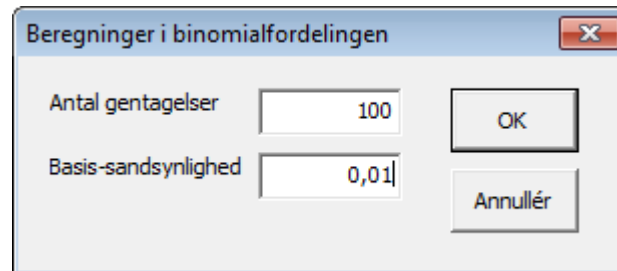
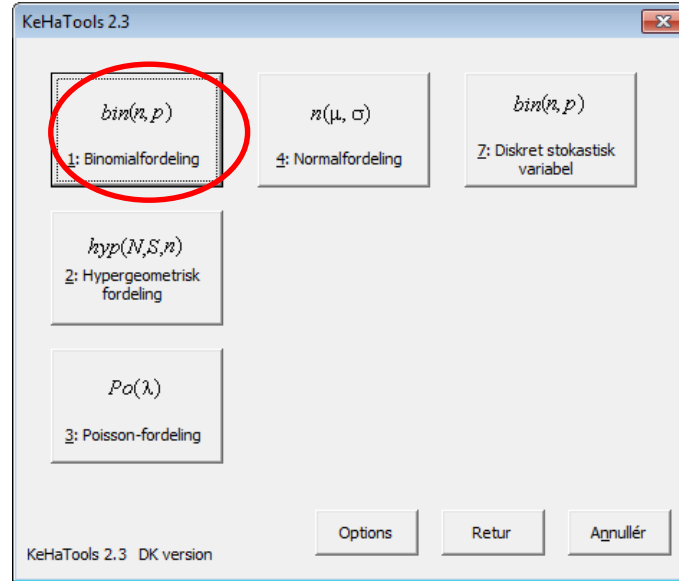
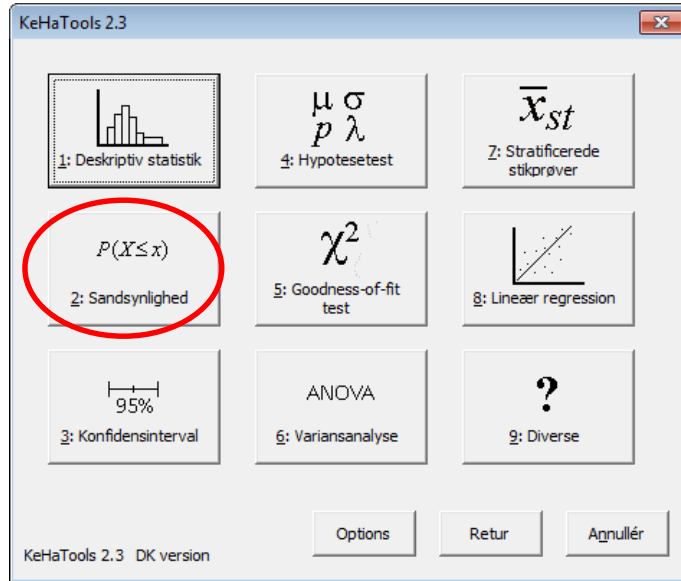


Videregående Statistik og KeHaTools Kapitel 9: Diskrete fordelinger

Oversigt

- Eksempel 9.1-9.2 binomialfordelingen
- Eksempel 9.4-9.5 den hypergeom. ford.
- Eksempel 9.8-9.9 Poisson-fordelingen
- Eksempel 9.10-9.11 test i Poisson-ford
- Eksempel 9.12 test i binomialford.

