1) n=22,   
  
A) Mean = n = 22\*0.72 = 15.84  
 SD , 2.105991

B) P(Y ≤ 16) = 0.6100871

C) P(Y < 16) = 0.422552

D) P(16 ≤ Y < 18) = 0.1701999

E) P(Y = 18) = 0.1215714

F) P(Y ≥ 18) = 0.2197129

G) without continuity correction,  
P(Y≥18) = 1 – P(Y<18) = 1 - P(Y≤17) = 1-pnorm(17,mean=15.84,sd=2.105991,lower.tail = TRUE)

so, without continuity correction , P(Y≥18) = 0.2908821

H) with continuity correction,

P(Y≥18) = 1 – P(Y<18) = 1 - P(Y≤17.5) = 1-pnorm(17.5,mean=15.84,sd=2.105991,lower.tail = TRUE)

so, without continuity correction , P(Y≥18) = 0.2152818

2) n = #of students = 75 (trial)  
 y = #of STEM majors = 51 (success)A) [Estimate of STEM population proportion]

Estimate of standard deviation, SE() = = = = 0.05386403

B) 95% confidence interval for true population proportion =

C) H0 :   
 HA :

,,

Test statistics z =

Rejection region, z, or z z

In this case, , so we can reject the null hypothesis with 95% confidence, which means we can conclude (with 95% certainty) that the population proportion of STEM majors is greater than 0.5.

From running prop.test, p-value = 0.00091114. (Ans)

1-sample proportions test without continuity correction

data: 51 out of 75, null probability 0.5

X-squared = 9.72, df = 1, p-value = 0.0009114

alternative hypothesis: true p is greater than 0.5

95 percent confidence interval:

0.5864651 1.0000000

sample estimates:

p

0.68

3) n = #of items = 60 (trial)  
 y = #of defective items = 10 (success)A) [Estimate of population proportion]

B) α = 0.1, 90% confidence interval = ( 0.0958273,0.2691848)

1-sample proportions test with continuity correction

data: 10 out of 60, null probability 0.5

X-squared = 25.35, df = 1, p-value = 4.782e-07

alternative hypothesis: true p is not equal to 0.5

90 percent confidence interval:

0.0958273 0.2691848

sample estimates:

p

0.1666667

C) 90% confidence interval = (0.09330693 0.26629080)

Exact binomial test

data: 10 and 60

number of successes = 10, number of trials = 60, p-value =

1.616e-07

alternative hypothesis: true probability of success is not equal to 0.5

90 percent confidence interval:

0.09330693 0.26629080

sample estimates:

probability of success

0.1666667

4) A)  
i) n=9

power.anova.test(groups = 4, between.var = between\_var\_i, within.var = within\_Var, sig.level = 0.05,power=0.9)

Balanced one-way analysis of variance power calculation

groups = 4

n = 8.139055

between.var = 66.66667

within.var = 100

sig.level = 0.05

power = 0.9

NOTE: n is number in each group

**ii) n= 16**

power.anova.test(groups = 4, between.var = between\_var\_ii, within.var = within\_Var, sig.level = 0.05,power=0.9)

Balanced one-way analysis of variance power calculation

groups = 4

n = 15.18834

between.var = 33.33333

within.var = 100

sig.level = 0.05

power = 0.9

NOTE: n is number in each group

iii) n= 11

power.anova.test(groups = 4, between.var = between\_var\_iii, within.var = within\_Var, sig.level = 0.05,power=0.9)

Balanced one-way analysis of variance power calculation

groups = 4

n = 10.48319

between.var = 50

within.var = 100

sig.level = 0.05

power = 0.9

NOTE: n is number in each group

ii) scenario ii requires the largest sample size.   
We know that power increases as sample size and differences among the true means increase, and decrease as error standard deviation decreases.   
This means, that if the power stays the same, increasing differences among true means will reduce the sample size. And decreasing differences among true means will increase the sample size.  
Of the given three scenario, scenario ii has the lowest differences among true means (between variance = 33.33 ), which results in the largest sample size.