**CMD 305 - COURSE**

**(RESEARCH METHODOLOGY & BIOSTATISTICS)**

**(2018-2019)**

**TUTORIAL TOPIC : Sample size estimation(Exercise)**

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Q1) We want to estimate the mean systolic blood pressure of Saudi females. The standard deviation is around 20 mmHg and we wish to estimate the true mean to within 10 mmHg with 95% confidence. What is the required sample size?

Q2) A researcher wanted to estimate of average number of cigarettes smoke per week by under graduate students studying in a certain city. How many students are to be selected in to the sample such that the estimate of mean number of cigarettes smoke is to be within 10 of the true average with 95% confidence? (Based on a pilot study, it was found that the Sd., of number of cigarettes smoke is 30).

Q3) We wish to estimate the proportion of Saudi males who smoke. What sample size do we require to achieve a 95% confidence interval of width ± 5% ( that is to be within 5% of the true value) ? A study some years ago found approximately 30% were smokers?

Q4) An epidemiologist was asked to asked to estimate the Knowledge level (%) towards organ donation in a particular community. How many subjects he should select, if the resulting estimate is to fall within 10 %( width of confidence interval) of the true proportion with 95% confidence?. What will happen to sample size if width of confidence interval is 5 %. (From a pilot study he came to know that knowledge level =40%)

Q5) An epidemiologist wants to test whether a iron supplement for pregnant women will increase the increase their Hb level. One group of women will receive new supplement and the other group the usual supplement. From a pilot study the sd of Hb is 4 g/dl and is assumed to be same for both groups.. what is the sample size required to test the hypothesis of no difference in mean Hb level at 99% level of confidence and 90% power of detecting an increase of 2 g/dl.

Q6. Suppose it has been estimated that the rate of caries is 800 per 1000 school children in one district and 600 per 1000 in another district. What is the sample size required from each district to determine whether the difference is significant at the 95% level if we wish to have an 90% of chance of detecting the difference if it is real?

Q7.Calculate the sample size for your research study. First write down in your own words the sample size requirements for your research study in the form of a question. (Hint: follow the method as shown in the Questions 1 to 6 above. Next In your write up, give whether your outcome variable is continuous or categorical variable and whether it is descriptive or comparison of two groups)

Sample size formulae

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| A) If outcome variable is quantitative/continuous then outcome measure is **mean**  Example: Height, weight, BMI, HB, BP etc., |
| For **a single mean:**  Sample size :n = Z2α S2 /d2  Where , **S** (=sd, get from the literature review or from the pilot study ) |
| **For two means:**  Sample size **:**n =2S2 (Zα+Zβ)2 /d2 , per arm    Where , **S** (=sd, get from the literature review or from the pilot study ) |