Eksempel 9.1 - I



Eksempel 9.1 - II

Microsoft Excel window: Mappel - Microsoft Excel

Menu: Filer, Stai, Ind, Sidi, For, Dat, Ger, Vis, U

Buttons: Hent eksterne data, Opdater alle Forbindelser, Sorter og filtre, Dataværktøjer, Disposition, Ana

Formula bar: D114, fx, =1-

Worksheet: Beregninger i Binomialfordelingen

Parameters:

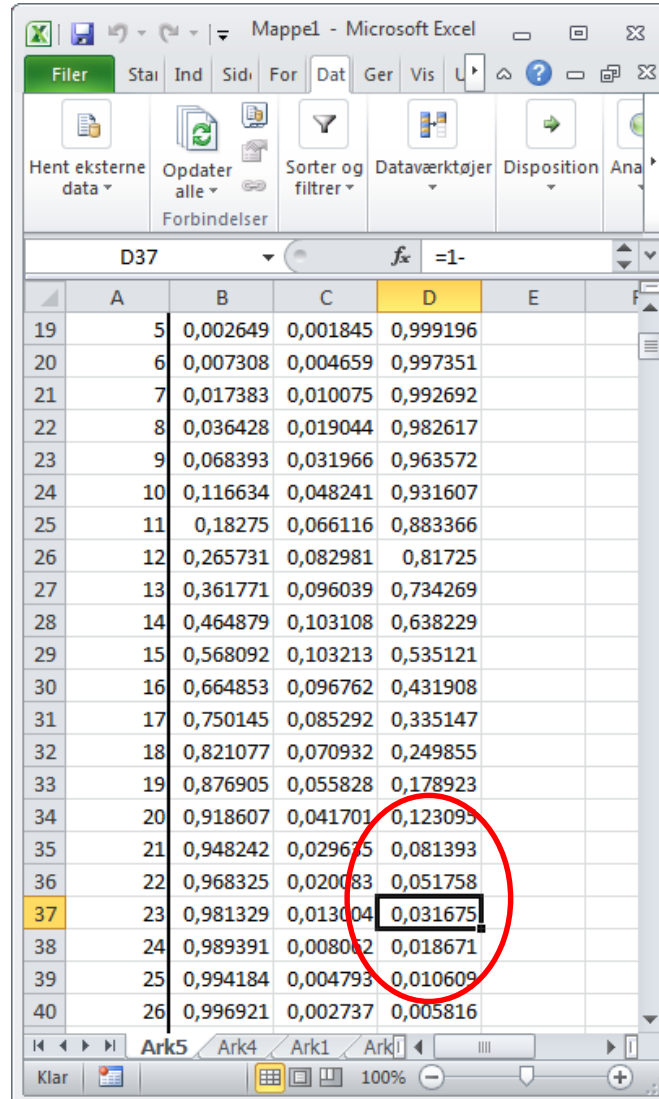
- Antal gent: 100
- Basis-sanc: 0,01
- Middelvæ: 1
- Varians: 0,99
- Standardda: 0,994987

Table over sandsynligheder:

| k | P(X≤k) | P(X=k) | P(X≥k) |
|---|----------|----------|----------|
| 0 | 0,366032 | 0,366032 | 1 |
| 1 | 0,735762 | 0,36977 | 0,633968 |
| 2 | 0,920627 | 0,184865 | 0,264238 |
| 3 | 0,981626 | 0,060999 | 0,079373 |
| 4 | 0,996568 | 0,014942 | 0,018374 |
| 5 | 0,999465 | 0,002898 | 0,003432 |
| 6 | 0,999929 | 0,000463 | 0,000535 |
| 7 | 0,999992 | 6,29E-05 | 7,11E-05 |
| 8 | 0,999999 | 7,38E-06 | 8,22E-06 |

