

1. A fair 20 sided dice with faces numbered 1 to 20 is rolled. The event A is defined as 'the number obtained is a multiple of 4'.

$$A = \{4, 8, 12, 16, 20\}$$

- a. Determine P(A).

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

The dice is rolled 100 times

- b. How many times would you expect a multiple of 4?

$$100 \times \frac{1}{4} = 25$$

2. A bag contains 40 discs numbered 1 to 40. A disc is selected at random. Find the probability

- a. That the number on the disc is an even number.

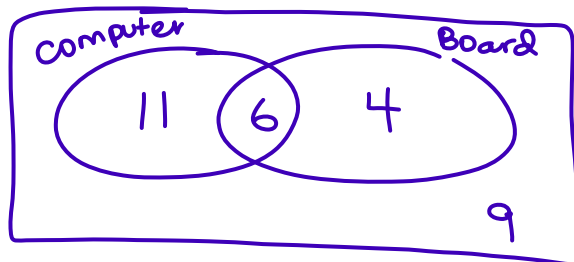
$$\frac{20}{40} = \frac{1}{2}$$

- b. That the number on the disc has the digit 1 in it.

List options  $\rightarrow 1, 10-19, 21, 31$

$$\frac{13}{40}$$

3. In a group of 30 students, 17 play computer games, 10 play board games and 9 play neither. Draw a Venn diagram.



$$\begin{array}{r} 30 \\ -9 \\ \hline 21 \\ -17 \\ \hline 4 \end{array} \quad \begin{array}{r} 21 \\ -10 \\ \hline 11 \end{array}$$

$$\begin{array}{r} 17 \\ +10 \\ \hline 27 \\ -21 \\ \hline 6 \end{array}$$

6  $\rightarrow$  and, overlap, intersection

- a. What is P(student chosen at random plays board games)?

$$\frac{10}{30} = \frac{1}{3}$$

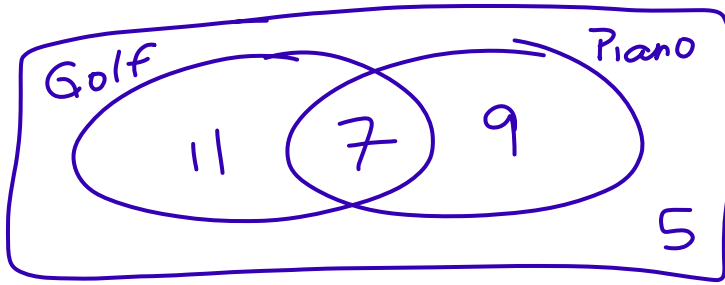
- b. Student plays both computer and board games?

$$\frac{6}{30} = \frac{1}{5}$$

- c. Student plays board games but not computer games?

$$\frac{4}{30} = \frac{2}{15}$$

4. Of the 32 kids in a class, 18 play golf, 16 play piano and 7 play both. How many play neither?



$$\begin{array}{r} -18 \\ 7 \\ \hline 11 \end{array} \quad \begin{array}{r} -16 \\ 7 \\ \hline 9 \end{array}$$

$$11 + 9 + 7 = 27$$

$$32 - 27 = 5$$

- a. What is the probability a student chosen at random plays golf but not piano?

$$\frac{11}{32}$$

- b. Piano but not golf?

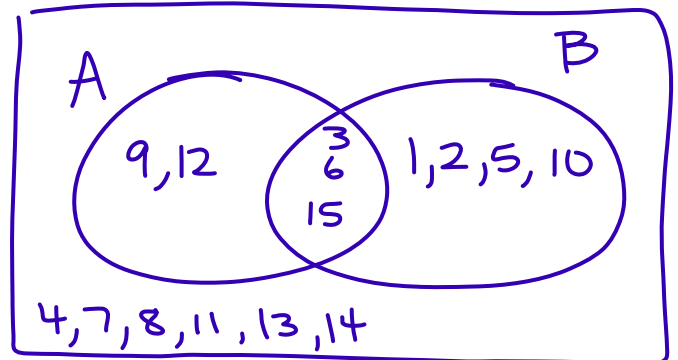
$$\frac{9}{32}$$

5. The universal set  $U$  is defined as the set of positive integers less than or equal to 15. The subsets  $A$  and  $B$  are defined as  $A = \{\text{integers that are multiples of 3}\}$  and  $B = \{\text{integers that are factors of 30}\}$ . List the elements of both subsets.

