



JAMES **RANDI** EDUCATIONAL FOUNDATION

JREF IN THE CLASSROOM

Do You Have ESP?

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about the JREF

Our mission is to promote critical thinking by reaching out to the public and media with reliable information about paranormal and supernatural ideas, which are widespread in our society today.

The James Randi Educational Foundation was founded in 1996 to help people defend themselves from paranormal and pseudoscientific claims. The JREF offers a still-unclaimed million-dollar reward for anyone who can produce evidence of paranormal abilities under controlled conditions. Through scholarships, workshops, and innovative resources for educators, the JREF works to inspire this investigative spirit in a new generation of critical thinkers.

Your support helps the JREF to . . .

- Expose paranormal and pseudoscientific frauds in the media, and hold media organizations accountable for promoting dangerous nonsense.
- Support scientific research into paranormal claims.
- Provide grants and free teaching modules to help educators inspire an investigative spirit in the next generation of critical thinkers.
- Award scholarships that encourage scientific skepticism among students.
- Support grassroots skeptics' groups with tools to help them organize and promote skepticism and critical thinking.
- Digitally publish the important works of skepticism for distribution on the iPad, Kindle, and other e-readers.
- Organize major conferences and other gatherings that bring the entire skeptical community together.

SUPPORTING THE WORK OF THE JAMES RANDI EDUCATIONAL FOUNDATION

The James Randi Educational Foundation relies on the support of people like you in order to carry out its mission. Whether it is our renewed support of grassroots skeptic outreach, our investment in resources for educators and students, our expanding digital educational offerings such as digital books and videos, or Randi's lecture tours, your financial donations help make our programs possible.

You may support the JREF by joining us as a contributor online at **randi.org**. You may find that you can be more generous by making a pledge of monthly support. For more information about pledges, please contact development@randi.org.

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Have you ever felt like you knew what someone was going to say before they said it? Or that you had a feeling that the phone was going to ring and it did? Have you had a "psychic" tell you something about yourself that s/he couldn't know unless s/he could read your mind? Have you ever thought you had a "sixth sense"? What explains this? Many have experienced one or more of these events, described them as extraordinary, and attributed them to extrasensory perception or ESP.

WHAT IS ESP?

The term "ESP" was invented by Dr. J.B. Rhine and used by him to refer to supposed abilities such as telepathy, which involves the ability know the thoughts of another person without the use of the recognized senses. Clairaudience (hearing other's thoughts), clairvoyance (hearing other's thoughts), and precognition (knowledge of future events) also fall under this term. ESP is a term widely used by the general public to describe any of a number of paranormal abilities. Those in the psychic advice industry use ESP to describe their method of acquiring privileged information not available to those restricted to the five traditional senses.

Psychic abilities have also been used as character traits and thematic elements in American pop culture and most prominently in comic books and science fiction writing. Most of us are familiar with well-known fictional telepaths including the Jedi of Star Wars, Aquaman, and Mr. Spock of Star Trek.

MR. SPOCK MIND-MELDS IN
"A DAGGER OF THE MIND."
STAR TREK THE ORIGINAL SERIES
©1967 PARAMOUNT

AQUAMAN N°.1
©1962 D.C. COMICS





Belief in paranormal claims related to ESP remains widespread. The Gallup Organization conducted a survey of the beliefs of the general United States population about paranormal topics in 2005. The survey found that 41 percent of those polled believed in extrasensory perception and 26 percent believed in clairvoyance. Thirty-one percent of those surveyed believed in telepathy or psychic communication.

Parapsychological research (the study of psychic abilities) has been going on in laboratory settings, primarily in the United States and United Kingdom, for more than 100 years. The field saw increasing interest and improving techniques through its peak in the 1970s. At different times over the last century, laboratories searching for evidence of paranormal abilities could be found in many top universities in the United States and Europe.

The United States military and intelligence communities also have long histories in psychic research. Declassified documents describe major research programs like the one at the U. S. Army's Fort Mead. The Fort Mead program was developed to examine the psychic phenomenon known as "remote viewing". Remote viewing involves the acquisition of information from distant unseen locations using psychic abilities. Convinced that remote viewing was a real phenomenon, researchers hoped to increase its range and accuracy through training. This is one of many projects that saw intelligence-gathering value in ESP research.