Bottom status bar: Ark4, Ark1, Ark2, Ark3, 100%

Eksempel 9.2

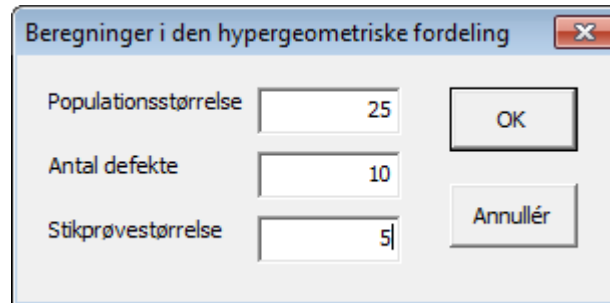
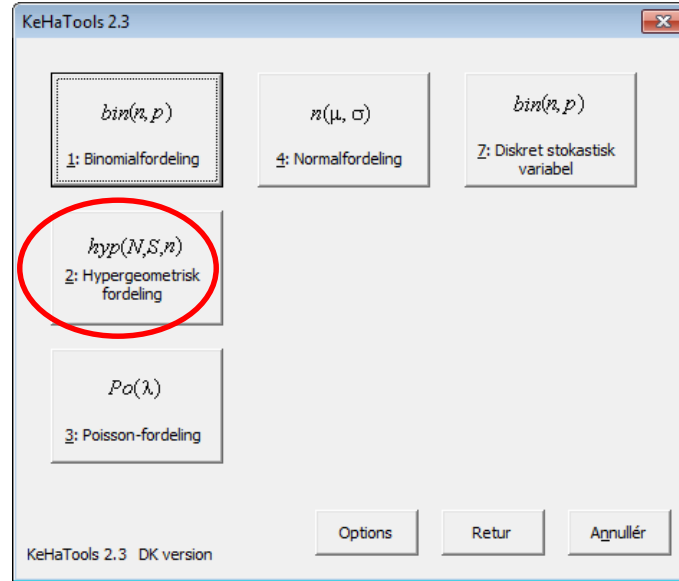
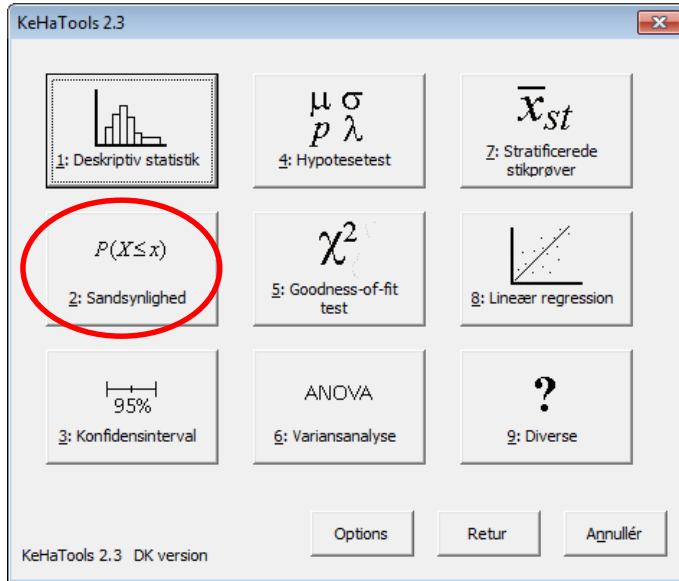


The screenshot shows the Microsoft Excel interface with the following data table:

| | A | B | C | D | E | F |
|----|----|----------|----------|----------|---|---|
| 19 | 5 | 0,002649 | 0,001845 | 0,999196 | | |
| 20 | 6 | 0,007308 | 0,004659 | 0,997351 | | |
| 21 | 7 | 0,017383 | 0,010075 | 0,992692 | | |
| 22 | 8 | 0,036428 | 0,019044 | 0,982617 | | |
| 23 | 9 | 0,068393 | 0,031966 | 0,963572 | | |
| 24 | 10 | 0,116634 | 0,048241 | 0,931607 | | |
| 25 | 11 | 0,18275 | 0,066116 | 0,883366 | | |
| 26 | 12 | 0,265731 | 0,082981 | 0,81725 | | |
| 27 | 13 | 0,361771 | 0,096039 | 0,734269 | | |
| 28 | 14 | 0,464879 | 0,103108 | 0,638229 | | |
| 29 | 15 | 0,568092 | 0,103213 | 0,535121 | | |
| 30 | 16 | 0,664853 | 0,096762 | 0,431908 | | |
| 31 | 17 | 0,750145 | 0,085292 | 0,335147 | | |
| 32 | 18 | 0,821077 | 0,070932 | 0,249855 | | |
| 33 | 19 | 0,876905 | 0,055828 | 0,178923 | | |
| 34 | 20 | 0,918607 | 0,041701 | 0,123095 | | |
| 35 | 21 | 0,948242 | 0,029675 | 0,081393 | | |
| 36 | 22 | 0,968325 | 0,020083 | 0,051758 | | |
| 37 | 23 | 0,981329 | 0,013004 | 0,031675 | | |
| 38 | 24 | 0,989391 | 0,008052 | 0,018671 | | |
| 39 | 25 | 0,994184 | 0,004793 | 0,010609 | | |
| 40 | 26 | 0,996921 | 0,002737 | 0,005816 | | |