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| B) If outcome variable is qualitative/categorical then outcome measure is **proportion**  Example: proportion of smokers, diabetes, anemia etc., |
| **For a single proportion**  Sample size**:** n = Z2α P(1-P)/d2  Where , **P** (=proportion, get from the literature review or from the pilot study ) |
| **For two proportions**  Sample size **:**    Where , P1 and P2( are proportions for group1 and group2 we are studying ,for example , obese- non obese, smokers-non smokers etc., , get from the literature review or from the pilot study ) |
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| **d = precision ( the researcher has to decide)**  **Zα = 1.96 for 95% confidence level, usually**  **Zβ = 1.282 for 90% power, usually** |
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| **TABLE 1A** | **SAMPLE SIZES FOR A SINGLE MEAN FOR VARIOUS d and sd for 95% level, Za=1.96** | | | | | | | | | | | | | | | | | | | |
|  | **d** | | | | | | | | | | | | | | | | | | | |
| **sd** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** |
| **1** | 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **2** | 16 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **3** | 35 | 9 | 4 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **4** | 62 | 16 | 7 | 4 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **5** | 97 | 25 | 11 | 7 | 4 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **6** | 139 | 35 | 16 | 9 | 6 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **7** | 189 | 48 | 21 | 12 | 8 | 6 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **8** | 246 | 62 | 28 | 16 | 10 | 7 | 6 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| **9** | 312 | 78 | 35 | 20 | 13 | 9 | 7 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 |
| **10** | 385 | 97 | 43 | 25 | 16 | 11 | 8 | 7 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| **11** | 465 | 117 | 52 | 30 | 19 | 13 | 10 | 8 | 6 | 5 | 4 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 |
| **12** | 554 | 139 | 62 | 35 | 23 | 16 | 12 | 9 | 7 | 6 | 5 | 4 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| **13** | 650 | 163 | 73 | 41 | 26 | 19 | 14 | 11 | 9 | 7 | 6 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 2 | 2 |
| **14** | 753 | 189 | 84 | 48 | 31 | 21 | 16 | 12 | 10 | 8 | 7 | 6 | 5 | 4 | 4 | 3 | 3 | 3 | 3 | 2 |
| **15** | 865 | 217 | 97 | 55 | 35 | 25 | 18 | 14 | 11 | 9 | 8 | 7 | 6 | 5 | 4 | 4 | 3 | 3 | 3 | 3 |
| **16** | 984 | 246 | 110 | 62 | 40 | 28 | 21 | 16 | 13 | 10 | 9 | 7 | 6 | 6 | 5 | 4 | 4 | 4 | 3 | 3 |
| **17** | 1111 | 278 | 124 | 70 | 45 | 31 | 23 | 18 | 14 | 12 | 10 | 8 | 7 | 6 | 5 | 5 | 4 | 4 | 4 | 3 |
| **18** | 1245 | 312 | 139 | 78 | 50 | 35 | 26 | 20 | 16 | 13 | 11 | 9 | 8 | 7 | 6 | 5 | 5 | 4 | 4 | 4 |
| **19** | 1387 | 347 | 155 | 87 | 56 | 39 | 29 | 22 | 18 | 14 | 12 | 10 | 9 | 8 | 7 | 6 | 5 | 5 | 4 | 4 |
| **20** | 1537 | 385 | 171 | 97 | 62 | 43 | 32 | 25 | 19 | 16 | 13 | 11 | 10 | 8 | 7 | 7 | 6 | 5 | 5 | 4 |
| **21** | 1695 | 424 | 189 | 106 | 68 | 48 | 35 | 27 | 21 | 17 | 15 | 12 | 11 | 9 | 8 | 7 | 6 | 6 | 5 | 5 |
| **22** | 1860 | 465 | 207 | 117 | 75 | 52 | 38 | 30 | 23 | 19 | 16 | 13 | 12 | 10 | 9 | 8 | 7 | 6 | 6 | 5 |
| **23** | 2033 | 509 | 226 | 128 | 82 | 57 | 42 | 32 | 26 | 21 | 17 | 15 | 13 | 11 | 10 | 8 | 8 | 7 | 6 | 6 |
| **24** | 2213 | 554 | 246 | 139 | 89 | 62 | 46 | 35 | 28 | 23 | 19 | 16 | 14 | 12 | 10 | 9 | 8 | 7 | 7 | 6 |
| **25** | 2401 | 601 | 267 | 151 | 97 | 67 | 49 | 38 | 30 | 25 | 20 | 17 | 15 | 13 | 11 | 10 | 9 | 8 | 7 | 7 |
| **26** | 2597 | 650 | 289 | 163 | 104 | 73 | 53 | 41 | 33 | 26 | 22 | 19 | 16 | 14 | 12 | 11 | 9 | 9 | 8 | 7 |
| **27** | 2801 | 701 | 312 | 176 | 113 | 78 | 58 | 44 | 35 | 29 | 24 | 20 | 17 | 15 | 13 | 11 | 10 | 9 | 8 | 8 |
| **28** | 3012 | 753 | 335 | 189 | 121 | 84 | 62 | 48 | 38 | 31 | 25 | 21 | 18 | 16 | 14 | 12 | 11 | 10 | 9 | 8 |
| **29** | 3231 | 808 | 359 | 202 | 130 | 90 | 66 | 51 | 40 | 33 | 27 | 23 | 20 | 17 | 15 | 13 | 12 | 10 | 9 | 9 |
| **30** | 3458 | 865 | 385 | 217 | 139 | 97 | 71 | 55 | 43 | 35 | 29 | 25 | 21 | 18 | 16 | 14 | 12 | 11 | 10 | 9 |
| **31** | 3692 | 923 | 411 | 231 | 148 | 103 | 76 | 58 | 46 | 37 | 31 | 26 | 22 | 19 | 17 | 15 | 13 | 12 | 11 | 10 |
| **32** | 3934 | 984 | 438 | 246 | 158 | 110 | 81 | 62 | 49 | 40 | 33 | 28 | 24 | 21 | 18 | 16 | 14 | 13 | 11 | 10 |
| **33** | 4184 | 1046 | 465 | 262 | 168 | 117 | 86 | 66 | 52 | 42 | 35 | 30 | 25 | 22 | 19 | 17 | 15 | 13 | 12 | 11 |
| **34** | 4441 | 1111 | 494 | 278 | 178 | 124 | 91 | 70 | 55 | 45 | 37 | 31 | 27 | 23 | 20 | 18 | 16 | 14 | 13 | 12 |
| **35** | 4706 | 1177 | 523 | 295 | 189 | 131 | 97 | 74 | 59 | 48 | 39 | 33 | 28 | 25 | 21 | 19 | 17 | 15 | 14 | 12 |
| **36** | 4979 | 1245 | 554 | 312 | 200 | 139 | 102 | 78 | 62 | 50 | 42 | 35 | 30 | 26 | 23 | 20 | 18 | 16 | 14 | 13 |
| **37** | 5260 | 1315 | 585 | 329 | 211 | 147 | 108 | 83 | 65 | 53 | 44 | 37 | 32 | 27 | 24 | 21 | 19 | 17 | 15 | 14 |
| **38** | 5548 | 1387 | 617 | 347 | 222 | 155 | 114 | 87 | 69 | 56 | 46 | 39 | 33 | 29 | 25 | 22 | 20 | 18 | 16 | 14 |
| **39** | 5844 | 1461 | 650 | 366 | 234 | 163 | 120 | 92 | 73 | 59 | 49 | 41 | 35 | 30 | 26 | 23 | 21 | 19 | 17 | 15 |
| **40** | 6147 | 1537 | 683 | 385 | 246 | 171 | 126 | 97 | 76 | 62 | 51 | 43 | 37 | 32 | 28 | 25 | 22 | 19 | 18 | 16 |

