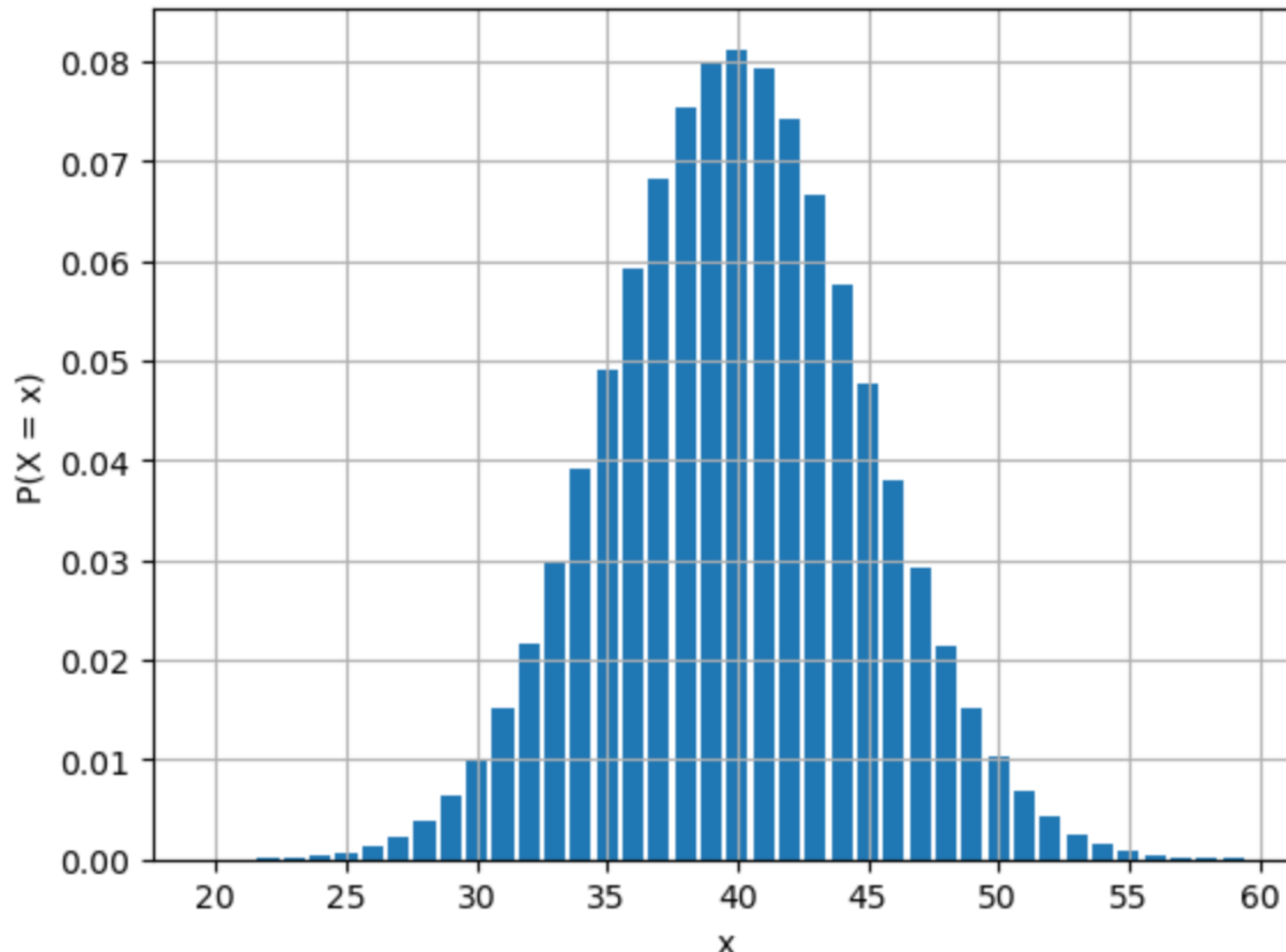
Normalfordeling er en [sannsynlighetsfordeling](#) som blir mye brukt i [matematisk statistikk](#). Grunnen er dels at visse typer av observerte data er tilnærmet normalfordelt, og dels at normalfordelingen opptrer som grensefordeling for en rekke andre typer fordelinger.

Eks 1: Normaltilnærming til binomisk fordeling

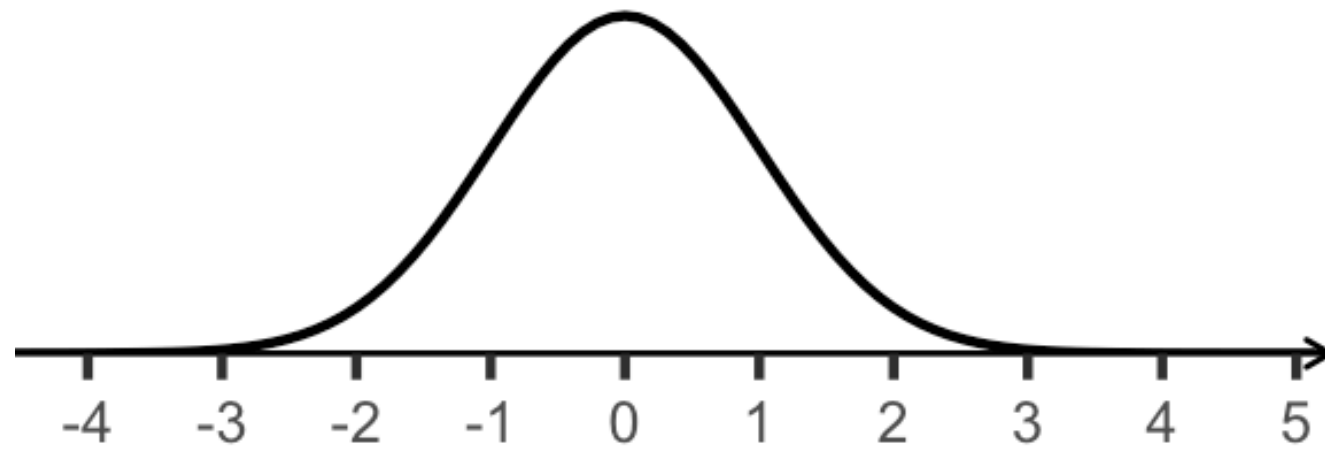
Eks 1: Normaltilnærming til binomisk fordeling

```
n = 100 # antall forsøk  
p = 0.4 # sannsynligheten for suksess
```

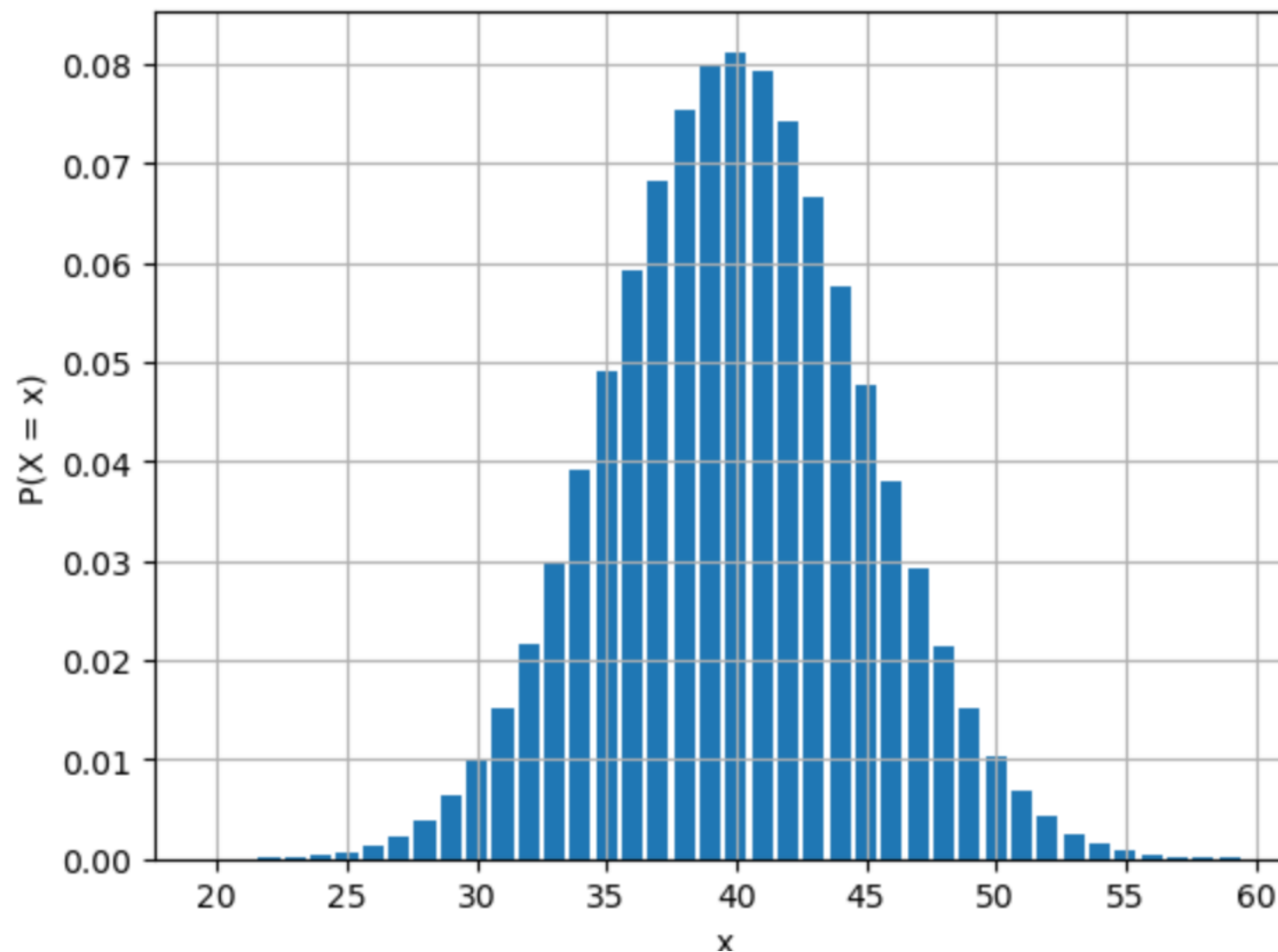
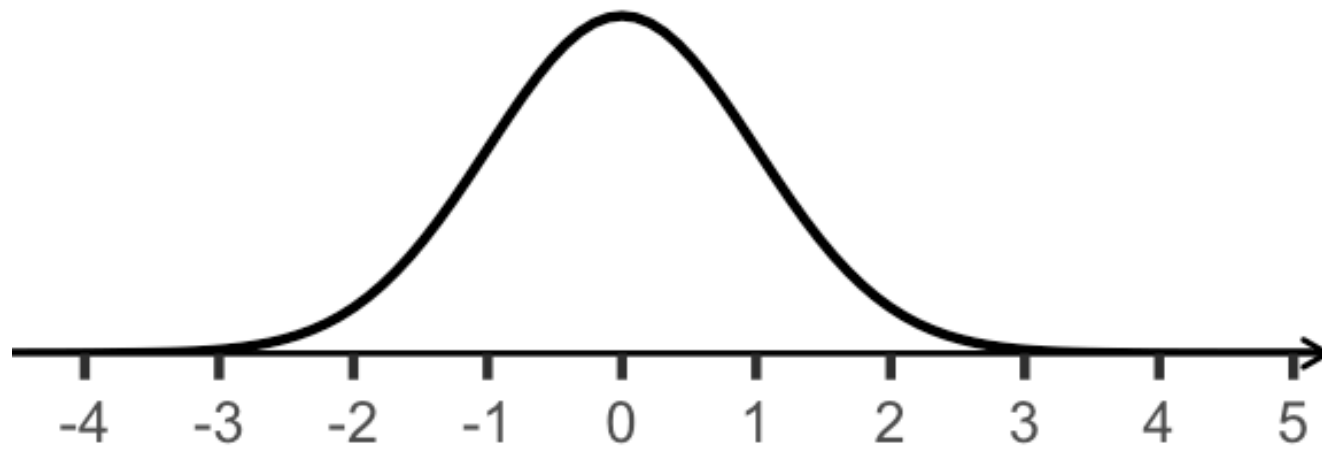
```
plt.bar(range(20,60), stats.binom.pmf(range(20, 60), n,p))  
plt.grid(); plt.ylabel("P(X = x)"); plt.xlabel("x")  
plt.show()
```



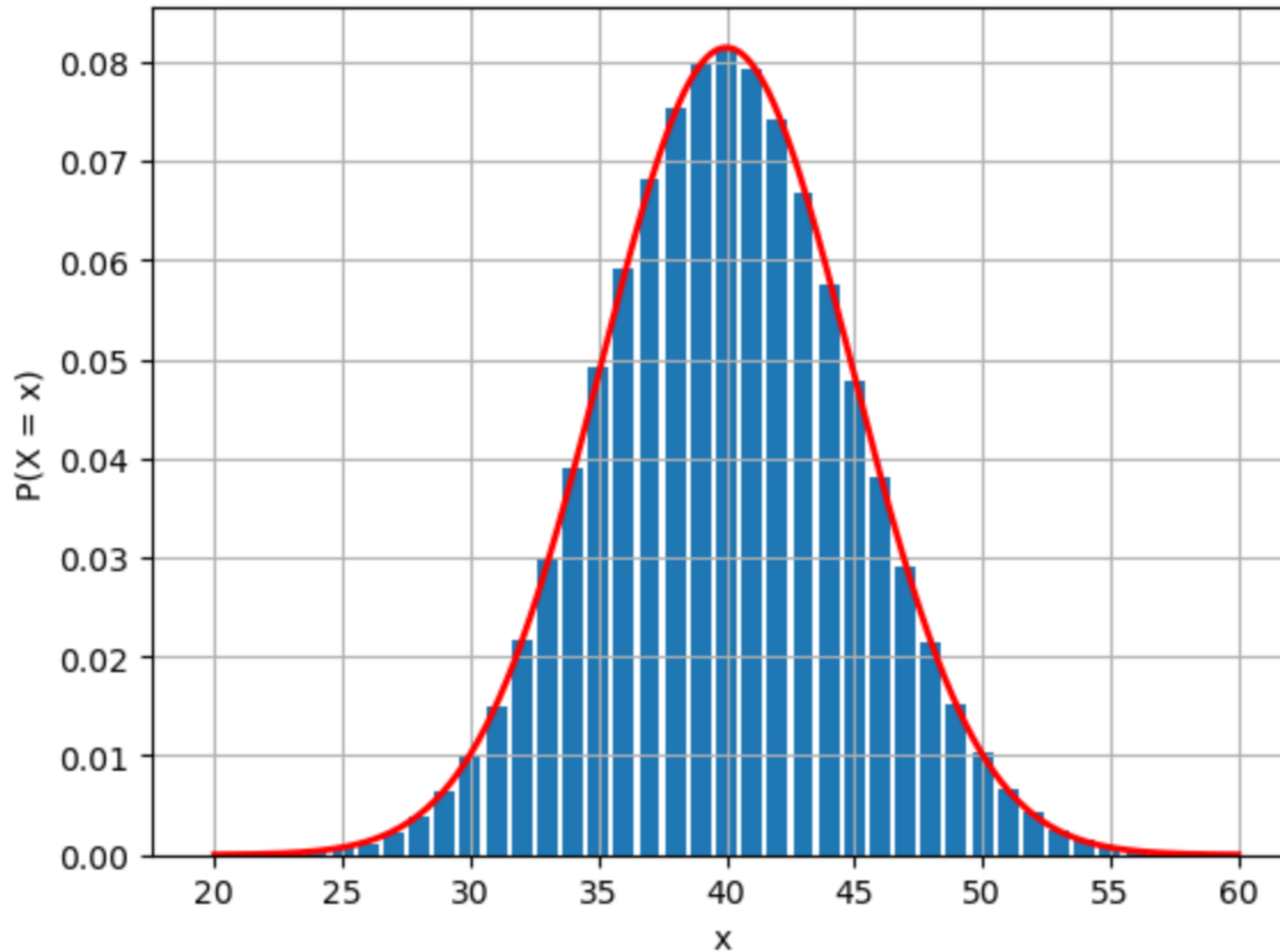
Eks 1: Normaltilnærming til binomisk fordeling



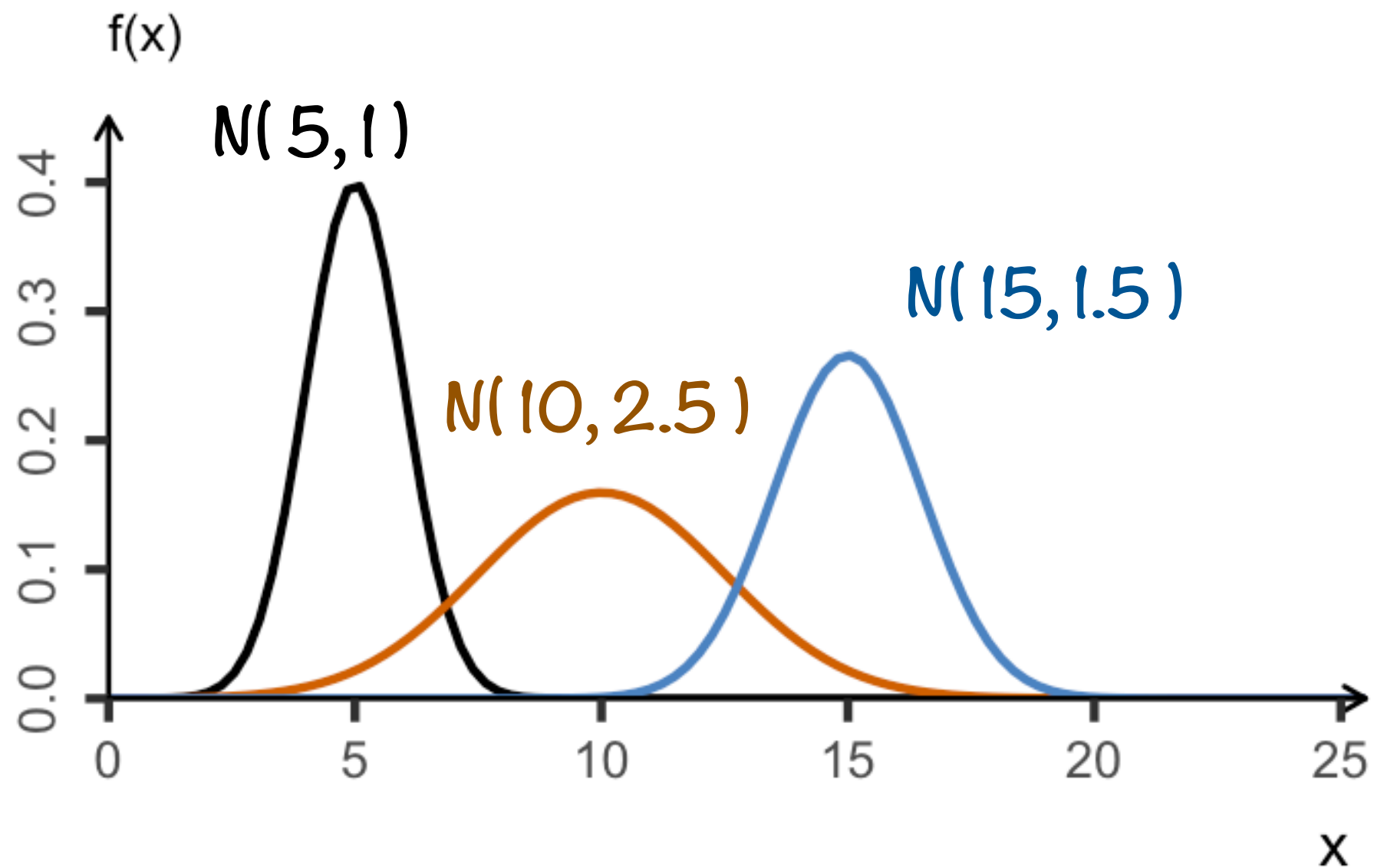
Eks 1: Normaltilnærming til binomisk fordeling



Eks 1: Normaltilnærming til binomisk fordeling



Eks 2: Standard normalfordeling og tabeller



Eks 2: Standard normalfordeling og tabeller

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STANDARD NORMAL DENSITY: $\Phi(z) = P(Z \leq z)$

z	..0	..1	..2	..3	..4	..5	..6	..7	..8	..9
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Eks 2: Standard normalfordeling og tabeller

STANDARD NORMAL DISTRIBUTION: $\Phi(z) = P(Z \leq z)$

z	..0	..1	..2	..3	..4	..5	..6	..7	..8	..9
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-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379

STANDARD NORMAL DISTRIBUTION: $\Phi(z) = P(Z \leq z)$

z	..0	..1	..2	..3	..4	..5	..6	..7	..8	..9
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177