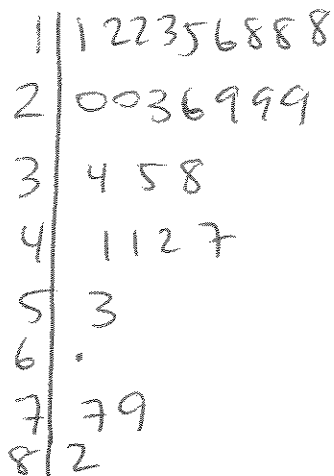Statistics & Probability Jeopardy

<u>Data Graphs</u>
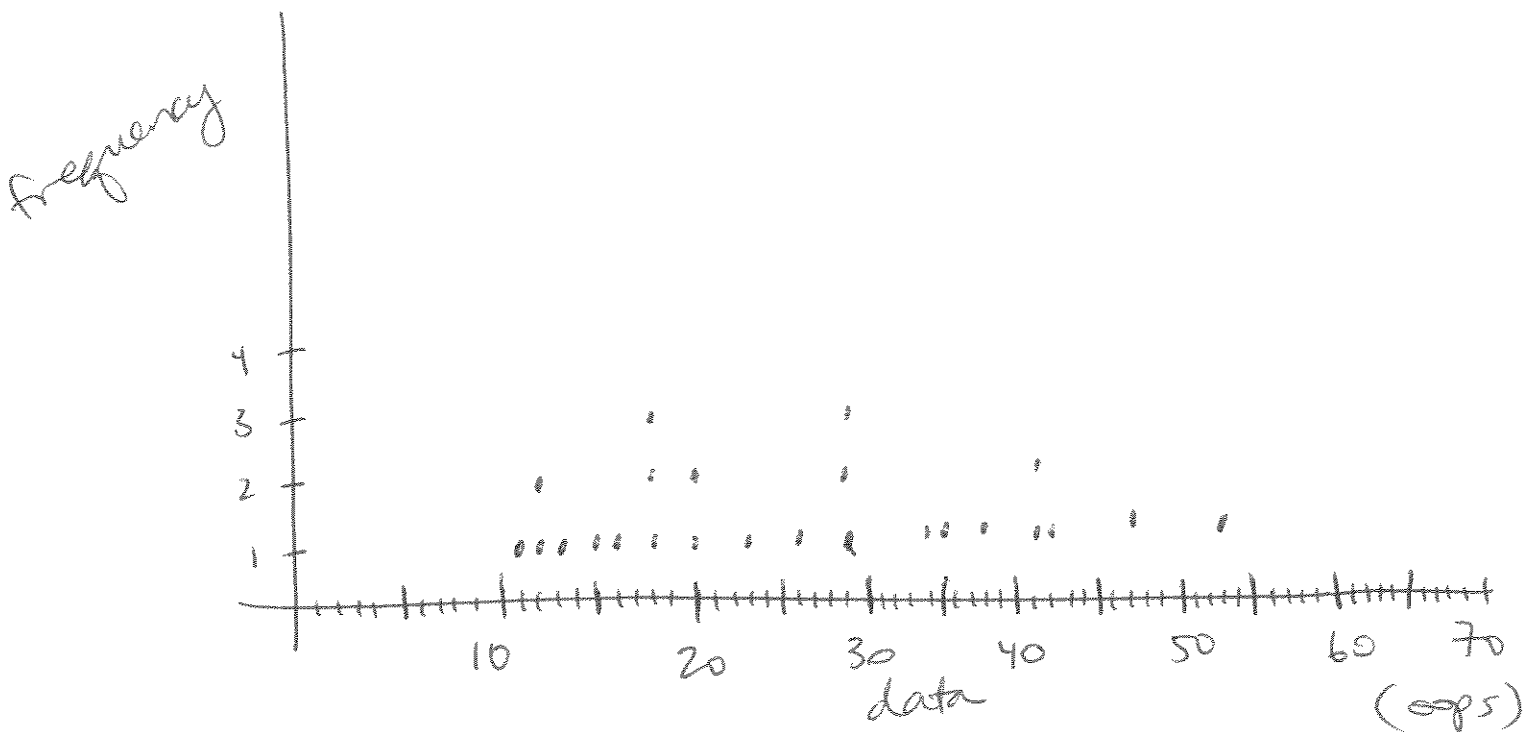For the given information

11, 12, 12, 13, 15, 16, 18, 18, 18,
20, 20, 23, 26, 29, 29, 29,
34, 35, 38, 41, 41, 42, 47, 53, 77, 79, 82

10 points—Construct a stem and leaf plot (using above information).

```
1 | 1 2 2 3 5 6 8 8 8
2 | 0 0 3 6 9 9 9
3 | 4 5 8
4 | 1 1 2 7
5 | 3
6 | .
7 | 7 9
8 | 2
```

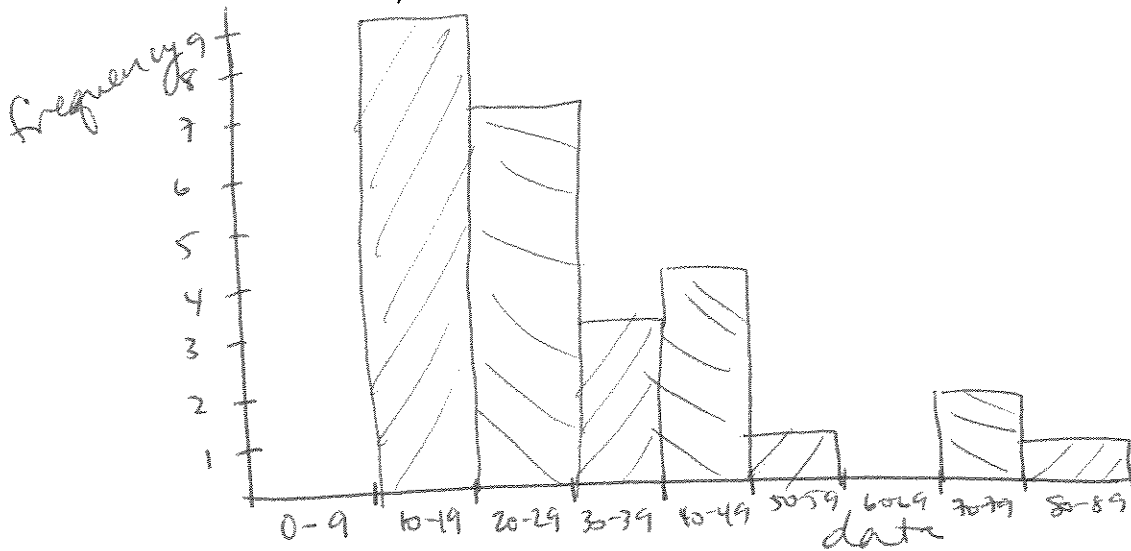20 points—Construct a line plot (using above data).

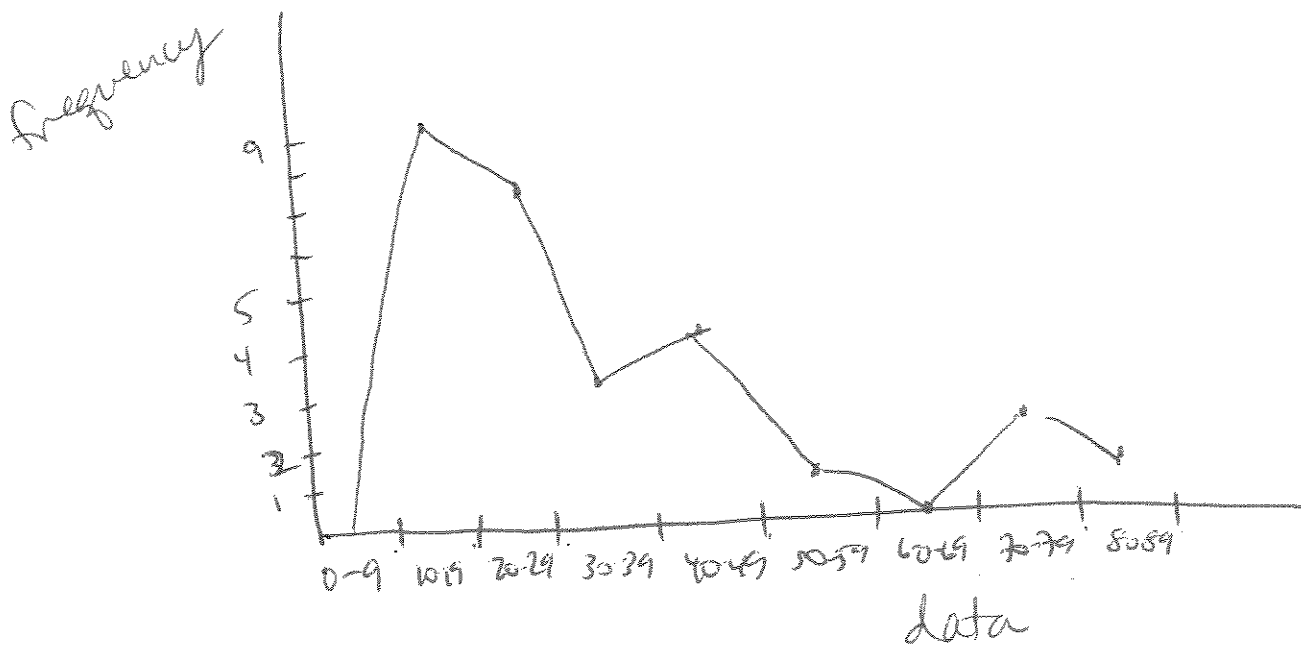(oops)

Data Graphs (continued)

For the given information

12, 12, 12, 13, 15, 16, 18, 18, 18,

20, 20, 23, 26, 29, 29, 29,

34, 35, 38, 41, 41, 42, 47, 53, 77, 79, 82

30 points—Construct a histogram (using above data).

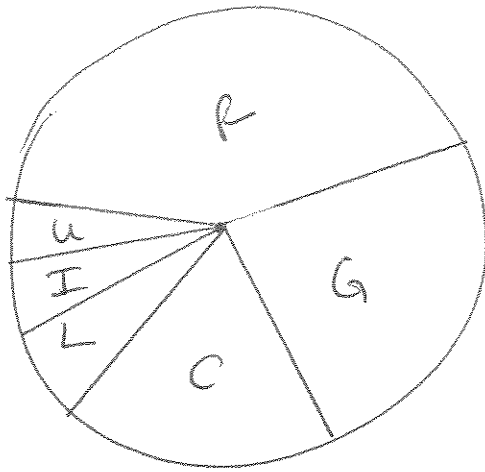40 points—Construct a line graph (using above data).

Data Graphs (continued)

50 points—Here is information about a monthly budget:

- G groceries $300
- R rent $550
- C car payment $250
- I insurance $60
- U utilities $50
- L clothing $75

total: 1285

Construct a pie chart (a.k.a. Circle graph) to display this data. (Make sure to specify angles.)

- G: $\frac{300}{1285} \approx 23.3\%$ $84°$
- R: $\frac{550}{1285} \approx 42.8\%$ $154°$
- C: $\frac{250}{1285} \approx 19.5\%$ $70°$
- I: $\frac{60}{1285} \approx 4.7\%$ $17°$
- U: $\frac{50}{1285} \approx 3.9\%$ $14°$
- L: $\frac{75}{1285} \approx 5.8\%$ $21°$

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<u>Distributions</u>
For the given data:

5, 8, 10, 10, (11), 12, 12, 15, 21

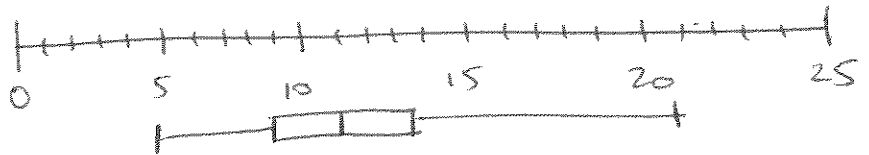10 points—Find the mean, median and mode.

$$mean = \frac{104}{9} \approx 11.\overline{5}$$

$$median = 11$$

$$mode = 10 \text{ and } 12$$

20 points—Create a box and whisker plot for this data.

low = 5
lq = 9
median = 11
uq = 13.5
high = 21

30 points—Find the standard deviation for the data.

$$\sigma^2 = \left[(5-11.\overline{5})^2 + (8-11.\overline{5})^2 + 2(10-11.5)^2 + (11-11.5)^2 \right.$$
$$\left. + 2(12-11.5)^2 + (15-11.5)^2 + (21-11.\overline{5})^2 \right] \frac{1}{9}$$

$$\sigma^2 \approx 18.02$$

$$\sigma \approx 4.25$$

Distributions (continued)

For the given data:

    5, 8, 10, 10, 11, 12, 12, 15, 21

    40 points—If ten more data values, whose mean is 8.5, were added to this data set, what would the mean of all the data be?

$$\bar{X}_{new} = \frac{104 + 85(10)}{9 + 10} = \frac{189}{19} \approx 9.95$$

The mean for my last Math1010 exam was $\bar{x}$ 82.3 with a standard deviation of 7.6.

    (a) 50 points--A student who scored 75% on the exam performed better than what percent of students in the class?

$$z = \frac{x - 82.3}{7.6}$$

$x = 75$

$$z = \frac{75 - 82.3}{7.6} \approx -0.9605$$

$$\Rightarrow 17\%$$

    (b) 60 points—Within what interval (centered about the mean) did 68% of my students score on the exam?

$$74.7 \text{ to } 89.9$$

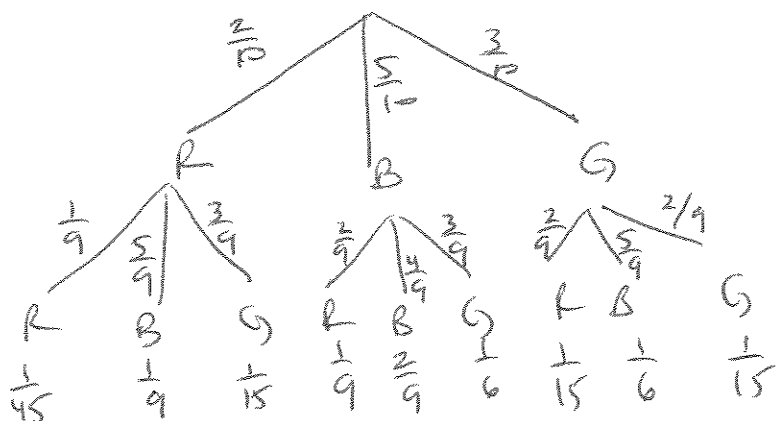   (c) 70 points—What score did 95% of my students do worse than?

$$z = 1.645$$

$$1.645 = \frac{x - 82.3}{7.6}$$

$$x = 94.8$$

Probability/Odds

I have 10 candies in a jar, 2 are red, 5 are blue and 3 are green. I will select (at random) one candy, record its color, select another candy from the jar, record its color, ~~and then select the final (third) candy, also recording its~~ ~~color.~~ (Note: no replacement.)

    10 points—Draw a probability tree diagram representing this experiment.

$$\frac{2}{10} \qquad \frac{5}{10} \qquad \frac{3}{10}$$

R   B   G

$$\frac{1}{9} \quad \frac{5}{9} \quad \frac{3}{9} \qquad \frac{2}{9} \quad \frac{4}{9} \quad \frac{3}{9} \qquad \frac{2}{9} \quad \frac{5}{9} \quad \frac{2}{9}$$

R   B   G   R   B   G   R   B   G

$$\frac{1}{45} \quad \frac{1}{9} \quad \frac{1}{15} \quad \frac{1}{9} \quad \frac{2}{9} \quad \frac{1}{6} \quad \frac{1}{15} \quad \frac{1}{6} \quad \frac{1}{15}$$
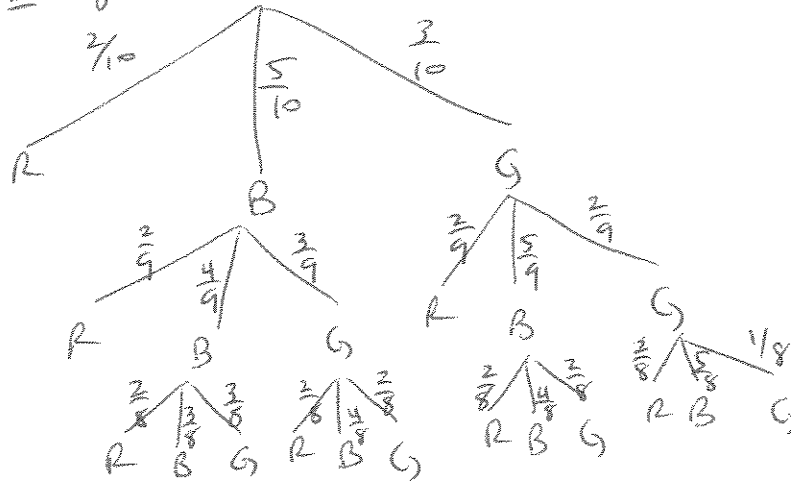
    20 points—What is the probability that you get at least one green candy?

$$\frac{1}{15} + \frac{1}{6} + \frac{3}{10} = \frac{2}{30} + \frac{5}{30} + \frac{9}{30} = \frac{16}{30} = \frac{8}{15}$$

<u>Probability/Odds (continued)</u>

    30 points—Redraw a probability tree diagram, assuming that you keep drawing candies until you get a red candy. ≅ you draw 3 candies. ☺

    40 points—For your new probability tree diagram (from the 30 points question), what is the probability that it took you three draws to get a red candy?