The cell containing the value 0,031675 in row 37, column D is highlighted with a red circle and a black border.

Eksempel 9.4 - I



Eksempel 9.4 - II

Microsoft Excel - Mappel

Formelbånd: D20 =1-B19

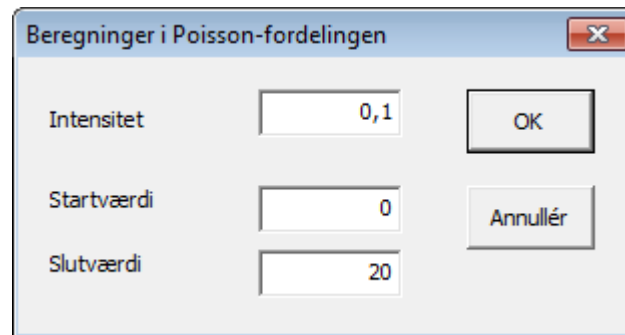
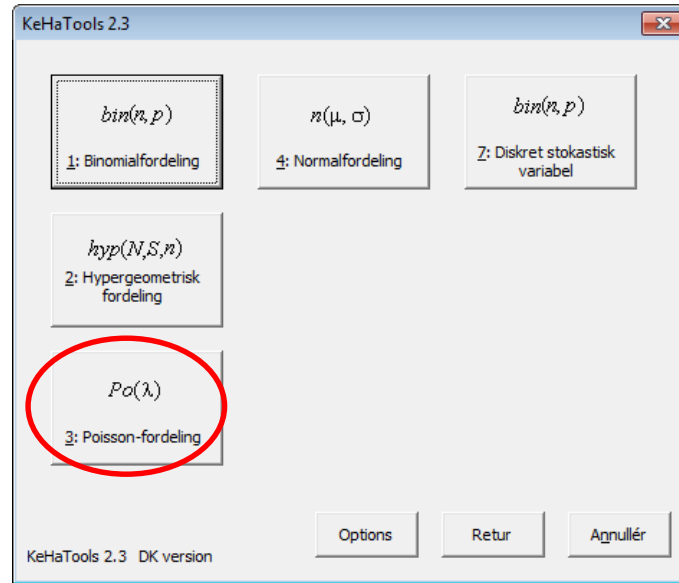
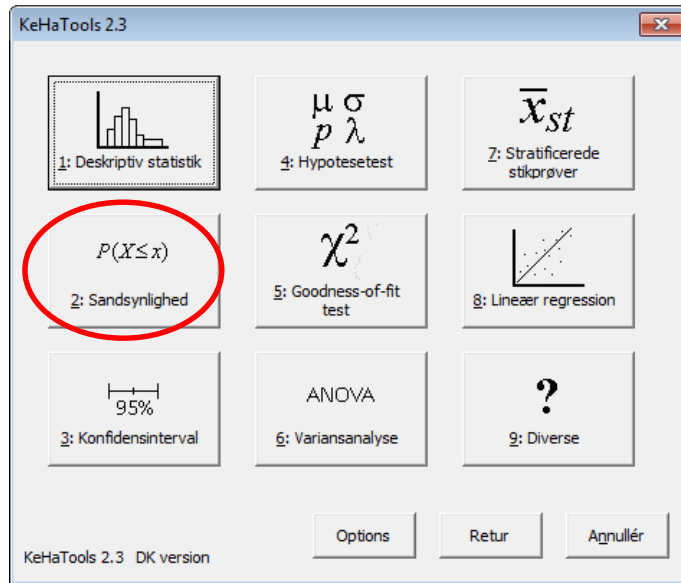
Beregninger i den hypergeometriske fordeling

| | | | | |
|---|--|--------------|----|--|
| 3 | | Populatio | 25 | |
| 4 | | Antal defekt | 10 | |
| 5 | | Stikprøve | 5 | |
| 7 | | Middelvæ | 2 | |
| 8 | | Varians | 1 | |
| 9 | | Standarda | 1 | |