$$A = \{3, 6, 9, 12, 15\}$$

$$B = \{1, 2, 3, 5, 6, 10, 15\}$$

- a. Make a Venn diagram for the scenario



A number is chosen at random from  $U$ . Find the probability that the number is

- b. Both a multiple of 3 and a factor of 30

$$\frac{3}{15} = \frac{1}{5}$$

- c. Neither a multiple of 3 nor a factor of 30

$$\frac{6}{15} = \frac{2}{5}$$

6. A card is drawn at random from an ordinary pack of 52 cards. Find the probability that the card is a heart or a king.

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

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

$$= \frac{16}{52} = \frac{4}{13}$$

7. If A and B are two events such that  $P(A) = \frac{9}{20}$  and  $P(B) = \frac{3}{10}$  and  $P(A \cup B) = 2P(A \cap B)$ , find

$$P(A) + P(B) - P(A \cap B) = 2P(A \cap B)$$

a.  $P(A \cup B)$   
 $= 2\left(\frac{1}{4}\right) = \frac{1}{2}$

$$P(A) + P(B) = 3P(A \cap B)$$

$$\frac{9}{20} + \frac{3}{10} = 3P(A \cap B)$$

b.  $P(A \cup B)^c \rightarrow$  complement, or NOT

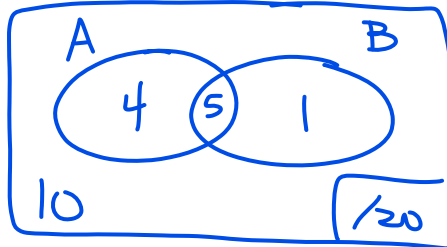
$$1 - P(A \cup B) = 1 - \frac{1}{2} = \frac{1}{2}$$

$$\frac{15}{20} = 3P(A \cap B)$$

$$\frac{5}{20} = P(A \cap B) = \frac{1}{4}$$

c.  $P(A \cap B)$

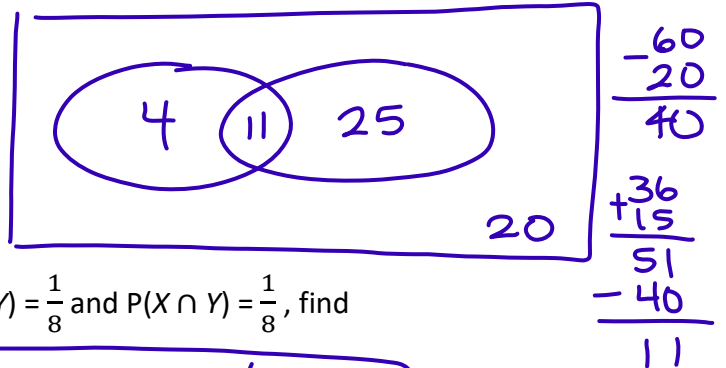
$$\frac{4}{20} = \frac{1}{5}$$



8. In a certain road  $\frac{1}{3}$  of the houses have no newspapers delivered. If  $\frac{1}{4}$  have a national paper delivered and  $\frac{3}{5}$  have a local paper delivered, what is the probability that a house chosen at random has both?

NO  $\frac{1}{3} \rightarrow \frac{20}{60}$   
Nat  $\frac{1}{4} \rightarrow \frac{15}{60}$

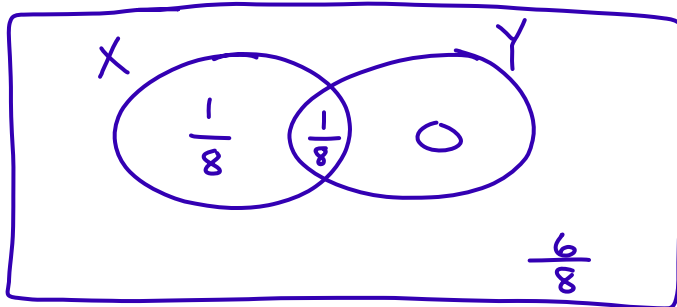
$\frac{3}{5} \rightarrow \frac{36}{60}$  Local  
 $P(\text{Both}) = \frac{11}{60}$



9. If X and Y are two events such that  $P(X) = \frac{1}{4}$  and  $P(Y) = \frac{1}{8}$  and  $P(X \cap Y) = \frac{1}{8}$ , find

a.  $P(X \cup Y)$

$$\frac{2}{8} = \frac{1}{4}$$



b.  $P(X \cup Y)^c$

$$\frac{6}{8} = \frac{3}{4}$$

10. If  $P(A) = 0.2$  and  $P(B) = 0.5$  and  $P(A \cap B) = 0.1$ , find

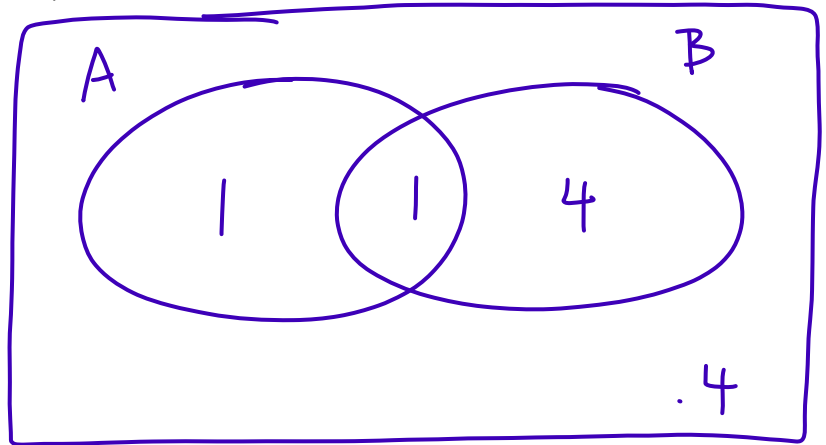
a.  $P(A \cup B)$  .6

b.  $P(A \cup B)'$

$1 - .6 = .4$

c.  $P(A' \cup B)$

.9



11. A box contains pens of various colors. A teacher picks out a pen at random. The probability of drawing out a red pen is  $\frac{1}{5}$  and the probability of drawing out a green pen is  $\frac{3}{7}$ . What is the probability of drawing neither a red nor a green?