Has any scientific evidence been found for ESP? There have been several major studies that claimed statistically significant (achieving a success rate that is unlikely to be the result of chance) results supporting its existence. After years of extensive review by the scientific community, however, few still consider these studies to be of any scientific value. The results have been attributed to misinterpretation of results and flawed experimental design. When science is done right, results are always open to the scrutiny of other scientists.

Some 100 years is long enough to investigate these claims. Scientists see no reason to continue work in a field that has never produced meaningful results supporting the existence of psychic abilities. What do you think?

a brief history of **modern research**

The most important figure in psychic research is probably Dr. J. B. Rhine. Rhine originally planned to enter the ministry, but graduated in botany at the University of Chicago. It was in 1922 that Rhine first became interested in the subject after hearing a lecture by Sir Arthur Conan Doyle, creator of the world-famous Sherlock Holmes and passionate believer in the existence of psychic abilities. He was further inspired by reading the Sir Oliver Lodge's *The Survival of Man*. Rhine would be closely associated with Conan Doyle and other prominent spiritualists until an investigation early in his career put him at odds with many in that community. He found Margery Crandon, a well-known medium, to be a fraud.

In 1926, Rhine became acquainted with Duke University psychologist Dr. William McDougall and soon the two began focusing on the development new “scientific” methods for investigating paranormal phenomena. They would describe their research area as parapsychology to intentionally distinguish their field from traditional psychology.

the rhine
research lab
duke university



By 1930, Rhine and McDougall had begun studies at a psychology lab on the Duke University campus in Durham, North Carolina along with a colleague, Dr. Karl Zener. Zener would be best known for developing the set of five-symbol cards now known as Zener cards for Rhine to use in testing for psychic powers. Within a few years, they had established the Duke University Parapsychology Laboratory at Durham. The lab would develop nearly every method and concept at the core of

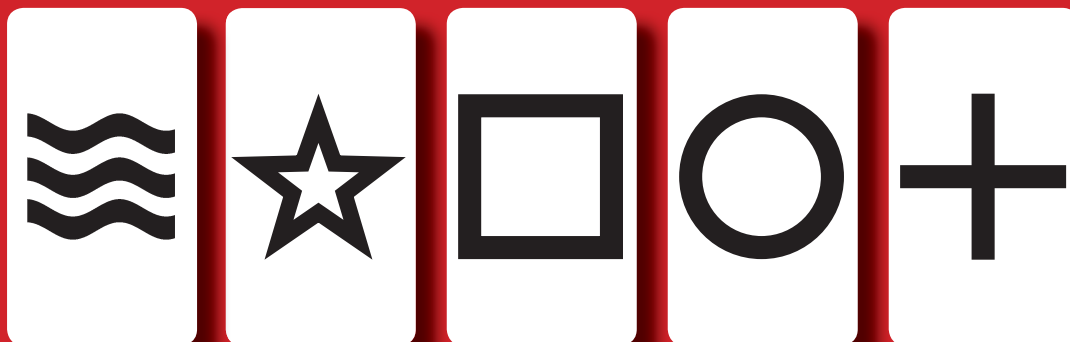
experimental para-psychology including the term Extrasensory Perception (ESP). ESP became the primary focus of the lab and a massive body of data was produced. They conducted more than one million trials as part of 33 experiments. Several studies reported statistically significant results in support of ESP.

THEIR PLACE IN SCIENCE

Many agree that Rhine's work was pioneering and that he was sincerely dedicated to the search for evidence of ESP. Unfortunately, his passion for the subject couldn't overcome the low quality of his re-search or his failure to produce any compelling evidence to support his claims. Today few mainstream scientists give any serious consideration to the contributions made by Rhine and his fellow parapsychologists. Even worse, critics have pointed to numerous cases of misrepresented data, sloppy methods, and even fraud associated rendering his entire body of work as tainted useless.

Rhine firmly believed he was seeing evidence for ESP in the research. This "evidence" was found when he limited his analyses to data collected from trials with his most "gifted" subjects. His focus on successes of gifted subjects gave a false view of the overall results. It is now well established that Rhine and his colleagues had been allowing themselves to ignore much of the data they had collected and reported only those with positive results. Negative data were set aside. This is a common problem in studies of paranormal abilities and other areas of fringe science, where investigators frequently start with a conclusion and work to find evidence in support of it (in this case, that "ESP is real").

a typical
set of
zener
cards



The final blow to Rhine occurred when Dr. Walter Levy, a trusted colleague at the Foundation for Research on the Nature of Man (FRNM), a private organization established by Rhine in 1962, was discovered to be cheating on an impressive animal-ESP test that had been reported as a huge success. Levy confessed and was fired.

