Probability and Statistics Review

1. Find the odds of an event occurring given the probability of the event.

   a. $\frac{1}{4}$ b. $\frac{5}{8}$ c. $\frac{7}{12}$

   $1:3$ $5:3$ $7:5$

2. Find the probability of an event occurring given the odds of the event.

   a. $\frac{3}{4}$ b. $\frac{2}{3}$ c. $\frac{6}{7}$

   $3/7$ $2/5$ $6/13$

3. A pair of dice is thrown. What is the probability that both dice show a number less than 5?

   $\frac{4}{6} \cdot \frac{4}{6} = \frac{16}{36} = \boxed{\frac{4}{9}}$

For questions 4 and 5, consider a bag that contains 8 red marbles, 5 white marbles, and 2 blue marbles.   15 total

4. If 3 marbles are selected in succession with replacement, what is the probability that the marbles are white, blue, and red in that order?

   $\frac{5}{15} \cdot \frac{2}{15} \cdot \frac{8}{15} = \frac{80}{3375} = \boxed{\frac{16}{675}}$

5. If 3 marbles are selected in succession without replacement, what is the probability that the marbles are white, blue, and red in that order?

   $\frac{5}{15} \cdot \frac{2}{14} \cdot \frac{8}{13} = \frac{80}{2730} = \boxed{\frac{8}{273}}$

6. Janet has 3 dimes and 6 nickels in her pocket. She selects 3 coins without replacement. What is the probability that she selects all dimes or all nickels?

   $\frac{3}{9} \cdot \frac{2}{8} \cdot \frac{1}{7} = \frac{1}{84}$ $\frac{6}{9} \cdot \frac{5}{8} \cdot \frac{4}{7} = \frac{120}{504} = \frac{5}{21}$ $\frac{1}{84} + \frac{5}{21} = \boxed{\frac{1}{4}}$

7. A card is drawn from a standard deck of 52 playing cards. What is the probability that a heart or face card is drawn?

   $\frac{13}{52} + \frac{12}{52} - \frac{3}{52} = \frac{22}{52} = \boxed{\frac{11}{26}}$

8. Two dice are rolled. What is the probability that each die shows a 4? Is this a dependent or independent event?

   Independent, $\frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$

Determine whether the events are mutually exclusive or inclusive. Then find the probability.

9. There are 5 English, 2 math, and 3 chemistry books on a shelf. If a book is randomly selected, what is the probability of selecting a math book or a chemistry book?

   mutually exclusive $\frac{5}{10} = \boxed{\frac{1}{2}}$

10. A die is rolled. What is the probability of rolling a 6 or a number less than 4?

mutually exclusive $\frac{1}{6} + \frac{3}{6} = \frac{4}{6} = \boxed{\frac{2}{3}}$

11. A die is rolled. What is the probability of rolling a 6 or a number greater than 4?

inclusive $\frac{1}{6} + \frac{2}{6} - \frac{1}{6} = \frac{2}{6} = \boxed{\frac{1}{3}}$

12. A card is drawn from a standard deck of cards. What is the probability of drawing a king or a red card?

inclusive $\frac{4}{52} + \frac{26}{52} - \frac{2}{52} = \frac{28}{52} = \boxed{\frac{7}{13}}$

13. Find the variance of the data set {13, 16, 17, 18, 16, 12, 14, 12}. Round to the nearest hundredth if necessary.   mean: 14.75

$\frac{(13-14.75)^2 + (16-14.75)^2 + \ldots (12-14.75)^2}{8}$ $\boxed{4.69}$

14. Find the standard deviation for the data in Question 14. Round to the nearest hundredth if necessary.   take $\sqrt{\ }$ from #13 $\boxed{2.17}$

Find the variance and standard deviation of the data set. Round to the nearest hundredth if necessary.

15. {56, 56, 57, 58, 58, 58, 59, 61}   2.31, 1.53

16. {3.4, 4.2, 8.6, 5.1, 3.6, 2.8, 7.1, 4.4, 5.2, 5.6}

    2.81 , 1.68

17. Determine if the data in the table appear to be positively or negatively skewed or normally distributed.

Frequency	Income (Thousands)
3	Less than 31
50	31-40
70	41-50
87	51-60
70	61-70
40	71-80
30	81-90
20	91-100
11	101-110
9	111-120
5	121-130
3	131-140
2	141-150

positively skewed

The utility bills in a city of 5000 households are normally distributed with a mean of $180 and a standard deviation of $16.

18. About how many utility bills were between $164 and $196? 1 Stand. dev.

$5000 \times .68 = \boxed{3400}$ 68%

19. About how many bills were more than $212? 2 Stand. dev.

$5000 \times .025 = \boxed{125}$ 100 - 95% but only top ½ so 2.5%

20. About how many bills were less than $164? 100 - 50% = 50% < 180

$5000 \times .16 = \boxed{800}$ 164 1 Stand. dev below so ½ of
50 - 34 = 16% 68%

21. What is the probability that a household selected at random will have a utility bill between $164 and $180? 1 standard dev. below

34% 68 ÷ 2

22. In a poll asking people to name their most valued freedom, 51% of the randomly selected people said it was the freedom of speech. Find the margin of sampling error is 625 people were randomly selected.

P = .51
n = 625

$$ME = 2\sqrt{\frac{.51(1-.51)}{625}} = .039991 \approx \boxed{4\%}$$

23. According to a recent survey of mothers with children who play sports, 63% of them would prefer that their children not play football. Suppose the margin of error is 4.5%. How many mothers were surveyed?

$$.045 = 2\sqrt{\frac{.63(1-.63)}{n}}$$

$$.0225 = \sqrt{\frac{.2331}{n}}$$

$$.00050625 = \frac{.2331}{n}$$

$$n = \frac{.2331}{.00050625}$$

$$n = 460.444$$

$\boxed{\text{about 460 moms}}$