$\frac{7}{7} - \frac{1}{5} - \frac{3}{7} = \frac{7}{7} - \frac{2}{35} - \frac{15}{35} = \frac{7}{7} - \frac{17}{35} = \frac{35}{35} - \frac{17}{35} = \frac{18}{35}$

12. Two events  $N$  and  $M$  are such that  $P(N) = \frac{1}{5}$  and  $P(M) = \frac{1}{10}$  and  $P(N \cup M) = \frac{3}{10}$ . Are the events mutually exclusive?

$P(N) + P(M) = \frac{1}{5} + \frac{1}{10} = \frac{2}{10} + \frac{1}{10} = \frac{3}{10}$  yes

Since  $P(N \cap M) = 0$

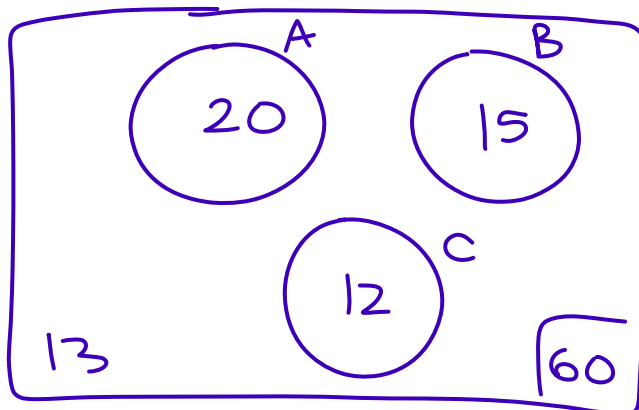
13. In an inter-school quiz, the probability of school A winning the competition is  $\frac{1}{3}$  and probability of school B winning is  $\frac{1}{4}$  and probability of school C winning is  $\frac{1}{5}$ . Find the probability that

a. A or B wins  $\frac{7}{12} = \frac{35}{60}$

b. A, B or C wins  $\frac{47}{60}$

c. None of these win

$\frac{13}{60}$



14. Draw a sample space diagram to represent scores when two dice are thrown. Then find the probability of

	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

a. Obtaining a score of 6

$$\frac{5}{36}$$

b. Throwing a double

$$\frac{6}{36} = \frac{1}{6}$$

c. Scoring less than 6

$$\frac{10}{36} = \frac{5}{18}$$

15. In an experiment a coin is tossed and dice is rolled. Draw the sample space diagram for this experiment. Find the probability that in a single experiment you obtain a head and a number less than 3 on the dice.

	1	2	3	4	5	6	$P(H \cap < 3)$
H	1H	2H	3H	4H	5H	6H	$\frac{2}{12} = \frac{1}{6}$
T	1T	2T	3T	4T	5T	6T	

16. Three coins are tossed one at a time and the results are noted. List the complete sample space. Find the probability that:

HHH, THH, HTH, HHT, TTH, THT, HTT, TTT

a. The number of heads is greater than the number of tails

$$\frac{4}{8} = \frac{1}{2}$$

b. At least 2 heads are tossed consecutively

$$\frac{3}{8}$$

c. Heads and tails are tossed alternately

$$\frac{2}{8} = \frac{1}{4}$$

17. A box contains three cards bearing the numbers 1, 2, 3. A second box contains four cards with numbers 2, 3, 4, 5. A card is chosen at random from each box. Draw the sample space. Then find the probability

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

a. The cards have the same number

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

b. The larger of the two numbers drawn is 3

$$\frac{3}{12} = \frac{1}{4} \quad (\text{if you don't consider } 3,3)$$

c. The sum of the two numbers on the cards is less than 7

$$\frac{9}{12} = \frac{3}{4}$$

d. The product of the numbers on the cards is at least 8

$$\frac{5}{12}$$

e. At least one even number is chosen

$$\frac{8}{12} = \frac{2}{3}$$

18. One bag contains 3 red and 2 white balls, another bag contains 1 red and 4 white balls. A ball is selected at random from each bag. Find the probability that

a. Both balls are red

$$\frac{3}{5} \cdot \frac{1}{5} = \frac{3}{25}$$

b. The balls are different colors

$$\frac{3}{5} \cdot \frac{4}{5} + \frac{2}{5} \cdot \frac{1}{5} = \frac{12+2}{25} = \frac{14}{25}$$

c. At least one ball is white

$$\hookrightarrow (1 - \text{Both Red}) = 1 - \frac{3}{25} = \frac{22}{25}$$

19. Adam is playing in a cricket match and a game of hockey this weekend. The probability is team will win the cricket match is 0.75 and the probability of winning the hockey match is 0.85. Assume that these events are independent. What is the probability he will win both matches?