The Rhine lab is just one of many such labs that have made repeated claims of positive results only to have their findings rejected because the results reflected problems with their experiments and not the subject's abilities. Although proponents of paranormal research are fond of quoting the immense odds against success in ESP tests by chance alone, those figures are meaningless if the experiments are not properly conducted.

We will be conducting our own investigations into psychic powers and using methods similar to those employed by Rhine. The methods are sound if researchers are rigorous and consistent with their use.

testing for **paranormal abilities**

TYPES OF TESTS

We can test for three main kinds of ESP. They are telepathy (mind reading), clairvoyance (knowing without use of conventional senses or telepathy), and precognition (knowing the future).

J. B. Rhine's goal was to establish direct, honest, and sound methods of testing for paranormal abilities. The test kit provides everything needed to conduct an experiment like those carried out by J.B. Rhine and later researchers. We will be consistent with Rhine's terminology by calling our experimenter "the sender" and our subject "the receiver". The testing apparatus is simple. The kit contains five sets of five cards for a total of twenty-five. Each five-card set has a different image on it; there is a circle, a plus, wavy lines, a square, and a star. There is also an additional set of five subject cards that the subject may use as reference to become familiar with the symbols. The test cards are commonly referred to as Zener cards named after Karl Zener, the ESP researcher who invented them.

Print the included cards on card stock and carefully cut along the dotted lines. Data collection sheets are also included and can be printed as needed.

TELEPATHY

A basic experiment is to shuffle the cards and allow the experimenter to run through them, one at a time, while the subject attempts to determine what they are. Of course, the experimenter and the subject must be out of view from each other. This can be accomplished with a curtain or other makeshift barrier. The experimenter will view each card and an attempt will be made to send that mental image to the subject. The experimenter will record the "target," which is the symbol on her card, and then record the "call", which is the symbol that the subject believes is on the card. Cards are returned to the deck and the deck is reshuffled. This is repeated for the number of trials established for this test.

The judge should enter an "X" in the score column when the two symbols agree, which means there has been a "hit." A dash should be entered when the symbols do not agree.

After completing the series of trial, subtotals and totals should be calculated by an independent judge and the entire data sheet filled out as instructed. Experimenters may then refer to the statistical significance table below to check their results.

Researchers can be misled by results that appear significant enough to report as evidence of psychic effects. While the results may be strong enough to convince us that the subject is capable of "receiving" the symbol on the card, we should always consider the possibility that there may be other more likely explanations. This significance can reflect the subject having the ability to "receive" the card with conventional senses, perhaps by reading the eyes of the sender. This is sometimes referred to as sensory leakage.

GANZFELD EXPERIMENTS

this technique is used in the field of parapsychology to test individuals for extrasensory perception (ESP).

It uses homogenous and unpatterned sensory stimulation to produce an effect similar to sensory deprivation.

CLAIRVOYANCE TESTS

The test for clairvoyance is to be conducted in the same way as those for telepathy but with one major difference. In this case, the experimenter makes no attempt to see the identity of the card until all of the "calls" have been made. The subject provides all 25 guesses and these guesses are recorded



in column C. The experimenter will then list all of the card symbols in the proper order that they appeared in the deck and record them in column T, but only after all of the calls have been made.

PRECOGNITION TESTS

It is very difficult to tell the difference between clairvoyance and precognition in trials. Who can tell which possible force is operating? One possible solution is to conduct precognition test where no selection is made until a subject has announced a call. Only after a call is made will the experimenter draw a card at random. The symbols are then recorded, the card is put back into the deck and the deck is reshuffled. This process is repeated as many times as necessary.

a few **important rules**

Inexperienced experimenters may commit the mistake of only accepting data that are favorable. Never drop portions of the data because they are only average or negative. Those data are just as important. Another pitfall to avoid is optional stopping. It's important that you declare a number of trials in advance and stick with that number. It is easy to quit while you're ahead and avoid the inclusion of negative results.

All tests are subject to random effects that can't be controlled. With a larger number of trials, it becomes more likely that these random factors will cancel each other out and that a real phenomenon will be detected if it exists.

