LEAST COST FORMULATIONS, LTD.

824 Timberlake Drive, Virginia Beach, VA 23464-3239
Tel: (757) 467-0954   Fax: (757) 467-2947
E-mail: office@lcfltld.com   URL: http://lcfltd.com/

TECHNICAL REPORT

NUMBER: TR308   DATE: 2010 June 4

TITLE: Sampling plans to verify the proportion of an event exceeds or falls below a specified value.

AUTHOR: R. A. LaBudde

ABSTRACT: Tables of sampling plans are provided that ensure that the 1-sided modified Wilson 95% confidence interval for a proportion falls above or below a specified value. Exhibit 1 shows the low range, where a proportion must fall below a specified value, and Exhibit 2 shows a high range, where a proportion must fall above a specified value. For example, in Exhibit 1, if the proportion of an event must fall below 5% with 95% 1-sided confidence, the sample size of 60 with no occurrences of the event will suffice. Similarly for a sample size of 90 with one or less occurrences of the event. For this latter sampling plan, if one occurrence is actually observed, the 95% 2-sided confidence interval on the proportion will be [0.0%, 6.0%], and the "average outgoing quality level" of the plan will be 3.0% (i.e., the process must be at 3% or less to pass the plan on the average). The plans of Exhibit 2 are interpreted in a similar way. For example, if the proportion of an event must fall above 95% with 95% 1-sided confidence, the sample size of 60 with all being occurrences of the event will suffice. Similarly for a sample size of 90 with 89 or more occurrences.

KEYWORDS: 1) PROPORTION   2) WILSON   3) SAMPLE SIZE

REL.DOC.:   TR258

REVISED:

Sample Size Required for Proportion **LOW** *Version:* **1.0**

ASSUME:
1. Binary outcome (occur / not occur).
2. Constant probability rho of event occurring.
3. Independent trials (e.g., simple random sample).
4. Fixed number of trials N.

INFERENCE: 95% confidence interval lies entirely at or BELOW specified maximum rho.
DESIRED: Sample size N needed.
NOTES:
1. Based on modified Wilson score 1-sided confidence interval.
2. AOQL = Average Outgoing Quality Level

Maximum Probability rho	Sample Size N	Maximum Number Events x	Minimum Number Non-events y	1-sided Upper Confidence Limit on rho	Expected Lower Confidence Limit on rho	Expected Upper Confidence Limit on rho	Effective AOQL rho
50%	3	0	3	47.4%	0.0%	56.1%	28.1%
50%	10	2	8	45.9%	5.7%	51.0%	28.3%
50%	20	6	14	48.4%	14.5%	51.9%	33.2%
50%	40	14	26	48.0%	22.1%	50.5%	36.3%
50%	80	32	48	49.2%	30.0%	51.0%	40.5%
45%	2	0	2	57.5%	0.0%	65.8%	32.9%
45%	10	1	9	34.8%	0.0%	40.4%	20.2%
45%	20	5	15	43.2%	11.2%	46.9%	29.0%
45%	40	12	28	42.9%	18.1%	45.4%	31.8%
45%	80	28	52	44.1%	25.5%	45.9%	35.7%
40%	5	0	5	35.1%	0.0%	43.4%	21.7%
40%	10	1	9	34.8%	0.0%	40.4%	20.2%
40%	20	4	16	37.8%	8.1%	41.6%	24.8%
40%	40	10	30	37.6%	14.2%	40.2%	27.2%
40%	80	24	56	39.0%	21.1%	40.8%	30.9%
35%	6	0	6	31.1%	0.0%	39.0%	19.5%
35%	10	1	9	34.8%	0.0%	40.4%	20.2%
35%	20	3	17	32.2%	5.2%	36.0%	20.6%
35%	40	9	31	34.9%	12.3%	37.5%	24.9%
35%	80	21	59	35.0%	17.9%	36.8%	27.3%
30%	7	0	7	27.9%	0.0%	35.4%	17.7%
30%	10	0	10	21.3%	0.0%	27.8%	13.9%
30%	20	2	18	26.2%	2.8%	30.1%	16.4%
30%	40	7	33	29.3%	8.7%	31.9%	20.3%
30%	80	17	63	29.6%	13.7%	31.4%	22.6%
25%	9	0	9	23.1%	0.0%	29.9%	15.0%
25%	10	0	10	21.3%	0.0%	27.8%	13.9%
25%	20	1	19	19.6%	0.0%	23.6%	11.8%
25%	40	5	35	23.5%	5.5%	26.1%	15.8%
25%	80	13	67	24.1%	9.7%	25.8%	17.8%
20%	11	0	11	19.7%	0.0%	25.9%	12.9%
20%	20	1	19	19.6%	0.0%	23.6%	11.8%
20%	40	3	37	17.3%	2.6%	19.9%	11.2%
20%	80	10	70	19.8%	6.9%	21.5%	14.2%
15%	20	0	20	11.9%	0.0%	16.1%	8.1%
15%	40	2	38	14.0%	1.4%	16.5%	8.9%
15%	80	6	74	13.9%	3.5%	15.4%	9.4%
10%	40	0	40	6.3%	0.0%	8.8%	4.4%
10%	60	2	58	9.6%	0.9%	11.4%	6.1%
10%	80	3	77	9.0%	1.3%	10.5%	5.9%
5%	60	0	60	4.3%	0.0%	6.0%	3.0%
5%	80	0	80	3.3%	0.0%	4.6%	2.3%
5%	90	1	89	4.8%	0.0%	6.0%	3.0%
5%	96	1	95	4.5%	0.0%	5.7%	2.8%
2%	130	0	130	2.0%	0.0%	2.9%	1.4%
2%	240	1	239	1.8%	0.0%	2.3%	1.2%
1%	280	0	280	1.0%	0.0%	1.4%	0.7%
1%	480	1	479	0.9%	0.0%	1.2%	0.6%

Sample Size Required for Proportion   **HIGH**   *Version:*   *0.0*

ASSUME:
1. Binary outcome (occur / not occur).
2. Constant probability rho of event occurring.
3. Independent trials (e.g., simple random sample).
4. Fixed number of trials N.

INFERENCE: 95% confidence interval lies entirely at or ABOVE specified minimum rho.
DESIRED: Sample size N needed.
NOTES:
1. Based on modified Wilson score 1-sided confidence interval.
2. AOQL = Average Outgoing Quality Level

Minimum Probability rho	Sample Size N	Minimum Number Events x	Maximum Number Non-events y	1-sided Lower Confidence Limit on rho	Expected Lower Confidence Limit on rho	Expected Upper Confidence Limit on rho	Effective AOQL rho
50%	3	3	0	52.6%	43.8%	100.0%	71.9%
50%	10	8	2	54.1%	49.0%	94.3%	71.7%
50%	20	14	6	51.6%	48.1%	85.5%	66.8%
50%	40	26	14	52.0%	49.5%	77.9%	63.7%
50%	80	48	32	50.8%	49.0%	70.0%	59.5%
55%	4	4	0	59.7%	51.0%	100.0%	75.5%
55%	10	9	1	65.2%	59.6%	100.0%	79.8%
55%	20	15	5	56.8%	53.1%	88.8%	71.0%
55%	40	28	12	57.1%	54.6%	81.9%	68.2%
55%	80	52	28	55.9%	54.1%	74.5%	64.3%
60%	5	5	0	64.9%	56.5%	100.0%	78.3%
60%	10	9	1	65.2%	59.6%	100.0%	79.8%
60%	20	16	4	62.2%	58.4%	91.9%	75.2%
60%	40	30	10	62.4%	59.8%	85.8%	72.8%
60%	80	56	24	61.0%	59.2%	78.9%	69.1%
65%	6	6	0	68.9%	61.0%	100.0%	80.5%
65%	10	9	1	65.2%	59.6%	100.0%	79.8%
65%	20	17	3	67.8%	64.0%	94.8%	79.4%
65%	40	31	9	65.1%	62.5%	87.7%	75.1%
65%	80	59	21	65.0%	63.2%	82.1%	72.7%
70%	7	7	0	72.1%	64.6%	100.0%	82.3%
70%	10	10	0	78.7%	72.2%	100.0%	86.1%
70%	20	18	2	73.8%	69.9%	97.2%	83.6%
70%	40	33	7	70.7%	68.0%	91.3%	79.7%
70%	80	63	17	70.4%	68.6%	86.3%	77.4%
75%	9	9	0	76.9%	70.1%	100.0%	85.0%
75%	10	10	0	78.7%	72.2%	100.0%	86.1%
75%	20	19	1	80.4%	76.4%	100.0%	88.2%
75%	40	35	5	76.5%	73.9%	94.5%	84.2%
75%	80	67	13	75.9%	74.2%	90.3%	82.2%
80%	11	11	0	80.3%	74.1%	100.0%	87.1%
80%	20	19	1	80.4%	76.4%	100.0%	88.2%
80%	40	37	3	82.7%	80.1%	97.4%	88.8%
80%	80	70	10	80.2%	78.5%	93.1%	85.8%
85%	20	20	0	88.1%	83.9%	100.0%	91.9%
85%	40	38	2	86.0%	83.5%	98.6%	91.1%
85%	80	74	6	86.1%	84.6%	96.5%	90.6%
90%	40	40	0	93.7%	91.2%	100.0%	95.6%
90%	60	58	2	90.4%	88.6%	99.1%	93.9%
90%	80	77	3	91.0%	89.5%	98.7%	94.1%
95%	60	60	0	95.7%	94.0%	100.0%	97.0%
95%	80	80	0	96.7%	95.4%	100.0%	97.7%
95%	90	89	1	95.2%	94.0%	100.0%	97.0%
95%	96	95	1	95.5%	94.3%	100.0%	97.2%
98%	130	130	0	98.0%	97.1%	100.0%	98.6%
98%	240	239	1	98.2%	97.7%	100.0%	98.8%
99%	280	280	0	99.0%	98.6%	100.0%	99.3%
99%	480	479	1	99.1%	98.8%	100.0%	99.4%

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