

What is a probability?

How *likely* something is to happen.

Many events can't be predicted with total certainty. The best we can say is how **likely** they are to happen, using the idea of probability.

Tossing a Coin



When a coin is tossed, there are two possible outcomes:

- heads (H) or
- tails (T)

We say that the probability of the coin landing **H** is $\frac{1}{2}$

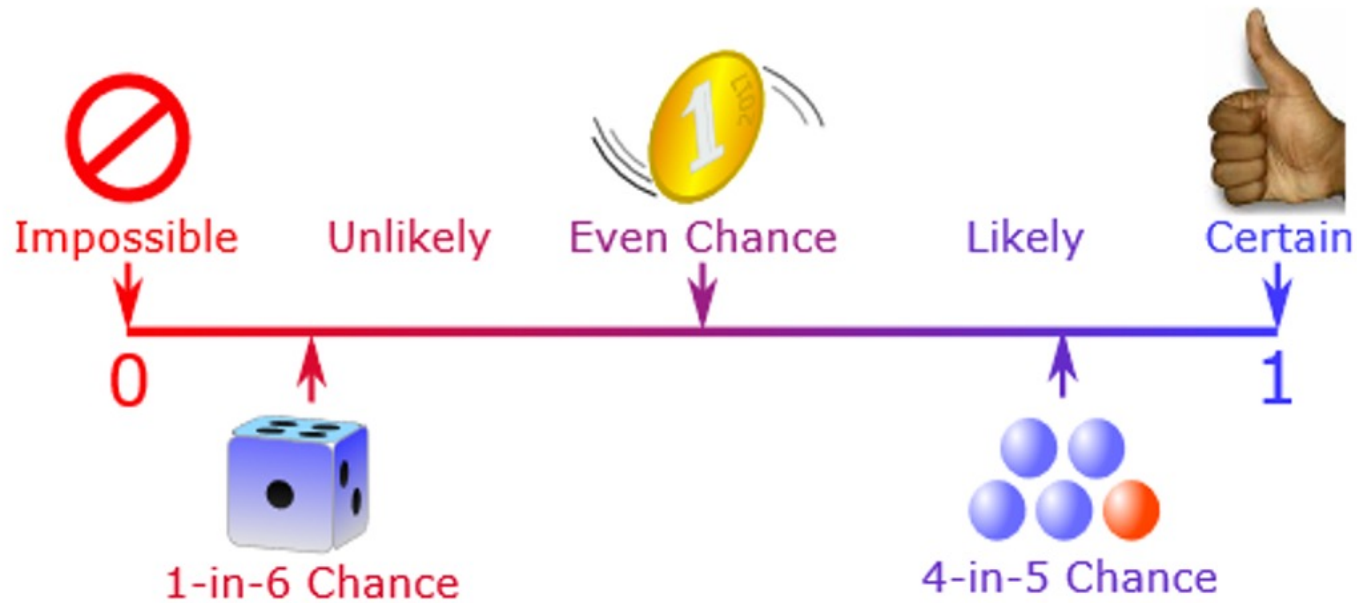
And the probability of the coin landing **T** is $\frac{1}{2}$

What is probability?

In general:

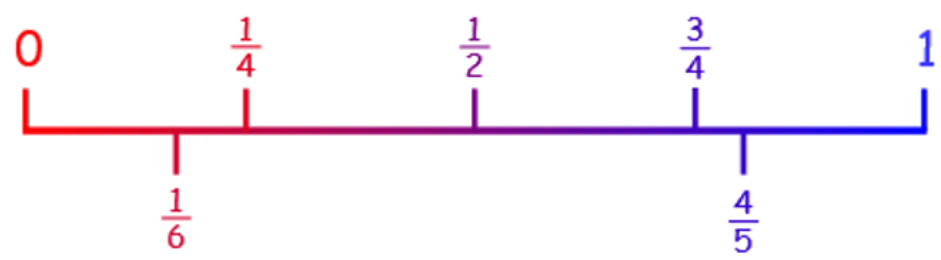
$$\text{Probability of an event happening} = \frac{\text{Number of ways it can happen}}{\text{Total number of outcomes}}$$

The Probability Line



Probability Values

We can use fractions:



Or percents:



Or decimals:



2. Introduce by considering the probability scale

0-1 scale



Vocabulary

Event: one or more outcomes of an experiment.