Experimenters can influence the performance of subjects through conscious or unconscious bias being introduced into the experiment. If this behavior is not controlled, this can substantially affect research results. Experimenters can also unknowingly be a source of information affecting the subject's response (i.e. facial expressions). The use of the technique known as "double-blind" is essential to ESP testing. In double-blind trials, neither the subjects of the experiment nor the persons administering the experiment know the critical aspects of the experiment.

You will be able to avoid the above problems and produce more meaningful data by adhering to the following five rules . . .

- Rule 1:** Declare in advance whether your set of tests will be an actual test or only a dry run. If it is an actual test, count it in the final evaluation. If not, do not count it and only keep it for reference.
- Rule 2:** Always complete a set of tests by conducting the number of trials that was decided upon and recorded before the start of the test. Further tests may be run, but these must be set up and recorded in the same manner as the previous one, with the number of trials decided upon and recorded ahead of time.
- Rule 3:** Set the number of trials as large as seems practical. Because you may be limited by the length of your class period, that number may be 100. If you have more time, increase your sample to 250 or 500.
- Rule 4:** Keep a careful record of test conditions established for each test, as well as variations from one test to another. By this means, you may find that some otherwise trivial factor is seriously affecting the test results.
- Rule 5:** An outside judge, unaware of expected results, must be used to record and total the scores on the data sheets.

ABOUT CHEATING

As you become more familiar with conducting tests of this kind, you will become aware of the many ways in which an experimenter or subject could cheat to change the results. This type of tampering has occurred regularly in the history of ESP research. Most major “breakthroughs” in parapsychology re-search have failed to withstand any type of careful examination when the evidence has been made available for analysis. More important is that published results have never been replicated when independent researchers have repeated those experiments.

This module will give you the tools to do preliminary experiments based on those conducted by para-psychologists. Although many serious scientific investigations into ESP required much additional planning and resources, those studies were only as good as the attention given to establishing and maintaining careful control of the research conditions. The same will be true of your experiments.

THINK YOU CAN'T BE FOOLED? THINK AGAIN...

Project Alpha Fools Scientists

In 1979, The McDonnell Laboratory for Psychical Research at Washington University in St. Louis was awarded a grant of \$500,000; the money would be used for scientific investigation into psychic phenomena under controlled laboratory conditions.

James Randi, a professional magician and veteran psychic investigator expressed concern that the proposed research methods were vulnerable to study subjects with knowledge of magic tricks. Randi prepared for the researchers a list of activities to be wary of and offered suggestions for preventing such trickery. He stressed the need for the most rigid experimental controls possible. His recommendations were ignored.

Two primary subjects of the lab's research were teenagers Steve Shaw and Michael Edwards. They were asked to participate in the study because of preliminary results suggesting they possessed the paranormal ability of spoon bending, an area of special interest to the researchers. In



L to R: Steve “Banacheck” Shaw, Michael Edwards, James Randi

reality, the two were skilled magicians associated with Randi. They had been using sleight-of-hand tricks, which were mistaken for a wide range of paranormal abilities. They used methods from mentalism, magic, and subtle misdirection to alter research equipment, distract the researchers, and alter established protocols, often right in front of the investigators and cameras.

After 21 months, Shaw, Edwards, and Randi publicly announced the elaborate hoax. The announcement was met with responses describing the project as everything from “triumphant” to “reckless.” Many, even some within the parapsychological community, agreed the hoax was long overdue and was successful in exposing the dangers of ignoring the need for rigid protocols.



planning & **analyzing the data**

RESEARCH OBJECTIVE

Good experimental science begins with clearly stated research objectives. The objectives will keep the research focused and will guide the selection of methods for collecting and analyzing the data. A good place to start is by identifying what is the single most important question that you want this research to answer. Once you frame such a question, you can then determine if it can be answered by experimental tests. For example, “Is video game play related to an increase in hand-eye coordination?” is a question that could, in principle, be answered by an experiment that tests coordination of volunteers before and after they learn to play a certain video game. On the other hand, a question like “Should video gaming be taught in school?” is a question that involves value judgments that are beyond the scope of experimental research.

It is important to make sure that your research questions are stated in ways that are clear and not open to misinterpretation. This can be especially challenging when research involves unusual claims such as ESP or psychic ability. Questions like “Can psychics sense things?” and “Is ESP real?” are too vague. A better research question would be “Can test subjects correctly identify Zener cards without the aid of traditional senses?”

Those making psychic claims are often vague about the actual abilities they claim to possess. When someone states that s/he can effectively predict the outcome of a dice roll, this claim is specific and can be tested for validity. A psychic’s claim that s/he can “sense things” is not defined well enough to examine scientifically.

HYPOTHESIS TESTING

Good research questions generally lead to competing statements, or hypotheses, that can be tested against each other. Scientific studies are tests of these theoretically likely hypotheses and are derived from what scientists have learned about the research question. A theoretically likely hypothesis is one which is likely to be true, but one for which we do not yet have enough evidence to accept. Sometimes a researcher is interested in testing a hypothesis that is not theoretically likely and even in conflict with current scientific understanding. These can be called “extraordinary claims” and require “extraordinary evidence” for support.

Science starts with the assumption that what we currently know about the world is correct. This allows us to develop a “null hypothesis”, or a statement of no effect. It is important that this statement be both testable and falsifiable. The “alternative hypothesis” describes some kind of effect or relationship. These statements should be as precise and quantitative as possible. For example, in our Zener card guessing experiment, our null hypothesis would be “Subjects cannot correctly predict cards any better than just guessing (no ESP).” We are testing that against the alternative hypothesis that “Subjects can correctly predict cards more often than we’d expect by just guessing (positive ESP).”

When we design a study, we do our best to ensure that, if the null hypothesis is rejected, the only hypothesis left that could explain the findings is the research hypothesis (that the participant is psychic).

STATISTICAL SIGNIFICANCE

What would evidence for ESP look like? In card guessing experiments, it would mean getting some number more “hits” than someone without ESP might expect to get. When “just guessing” one of the

five Zener symbols, you should expect to get about one out of every five tries, but sometimes it will be more and sometimes it will be less. Exactly how many more hits would you need in order to tell the difference between ordinary variability and extraordinary ability?

Scientists use the mathematics of probability to determine how many hits would be needed to achieve a statistically significant result. Unlike that used in everyday language, this special kind of significance tells us nothing about the importance or meaningfulness of our findings. With special methods and criteria, scientific studies can look for answers to questions of purpose or importance. One way is to find clinical significance, which is used to describe the effect of a particular treatment on the diagnosis of the subjects. Statistical significance only tells us how unlikely it is that our results occurred by chance.

For a given number of tries, we calculate the likelihood of getting hits without ESP. The larger the number of hits, the smaller is the likelihood of achieving it just by guessing, making the evidence against just guessing and for ESP more compelling. Generally, scientists require a performance so extreme that its likelihood of happening just by guesswork is less than 5%. This likelihood of a result by chance is called the significance level, and smaller is better in the sense that small likelihoods mean more impressive performance. In some research where the stakes are high, we require an even more extreme level of performance, corresponding to a significance level of 1% or even less.

The level of significance for an experiment should be chosen before any data is collected.

SAMPLE SIZE

How many tries do you need in order to have a good experiment? A small sample may be enough to tell the difference between no ESP and a perfect ability to guess correctly every time—after all, a single miss would falsify a claim of perfection. But parapsychologists generally don't make claims of perfect abilities; a more realistic hypothesis is that everyone is a "little bit" psychic. It would take a much larger sample to fairly test a hypothesis relating to a moderate psychic ability.

Think about flipping a coin. If you predict heads and flip it once and get heads, you could claim that you correctly predicted the outcome 100% of the time. That is not extraordinary if you know there was only flip (50/50 chance). Try it five times. Getting it right is less likely, but perhaps still within the expectations of chance. With just 10 flips, you are looking at a chance of about 1 in 1000 and at 12 flips you have odds of about 1 in 4,000. While anyone would ignore the results from the single coin flip, most would agree that the same 100% rate rapidly becomes less likely the result of chance as the sample size increases and more likely the result of some other force acting on the coin.

Once the level of significance is set, we can mathematically calculate how large the sample would need to be in order to have a good test for a given level of precision (in other words, to reasonably detect a given degree of ability better than just guessing).

Calculations like this are important when planning an experiment. For example, if the ability being tested is very modest, then it is important to know up front if there will be sufficient time and resources to collect the very large amount of data that would be needed.

ANALYZING THE DATA

Sample size and significance level go together to determine how to interpret the results of the experiment. The table below summarizes the calculated criteria for experiments of several different sample sizes. For each experiment, you can see what would be required in order to demonstrate statistically significant evidence for ESP when trying to predict cards in a shuffled Zener deck, when the null hypothesis expects only a 1 in 5 (20%) success rate. See chart on following page . . .

