

In order to build circuits to manipulate, transmit or store information, we are going to need some engineering tools to see if we're choosing a good representation for the information -- that's the subject of this chapter.

We'll study different ways of encoding information as bits and learn the mathematics that help us determine if our encoding is a good one.

We'll also look into what we can do if our representation gets corrupted by errors.

It would be nice to detect that something bad has happened and possibly even correct the problem.

Let's start by asking "what is information?"

From our engineering perspective, we'll define information as data communicated or received that resolves uncertainty about a particular fact or circumstance.

In other words, after receiving the data we'll know more about that particular fact or circumstance.

The greater the uncertainty resolved by the data, the more information the data has conveyed.

**LET'S LOOK AT
AN EXAMPLE:**

a card has been chosen at random from a normal deck of 52 playing cards.

Without any data about the chosen card, there are 52 possibilities for the type of the card.

Now suppose you receive one of the following pieces of data about the choice.

A. You learn the suit of the card is "heart".

This narrows the choice to down one of 13 cards.

B. You learn instead the card is NOT the Ace of Spades.

This still leaves 51 cards that it might be.

C. You learn instead that the card is a face card, that is, a Jack, Queen or King.

So the choice is one of 12 cards.

D. You learn instead that the card is the "suicide king."

Our little blue friend is showing us that this is actually a particular card – the King of Hearts where the king is sticking the sword through his head!

No uncertainty here, we know exactly what the choice was.

Which of the possible pieces of data conveys the most information?

In other words, which data resolves the most uncertainty about the chosen card?

Similarly, which data conveys the least amount of information?

Before we talk about the mathematics behind the correct answers to these questions, vote for your answers in the following poll.