

A Guide to Calculating Probability

Teaching Approach

To master the work covered in the Grade 12 Probability, the following background knowledge is needed:

- What is probability?
- What are tree diagrams and two way tables and how are they constructed?
- What is the national lottery and how does it work?
- What are slot machines and how do they work?
- Knowledge of what playing cards are, how they look and what their properties are is required.
- There must be some prior knowledge of what card games are.
- What do weather forecasts look like?
- Advertisements that include probability as part of their marketing must have been seen

It is also important that learners read newspaper articles that include words like likely, probably, never, always etc to familiarise themselves with the everyday use of probability.

It is important that you encourage the learners to voice their opinions about the validity of a statement and that they bring in their own resource material to discuss in class.

Why don't you try the following lesson suggestions for this section:

1. Lesson suggestion:

- Ask learners to register on www.superbru.com. Use the website to predict which teams will win which games. Ask one set of learners to research the teams and base their predictions on past performance and statistics. Ask the other set of learners to just pick who they think will win the game based on their personal preference.
- Compare the results on Superbru and use these results to discuss how probability cannot always accurately predict what the outcome of sports games will be.

2. Lesson suggestion:

- Use www.hippo.co.za to investigate what happens to insurance quotes when you change the gender and age of a person looking for quotes. Make sure to keep the make and model of the car you are trying to insure the same.
- Use this activity to talk about what risk assessment is and how it influences insurance premiums.
- You could also vary the make and model of the car to show how different kinds of cars are more expensive to insure and investigate the reasons for this.

3. Lesson suggestion:

- Ask learners to bring in examples of advertisements from the beauty industry that use percentages.
- Investigate the sample size that must be listed on the advertisement.

- Evaluate the statements on the advertisement for accuracy.
 - The following website may be helpful: www.fashionadexplorer.com
4. Lesson suggestion:
- Use a die and a pack of cards and ask learners to roll the die and draw a card.
 - Use this to explain that the events are independent as the one doesn't influence the other.
 - Ask the learners to roll a die three times and ask them whether they think these events are dependent or independent.
 - Ask learners to draw two cards without replacement. Ask them whether the probability changes from one event to the next.

Video Summaries

Some videos have a 'PAUSE' moment, at which point the teacher or learner can choose to pause the video and try to answer the question posed or calculate the answer to the problem under discussion. Once the video starts again, the answer to the question or the right answer to the calculation is given.

Mindset suggests a number of ways to use the video lessons. These include:

- Watch or show a lesson as an introduction to a lesson
- Watch or show a lesson after a lesson, as a summary or as a way of adding in some interesting real-life applications or practical aspects
- Design a worksheet or set of questions about one video lesson. Then ask learners to watch a video related to the lesson and to complete the worksheet or questions, either in groups or individually
- Worksheets and questions based on video lessons can be used as short assessments or exercises
- Ask learners to watch a particular video lesson for homework (in the school library or on the website, depending on how the material is available) as preparation for the next days lesson; if desired, learners can be given specific questions to answer in preparation for the next day's lesson

1. The Odds in Gambling

This video explains the basics of probability such as the formula and scale from 0 to 1.

2. Prediction

This video explains the difference between relative frequency and theoretical probability by referring to coins toss experiments. It also explains the difference between dependent and independent events and the influence this has on probability calculations.

3. Compound Events

This video deals with finding the number of possible outcomes for compound events by using tree diagrams and two way tables.

4. Evaluating Expressions Involving Probability

In this lesson we look at evaluating expressions involving probability found in sports, gambling, the insurance industry and the cosmetic industry.

Resource Material

Resource materials are a list of links available to teachers and learners to enhance their experience of the subject matter. They are not necessarily CAPS aligned and need to be used with discretion.

| | | |
|---|---|--|
| 1. The Odds in Gambling | http://www.math.cornell.edu/~mec/2006-2007/Probability/ProbGames.htm | Card games and probability |
| | http://www.sciencebuddies.org/science-fair-projects/project_ideas/Math_p017.shtml | Card games and probability |
| 2. Prediction | www.weathersa.co.za | Weather predictions |
| | www.sport24.co.za | