1) There are supposed to be 20% orange M&M's. Suppose a bag of 122 has only 21 orange ones. **Does this <u>contradict</u> the company's 20% claim**? (Note: think about whether this is a one-tailed or two-tailed test.)

2) A company claims to have invented a hand-held sensor that can detect the presence of explosives inside a closed container. Law enforcement and security agencies are very interested in purchasing several of the devices if they are shown to perform effectively. An independent laboratory arranged a preliminary test. If the device can detect explosives at a rate greater than chance would predict, a more rigorous test will be performed. They placed four empty boxes in the corners of an otherwise empty room. For each trial they put a small quantity of an explosive in one of the boxes selected at random. The company's technician then entered the room and used the sensor to try to determine which of the four boxes contained the explosive. The experiment consisted of 50 trials, and the technician was successful in finding the explosive 16 times. **Does this indicate that the device is <u>effective</u>** in sensing the presence of explosives, and should undergo more rigorous testing? (Note: what's the probability of just guessing? What does it mean to be "effective" as compared to chance? Is this a one-tailed or two-tailed test?)

3) Here is the saturated fat content (in grams) for several pizzas sold by two national chains. We want to know **if the two pizza chains have significantly different mean saturated fat content**s.

Brand D	17	12	10	8	8	10	10	5	16	16
	8	12	15	7	11	11	13	13	11	12
Brand PJ	6	7	11	9	4	4	7	9		
	11	3	4	5	8	5	5			

Mechanics. $n_D = 20$ $\bar{y}_D = 11.25$ $s_D = 3.193$

$n_{PJ} = 15$ $\bar{y}_{PJ} = 6.53$ $s_{PJ} = 2.588$

$\bar{y}_D - \bar{y}_{PJ} = 4.72$ $df = 32.757$ (from technology)

4) The vast majority of states and the District of Columbia have adopted the Common Core State Standards (CCSS) for math and English language arts. Do teachers support the CCSS? In March 2003, The American Federal of Teachers (AFT) asked AFT member teachers "Based on what you know about the Common Core State Standards and the expectations they set for children, do you approve or disapprove of your state's decision to adopt them?" The following results were reported in American Educator: 27% Strongly Approve; 48% Somewhat Approve; 14% Somewhat Disapprove; 8% Strongly Approve; 3% Not Sure. A district superintendent asked the same question to the teachers in her district to assess the level of teacher support for the CCSS within the district. She obtained the following results. **Test an**

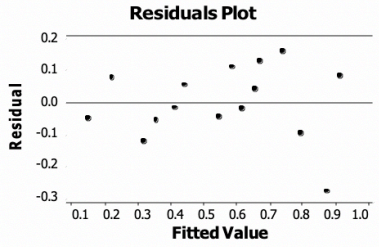
appropriate hypothesis to ascertain if the district CCSS approval distribution matches the national AFT approval distribution.

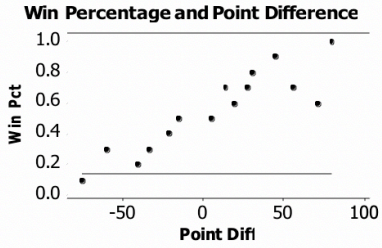
Response	Strongly Approve	Somewhat Approve	Somewhat Disapprove	Strongly Disapprove	Not Sure
Frequency	55	106	28	32	9

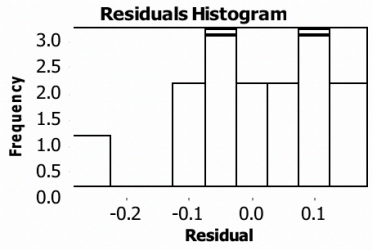
5)

A sports analyst was interested in finding out how well a football team's winning percentage (stated as a proportion) can be predicted based upon points scored and points allowed. She selects a random sample of 15 football teams. Each team played 10 games. She decided to use the point differential, points scored minus points allowed as the predictor variable. The data are shown in the table to the right, and regression output is given below.

Point Diff	Win Pct
-75	.100
-60	.300
-40	.200
-33	.300
-21	.400
-15	.500
5	.500
14	.700
20	.600
28	.700
31	.800
45	.900
56	.700
72	.600
80	1.000







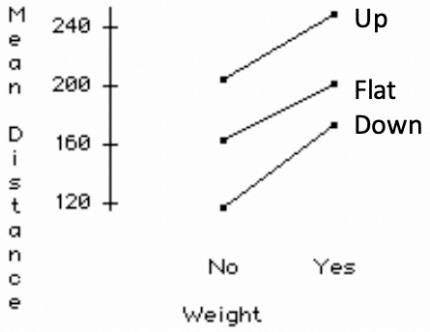

```
Regression Analysis: Win Pct versus Point Diff
Predictor         Coef     SE Coef      T      P
Constant       0.51802    0.03071  16.87  0.000
Point Diff   0.0049500  0.0006682   7.41  0.000

S = 0.117511   R-Sq = 80.8%   R-Sq(adj) = 79.4%
```

Is there evidence of an association between Point Differential and Winning Percentage? Test an appropriate hypothesis and state your conclusion in the proper context.

What's a 95% confidence interval for the slope? [Hint: you need to get the critical value t* from the t-table, and the standard error SE from the regression output]

A student wants to build a paper airplane that gets maximum flight distance. She tries three ways of *bending* the wing (*down, flat,* and *up*) and two levels of nose *weight* (*no* and *yes*—a paper clip). She randomizes the 12 runs (each condition replicated twice). The analysis of variance for the 12 runs is shown in the table below along with an interaction plot and tables of the mean distance for the different wing bends and weights.



Source	df	Sums of Squares	Mean Square	F-ratio	P-value
Wing Bend	2	13565.2	6782.58	152.7	< 0.0001
Weight	1	6768.75	6768.75	152.39	< 0.0001
Interaction	2	186.5	93.25	2.0994	0.2036
Error	6	266.5	44.4167		
Total	11	20786.9			

Wing Bend	Expected Mean
Down	145.0
Flat	182.5
Up	227.2

Weight	Expected Mean
No	161.2
Yes	208.7

What are the factors?
From the table, what's the MSE?
What's the null hypothesis being tested by the F-ratio relative to wing bend?
What's the null hypothesis being tested by the F-ratio relative to weight?
What are the alternative hypotheses?
What are your conclusions relative to the influence of wing bend and weight on flight distance?
Looking at the interaction plot, should I include an interaction? What's the evidence from the ANOVA table?