

# PROBABILITY

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STATISTICS SOUTH AFRICA

**DURATION:** 2 HOURS  
**NUMBER OF PARTICIPANTS:** 30  
**TARGET AUDIENCE:** FET (GRADE 10 – 12)

## MOTIVATION FOR WORKSHOP

*Probability is a concept that prior to the curriculum review, formed part of content that was examined in an optional Paper 3. The implementation of Curriculum and Assessment Policy Statement (CAPS) has made the teaching of probability compulsory. As a result, all mathematics teachers are faced with a challenge of having to handle probability, a concept that was either not included in their formal professional training or have limited exposure or experience toward teaching it to learners. The purpose of conducting a workshop on probability is an attempt to provide an opportunity for teachers to interact with probability concepts and content that are necessary for teaching and learning.*

## CONTENT OF THE WORKSHOP

Few interesting and relevant data from Census 2011 will be shared with the audience. This worksheet consists of ten activities including the following:

- Calculations of theoretical and relative frequency of events happening;
- Draw and interpret Venn diagrams;
- Use Venn diagrams to determine the probability of events happening;
- Defining mutually exclusive events and
- Using probability rules to determine probabilities.

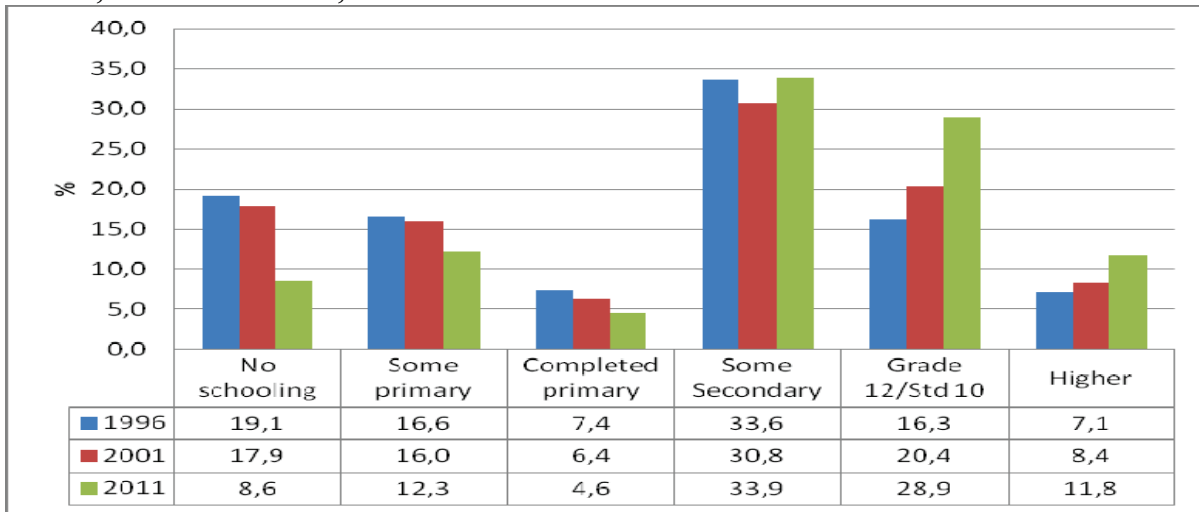
### Proposed time allocation for activities

1. Interpretations / discussion of Census 2011 findings	20 Min
2. Probability scale and concepts	20 Min
3. Probability problems from worksheets (hand outs)	60 Min
4. Summary of key concepts and handing out of study guides	20 Min

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**Activity1. (Census 2011)**

Highest level of education amongst persons aged 20 years and older and above, Censuses 1996, 2001 and 2011



- 1) What can you deduce from the P(No schooling) of 2011 and 1996?
- 2) The percentage of people, who completed primary education decreased in 2011 than in 1996. Why?
- 3) The percentage of people, who completed grade 10 and higher institution of learning increased. Why?

**CALCULATING PROBABILITY**

**Theoretical probability**

**ACTIVITY.2**

Give each of the answers in (b)

- i) as a common fraction in simplest form,
- ii) as a decimal fraction (correct to 2 decimal places)
- iii) as a percentage (correct to 1 decimal place).

A fair die is rolled once.

- a) List the elements of the sample space.
- b) What is the probability that you will get
  - i) A six?
  - ii) An odd number?
  - iii) A seven?
  - iv) More than 2?
  - v) Less than 10?



