

Statistika

Vaja 4

A. Blejec

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1 Normalna porazdelitev

Naloga 1 $Z \sim N(0, 1)$

$$P(1.32 \leq Z) = 0.5 - H(1.32) = 0.5 - 0.4066 = 0.0934$$

$$P(-1.33 < Z \leq 2.34) = H(2.34) - H(-1.33) = H(2.34) + H(1.33) = 0.4904 + 0.4082 = 0.8986$$

$$P(-2.03 < Z \leq -1.27) = H(-1.27) - H(-2.03) = -H(1.27) + H(2.03) = H(2.03) - H(1.27) = 0.4788 - 0.398 = 0.0808$$

$$P(1.23 < Z \leq 1.27) = H(1.27) - H(1.23) = 0.398 - 0.3907 = 0.0073$$

$$P(0.35 < Z \leq 2.32) = H(2.32) - H(0.35) = 0.4898 - 0.1368 = 0.353$$

$$P(Z > 2.35) = 1 - P(Z \leq 2.35) = 0.5 - H(2.35) = 0.5 - 0.4906 = 0.0094$$

$$P(Z = 2.34) = 0$$

Naloga 2 Iščemo mejo (kvantil) pri znani verjetnosti (kvantilnem rangi):

$$P(Z \leq b) = 0.01 = P(-\infty < Z \leq b) = H(b) + 0.5$$
$$H(b) = 0.01 - 0.5 = -0.49 \Rightarrow b = -2.326$$

$$P(Z \leq b) = 0.02 = P(-\infty < Z \leq b) = H(b) + 0.5$$
$$H(b) = 0.02 - 0.5 = -0.48 \Rightarrow b = -2.054$$

$$P(Z \leq b) = 0.05 = P(-\infty < Z \leq b) = H(b) + 0.5$$
$$H(b) = 0.05 - 0.5 = -0.45 \Rightarrow b = -1.645$$

$$P(Z \leq b) = 0.1 = P(-\infty < Z \leq b) = H(b) + 0.5$$
$$H(b) = 0.1 - 0.5 = -0.4 \Rightarrow b = -1.282$$

$$P(Z \leq b) = 0.45 = P(-\infty < Z \leq b) = H(b) + 0.5$$
$$H(b) = 0.45 - 0.5 = -0.05 \Rightarrow b = -0.126$$

$$P(Z \leq b) = 0.5 = P(-\infty < Z \leq b) = H(b) + 0.5$$
$$H(b) = 0.5 - 0.5 = 0 \Rightarrow b = 0$$

$$P(Z \leq b) = 0.6 = P(-\infty < Z \leq b) = H(b) + 0.5$$
$$H(b) = 0.6 - 0.5 = 0.1 \Rightarrow b = 0.253$$

$$P(Z \leq b) = 0.88 = P(-\infty < Z \leq b) = H(b) + 0.5$$
$$H(b) = 0.88 - 0.5 = 0.38 \Rightarrow b = 1.175$$

$$P(Z \leq b) = 0.9 = P(-\infty < Z \leq b) = H(b) + 0.5$$
$$H(b) = 0.9 - 0.5 = 0.4 \Rightarrow b = 1.282$$

Naloga 3 Iščemo mejo, pri znani verjetnosti zunaj intervala $(-b, b)$: $P(|Z| > b) = P(Z < -b) + P(Z > b) = 1 - 2H(b) = 0.01$
 $H(b) = (1 - 0.01)/2 = 0.495 \Rightarrow b = 2.576$

$P(|Z| > b) = P(Z < -b) + P(Z > b) = 1 - 2H(b) = 0.02$
 $H(b) = (1 - 0.02)/2 = 0.49 \Rightarrow b = 2.326$

$P(|Z| > b) = P(Z < -b) + P(Z > b) = 1 - 2H(b) = 0.05$
 $H(b) = (1 - 0.05)/2 = 0.475 \Rightarrow b = 1.96$

$P(|Z| > b) = P(Z < -b) + P(Z > b) = 1 - 2H(b) = 0.1$
 $H(b) = (1 - 0.1)/2 = 0.45 \Rightarrow b = 1.645$

$P(|Z| > b) = P(Z < -b) + P(Z > b) = 1 - 2H(b) = 0.45$
 $H(b) = (1 - 0.45)/2 = 0.275 \Rightarrow b = 0.755$

