

Section 10.7 Addition Rule for Prob $\frac{1}{6}$

Two events are mutually exclusive if they cannot both occur at the same time.

ex 1 (like HW #1-4) Determine if the following events are mutually exclusive or not.

- a) Flip a fair coin: the coin lands on heads or the coin lands on tails

Mutually exclusive since a coin cannot be on heads and tails at the same time

- b) Roll a die: the die lands on 3 or the die lands on an odd number

Not mutually exclusive since you can land on a 3 and an odd # at the same time (bc 3 is odd)

- c) Select a course: It is a calculus course or it is an english course

Mutually exclusive since a single course cannot be both calculus and english at the same time

✓
d) Pick a registered voter: the voter is Democrat or the voter is Republican
Mutually exclusive since you cannot register with more than one party

e) Pick a card: the card is a 4 or the card is a heart
Not mutually exclusive since there is a card that is both a 4 and a heart

f) Select a student in your class: the student has brown hair or the student has green eyes
Not mutually exclusive since a person can have both brown hair and green eyes

If A and B are mutually exclusive
 $P(A \text{ or } B) = P(A) + P(B)$

If A and B are not mutually exclusive
 $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

ex 2 (Hw # 7) A card is chosen at random from a standard 52 card deck. Find the prob the card is:

a) a 4 or a king

mutually exclusive
one card cannot be a 4 and king at the same time

$$P(4) + P(K)$$

prob of drawing a 4 prob of drawing a king

$$\frac{4}{52} + \frac{4}{52} = \boxed{\frac{8}{52} \text{ or } \frac{2}{13}}$$

4 fours 4 kings

b) a 4 or a heart

not mutually exclusive
since one card can be both a 4 and a heart

$$P(4) + P(\text{heart}) - P(4 \text{ and heart})$$

$$\frac{4}{52} + \frac{13}{52} - \frac{1}{52}$$

4 fours 13 hearts 1 card - the 4 of hearts

$$= \boxed{\frac{16}{52} \text{ or } \frac{4}{13}}$$

4/6

ex 3 (like Hw #5+6) In a class of 25 students, 13 have an A, 10 have a B, and 2 have a C.

If a student is chosen at random, what is the prob the student has an A or B?

Sets of students with an A, B, or C are all mutually exclusive

$$\underbrace{P(A)}_{\text{prob stud chosen has A}} + \underbrace{P(B)}_{\text{prob stud chosen has B}}$$

$$\frac{13}{25} + \frac{10}{25}$$

← #stud with an A ← #stud with a B

← total

$$= \boxed{\frac{23}{25}}$$

5/6

ex 4 (like HW #8 + #9)

How study	Morning	Between classes	Evening	Total
group	7	5	6	18
alone	9	3	3	15
Total	16	8	9	33

A student is surveyed at random. Find the probability:

a) the student studies in the evening

$$\frac{9}{33} = \frac{3}{11}$$

9 total stud who study in evening
33 total students

b) the student studies in the morning or in a group

These events are ~~not mutually exclusive~~ so we use the formula:

$$P(\text{morning}) + P(\text{group}) - P(\text{morning and group})$$

$$\frac{16}{33} + \frac{18}{33} - \frac{7}{33} = \frac{27}{33} \text{ or } \frac{9}{11}$$

6/6

c) the student studies in the evening or alone

$$P(\text{evening}) + P(\text{alone}) - P(\text{evening} + \text{alone})$$
$$\frac{9}{33} + \frac{15}{33} - \frac{3}{33}$$

$$= \boxed{\frac{21}{33} = \frac{7}{11}}$$