Monday, April 22, 2019

$t_{28} = 3.55$
p-val = 0.005

- Warm-up
  - **Assume conditions are met**, what conclusion can be made from a linear regression t-test using the computer print-out that examines the relationship between lean body mass (in kg) and the resting metabolic rate (in calories per day) in sedentary males? The sample contained 30 sedentary males.

$H_0 : \beta_1 = 0$
$H_A : \beta_1 > 0$

Predictor	Coef	StDev	T	P
Constant	264.0	276.9	0.95	0.363
Mass	22.563	6.360	3.55	0.005

S = 144.9 R-Sq = 55.7% R-Sq(adj) = 51.3%

Due to a low p-value of 0.005, less than an α of 0.05, we reject the null. There is statistical evidence that the relationship between lean body mass and resting metabolic rate is positive.

- What to do with categorical data? Chi-square

Objectives

- Content: I will understand the purpose of each type of inference procedure and when to apply them.
- Social: I will listen well and participate in class activities.
- Language: I will write clear notes and look for the differences in questions to make determinations for inference procedures.

Categorical Data X^2 Chi Square

Degrees of Freedom: number of categories − 1

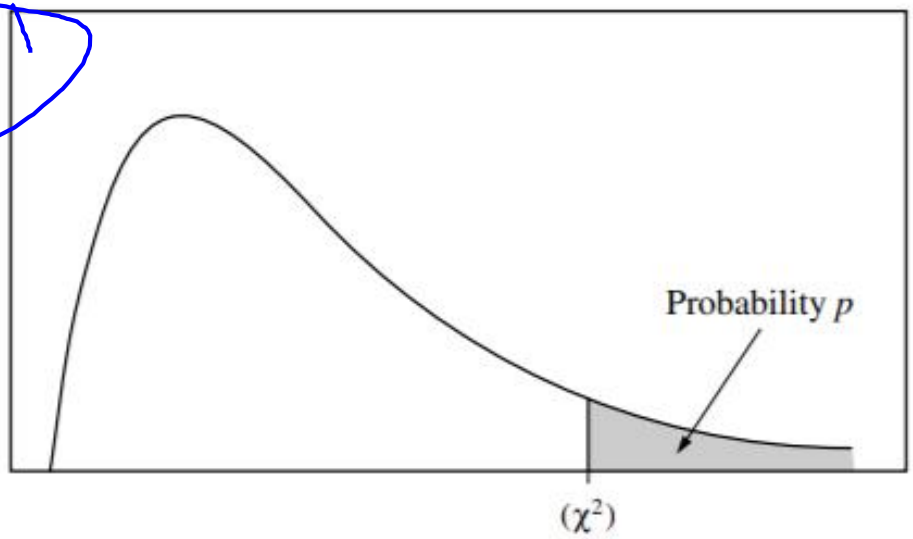


Table entry for p is the point (χ^2) with probability p lying above it.

Table C χ^2 critical values

	Tail probability p											
df	.25	.20	.15	.10	.05	.025	.02	.01	.005	.0025	.001	.0005
1	1.32	1.64	2.07	2.71	3.84	5.02	5.41	6.63	7.88	9.14	10.83	12.12
2	2.77	3.22	3.79	4.61	5.99	7.38	7.82	9.21	10.60	11.98	13.82	15.20
3	4.11	4.64	5.32	6.25	7.81	9.35	9.84	11.34	12.84	14.32	16.27	17.73
4	5.39	5.99	6.74	7.78	9.49	11.14	11.67	13.28	14.86	16.42	18.47	20.00
5	6.63	7.29	8.12	9.24	11.07	12.83	13.39	15.09	16.75	18.39	20.51	22.11
6	7.84	8.56	9.45	10.64	12.59	14.45	15.03	16.81	18.55	20.25	22.46	24.10
7	9.04	9.80	10.75	12.02	14.07	16.01	16.62	18.48	20.28	22.04	24.32	26.02
8	10.22	11.03	12.03	13.36	15.51	17.53	18.17	20.09	21.95	23.77	26.12	27.87
9	11.39	12.24	13.29	14.68	16.92	19.02	19.68	21.67	23.59	25.46	27.88	29.67
10	12.55	13.44	14.53	15.99	18.31	20.48	21.16	23.21	25.19	27.11	29.59	31.42
11	13.70	14.63	15.77	17.28	19.68	21.92	22.62	24.72	26.76	28.73	31.26	33.14
12	14.85	15.81	16.99	18.55	21.03	23.34	24.05	26.22	28.30	30.32	32.91	34.82
13	15.98	16.98	18.20	19.81	22.36	24.74	25.47	27.69	29.82	31.88	34.53	36.48
14	17.12	18.15	19.41	21.06	23.68	26.12	26.87	29.14	31.32	33.43	36.12	38.11
15	18.25	19.31	20.60	22.31	25.00	27.49	28.26	30.58	32.80	34.95	37.70	39.72
16	19.37	20.47	21.79	23.54	26.30	28.85	29.63	32.00	34.27	36.46	39.25	41.31
17	20.49	21.61	22.98	24.77	27.59	30.19	31.00	33.41	35.72	37.95	40.79	42.88
18	21.60	22.76	24.16	25.99	28.87	31.53	32.35	34.81	37.16	39.42	42.31	44.43
19	22.72	23.90	25.33	27.20	30.14	32.85	33.69	36.19	38.58	40.88	43.82	45.97
20	23.83	25.04	26.50	28.41	31.41	34.17	35.02	37.57	40.00	42.34	45.31	47.50
21	24.93	26.17	27.66	29.62	32.67	35.48	36.34	38.93	41.40	43.78	46.80	49.01
22	26.04	27.30	28.82	30.81	33.92	36.78	37.66	40.29	42.80	45.20	48.27	50.51
23	27.14	28.43	29.98	32.01	35.17	38.08	38.97	41.64	44.18	46.62	49.73	52.00

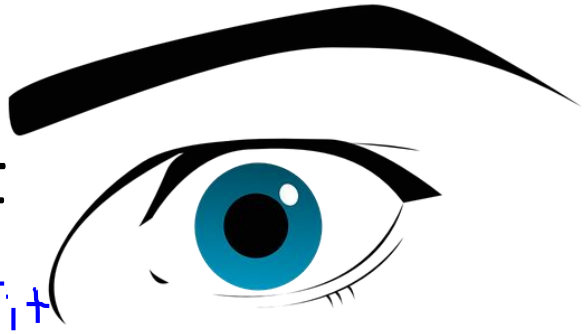
Chi-Square Formula

$$X^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$

EYE COLOR	Black	Brown	Blue	Green	Gray	Total
Female	20	30	10	15	10	85
Male	25	15	12	20	10	82
Total	45	45	22	35	20	167

Sample Size: expected value in each ≥ 5

Chi Square GOF



one group into one set of categories

Goodness Of Fit

EYE COLOR	Black	Brown	Blue	Green	Gray	Total
Total	45	45	22	35	20	167
expected	33.4	33.4	33.4	33.4	33.4	

H_0: Eye color is equally distributed among color.

H_A: Eye color is not equally distributed among color

- The sampling method is simple random sampling.
- The variable under study is categorical.
- The expected value of the number of sample observations in each level of the variable is at least 5

Chi Square Independence or Association

2 sets of categories

EYE COLOR	Black	Brown	Blue	Green	Gray	Total
Female	20	30	10	15	10	85
Male	25	15	12	20	10	82
Total	45	45	22	35	20	167

H_O: Eye color and gender are not associated with each other.
Eye color and gender are independent of each other.

H_A:

- The sampling method is simple random sampling.
- The variable under study is categorical.
- The expected value of the number of sample observations in each level of the variable is at least 5

Chi Square Homogeneity

2 sets of categories

EYE COLOR	Black	Brown	Blue	Green	Gray	Total
Female	20	30	10	15	10	85
Male	25	15	12	20	10	82
Total	45	45	22	35	20	167

H_O: Eye color and gender are equally distributed.

H_A: Eye color and gender are not equally distributed

- The sampling method is simple random sampling.
- The variable under study is categorical.
- The expected value of the number of sample observations in each level of the variable is at least 5

Inference Procedures

One-sample z interval for p	One-sample z test for p
One-sample t interval for μ, including paired data	One-sample t test for μ, including paired data
Two-sample z interval for $p_1 - p_2$	Two-sample z test for $p_1 - p_2$
Two-sample t interval for $\mu_1 - \mu_2$	Two-sample t test for $\mu_1 - \mu_2$
t interval for the slope of a least-squares regression line	t test for the slope of a least-squares regression line
Chi-square test for goodness-of-fit	
Chi-square test for homogeneity	
Chi-square test for association/independence	

1. Two-sample t interval for $\mu_1 - \mu_2$
2. One-sample t interval/test for μ
3. One-sample z interval for p
4. t interval/test fo
5. Chi-square test
6. If the sample in
   the sample inclu
7. One-sample t in
8. Chi-square test
9. If the response v
   μ (paired data)
   side A or side B
10. Two-sample z i

1. Which brand of AA batteries last longer—Duracell or Eveready?

2. According to a recent survey, a typical teenager has 38 contacts stored in his/her cellphone. Is this true at your school?

3. What percent of students at your school have a MySpace page?

4. Is there a relationship between the age of a student's car and the mileage reading on the odometer at a large university?

5. Is there a relationship between students' favorite academic subject and preferred type of music at a large high school?

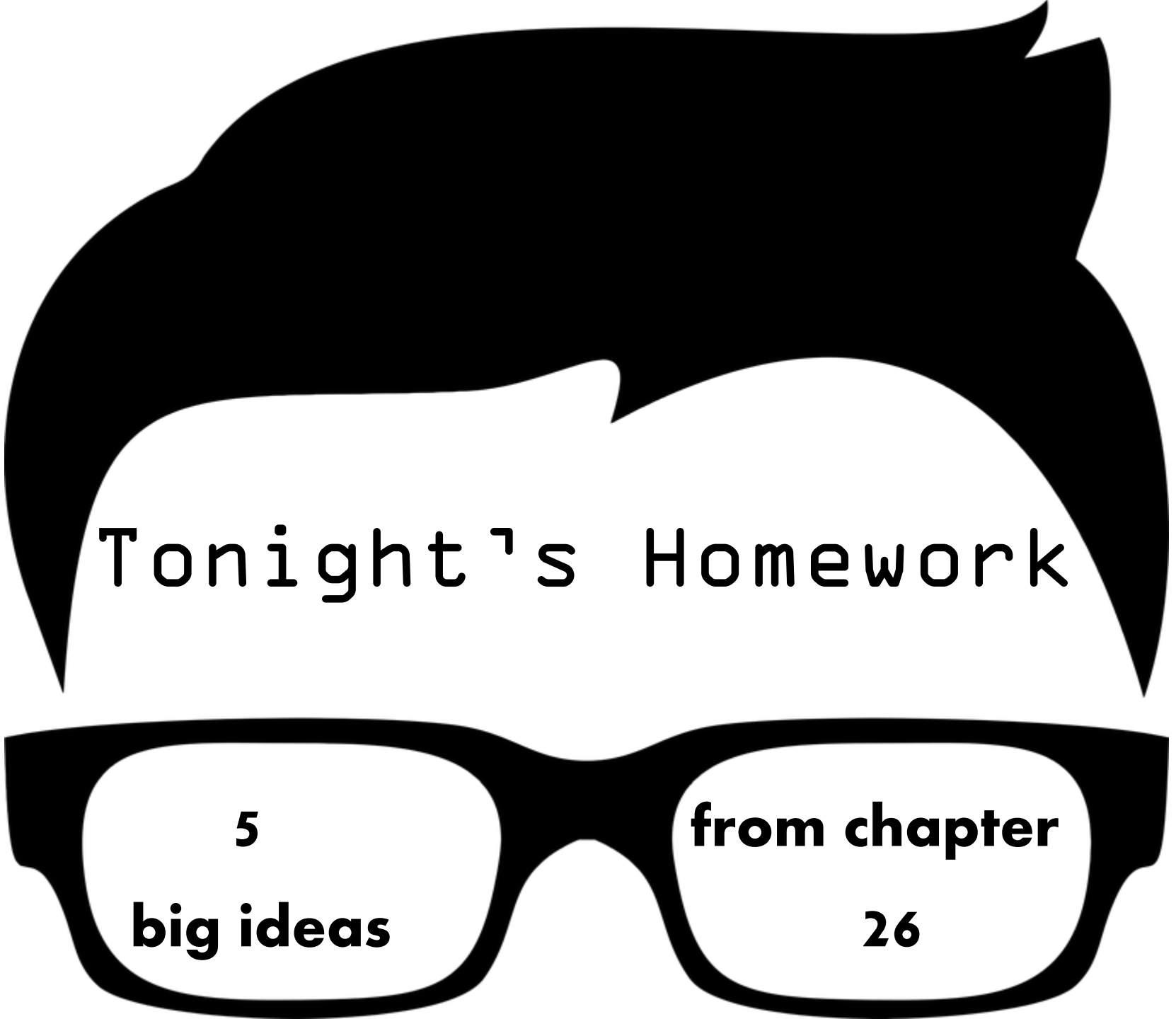
6. Who is more likely to own an iPod—middle school girls or middle school boys?

7. How long do teens typically spend brushing their teeth?

8. Are the colors equally distributed in Fruit Loops?

9. Which brand of razor gives a closer shave? To answer this question, researchers recruited 25 men to shave one side of their face with Razor A and the other side with Razor B.

10. How much more effective is exercise and drug treatment than drug treatment alone at reducing the incidence of heart attacks among men aged 65 and older?


Tonight's Homework
5
big ideas
from chapter
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