Tablet over sandsynligheder

| k | $P(X \leq k)$ | $P(X = k)$ | $P(X \geq k)$ |
|---|---------------|------------|---------------|
| 0 | 0,056522 | 0,056522 | 1 |
| 1 | 0,313439 | 0,256917 | 0,943478 |
| 2 | 0,698814 | 0,385375 | 0,686561 |
| 3 | 0,935968 | 0,237154 | 0,301186 |
| 4 | 0,995257 | 0,059289 | 0,064032 |
| 5 | 1 | 0,004743 | 0,004743 |

Eksempel 9.8 - I



Eksempel 9.8 - II

The screenshot shows a Microsoft Excel spreadsheet titled "Mappel - Microsoft Excel". The active cell is D33, containing the formula $=1-POISSON($. The spreadsheet is divided into two main sections:

Beregninger i Poisson-fordelingen

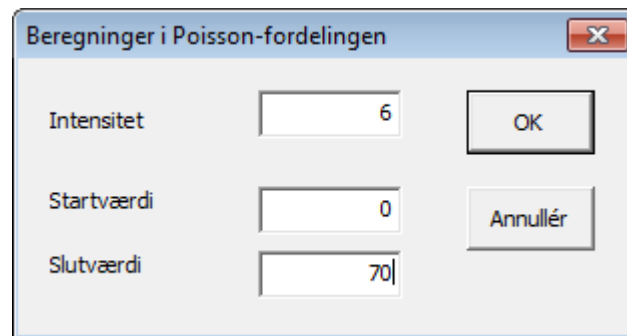
| | | |
|--|------------|----------|
| | Intensitet | 0,1 |
| | Middelvæ | 0,1 |
| | Varians | 0,1 |
| | Standarda | 0,316228 |

Tabel over sandsynligheder

| k | $P(X \leq k)$ | $P(X = k)$ | $P(X \geq k)$ |
|---|---------------|------------|---------------|
| 0 | 0,904837 | 0,904837 | 1 |
| 1 | 0,995321 | 0,090484 | 0,095163 |
| 2 | 0,999845 | 0,004524 | 0,004679 |
| 3 | 0,999996 | 0,000151 | 0,000155 |
| 4 | 1 | 3,77E-06 | 3,85E-06 |
| 5 | 1 | 7,54E-08 | 7,67E-08 |
| 6 | 1 | 1,26E-09 | 1,27E-09 |
| 7 | 1 | 1,8E-11 | 1,82E-11 |
| 8 | 1 | 2,24E-13 | 2,27E-13 |
| 9 | 1 | 2,49E-15 | 2,44E-15 |

Eksempel 9.8 - III

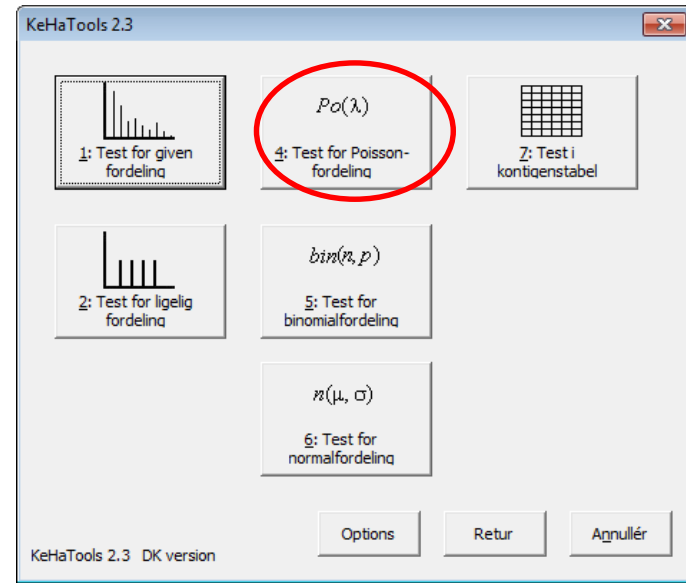
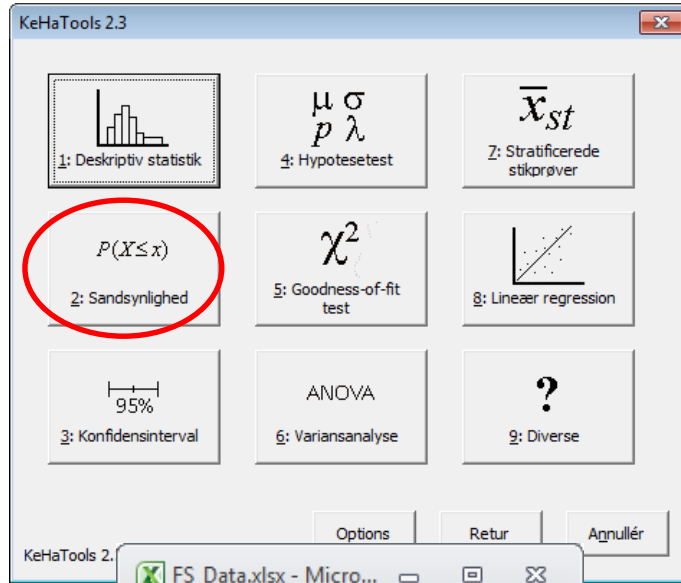
- For Y_s vedkommende er intensiteten 6
- Ved så høje intensiteter bør man ændre på start- og slutværdi, så man kan se de relevante sandsynligheder



The image shows a screenshot of a software dialog box titled "Beregninger i Poisson-fordelingen". The dialog box has a light blue title bar with a close button (X) in the top right corner. It contains three input fields and two buttons. The first input field is labeled "Intensitet" and contains the number "6". The second input field is labeled "Startværdi" and contains the number "0". The third input field is labeled "Slutværdi" and contains the number "70". To the right of the input fields are two buttons: "OK" and "Annullér".

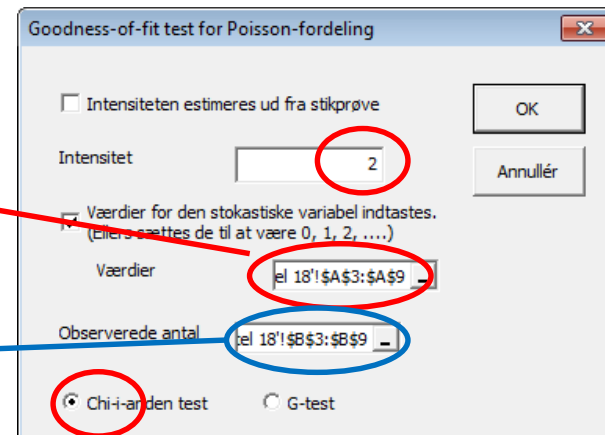
| Parameter | Value |
|------------|-------|
| Intensitet | 6 |
| Startværdi | 0 |
| Slutværdi | 70 |

Eksempel 9.10 - I



Excel spreadsheet showing data for Example 18.10. The data is as follows:

| | A | B | C |
|----|---------------------------|----|---|
| 1 | Eksempel 18.10 | | |
| 2 | Antal danl. Ant. horkomne | | |
| 3 | 0 | 14 | |
| 4 | 1 | 22 | |
| 5 | 2 | 27 | |
| 6 | 3 | 16 | |
| 7 | 4 | 9 | |
| 8 | 5 | 1 | |
| 9 | 6 | 3 | |
| 10 | | | |



Eksempel 9.10 - II

FS_Data.xlsx - Microsoft Excel

fx =CHIFORDELING(C22;C21)

Goodness-of-fit test for Poisson-fordeling

Hypoteser

H_0 : Fordelingen af observationerne følger en Poisson-fordeling med intensitet 2

H_A : Fordelingen af observationerne følger ikke en Poisson-fordeling med intensitet 2

Beregninger

Intensitet 2

| i | p_i | E_i | O_i | Testst |
|-----|----------|----------|-------|----------|
| 0 | 0,135335 | 12,45085 | 14 | 0,192748 |
| 1 | 0,270671 | 24,90169 | 22 | 0,338122 |
| 2 | 0,270671 | 24,90169 | 27 | 0,176811 |
| 3 | 0,180447 | 16,60113 | 16 | 0,021767 |
| 4 | 0,090224 | 8,300564 | 9 | 0,058937 |
| 5 | 0,036089 | 3,320226 | 1 | 1,62141 |
| 6 | 0,016564 | 1,523852 | 3 | 1,429937 |
| Sum | 1 | 92 | 92 | 3,839733 |

Resultat

Frihedsgrader 6

Teststørrelse 3,839733

p-værdi 0,698354

Eksempel 9.10 - III

- Man må prøve igen:

| | L | M | N | O |
|----|----------------|-----------------|---|---|
| 1 | Eksempel 18.10 | | | |
| 2 | Antal dan | Antal bortkomne | | |
| 3 | 0 | 14 | | |
| 4 | 1 | 22 | | |
| 5 | 2 | 27 | | |
| 6 | 3 | 16 | | |
| 7 | 4 | 9 | | |
| 8 | 5 | 4 | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |

| | A | B | C | D | E | F |
|----|--|----------|----------|-------|----------|----------|
| 1 | Goodness-of-fit test for Poisson-fordeling | | | | | |
| 2 | | | | | | |
| 3 | Hypoteser | | | | | |
| 4 | H_0 : Fordelingen af observationerne følger en Poi | | | | | |
| 5 | H_A : Fordelingen af observationerne følger ikke e | | | | | |
| 6 | | | | | | |
| 7 | Beregninger | | | | | |
| 8 | Intensitet | | 2 | | | |
| 9 | | | | | | |
| 10 | i | p_i | E_i | O_i | Testst | |
| 11 | 0 | 0,135335 | 12,45085 | 14 | 0,192748 | |
| 12 | 1 | 0,270671 | 24,90169 | 22 | 0,338122 | |
| 13 | 2 | 0,270671 | 24,90169 | 27 | 0,176811 | |
| 14 | 3 | 0,180447 | 16,60113 | 16 | 0,021767 | |
| 15 | 4 | 0,090224 | 8,300564 | 9 | 0,058937 | |
| 16 | 5 | 0,052653 | 4,844078 | 4 | 0,14708 | |
| 17 | Sum | | 1 | 92 | 92 | 0,935466 |
| 18 | | | | | | |
| 19 | Resultat | | | | | |
| 20 | Frihedsgr | | 5 | | | |
| 21 | Teststørre | | 0,935466 | | | |
| 22 | p-værdi | | 0,967601 | | | |
| 23 | | | | | | |
| 24 | | | | | | |
| 25 | | | | | | |

Eksempel 9.11 - I

| | E | F | G |
|----|----------------|----------------|---|
| 1 | Eksempel 18.11 | | |
| 2 | Antal kunder | Antal minutter | |
| 3 | 0 | 221 | |
| 4 | 1 | 173 | |
| 5 | 2 | 60 | |
| 6 | 3 | 15 | |
| 7 | 4 | 9 | |
| 8 | 5 | 2 | |
| 9 | | | |
| 10 | | | |

Goodness-of-fit test for Poisson-fordeling

Intensiteten estimeres ud fra stikprøve

Intensitet

Værdier for den stokastiske variabel indtastes.
(Ellers sættes de til at være 0, 1, 2,)

