Problem 1

1. $E(X) = 0 * 0.15 + 1 * 0.02 + 2 * 0.19 + 3 * 0.30 + 4 * 0.15 + 5 * 0.18 + 6 * 0.01 = 2.86$

The expected number of dosages received is 2.86.

2. $P(X \geq 3) = 0.30 + 0.15 + 0.18 + 0.01 = 0.64$

The probability of a Dane receiving at least 3 dosages is 64%.

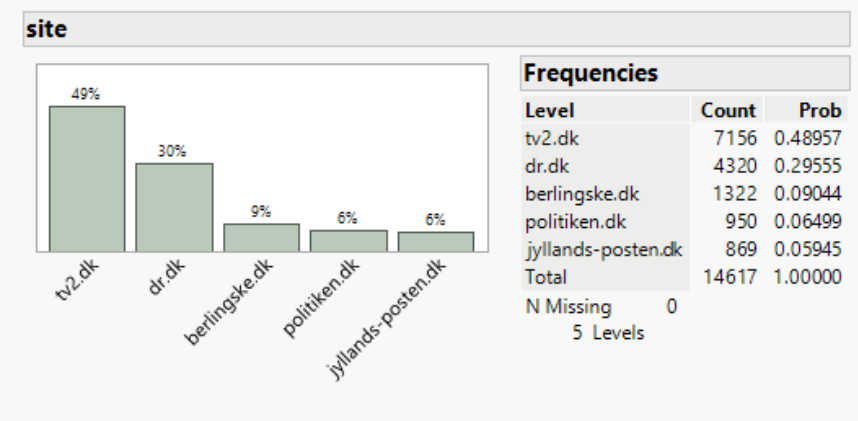
3. $P(X \geq 3 \mid X \geq 1) = \frac{0.64}{1-0.15} = \frac{0.64}{0.85} = 0.752941$

The probability that a Dane has received 3 or more dosages given that they have received at least one dosage is 75.29%.

Problem 2

site	Views (1000s)
berlingske.dk	1322
dr.dk	4320
jyllands-posten.dk	869
politiken.dk	950
tv2.dk	7156

1. Pareto plot for the data:



The mode for the data set is tv2.dk as it is the Danish online news site with the highest daily number of views with 7,156 out of a total of 14,617.

Problem 3

- $\hat{p}_{male} = \frac{62}{79} = 0.78481$
- $\hat{p}_{female} = \frac{81}{151} = 0.53642$

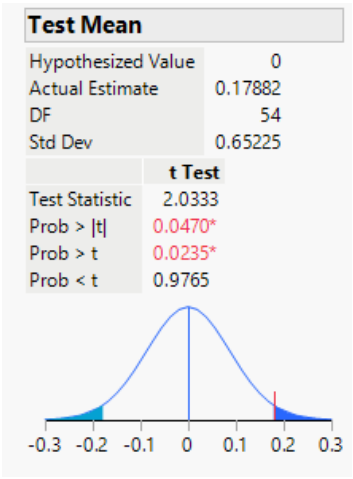
1. 90% confidence interval for the difference in probabilities:

$$]0.147196300; 0.349576272[$$

Using a calculator for the 95% quantile in the normal distribution, we can say with 90% confidence that the true difference between the probability that a man knows what an ad blocker is and the probability that a woman knows what an ad blocker is, is between 0.147196 and 0.349676. More specifically we can say that there is a significant difference between the two probabilities, and that men are more likely to know what an ad blocker is than women.

Problem 4

1. Since we are measuring the same dogs at different times, I use JMP to conduct a paired t-test:



The mean and standard deviation are 0.17882 and 0.65225, respectively. This gives us a test statistic of 2.0333, which under the null is t-distributed with 54 degrees of freedom, yielding a p-value of 0.0470. Therefore, we reject the null hypothesis of no difference and conclude that the expected level of aggressive behavior changes over time: it appears that aggressive behavior increases over time, as the average difference is positive.

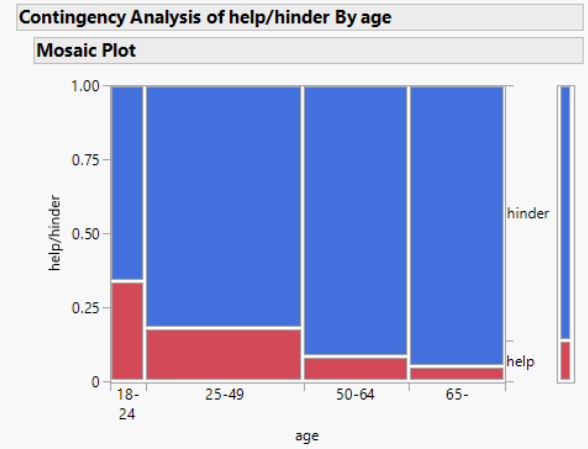
Problem 5

1. The 95% confidence interval for the proportion of the population believing that disruptive protests help the protesters' cause calculated using software is

$$]0.12054098; 0.15461825[$$

We can therefore say with 95% confidence that the true population proportion believing that disruptive protests help the protesters' cause lies between 12.0541% and 15.4618%.

2.



Freq: count

Contingency Table

help/hinder

Count / Row %	help	hinder	Total
18-24	48 34.04	93 65.96	141
25-49	113 17.99	515 82.01	628
50-64	35 8.33	385 91.67	420
65-	20 5.25	361 94.75	381
Total	216	1354	1570

age

Tests

N	DF	-LogLike	RSquare (U)
1570	3	43.577912	0.0693

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	87.156	<.0001*
Pearson	92.056	<.0001*

The Pearson χ^2-test statistic equals 92.056. Under the null it is approximately χ^2-distributed with 3 degrees of freedom, giving us a p-value of less than 0.001. Thus, we reject the null hypothesis of no dependence and conclude that the opinion about whether disruptive protests help or hinder the protesters' cause does depend on the respondent's age. The older the respondent is, the more likely they are to think that disruptive protests hinder the protesters' cause rather than help it, where the youngest group aged 18-24 have the highest proportion of believing that the disruptive protests help the protesters' cause.

Problem 6

1. The regression equation describing how aggression depends on the amount of fear exhibited 6 months after adoption is:

$$aggression = 0.5191367 + 0.0948846 * fear$$

The 95% prediction interval for the level of aggression shown by an adopted dog 6 months after adoption at fear equal to 0 calculated using JMP is:

$$]-0.545718171; 1.5839915544[$$

This means we can say with 95% probability that the level of aggression shown 6 months after adoption if the dog exhibits no signs of fear is contained in the interval -0.546 to 1.584.

2.

Summary of Fit

RSquare	0.038387
RSquare Adj	0.001402
Root Mean Square Error	0.511062
Mean of Response	0.580945
Observations (or Sum Wgts)	55

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	0.542169	0.271084	1.0379
Error	52	13.581573	0.261184	Prob > F
C. Total	54	14.123742		0.3614

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	0.4505773	0.139225	3.24	0.0021*
aggression10	0.1812538	0.136767	1.33	0.1909
fear	0.0882427	0.16795	0.53	0.6015

The estimated effect of fear is 0.0882427, whereas the estimate of the effect of aggression during the first 10 days of adoption equals 0.1812538.

The 95% confidence interval of the effect of fear when aggression during the first 10 days of adoption is taken into account is:

$$]-0.0007708; 0.1772562[$$

Looking at the confidence interval for the effect of fear on aggression when “aggression10” is taken into account, we can see that 0 is contained within. Thus, we cannot conclude that the effect is significant on the amount of aggression exhibited after 6 months of adoption.

The test statistic for the hypothesis of no effect of fear (when amount of aggression shown during the first 10 days of adoption is taken into account) equals 0.53. It is t-distributed with 52 degrees of freedom, which gives us a p-value of 0.6015. Hence, we do not reject the null hypothesis and conclude that once we have corrected for the effect of amount of aggression shown during the first 10 days of adoption, there seems to be no effect of fear exhibited on the amount of aggression exhibited after 6 months of adoption.