Experiment: a repeatable procedure with a set of possible results.

Independent Events are not affected by each other.

Mutually Exclusive events cannot happen at the same time.

Outcome: A possible result of an experiment.

Sample Space: all the possible outcomes of an experiment.

Mutually Exclusive Events

If two outcomes are mutually exclusive then they cannot happen at the same time.

E.g. if a dice is thrown $P(\text{throwing a six})$ and $P(\text{throwing a 4})$ are mutually exclusive.

The total probability of all the mutually exclusive outcomes of a single event is 1.

TOSSING 2 COINS



Sample space

H, H H, T T, H T, T

n= number of coins tossed

2^n outcomes

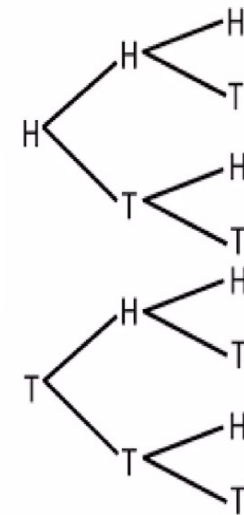
TOSSING 3 COINS :



If I toss three coins, what are the possible combinations?

T T T - 0 Heads (3 Tails)
H T T } 1 Head (2 Tails)
T H T }
T T H }
H H T } 2 Heads (1 Tail)
H T H }
T H H }
H H H - 3 Heads

There are 8 possible outcomes because $2 \times 2 \times 2 = 8$



ROLLING A DIE



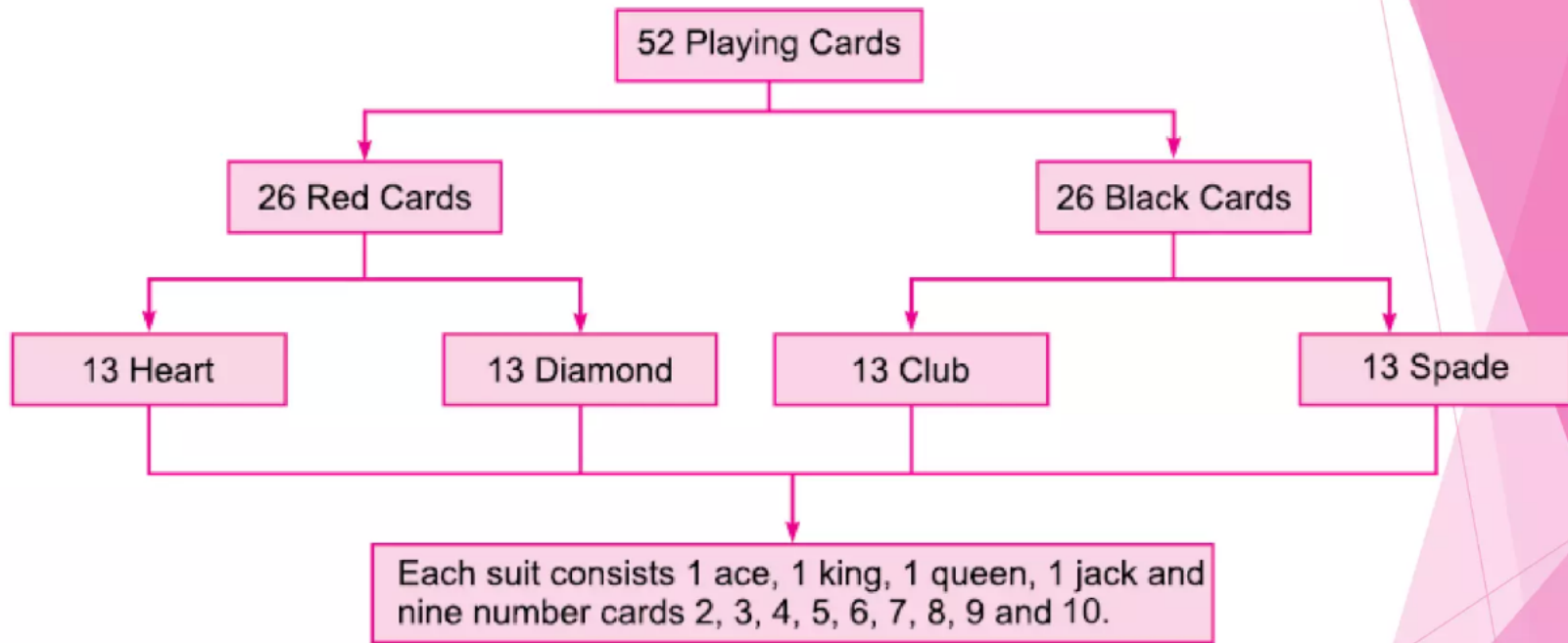
OUTCOMES = { 1, 2, 3, 4, 5, 6 }
TOTAL NO. OF OUTCOMES = 6

