Warm Up

A friend offers to buy you lunch if you can roll a sum of at least 9, or doubles (same number on both dice) using two fair dice. If you are unsuccessful you must buy lunch. Determine the probability of winning your lunch. Based upon probability should you take your friend up on this offer?

$P(9 \text{ and up}) = \frac{10}{36}$ $P(\text{doubles}) = \frac{6}{36}$

$P(9\uparrow \text{ or } D) = P(9\uparrow) + P(D) - P(9\uparrow \text{ and } D)$

$= \frac{10}{36} + \frac{6}{36} - \frac{2}{36}$

$= \frac{14}{36}$

Review Fractions

Multiply $\frac{3}{5} \times \frac{7}{4} = \frac{21}{20}$

$\frac{\cancel{4}^{1}}{\cancel{52}_{13}} \times \frac{\cancel{3}^{1}}{\cancel{51}_{17}} = \frac{1}{221}$

Dividing

$\frac{4}{7} \div \frac{12}{30}$

$\frac{120}{84}$ $\frac{\cancel{4}^{2}}{7} \times \frac{\cancel{30}^{5}}{\cancel{12}_{2}} = \frac{10}{7}$

Add or Subtracting

Find C.D.

$\frac{3}{4} + \frac{1}{5} - \frac{7}{12}$

$\times 15$

$\frac{45}{60} + \frac{12}{60} - \frac{35}{60}$

4: 4 8 12
5: 5 10 15
12: 12 24

$\frac{22}{60} = \frac{11}{30}$

$$P(\text{Sum of 9 or more}) + P(\text{doubles}) - D(9 \,\&\, D)$$

$$\frac{10}{36} + \frac{6}{36} - \left(\frac{\cancel{15}^{\,5}}{\cancel{36}_{\,3}} \times \frac{\cancel{6}^{\,1}}{36}\right) \quad \frac{5}{108}$$

$$\frac{16}{36} - \frac{5}{108}$$

$$= \frac{48}{108} - \frac{5}{108} = 43/108$$

Mutually Inclusive Events

QUESTION - "What is the probability of event A OR event B occurring?"

- when events CAN happen at the SAME time. Must be sure that events do not get counted twice

overlap

For mutually inclusive events,

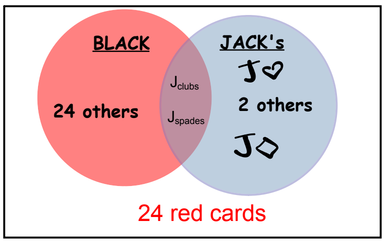
$$\boxed{P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)}$$

$[P(A) \times P(B)]$

Ex. What is the probability of drawing a black card or a Jack from a deck of cards?

- let's look at this type of probability using a Venn Diagram...

ex: P(black card OR a Jack)



P(black OR Jack) = P(black) + P(Jack) - P(black Jack)

$$= \frac{26}{52} + \frac{4}{52} - \frac{2}{52}$$

$$\frac{28}{52}$$

no overlap!

$P(A \text{ or } J)$

$P(A)+P(J)-0$

$\frac{1}{13}+\frac{1}{13}-0$

$\frac{2}{13}-0$

$\frac{2}{13}$

overlap!

$P(A \text{ or Red})$

$P(A)+P(R)-P(\text{Red A}$

$\frac{4}{52}+\frac{26}{52}-\frac{2}{52}$

$\frac{28}{52}$

$\frac{7}{13}$

3.14 HW

7. 4R
9B
7W

20

a) $P(R)+P(W)$

$\frac{4}{20}+\frac{7}{20}$

$\frac{11}{20}$

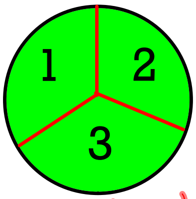
d) $P(R)+P(W)+P(B)$

$\frac{4}{20}+\frac{9}{20}+\frac{7}{20}$

$\frac{20}{20}$

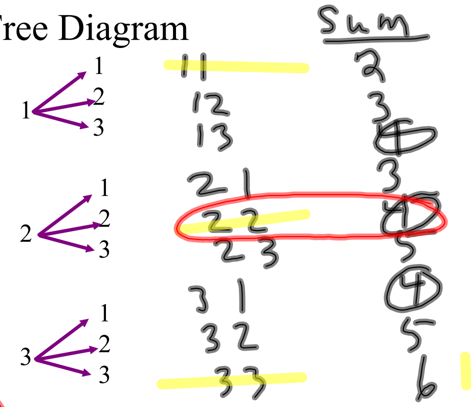
e) $P(R)=\frac{4}{20}=\frac{1}{5}$

Example: To continue your turn in a game, you must spin the spinner below twice and spin a sum of 4 or spin the same number two times.



$\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$

Tree Diagram



P(sum of 4 OR same number twice) =
P(Sum 4) + P(doubles) - P(sum of 4 AND same number twice)

$$\frac{3}{9} + \frac{3}{9} - \frac{1}{9}$$

$$\frac{5}{9}$$

$$P(A \text{ or } B) = P(A) + P(B) - \underline{P(A \text{ and } B)}$$

if no overlap
then $P(A \text{ and } B) = 0$

Ex. What is the probability of drawing a heart or a face card from a deck of cards?

$$P(\heartsuit \text{ or } FC) = P(\heartsuit) + P(FC) - P(\heartsuit \text{ and } FC)$$
$$= \frac{13}{52} + \frac{12}{52} - \frac{3}{52}$$
$$= \frac{22}{52} = \frac{11}{26}$$

Ex. Two regular dice, one blue the other green, are placed in a box. One of the dice is selected from the box, What is the probability of each of the following?

- The die is green or has a 2 showing

$$P(G \text{ or } 2) = P(G) + P(2) - P(G \text{ and } 2)$$
$$= \frac{1}{2} + \frac{1}{6} - \left(\frac{1}{2} \times \frac{1}{6}\right)$$
$$= \frac{1}{2} + \frac{1}{6} - \frac{1}{12}$$
$$= \frac{6}{12} + \frac{2}{12} - \frac{1}{12}$$
$$7/12$$

- The die is blue or has an odd number showing

$$P(B \text{ or } Odd) = P(B) + P(odd) - P(B \text{ and } odd)$$
$$= \frac{1}{2} + \frac{1}{2} - \left(\frac{1}{2} \times \frac{1}{2}\right)$$
$$= \frac{1}{2} + \frac{1}{2} - \frac{1}{4}$$
$$= \frac{2+2-1}{4}$$
$$= \frac{3}{4}$$

See Bonus on next pg.

HOMEWORK...

Worksheet - Mutually Inclusive Events.doc

- #1 - 5 (3.15)
- ~~Skills Evaluation #1 - 7 (omit 6)~~

Bonus

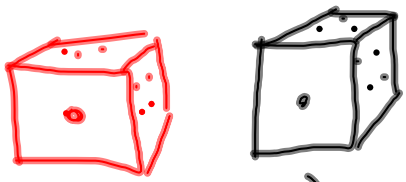
The top card from the deck is set-aside without looking at the card. What is the probability that the next card will be a diamond?

3.15

#1. $P(4 \text{ or } D) = P(4) + P(D) - P(4 \text{ and } D)$

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

#3



$P(R \text{ or } 4) = P(R) + P(4) - P(R \text{ and } 4)$

$= \frac{1}{2} + \frac{1}{6} - \left(P(R) \times P(4) \quad \frac{1}{2} \times \frac{1}{6} \right)$

$= \frac{1}{2} + \frac{1}{6} - \frac{1}{12}$

$=$

1 b) $P(R \text{ or } Q) = P(R) + P(Q) - P(R \text{ and } Q)$

$= \frac{26}{52} + \frac{4}{52} - \frac{2}{52}$

$\frac{1}{2} \times \frac{1}{13}$

$\frac{1}{26}$

d) $P(B \text{ or } \#) = P(B) + P(\#) - P(B \text{ and } \#)$

$= \frac{26}{52} + \frac{36}{52} - \frac{18}{52}$

$= \frac{44}{52}$

$= \frac{11}{13}$

3. $P(R \text{ or } 4) = P(R) + P(4) - P(R \& 4)$

$$= \frac{1}{2} + \frac{1}{6} - \frac{1}{12}$$

$P(R \& 4)$

$P(R) \times P(4)$

$\frac{1}{2} \times \frac{1}{6}$

$\frac{1}{12}$

$$= \frac{6}{12} + \frac{2}{12} - \frac{1}{12}$$

$$= \frac{7}{12}$$

3d) $P(R \text{ or } 5^{+}) = P(R) + P(5^{+}) - P(R \& 5^{+})$

$$\frac{1}{2} + \frac{1}{6} - \frac{1}{12}$$

$P(R) + P(B)$

$\frac{1}{2} + \frac{1}{2}$

Attachments

Worksheet - Mutually Inclusive Events(2).doc