Værdier

Observerede antal

Chi-i-anden test G-test

OK

Annullér

Eksempel 9.11 - II

FS_Data.xlsx - Microsoft Excel

Formler: $=\text{CHIFORDELING}(C21;C20)$

Goodness-of-fit test for Poisson-fordeling

Hypoteser

H_0 : Fordelingen af observationerne følger en Poisson-fordeling

H_A : Fordelingen af observationerne følger ikke en Poisson-fordeling

Beregninger

Intensitet 0,8

| i | p_i | E_i | O_i | Testst |
|-----|----------|----------|-------|----------|
| 0 | 0,449329 | 215,6779 | 221 | 0,131329 |
| 1 | 0,359463 | 172,5423 | 173 | 0,001214 |
| 2 | 0,143785 | 69,01693 | 60 | 1,178044 |
| 3 | 0,038343 | 18,40451 | 15 | 0,629776 |
| 4 | 0,007669 | 3,680903 | 9 | 7,686373 |
| 5 | 0,001411 | 0,677429 | 2 | 2,582108 |
| Sum | 1 | 480 | 480 | 12,20884 |

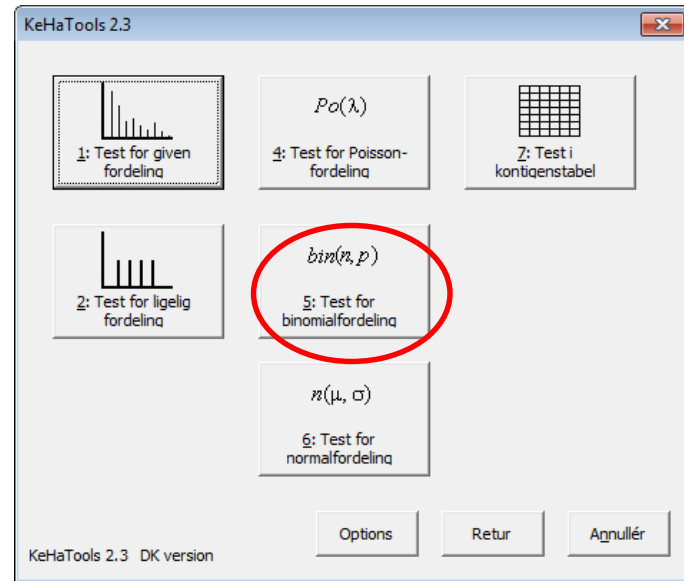
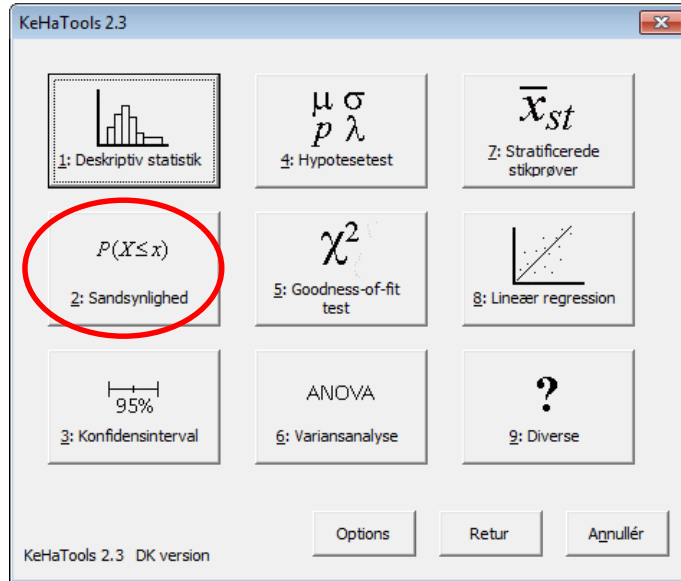
Resultat

Frihedsgrader 4

Teststørrelse 12,20884

p-værdi 0,015864

Eksempel 9.12 - I



FS_Data.xlsx - Micros...

M36

| | I | J | K |
|----|-------------------------|-----|---|
| 1 | Eksempel 9.12 | | |
| 2 | Antal knu: Antal bakker | | |
| 3 | 0 | 606 | |
| 4 | 1 | 318 | |
| 5 | 2 | 67 | |
| 6 | 3 | 8 | |
| 7 | 4 | 0 | |
| 8 | 5 | 1 | |
| 9 | 6 | 0 | |
| 10 | | | |
| 11 | | | |

Kapitel 9 | 100%