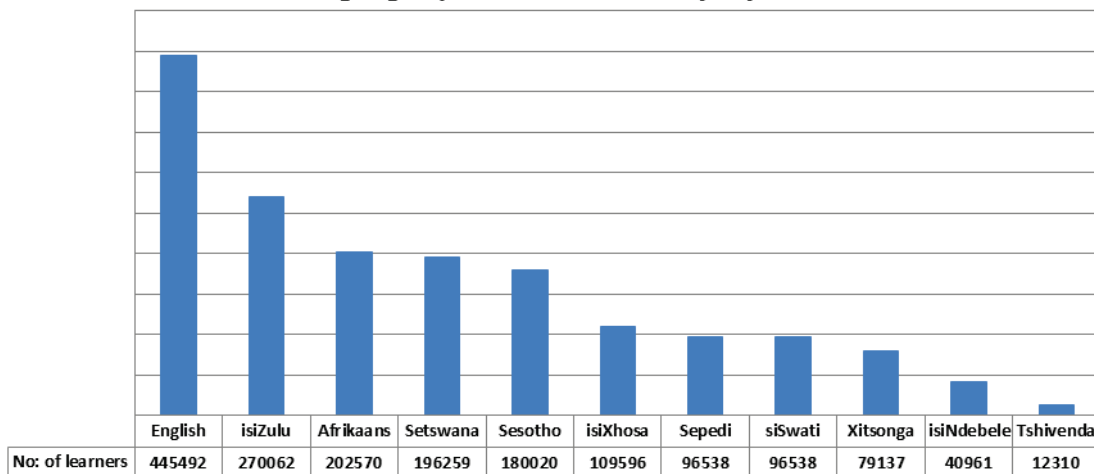
## Relative frequency



### ACTIVITY.3

The bar graph below is taken from 2009 Census@School. A sample of all the learners in South Africa was asked which of the official languages they spoke most in everyday conversation. (*The language used in everyday conversation is the language you use most of the time when talking and listening to others*). The bar graph shows their answers.

The official language spoken most in everyday conversation



- How many learners were surveyed?
- Estimate the probability (as a percentage correct to 1 decimal place) that a learner selected at random from the sample
  - Speaks mainly English in everyday conversation
  - Speaks mainly isiZulu OR Afrikaans in everyday conversation
- In Census 2011 it was found that in South Africa, with a population of 51 770 560. 9, 6% speak English and 36, 2% speak isiZulu or Afrikaans in everyday conversation. Which results, 2009 Census@School or Census 2011, give better estimates? Give reasons for your answer.

## Drawing Venn diagrams

### ACTIVITY.4

A sample space  $S$  consists of whole numbers from 20 to 29 inclusive.

Event  $A$  consists of the multiples of 4 in  $S$ .

Event  $B$  consists of the factors of 420 in  $S$ .

Event  $C$  consists of the multiples of 5 in  $S$ .

Event  $D$  consists of the multiples of 3 in  $S$ .

a) List the elements in

i)  $S$       ii)  $A$       iii)  $B$       iv)  $C$       v)  $D$

b) Draw Venn diagrams to show

i) Sample space  $S$  and event  $A$

ii) Sample space  $S$ , event  $A$  and event  $B$

iii) Sample space  $S$ , event  $C$  and event  $D$

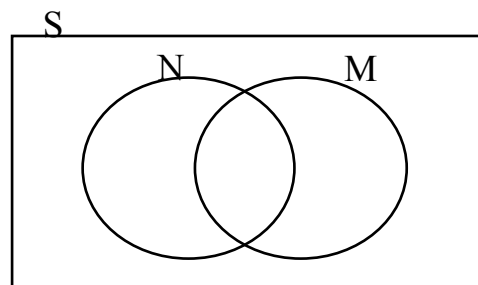
## Interpreting Venn diagrams

### ACTIVITY.5

Draw six Venn diagrams like the one given.