$P(|Z| > b) = P(Z < -b) + P(Z > b) = 1 - 2H(b) = 0.5$
 $H(b) = (1 - 0.5)/2 = 0.25 \Rightarrow b = 0.674$

$P(|Z| > b) = P(Z < -b) + P(Z > b) = 1 - 2H(b) = 0.6$
 $H(b) = (1 - 0.6)/2 = 0.2 \Rightarrow b = 0.524$

$P(|Z| > b) = P(Z < -b) + P(Z > b) = 1 - 2H(b) = 0.88$
 $H(b) = (1 - 0.88)/2 = 0.06 \Rightarrow b = 0.151$

$P(|Z| > b) = P(Z < -b) + P(Z > b) = 1 - 2H(b) = 0.9$
 $H(b) = (1 - 0.9)/2 = 0.05 \Rightarrow b = 0.126$

Naloga 4 $X \sim N(20, 10^2)$

$P(a < X \leq b) = P(20 < X \leq 30) = H(\frac{30-20}{10}) - H(\frac{20-20}{10}) = H(1) - H(0) = (0.3413) - (0) = 0.3413$

$P(a < X \leq b) = P(25 < X \leq 30) = H(\frac{30-20}{10}) - H(\frac{25-20}{10}) = H(1) - H(0.5) = (0.3413) - (0.1915) = 0.1498$

$P(a < X \leq b) = P(25 < X \leq 50) = H(\frac{50-20}{10}) - H(\frac{25-20}{10}) = H(3) - H(0.5) = (0.4987) - (0.1915) = 0.3072$

$P(a < X \leq b) = P(10 < X \leq 20) = H(\frac{20-20}{10}) - H(\frac{10-20}{10}) = H(0) - H(-1) = (0) - (-0.3413) = 0.3413$

$P(a < X \leq b) = P(15 < X \leq 25) = H(\frac{25-20}{10}) - H(\frac{15-20}{10}) = H(0.5) - H(-0.5) = (0.1915) - (-0.1915) = 0.383$

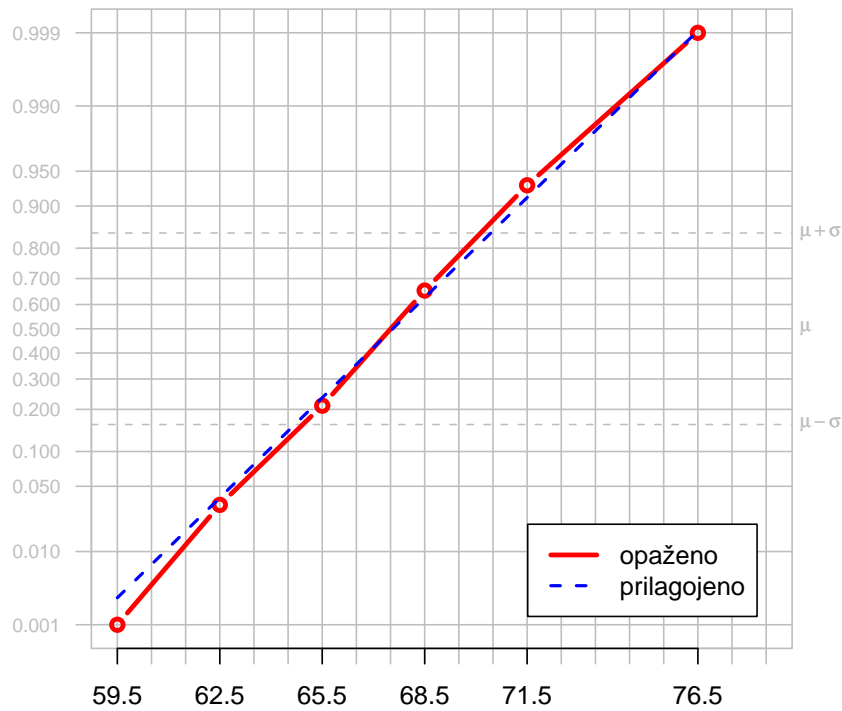
$P(a < X \leq b) = P(6 < X \leq 15) = H(\frac{15-20}{10}) - H(\frac{6-20}{10}) = H(-0.5) - H(-1.4) = (-0.1915) - (-0.4192) = 0.2277$