Probability for Rolling Two Dice



	1	2	3	4	5	6
1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
2	(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)
3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
4	(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)
5	(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)
6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)





a c a c i a

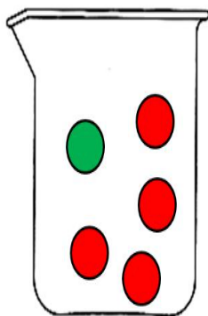
if the letters of the name of this shrub
are jumbled up in a bag
what are the probabilities of picking:

$$P(a) = \quad P(\text{not } a) =$$

$$P(c) = \quad P(\text{not } c) =$$

$$P(i) = \quad P(\text{not } i) =$$

$$P(e) = \quad P(\text{not } e) =$$



What is the probability of picking a green ball from this beaker?



$$\frac{1}{4}$$



$$\frac{1}{5}$$



$$\frac{4}{1}$$



$$\frac{5}{1}$$



Simon has some counters in a bag.
He chooses one at random – what is the probability it is green?



$$\frac{1}{5}$$



$$\frac{3}{12}$$

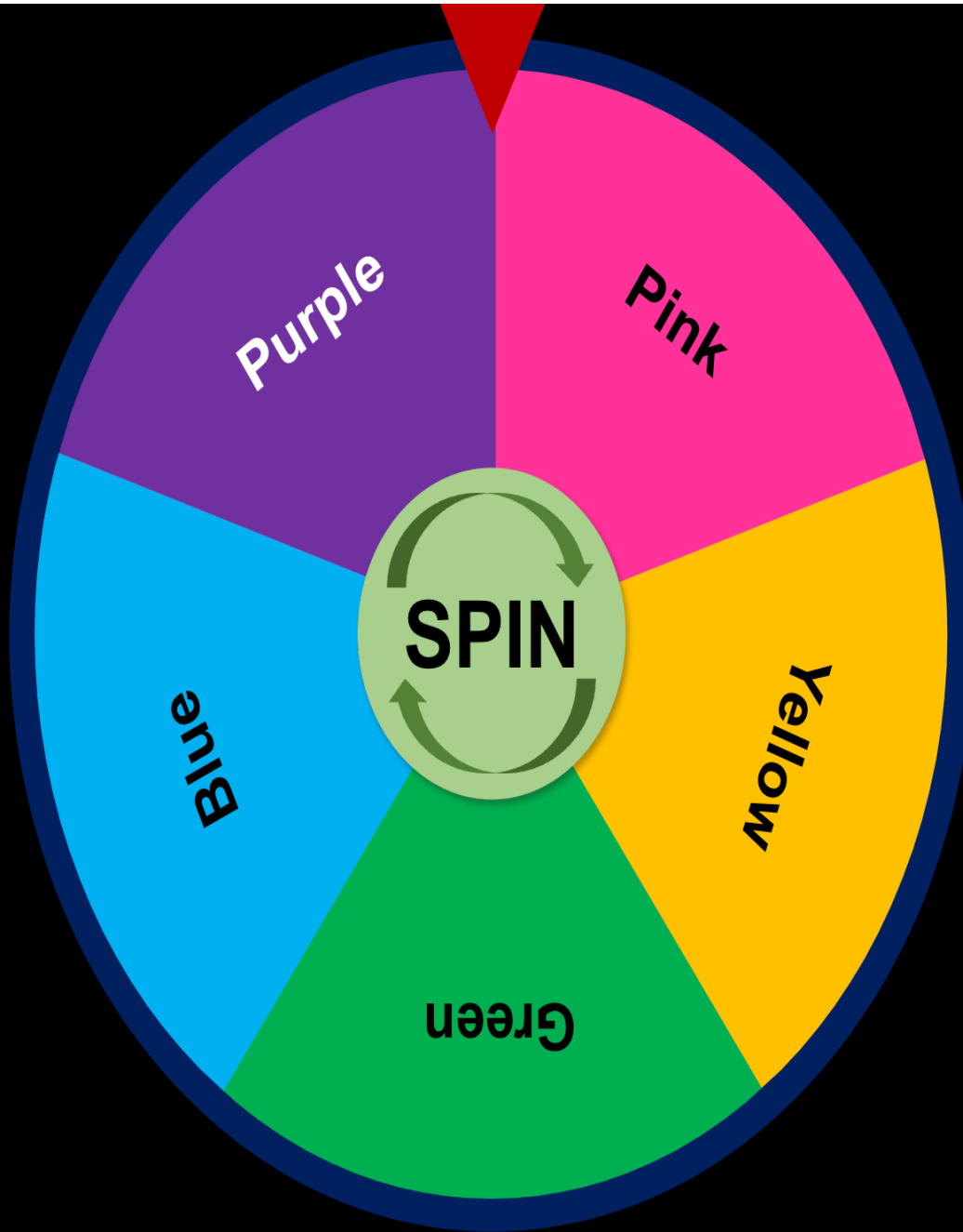


$$\frac{3}{9}$$



$$\frac{9}{12}$$

What's the probability it lands on pink?



If I spin this spinner 100 times, how many times do we expect it to land on pink?

Probability

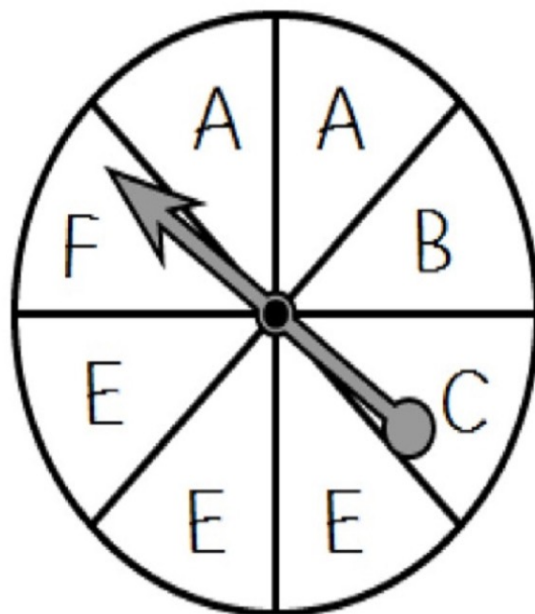
1. What is the probability of the spinner landing on C? _____

2. What is the probability of **not** spinning an C? _____

3. What is the probability of the spinner landing A or B? _____

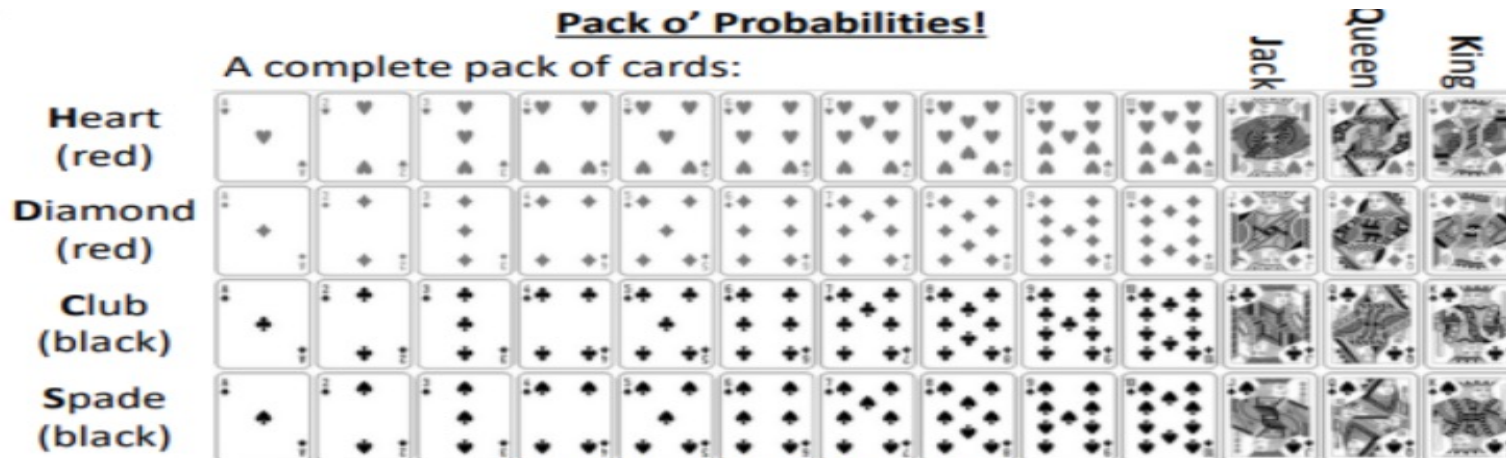
3. What is the probability of the spinner landing on one of the first five letters of the alphabet? _____

4. Are you more likely to spin a vowel or a consonant? Explain.



Pack o' Probabilities!

A complete pack of cards:



A card is picked at random.

Express these probabilities as fractions in their simplest form:

a: $P(\text{Black}) =$

b: $P(\text{Diamond}) =$

c: $P(\text{Spade or Heart}) =$

d: $P(\text{King}) =$

e: $P(9) =$

f: $P(\text{Red Queen}) =$

g: $P(3 \text{ of Clubs}) =$

h: $P(\text{Black } 6) =$

i: $P(2 \text{ or } 3) =$

j: $P(\text{Face card}) =$

k: $P(4C \text{ or } 5D) =$

l: $P(\text{Jack or } 10S) =$

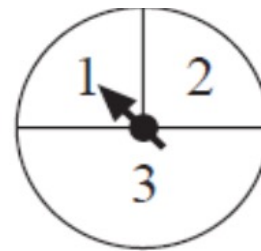
m: $P(\text{Lower than } 5) =$

n: $P(\text{NOT a King}) =$

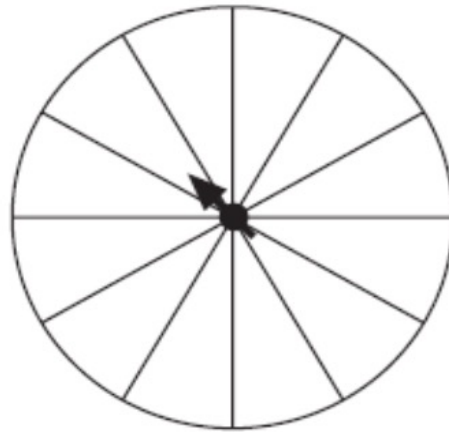
o: $P(\text{Spade OR King}) =$

p: $P(\text{Heart OR } 8 \text{ OR } 9) =$

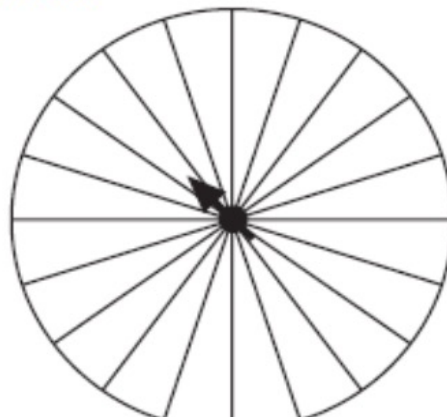
- (a) What is the probability of getting a 3 on this spinner?



- (b) Shade a copy of the following spinner so that the chance of getting a shaded section is double the chance of getting a white section.