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| **TABLE 1B** | **SAMPLE SIZES FOR A SINGLE PROPORTION FOR VARIOUS P and d for 95% level, Za=1.96** | | | | | | | | | | | | | | | | | | | |
|  | **d** | | | | | | | | | | | | | | | | | | | |
| **P** | **0.05** | **0.10** | **0.15** | **0.20** | **0.25** | **0.30** | **0.35** | **0.40** | **0.45** | **0.50** | **0.55** | **0.60** | **0.65** | **0.70** | **0.75** | **0.80** | **0.85** | **0.90** | **0.95** | **1.00** |
| **0.01** | 16 | 4 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.02** | 31 | 8 | 4 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.03** | 45 | 12 | 5 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.04** | 60 | 15 | 7 | 4 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.05** | 73 | 19 | 9 | 5 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.06** | 87 | 22 | 10 | 6 | 4 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.07** | 101 | 26 | 12 | 7 | 5 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.08** | 114 | 29 | 13 | 8 | 5 | 4 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.09** | 126 | 32 | 14 | 8 | 6 | 4 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.1** | 139 | 35 | 16 | 9 | 6 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.11** | 151 | 38 | 17 | 10 | 7 | 5 | 4 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.12** | 163 | 41 | 19 | 11 | 7 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.13** | 174 | 44 | 20 | 11 | 7 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.14** | 186 | 47 | 21 | 12 | 8 | 6 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.15** | 196 | 49 | 22 | 13 | 8 | 6 | 4 | 4 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.16** | 207 | 52 | 23 | 13 | 9 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.17** | 217 | 55 | 25 | 14 | 9 | 7 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| **0.18** | 227 | 57 | 26 | 15 | 10 | 7 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| **0.19** | 237 | 60 | 27 | 15 | 10 | 7 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| **0.2** | 246 | 62 | 28 | 16 | 10 | 7 | 6 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| **0.21** | 255 | 64 | 29 | 16 | 11 | 8 | 6 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| **0.22** | 264 | 66 | 30 | 17 | 11 | 8 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| **0.23** | 273 | 69 | 31 | 18 | 11 | 8 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| **0.24** | 281 | 71 | 32 | 18 | 12 | 8 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| **0.25** | 289 | 73 | 33 | 19 | 12 | 9 | 6 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| **0.26** | 296 | 74 | 33 | 19 | 12 | 9 | 7 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 |
| **0.27** | 303 | 76 | 34 | 19 | 13 | 9 | 7 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 |
| **0.28** | 310 | 78 | 35 | 20 | 13 | 9 | 7 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 |
| **0.29** | 317 | 80 | 36 | 20 | 13 | 9 | 7 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 |
| **0.3** | 323 | 81 | 36 | 21 | 13 | 9 | 7 | 6 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 |
| **0.31** | 329 | 83 | 37 | 21 | 14 | 10 | 7 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| **0.32** | 335 | 84 | 38 | 21 | 14 | 10 | 7 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| **0.33** | 340 | 85 | 38 | 22 | 14 | 10 | 7 | 6 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| **0.34** | 345 | 87 | 39 | 22 | 14 | 10 | 8 | 6 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| **0.35** | 350 | 88 | 39 | 22 | 14 | 10 | 8 | 6 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| **0.36** | 355 | 89 | 40 | 23 | 15 | 10 | 8 | 6 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| **0.37** | 359 | 90 | 40 | 23 | 15 | 10 | 8 | 6 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| **0.38** | 363 | 91 | 41 | 23 | 15 | 11 | 8 | 6 | 5 | 4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| **0.39** | 366 | 92 | 41 | 23 | 15 | 11 | 8 | 6 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| **0.4** | 369 | 93 | 41 | 24 | 15 | 11 | 8 | 6 | 5 | 4 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |

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|  | **Table 2A SAMPLE SZES for two means for various values of d and sd**  **Za for 99% level=2.58**  **Zb for 90% power = 1.28 d** | | | | | | | | | | | | | | | | | | | |
| **Sd** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| **1** | 30 | 7 | 3 | 2 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **2** | 119 | 30 | 13 | 7 | 5 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| **3** | 268 | 67 | 30 | 17 | 11 | 7 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **4** | 477 | 119 | 53 | 30 | 19 | 13 | 10 | 7 | 6 | 5 | 4 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 |
| **5** | 745 | 186 | 83 | 47 | 30 | 21 | 15 | 12 | 9 | 7 | 6 | 5 | 4 | 4 | 3 | 3 | 3 | 2 | 2 | 2 |
| **6** | 1073 | 268 | 119 | 67 | 43 | 30 | 22 | 17 | 13 | 11 | 9 | 7 | 6 | 5 | 5 | 4 | 4 | 3 | 3 | 3 |
| **7** | 1460 | 365 | 162 | 91 | 58 | 41 | 30 | 23 | 18 | 15 | 12 | 10 | 9 | 7 | 6 | 6 | 5 | 5 | 4 | 4 |
| **8** | 1907 | 477 | 212 | 119 | 76 | 53 | 39 | 30 | 24 | 19 | 16 | 13 | 11 | 10 | 8 | 7 | 7 | 6 | 5 | 5 |
| **9** | 2414 | 603 | 268 | 151 | 97 | 67 | 49 | 38 | 30 | 24 | 20 | 17 | 14 | 12 | 11 | 9 | 8 | 7 | 7 | 6 |
| **10** | 2980 | 745 | 331 | 186 | 119 | 83 | 61 | 47 | 37 | 30 | 25 | 21 | 18 | 15 | 13 | 12 | 10 | 9 | 8 | 7 |
| **11** | 3606 | 901 | 401 | 225 | 144 | 100 | 74 | 56 | 45 | 36 | 30 | 25 | 21 | 18 | 16 | 14 | 12 | 11 | 10 | 9 |
| **12** | 4291 | 1073 | 477 | 268 | 172 | 119 | 88 | 67 | 53 | 43 | 35 | 30 | 25 | 22 | 19 | 17 | 15 | 13 | 12 | 11 |
| **13** | 5036 | 1259 | 560 | 315 | 201 | 140 | 103 | 79 | 62 | 50 | 42 | 35 | 30 | 26 | 22 | 20 | 17 | 16 | 14 | 13 |
| **14** | 5841 | 1460 | 649 | 365 | 234 | 162 | 119 | 91 | 72 | 58 | 48 | 41 | 35 | 30 | 26 | 23 | 20 | 18 | 16 | 15 |
| **15** | 6705 | 1676 | 745 | 419 | 268 | 186 | 137 | 105 | 83 | 67 | 55 | 47 | 40 | 34 | 30 | 26 | 23 | 21 | 19 | 17 |
| **16** | 7629 | 1907 | 848 | 477 | 305 | 212 | 156 | 119 | 94 | 76 | 63 | 53 | 45 | 39 | 34 | 30 | 26 | 24 | 21 | 19 |
| **17** | 8612 | 2153 | 957 | 538 | 344 | 239 | 176 | 135 | 106 | 86 | 71 | 60 | 51 | 44 | 38 | 34 | 30 | 27 | 24 | 22 |
| **18** | 9655 | 2414 | 1073 | 603 | 386 | 268 | 197 | 151 | 119 | 97 | 80 | 67 | 57 | 49 | 43 | 38 | 33 | 30 | 27 | 24 |
| **19** | 10758 | 2689 | 1195 | 672 | 430 | 299 | 220 | 168 | 133 | 108 | 89 | 75 | 64 | 55 | 48 | 42 | 37 | 33 | 30 | 27 |
| **20** | 11920 | 2980 | 1324 | 745 | 477 | 331 | 243 | 186 | 147 | 119 | 99 | 83 | 71 | 61 | 53 | 47 | 41 | 37 | 33 | 30 |
| **21** | 13141 | 3285 | 1460 | 821 | 526 | 365 | 268 | 205 | 162 | 131 | 109 | 91 | 78 | 67 | 58 | 51 | 45 | 41 | 36 | 33 |
| **22** | 14423 | 3606 | 1603 | 901 | 577 | 401 | 294 | 225 | 178 | 144 | 119 | 100 | 85 | 74 | 64 | 56 | 50 | 45 | 40 | 36 |
| **23** | 15764 | 3941 | 1752 | 985 | 631 | 438 | 322 | 246 | 195 | 158 | 130 | 109 | 93 | 80 | 70 | 62 | 55 | 49 | 44 | 39 |
| **24** | 17164 | 4291 | 1907 | 1073 | 687 | 477 | 350 | 268 | 212 | 172 | 142 | 119 | 102 | 88 | 76 | 67 | 59 | 53 | 48 | 43 |
| **25** | 18625 | 4656 | 2069 | 1164 | 745 | 517 | 380 | 291 | 230 | 186 | 154 | 129 | 110 | 95 | 83 | 73 | 64 | 57 | 52 | 47 |