On each one shade one of the following:

- 1)  $N$
- 2)  $N$  and  $M$
- 3)  $N$  or  $M$
- 4)  $N$  but not  $M$
- 5)  $M$  but not  $N$
- 6) Neither  $M$  nor  $N$

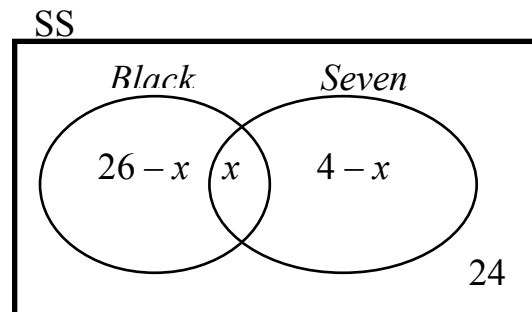


## Venn diagrams showing the number of outcomes in events

### ACTIVITY.6

The Venn diagram illustrates the number of playing cards in a pack of playing cards which are black as well as the number of cards that are sevens. Use the Venn diagram to answer the following:

- How many cards are there in a pack of cards?
- How many black cards are there in a pack of playing cards?
- How many sevens are there in a pack of playing cards?
- How many cards are black *or* seven?
- Find the value of  $x$ ; where  $x$  is the number of black sevens in a pack of playing cards.
- Check your answers by substituting for  $x$  and adding.



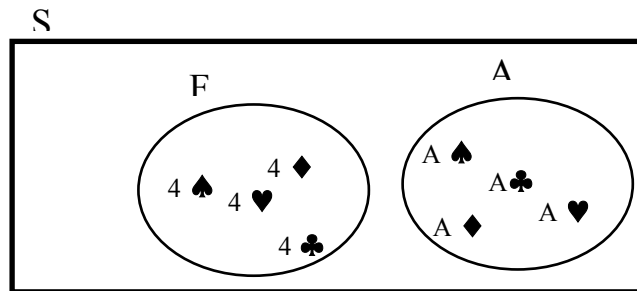
## Finding a relationship between the number of outcomes in different events

### ACTIVITY.7

The Venn diagram illustrates the number of playing cards in a pack of playing cards that are fours as well as the number of cards that are aces.

Let  $F$  be the set of fours in a pack of playing cards

Let  $A$  be the set of aces in a pack of playing cards



1) Use the Venn diagram to find the following:

- $n(F)$
- $n(A)$
- $n(F \text{ and } A)$
- $n(F \text{ or } A)$
- $n(F) + n(A) - n(F \text{ and } A)$

2) Is  $n(F) + n(A) - n(F \text{ and } A) = n(F \text{ or } A)$  ?

## Venn Diagrams showing the probability of events happening

### ACTIVITY.8

Two events  $A$  and  $B$  have the following probabilities:

$$P(A) = 0,2; P(B) = 0,4 \text{ and } P(A \text{ and } B) = 0,08$$

Draw a Venn diagram to illustrate the situation

- Determine  $P(A \text{ or } B)$
- Is  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ ?

## PROBABILITY RULES



### ACTIVITY.9

In the 2009 Census@School, the Grade 10 to 12 learners were asked what type of home they stay in most of the time. 58,6% of the learners answered that they live in a house (H) and 14,8% live in a traditional dwelling (T).

- a) Are 'living in a house (H)' and 'living in a traditional dwelling (T)' mutually exclusive?
- b) Calculate the percentage of the Grade 10 to 12 learners who do not live in a house or traditional dwelling.
- c) Draw a Venn diagram to show the percentage of learners who live in a house (H), the percentage of learners who live in a traditional dwelling (T) and the percentage of learners who do not live in a house or in a traditional dwelling.
- d) Suppose one of the Grade 10 to 12 learners is selected at random. Determine
  - i)  $P(H)$
  - ii)  $P(T)$
  - iii)  $P(\text{not } H)$
  - iv)  $P(\text{not } T)$
  - v)  $P(H \text{ or } T)$

**ACTIVITY.10**

In a the 2009 Census@School survey of 15 to 19 year olds, learners were asked what sport they would like to take part in. Below is data adapted from the database:

<b>Age 15 -19 males and females sport</b>	<b>%</b>
Athletics (A)	$x$
Volleyball (V)	21 %
Athletics and Volleyball	12 %
Neither of these sports	65 %

- a) Draw a Venn diagram to illustrate the data given in the table.
- b) Use the Venn diagram to determine the value of  $x$ .
- c) Calculate the probability that a learner chosen at random:
  - i) likes Athletics but not Volleyball
  - ii) likes Athletics or Volleyball

**REFERENCES:**

- Stats SA, 2011, Data handling & Probability study guide: Grades, 10, 11 and 12 HCD (Human Capacity Development.)
  - Statistical release : P0301.4 Census 2011
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