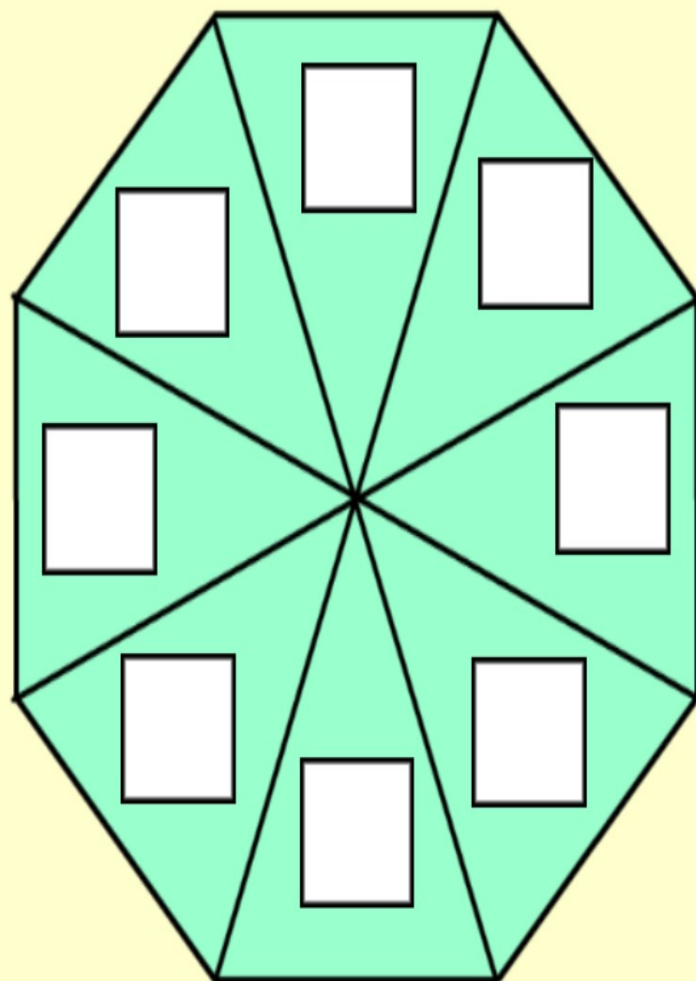
- (c) Shade a copy of the following spinner so that there is a 40% chance of getting a shaded section.



Probability

Complete the spinner so that:

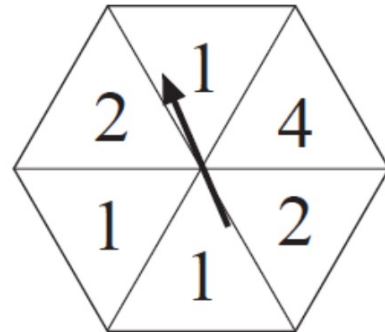
- The probability of landing on 6 is $\frac{1}{8}$
- The chance of landing on 3 is 50%
- It is more likely to land on 4 than 2.

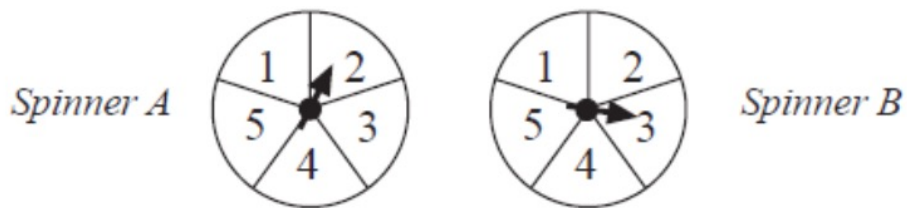


A six-sided spinner is shown in the diagram.
It is spun 180 times.

How many times would you expect to obtain:

- (a) a score of 1,
 - (b) a score less than 4,
 - (c) a score that is a *prime* number,
 - (d) a score of 4 ?
-





These two spinners are spun at the same time. Complete the table to show the possible outcomes for the total of the scores when added together.

		Spinner B				
		1	2	3	4	5
Spinner A	1					
	2					
	3					
	4					
	5					

Complete the following statements:

$$p(\text{score greater than } 3) = \text{---}$$

$$p(\text{even score}) = \text{---}$$

$$p(\text{score less than } 5) = \text{---}$$

$$p(\text{score of } 8) = \text{---}$$

1. If given two dice, what is the probability that the sum of the two numbers rolled will equal 9 ?
A) $1/9$. B) $1/24$ C) $1/18$. D) $1/9$
2. Two dice are rolled . What is the probability that the product of the numbers rolled is 15?
A) $1/9$. B) $1/4$. C) $1/6$. D) $1/18$
3. A circle is inscribed in a square. If a point inside the square is selected at random, what is the probability that the point will also be inside the circle?
A) $\pi /6$. B) $5/6$ C) $\frac{3}{4}$ D) $\pi /4$.
4. If 'p' is chosen at random from the set of { 4,6,7,9 } and 'q' is chosen at random from the set {12, 13, 15, 17 }, what is the probability that 'pq' is odd.
5. In a charity show tickets numbered consecutively from 101 to 350 are placed in a box. What is the probability that a ticket selected at random will have a number with hundredth digit 2 ?
6. From a pack of 52 playing cards, jacks, queens, kings, aces of red colour are removed. From the remaining a card is drawn at random. Find the probability that the card drawn is
a) A black queen B) a red card C) face card D) a spade