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| **Table 2B Sample sizes for 95% Confidence level, (Zα=1.96) and for 90% Power( Zβ= 1.282) Here P1 is Larger proportion and P2 is Smaller proportion** | | | | | | | | | | | | | | | | | | | |
|  | ***P1***                ***P1*** | | | | | | | | | | | | | | | | | | |
| ***P2*** | ***10%*** | ***15%*** | ***20%*** | ***25%*** | ***30%*** | ***35%*** | ***40%*** | ***45%*** | ***50%*** | ***55%*** | ***60%*** | ***65%*** | ***70%*** | ***75%*** | ***80%*** | ***85%*** | ***90%*** | ***95%*** | ***100%*** |
| ***10%*** |  | **914** | **263** | **130** | **79** | **53** | **39** | **29** | **22** | **18** | **14** | **11** | **9** | **7** | **5** | **4** | **3** | **2** | **1** |
| ***15%*** |  |  | **1209** | **331** | **158** | **93** | **62** | **44** | **32** | **25** | **19** | **15** | **12** | **9** | **7** | **5** | **4** | **3** | **2** |
| ***20%*** |  |  |  | **1461** | **389** | **181** | **105** | **69** | **48** | **35** | **26** | **20** | **16** | **12** | **9** | **7** | **5** | **4** | **3** |
| ***25%*** |  |  |  |  | **1671** | **436** | **200** | **114** | **74** | **51** | **37** | **27** | **21** | **16** | **12** | **9** | **7** | **5** | **4** |
| ***30%*** |  |  |  |  |  | **1839** | **473** | **214** | **121** | **77** | **53** | **38** | **28** | **21** | **16** | **12** | **9** | **6** | **5** |
| ***35%*** |  |  |  |  |  |  | **1965** | **499** | **223** | **125** | **79** | **53** | **38** | **27** | **20** | **15** | **11** | **8** | **6** |
| ***40%*** |  |  |  |  |  |  |  | **2050** | **515** | **228** | **126** | **79** | **53** | **37** | **26** | **19** | **14** | **10** | **7** |
| ***45%*** |  |  |  |  |  |  |  |  | **2092** | **520** | **228** | **125** | **77** | **51** | **35** | **25** | **18** | **12** | **9** |
| ***50%*** |  |  |  |  |  |  |  |  |  | **2092** | **515** | **223** | **121** | **74** | **48** | **32** | **22** | **15** | **11** |
| ***55%*** |  |  |  |  |  |  |  |  |  |  | **2050** | **499** | **214** | **114** | **69** | **44** | **29** | **19** | **13** |
| ***60%*** |  |  |  |  |  |  |  |  |  |  |  | **1965** | **473** | **200** | **105** | **62** | **39** | **25** | **16** |
| ***65%*** |  |  |  |  |  |  |  |  |  |  |  |  | **1839** | **436** | **181** | **93** | **53** | **32** | **20** |
| ***70%*** |  |  |  |  |  |  |  |  |  |  |  |  |  | **1671** | **389** | **158** | **79** | **43** | **25** |
| ***75%*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **1461** | **331** | **130** | **62** | **32** |
| ***80%*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **1209** | **263** | **97** | **42** |
| ***85%*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **914** | **184** | **60** |
| ***90%*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **578** | **95** |
| ***95%*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | **200** |
| ***100%*** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |