

check answers for reminder and #1-2:

4.01 10.56 34 47.5 54.67 68 68 95 95 95 95.99 97.10 99.7 99.7 99.7

Reminder from 14.6 notes, Normal Distribution:

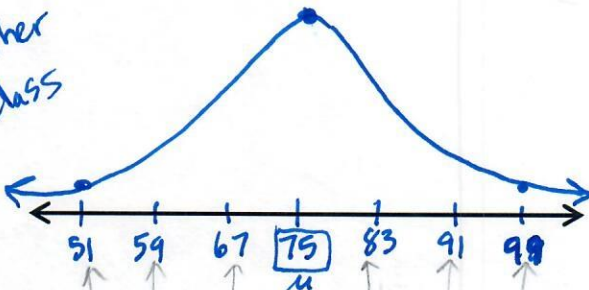
The Empirical Rule states that about 68% of the data is within **one** standard deviation of the mean.

95% of the data is within **two** standard deviations of the mean.

99.7% of the data is within **three** standard deviations of the mean.

1. The **mean** of a set of normally distributed data is **75** and the **standard deviation** is **8**. Sketch a graph of the situation.

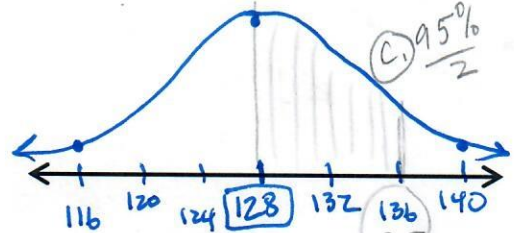
#1,2 go over together in class



State your answer to parts a-c by referring to the graph. No work to show!

- a. What percent of the data is in the interval 67-83? 68%
- b. What percent of the data is in the interval 59-91? 95%
- c. What percent of the data is in the interval 51-99? 99.7%

2. The **mean** of a set of normally distributed data is **128** and the **standard deviation** is **4**. Sketch a graph of the situation.



State answer to parts a-b by referring to graph. No work!

- a. What percent of the data is in the interval 116-140? 99.7%
- b. What percent of the data is in the interval 120-136? 95%

Refer to the graph, then show work for parts c-d.

- c. What percent of the data is in the interval 128-136? $\frac{95}{2} = 47.5\%$
- d. What percent of the data is in the interval 124-128? $\frac{68}{2} = 34\%$

Use a calculator to solve e - h, write notation that you use.

- e. What percent of the data is in the interval 125-131? $\text{normalcdf}(125, 131, 128, 4) \approx 54.67\%$
- f. What percent of the data is in the interval 118-136? $\text{normalcdf}(118, 136, 128, 4) \approx 97.10\%$
- g. What percent of the data is above 133? $\text{normalcdf}(133, 1000, 128, 4) \approx 10.56\%$
- h. What percent of the data is below 121? $\text{normalcdf}(-100, 121, 128, 4) \approx 4.01\%$
- i. What percent of the data is above 121? $100\% - 4.01\% = 95.99\%$

No calculator command, show work using answer from part h.

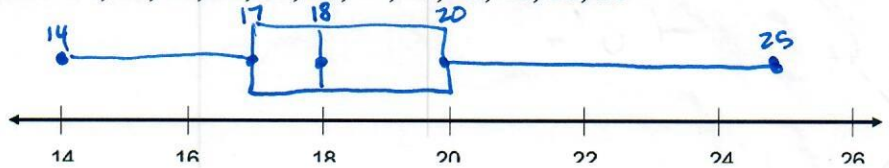
3. Enter these quiz scores into a calculator: 14, 18, 16, 20, 22, 18, 19, 20, 25, 18, 16, 18

a. State the five-number summary.

14, 17, 18, 20, 25
min Q1 Med Q3 max

use 1-var stats

b. Sketch a box-and-whisker plot.



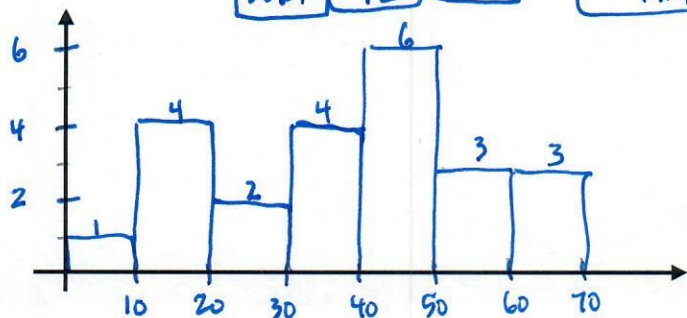
4. Enter the following values into a calculator and sort.

8 23 11 34 35 12 15 47 51 61 56 48
12 35 62 49 47 28 44 68 35 42 53

- a. Complete the frequency table, then sketch a histogram.
- b. Create a stem-and-leaf plot.
- c. State the mean, median, mode, and standard deviation.

mean: 38.09, median: 42, mode: 35, standard deviation: 17.49

check answers #3-4
14 17 17.49 18 20
25 35 38.09 42
1 2 3 3 4 4 6



interval	frequency
0-10	1
10-20	4
20-30	2
30-40	4
40-50	6
50-60	3
60-70	3

stem	leaf
0	8
1	1 2 2 5
2	3 8
3	4 (555)
4	2 4 7 7 8 9
5	1 3 6
6	1 2 8

* Sort data in calculator key: 6/1 = 61

5. A pair of number cubes is thrown. Find the probability that the numbers match (doubles) **given** that their sum is greater than 8.

$$P(\text{match} | \text{sum} > 8) = \frac{2}{10} = \frac{1}{5}$$

9	9	9	9
10	10	10	10
11	11	11	11
12	12	12	12

6. A pair of number cubes is thrown. Find the probability that their sum is greater than 8 **given** that the numbers match.

$$P(\text{sum} > 8 | \text{match}) = \frac{2}{6} = \frac{1}{3}$$

1,1	2,2	3,3
4,4	5,5	6,6

	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

7. Write your calculator command using binompdf or binomcdf, then state answer as a percent for the following conditions: A weather report is forecasting a 60% chance of rain for the next 3 days.

a. What is the probability of it raining exactly 2 of the next three days?

$$\text{binompdf}(3, .6, 2) = 43.2\%$$

b. What is the probability of it raining at least 2 of the next three days?

$$1 - \text{binomcdf}(3, .6, 1) = 64.8\%$$

subtract 1 and below to keep 2 and above

c. What is the probability of it raining no more than 2 of the next three days?

$$\text{binomcdf}(3, .6, 2) = 78.4\%$$

check answers #5-14			
1/3	1/5	1/12	2/13
5/6	270/1001	1320/1680	17.62%
43.2%	64.8%	78.4%	mutually exclusive
			not mutually exclusive

8. Write your calculator command using binompdf or binomcdf, then state answer as a percent for the following conditions: A pop quiz has 20 true-false questions and you are not prepared for it.

a. What is the probability of randomly guessing and getting exactly 10 questions correct?

$$\text{binompdf}(20, \frac{1}{2}, 10) \approx 17.62\%$$

b. What is the probability of randomly guessing and answering at least 12 questions correctly so you can earn a passing score?

$$1 - \text{binomcdf}(20, \frac{1}{2}, 11) \approx 25.17\%$$

subtract off 11 and below to keep 12 and above

9. A bag contains 4 yellow and 10 red markers. Four markers are drawn at random without replacement. What is the **probability** of drawing 2 yellow markers and 2 red markers?

$$\frac{{}^4C_2 \cdot {}^{10}C_2}{{}^{14}C_4} = \frac{6 \cdot 45}{1001} = \frac{270}{1001} \approx 26.97\%$$

students try this

4! repetitions
 $\frac{4!}{2!2!} = \frac{4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1 \cdot 2 \cdot 1} = 6$ Combs
 $\frac{{}^4C_2 \cdot {}^{10}C_2}{14 \cdot 13 \cdot 12 \cdot 11} = \frac{90}{2002}$
 indicates specific order = $\frac{45}{1001}$
 so... $6 \cdot (\frac{45}{1001}) = \frac{270}{1001}$
 must consider all arrangements of marbles
 yr yr
 rr yr
 etc

Using a standard deck of playing cards, **how many** 5-card hands are possible that have 3 face cards and 2 aces?

$${}^{12}C_3 \cdot {}^4C_2 = 220 \cdot 6 = 1320$$

nCr = general grouping of items

11. **How many** different ways can the letters in the word *lollipop* be arranged?

$$\frac{8!}{(3!2!2!)} = \frac{40320}{24} = 1680$$

12. A **single** number cube is rolled twice. Find the **probability** of rolling a 6 on the first toss and an odd number on the second toss.

$$\frac{1}{6} \cdot \frac{3}{6} = \frac{3}{36} = \frac{1}{12}$$

State if each event is **mutually exclusive** or **NOT mutually exclusive**, then solve for

13. the probability of selecting a card from a standard deck and it is a king or an ace.

$$P(\text{king}) + P(\text{ace}) = \frac{4}{52} + \frac{4}{52} = \frac{8}{52} \text{ or } \frac{2}{13}$$

add = "or" exclusive

14. the probability of tossing two number cubes and getting a sum greater than 6 or an even sum.

