AC Math I **T6 Worksheet #2** **Name_____Pd____**

Mutually Exclusive Events

A **compound event** involves two or more events such as tossing three number cubes or choosing two people to serve on a committee. When two events cannot occur at the same time, the events are **mutually exclusive**.

Probability of Mutually Exclusive Events

If A and B are mutually exclusive events, then the probability that A or B will occur is given by the formula:

P(A or B) = P(A) + P(B)

If A and B are mutually exclusive events, the P(A and B) = 0 since A and B cannot occur at the same time.

Ex) A fruit basket contains 3 pears, 2 red apples, 4 green apples, and 3 oranges. If Karen reaches into the basket and selects a piece of fruit at random, what is the probability that it is either red or orange?

P(red or orange) = P(red) + P(orange)

P(red) = $\frac{2}{12}$ P(orange) = $\frac{3}{12}$ P(red or orange) = $\frac{2}{12}+\frac{3}{12}=\frac{5}{12}$

The probability that the piece of fruit is either red or orange is $\frac{5}{12}$

Ex) There are 9 novels, 5 biographies, 3 poetry books, and 7 science books on a shelf. If Paula selects a book at random, what is the probability that it is a biography or a poetry book? Express your answer as a fraction

P(biography or poetry) = P(biography) + P(poetry)

P(biography) = $\frac{5}{24}$ P(poetry) = $\frac{3}{24}$ P(biography or poetry) = $\frac{5}{24}+\frac{3}{24}=\frac{8}{24}=\frac{1}{3}$

The probability that the book is either a biography or poetry is $\frac{1}{3}$

Inclusive Events

Events that are not mutually exclusive are **inclusive events**. These are events that can happen at the same time. For example, when calculating the probability of selecting a diamond or a face card, there are three mutually inclusive events: picking a jack of diamonds, a queen of diamonds, and a king of diamonds

Probability of Inclusive Events

If A and B are inclusive events, then the probability that A or B will occur is given by the formula:

P(A or B) = P(A) + P(B) – P(A and B)

Ex) Sigmund picked a pair of socks out of his drawer without looking in the drawer. Sigmund has 3 pairs of black dress socks, 4 pairs of brown dress socks, 3 pairs of black sport socks, and 5 pairs of white sport socks. What is the probability that Sigmund will select a pair of black socks or a pair of sport socks?

The events are inclusive events because a pair of socks can be both a sport sock and black

P(black or sport) = P(black) + P(sport) – P(black and sport)

P(black) = $\frac{6}{15}$ P(sport) = $\frac{8}{15}$ P(black and sport) = $\frac{3}{15}$

P(black or sport) = $\frac{6}{15}+\frac{8}{15}-\frac{3}{15}=\frac{11}{15}$

The probability that Sigmund selects a pair of black socks or a pair of sport socks is $\frac{11}{15}$

Ex) There are 8 girls and 12 boys in Miss Reading's homeroom. Five of the girls play sports and 3 do not play sports. Eight of the boys play sports and 4 do not play sports. If a student is selected at random, what is the probability that the student is a boy or plays sports? Express your answer as a fraction.

The events are inclusive events because a student can be both a boy and play a sport

P(boy or plays a sport) = P(boy) + P(plays a sport) – P(boy and plays a sport)

P(boy) = $\frac{12}{20}$ P(plays a sport) = $\frac{13}{20}$ P(boy and plays a sport) = $\frac{8}{20}$

P(black or sport) = $\frac{12}{20}+\frac{13}{20}-\frac{8}{20}=\frac{25}{20}-\frac{8}{20}=\frac{17}{20}$

The probability that the selected student is a boy or plays a sport is $\frac{17}{20}$

Conditional Events

A **conditional probability** is the probability that one event will occur given that another event has already occurred. This concept was introduced with dependent events.

Probability of Conditional Events

The conditional probability of event A, given event B has already occurred, is given by the formula:

P(A | B) = $\frac{P(AandB)}{P(B)}$**, where P(B) ≠ 0**

Ex) The table below shows the results of a class survey. Find the conditional probability that a student did more than 2 hours of homework last night given that the student is a female.

Did you do more than 2 hours of homework last night?		
	Male	Female
Yes	6	10
No	8	8

There are 14 males and 18 females for a total of 32 students. A total of 16 students did more than 2 hours of homework, while 16 students did not.

$$P(\text{more than 2 hours} \mid \text{female}) = \frac{P(\text{more than 2 hours and female})}{P(\text{female})}$$

$$P(\text{more than 2 hours} \mid \text{female}) = \frac{\frac{10}{32}}{\frac{18}{32}} = \frac{10}{18} = \frac{5}{9}$$

The probability that a student did more than 2 hours of homework last night, given that he student is a female, is $\frac{5}{9}$.

Exercises

Heather tosses two number cubes. State whether or not the two events are mutually exclusive. Explain.

1) The sum rolled is even; the numbers are the same

2) The sum rolled is odd; both numbers are odd

3) The sum rolled is greater than 8; both numbers are less than 4

4) The sum rolled is a prime number; the sum rolled is greater than 7

A and B are mutually exclusive events. Find P(A or B).

5) P(A) = 0.35, P(B) = 0.12

6) P(A) = 41%, P(B) = 19%

7) P(A) = $\frac{1}{4}$, P(B) = $\frac{1}{6}$

8) P(A) = $\frac{3}{22}$, P(B) = $\frac{7}{110}$

Lanny tosses a standard number cube. Find each probability. Express the answers as fractions.

9) P(odd or 5)

10) P(odd or greater than 1)

11) P(even or prime)

12) P(odd or prime)

13) P(1 or even)

14) P(less than 3 or greater than 3)

Use the table below to find each conditional probability. Express the answers as decimals rounded to the nearest thousandth, if necessary.

	Male	Female
Blue Eyes	34	45
Green Eyes	61	90
Brown Eyes	88	74

15) P(green eyes | female)

16) P(blue eyes | male)

17) P(brown eyes | male)

18) P(green or brown eyes | female)

19) P(blue or green eyes | male)

20) P(female | brown eyes)

21) There are 12 DVDs, 7 video games, 14 CDs, and 3 videotapes on Jaime's bedroom shelf. If Jaime selects an item at random from the shelf, what is the probability that it is a DVD or a video tape? Express the answer as a fraction.

22) Karen's book bag contains 3 novels, 1 biography, and 1 science book. Manny's book bag contains 1 math book, 2 science books, and 1 poetry book. Each student selects a book at random from his or her bag. What is the probability that either Karen's book is a novel or Manny's book is a math book? Express the answer as a decimal.

23) A survey of 200 downtown workers revealed that 31 females ride the train, 24 females ride the bus and 35 females car pool. The survey also found that 44 males ride the train, 38 males ride the bus and 28 males car pool.

A) Complete the table below to organize the survey results.

How do you get to work each day?		
	Male	Female
Train		
Bus		
Car Pool		

B) Kyle wants to know what percent of the workers surveyed are likely to car pool to work each day, given that they are male. What type of probability does this represent?

C) What is the probability that a downtown worker rides the bus to work each day, given that the worker is female? Express the answer as a decimal rounded to the nearest thousandth.

D) What is the probability that a downtown worker rides the train or the bus to work each day, given that the worker is male? Express the answer as a decimal rounded to the nearest thousandth.

24) William's batting average (chance of getting a hit) is 0.535 with runners in scoring position. What is the probability that William will get a hit during each of his next two attempts, given that runners are in scoring position? Round to the nearest thousandth.