$$\frac{5}{10}\left(\frac{4}{9}\right)\left(\frac{2}{8}\right) + \frac{5}{10}\left(\frac{3}{9}\right)\left(\frac{2}{8}\right) + \frac{3}{10}\left(\frac{5}{9}\right)\left(\frac{2}{8}\right) + \frac{3}{10}\left(\frac{2}{9}\right)\left(\frac{2}{8}\right)$$

$$= \frac{1}{18} + \frac{1}{24} + \frac{1}{24} + \frac{1}{60} = \frac{1}{18} + \frac{1}{12} + \frac{1}{60}$$

$$= \frac{10+15+3}{180} = \frac{28}{180} = \frac{7}{45}$$

Probability/Odds (continued)

Brittany and Angela have different tastes. Brittany's favorite colors are red, pink, orange, yellow and purple. Angela's favorite colors are blue, green, purple, yellow, and brown. I have paint choices of red, yellow, orange, pink, purple, blue, green, brown, white, gray and black. We select at random one paint choice.
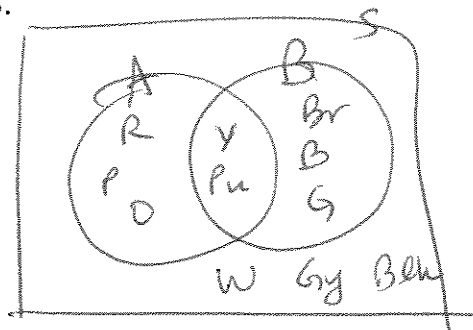
Let event A be the event that the paint choice is one of Angela's favorite colors and event B be the event that the paint choice is one of Brittany's favorite colors.

50 points—List the sample space S of outcomes for this experiment.

$$S = \{R, Y, O, P, Pu, B, G, Br, W, Gy, Blk\} \qquad n(S) = 11$$

$$B = \{R, P, O, Y, Pu\} \qquad A = \{B, G, Pu, Y, Br\}$$

60 points—Draw a Venn Diagram representing events A and B and sample space S.

70 points—Find $P(A)$ and $P(B)$.

$$P(A) = \frac{5}{11} \qquad P(B) = \frac{5}{11}$$

80 points—Find $P(A|B)$ and $P(B|A)$ and tell me, in words, what these events mean.

$$P(A|B) = \frac{2}{5} \qquad P(B|A) = \frac{2}{5}$$

A|B = event that we pick a color that Ashley likes if we already know it's a color Brittany likes

90 points—Find the odds in favor of choosing a color that both girls will like.

$$2:9$$

100 points—Find the odds against choosing a color that Brittany likes.

$$6:5$$

Permutations/Combinations

I have 30 people in a room.

10 points— I need to choose 6 of them to clean the schoolhouse. How many choices do I have?

$$_{30}C_6 = \frac{30!}{24!\,6!} = \frac{\overset{7}{30}\cdot29\cdot\overset{9}{28}\cdot\overset{13}{27}\cdot26\cdot25}{\cancel{6}\cdot\cancel{5}\cdot\cancel{4}\cdot\cancel{3}\cdot\cancel{2}}$$
$$= 29(63)(13)(25) =$$

20 points—I need to choose 4 people—1 person to do 593775 the sweeping, 1 person to clean the bathroom, 1 person to mow the lawn, and one more person to walk my dog.
How many choices do I have?

$$_{30}P_4 = \frac{30!}{26!} = 30(29)(28)(27) = 657,720$$

30 points—On a multiple-choice test with 15 questions, how many ways can I get at least 12 questions correct?

$$_{15}C_{12} = \frac{15!}{12!\,3!} = \frac{\overset{5}{15}\cdot\overset{7}{14}\cdot13}{\cancel{3}\cdot\cancel{2}} = 35(13) = 455$$

40 points—I am choosing five people out of 8 (4 girls and 4 boys) to do a job for me. The only characteristic I care about is whether or not these people are male or female. How many different boy/girl combinations do I have?

$$2^5 = 32$$

50 points—You have four chocolate cakes, three white cakes, and five carrot cakes. How many ways can you arrange them in a line? (Assume that each cake is indistinguishable from the other cakes of that same type.)

$$\frac{12!}{4!\,3!\,5!} = \frac{\overset{2}{\cancel{12}}\cdot11\cdot10\cdot9\cdot\overset{2}{\cancel{8}}\cdot7\cdot\cancel{6}\cdot\cancel{5}!}{\cancel{4}\cdot3\cdot\cancel{2}\cdot\cancel{3}\cdot\cancel{2}\quad\cancel{5}!}$$

$$= 110(18)(14) = 27,720$$