Naloga 5 Povprečje: 67.56667 Standardna deviacija: 2.871508

Tabela 1: Frekvenčna tabela za izračun pričakovanih verjetnosti

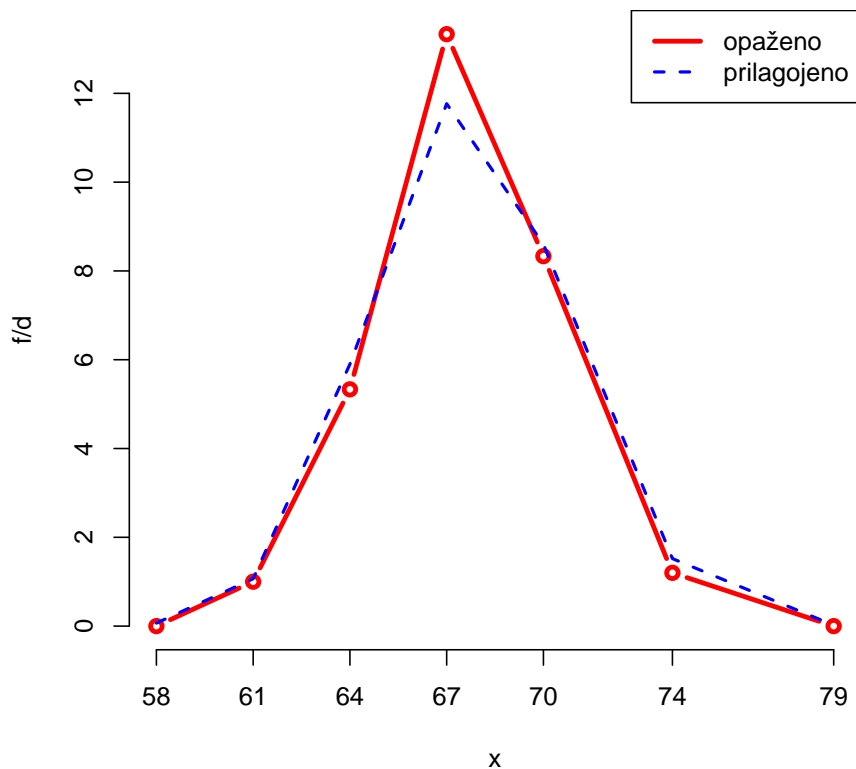
od	do	lx	ux	lZ	uZ	f	e	pf	pe	Pf	Pe	
1	59	<i>-Inf</i>	59.5	<i>-Inf</i>	-2.809	0	0.2	0.000	0.002	0.000	0.000	
2	60	62	59.5	62.5	-2.809	-1.764	3	3.2	0.033	0.036	0.000	0.002
3	63	65	62.5	65.5	-1.764	-0.720	16	17.7	0.178	0.197	0.033	0.038
4	66	68	65.5	68.5	-0.720	0.325	40	35.3	0.444	0.392	0.211	0.235
5	69	71	68.5	71.5	0.325	1.370	25	25.8	0.278	0.287	0.655	0.627
6	72	76	71.5	76.5	1.370	3.111	6	7.6	0.067	0.084	0.933	0.914
7	77		76.5	<i>Inf</i>	3.111	<i>Inf</i>	0	0.1	0.000	0.001	1.000	0.998

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Naloga 6

Za primerjavo si lahko ogledamo še frekvenčna poligona dejanske (rdeča polna črta) in prilagojene frekvenčna porazdelitve (modra črtkana črta).