$$P(\text{sum} > 6) + P(\text{even sum}) - P(\text{both}) = \frac{21}{36} + \frac{18}{36} - \frac{9}{36} = \frac{30}{36} = \frac{5}{6}$$

not exclusive

use nPr or nCr if choosing multiple items

repetitions multiply

add = "or"

Ch.14 review#2

NAME: *Key*

PER:

15. Standard automobile license plates in California display a nonzero digit, followed by three letters, followed by three digits. **How many** different standard plates are possible in this system?

non-zero digit $9 \cdot$ *letters* $26 \cdot 26 \cdot 26 \cdot$ *digits* $10 \cdot 10 \cdot 10 = 158,184,000$

16. **How many** different ways can six red balls, five white balls, and seven blue balls be arranged in a row?

reminder: use parentheses when entering into calc
 $\frac{8!}{(6!5!7!)} = 14,702,688$
 $\frac{6!}{(2!3!)} = 60$

17. **How many** ways can the letters in the word *banana* be arranged?

CHECK ANSWERS #15-27:

.066%	31.744%	32.92%
35.96%	79.01%	86.83%
$\frac{7}{11}$	60	270
110,544	2,598,960	990
14,702,688	158,184,000	1365

#18-24 Combinations/Permutations: use C(n, r) or P(n, r) and solve with a calculator. Show your set up.

18. **How many** ways can a president, vice president, and secretary be chosen from a class of 49 students?

$49P_3 = 110,544$ *specific titles = permutation*

19. A pizza parlor offers a choice of 15 different toppings. **How many** four-topping pizzas are possible?

$15C_4 = 1365$ *general combination of toppings, order they are placed on pizza is insignificant*

20. **How many** five-card hands can be dealt from a deck of 52 cards?

$52C_5 = 2,598,960$ *general grouping of 5 cards*

21. **How many** ways can first, second, and third prizes be awarded in a game with eleven contestants?

$11P_3 = 990$ *order is significant (changing the order creates a new arrangement)*

22. A bag contains 4 yellow and 10 red markers that are drawn without replacement. **How many** ways can four markers be selected if exactly two must be yellow? *..so the other two must be red*

$4C_2 \cdot 10C_2 = 270$

23. A bag contains 4 yellow and 10 red markers. Five markers are drawn without replacement. What is the **probability** of drawing 2 yellow markers and 3 red markers? Express answer as a percent.

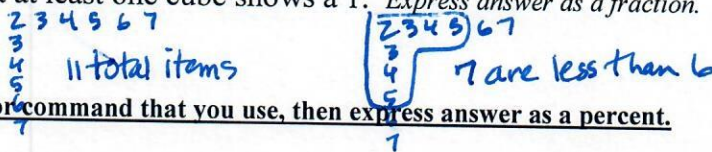
desired outcome $\rightarrow \frac{4C_2 \cdot 10C_3}{14C_5} \leftarrow$ *total outcomes* $\approx 35.96\%$

24. What is the **probability** of getting a 5-card hand that contains 3 hearts and 2 aces? Express answer as a %.

$\frac{13C_3 \cdot 4C_2}{52C_5} \approx .00066 \approx .066\%$

25. **Conditional probability:** *Count sample space from review #1* Two number cubes are tossed. What is the probability that the sum of the numbers shown on the cubes is less than 6 **given** that at least one cube shows a 1. Express answer as a fraction.

$P(\text{sum} < 6 | \text{at least one } 1) = \frac{7}{11}$



#26-27 Use binompdf or binomcdf to solve. Write the calculator command that you use, then express answer as a percent.

26. The probability of Brooke making a free throw is $\frac{2}{3}$. Find each probability if she shoots five times.

- a. P(exactly 4 made) b. P(at most 4 made) c. P(at least 3 made)

$\text{binompdf}(5, \frac{2}{3}, 4) \approx 32.92\%$ $\text{binomcdf}(5, \frac{2}{3}, 4) \approx 86.83\%$ $1 - \text{binomcdf}(5, \frac{2}{3}, 2) \approx 79.01\%$

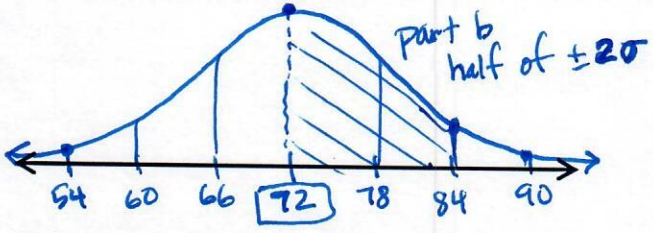
27. A weather reporter is forecasting a 40% chance of rain for the next five days.

Find the **probability** of having rain for 3 or more days.

$1 - \text{binomcdf}(5, .4, 2) = 31.744\%$

subtract P(0) + P(1) + P(2)
"3 or more" same as "at least 3"

28. What is the **probability** of drawing one card from a standard deck and getting a Jack **or** a Spade? *(*) not mutually exclusive*
 $P(\text{Jack}) + P(\text{Spade}) - P(\text{Jack of Spades}) = \frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$
29. What is the **probability** getting a sum of 9 on the first throw of two dice **and** a sum of 3 on the second toss?
 $P(\text{sum } 9) \cdot P(\text{sum } 3) = \frac{4}{36} \cdot \frac{2}{36}$ or $\frac{1}{9} \cdot \frac{1}{18} = \frac{1}{162}$
30. What is the **probability** getting a sum of 9 **or** a sum of 3 if you roll two dice?
 $P(\text{sum } 9) + P(\text{sum } 3) = \frac{4}{36} + \frac{2}{36} = \frac{6}{36} = \frac{1}{6}$ *(*) mutually exclusive*
31. The mean of a set of normally distributed test scores is 72 and the standard deviation is 6. Sketch a graph.



Use a calculator to solve parts d - f, write the notation that you use. Round your percent to the nearest tenth.

- Refer to your GRAPH, then state the answers to a - c:
- a. What percent of the data is between 54 and 90?
 $\pm 3\sigma$ so = 99.7%
- b. What percent of the data is between 72 and 84?
 $\pm 2\sigma \div 2$ $95\% \div 2 = 47.5\%$
- c. What percent of the data is between 66 and 78?
 $\pm 1\sigma = 68\%$

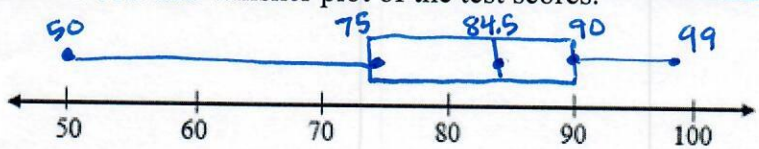
- d. What percent of the data is in the interval 60-80?
 $\text{normalcdf}(60, 80, 72, 6) \approx 88.6\%$
- e. What percent of the data is **above** 81?
 $\text{normalcdf}(81, 1000, 72, 6) \approx 6.7\%$
use larger # beyond data set
- f. What percent of the data is **below** 75?
 $\text{normalcdf}(-1000, 75, 72, 6) \approx 69.1\%$
use very small # beyond data set

CHECK ANSWERS #28-31: $\frac{4}{13}$ $\frac{1}{6}$ $\frac{1}{162}$ 6.7% 68% 69.1% 47.5% 88.6% 99.7%

32. Use your calculator, enter the values into a list, sort, and then use 1-Var Stats.

82 77 84 98 98 71 76 64 89 95 78 89 65 88 54
 96 87 92 80 85 93 89 50 62 79 90 86 75 99 62

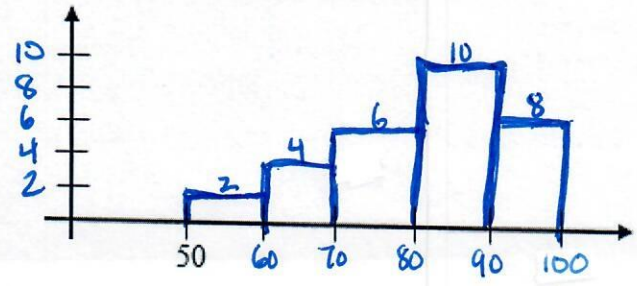
- a. List the five-number summary. $50, 75, 84.5, 90, 99$
 min Q_1 Med Q_3 max
- b. Draw a box-and-whisker plot of the test scores.



NOTE:
 50-60 same as $50 \leq \text{score} < 60$

test scores	frequency
50-60	2
60-70	4
70-80	6
80-90	10
90-100	8

- c. What is the arithmetic mean of the test scores? $\bar{x} \approx 81.1$
- d. What is the standard deviation of the test scores? $\sigma \approx 13.10$
- e. What is the mode of the test scores? 89 most common
- f. Construct a **frequency table** of the data.
- g. Make a stem-and-leaf plot of the data.
- h. Draw a histogram of the data with intervals of 10, starting at 50.



stem	leaf
5	04
6	2245
7	156789
8	0245678999
9	02356889

#32 CHECK ANSWERS

2
4
6
8
10
13.1
50
75
81.1
84.5
89
90
99
50-60
60-70
70-80
80-90
90-100

7 | 1 means 71