SAMPLE SIZE [n°. of calls]	NUMBER OF HITS NEEDED FOR SIGNIFICANCE OF 5%	MINIMUM PERCENTAGE OF HITS NEEDED FOR SIGNIFICANCE OF 5%
25	9	36%
100	28	28%
250*	63	25%
500	116	23%
1000	223	22%
2000	446	22%

*250 Is a good number that allows 10 passes through the deck, a convenient and not too overwhelming fun that can be completed in a single class period.

You can see that small sample sizes demand a much greater level of successful performance. For instance, a subject who correctly predicted 27 cards out of 100 tries has failed to give a statistically significant performance, even though they scored 27% correct. An unsuccessful test does not necessarily prove that the subject lacks ESP; it only shows that any ability was below the detectable threshold for that experiment. This is why it is so important to design tests that balance the need for scientific rigor and skepticism against the need to fairly consider reasonable claims.

discussion **questions**

- What were your results and were they significant?
- Did you accept or reject your null hypothesis?
- What conclusions (if any) did you draw from the results about whether or not your subject has ESP?
- Do you think the results of your study are valid?
- Is there anything you could do to prove the validity of these results?
- Do you think science is capable of answering questions about ESP?
- Do you think that modern scientists should continue to conduct research into the existence of psychic abilities?
- Whether you believe in the existence of ESP or not, what evidence would you require to change your mind?
- Did this exercise change your mind about psychic powers?

share your **results**

Careful experimental design, rigorous procedures, and thorough analysis of your results are all critical to getting reliable answers to scientific questions. The process doesn't end there. One of the reasons science works so well is because the ideas that are produced by it are free to be scrutinized by the scientific community. This scientific community can use its accumulated knowledge and further investigation to weigh the evidence for or against new ideas. Bad ideas don't last. Because of this, we say that science is "self-correcting."

We also share the results of our research with the scientific community because science is collaborative. We can often increase our understanding of phenomena by comparing our results with those of other researchers or repeating their experiments to determine if their findings can be replicated.

If you would like to share the results of your ESP trials with schools from around the world that have used this same classroom kit, scan your datasheets and email them to education@randi.org. We will be compiling results and making them available on our website.

further **reading**

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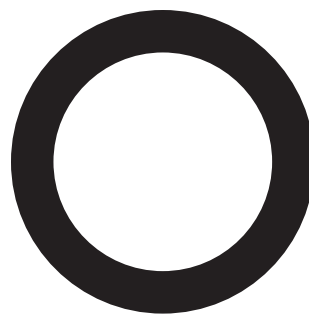
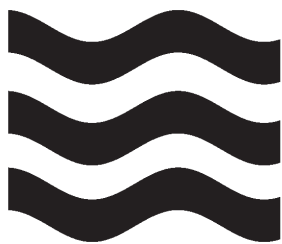
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zener cards

print on cardstock
cut carefully
using dotted lines



**PRINT OUT AND USE A SEPARATE DATA SHEET FOR EACH TEST**

SHEET N°.	DATE:		INTENDED Nº. OF TRIALS	TYPE OF TEST: SELECT ONE	TELEPATHY
	TIME:				PRECOGNITION
					CLAIRVOYANCE

SEATING ARRANGEMENT [draw below]	NOTES:
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ENTER ALL DATA WITH NON-ERASABLE PEN

T	C	SCORE	T	C	SCORE	T	C	SCORE	T	C	SCORE
1			26			51			76		
2			27			52			77		
3			28			53			78		
4			29			54			79		
5			30			55			80		
6			31			56			81		
7			32			57			82		
8			33			58			83		
9			34			59			84		
10			35			60			85		
11			36			61			86		
12			37			62			87		
13			38			63			88		
14			39			64			89		
15			40			65			90		
16			41			66			91		
17			42			67			92		
18			43			68			93		
19			44			69			94		
20			45			70			95		
21			46			71			96		
22			47			72			97		
23			48			73			98		
24			49			74			99		
25			50			75			100		
SUBTOTAL 1			SUBTOTAL 2			SUBTOTAL 3			SUBTOTAL 4		

WAS THIS TRIAL SIGNIFICANT?	YES	NO	
TOTALS SCORED BY:			
TOTALS CHECKED BY:			
WITNESS:			

TOTAL SCORE
SUM OF SUBTOTALS

SUBJECT:

EXPERIMENTER:



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