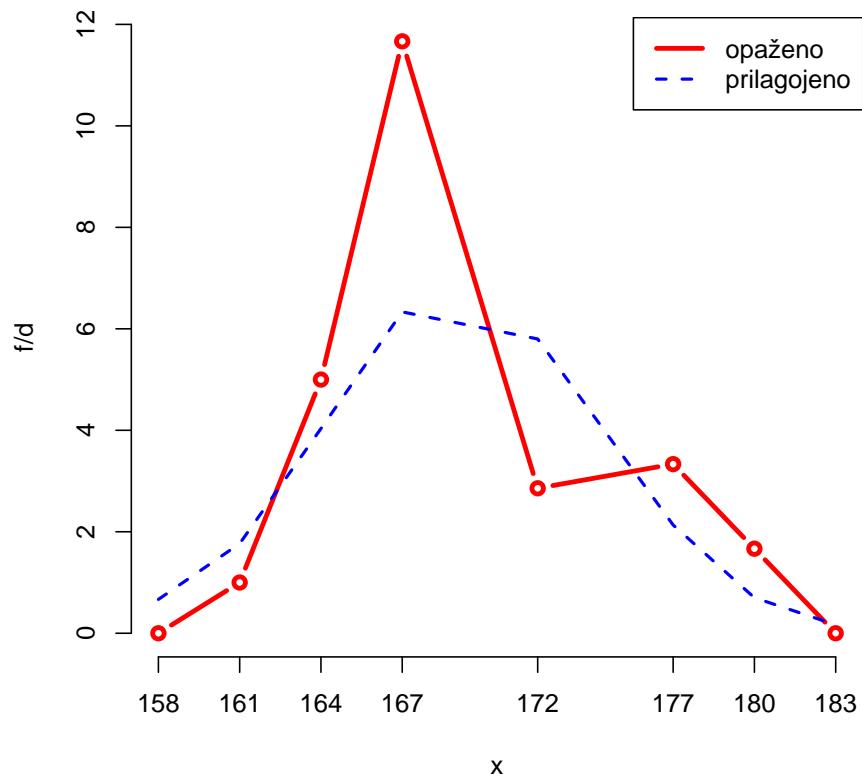
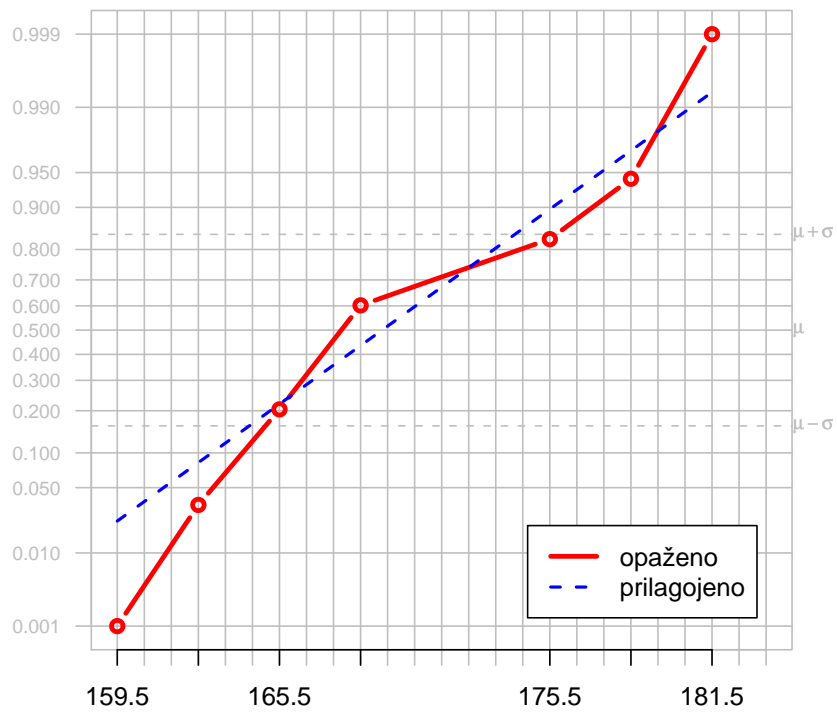
Naloga 7 Povprečje: 169.2955
Standardna deviacija: 4.913245

Tabela 2: Frekvenčna tabela za izračun pričakovanih verjetnosti

od	do	lx	ux	lZ	uZ	f	e	pf	pe	Pf	Pe	
1	159	$-Inf$	159.5	$-Inf$	-1.994	0	2.0	0.000	0.023	0.000	0.000	
2	160	162	159.5	162.5	-1.994	-1.383	3	5.3	0.034	0.060	0.000	0.023
3	163	165	162.5	165.5	-1.383	-0.772	15	12.1	0.170	0.137	0.034	0.083
4	166	168	165.5	168.5	-0.772	-0.162	35	19.0	0.398	0.216	0.204	0.220
5	169	175	168.5	175.5	-0.162	1.263	20	40.6	0.227	0.461	0.602	0.436
6	176	178	175.5	178.5	1.263	1.873	10	6.4	0.114	0.073	0.829	0.897
7	179	181	178.5	181.5	1.873	2.484	5	2.1	0.057	0.024	0.943	0.970
8	182		181.5	Inf	2.484	Inf	0	0.5	0.000	0.006	1.000	0.994

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Za primerjavo si lahko ogledamo še frekvenčna poligona dejanske (rdeča polna črta) in prilagojene frekvenčna porazdelitve (modra črtkana črta).



Naloga 8 S primerjavo krivulj opazimo, da porazdelitev g leži blizu premice. Le porazdelitev g je približno normalna.

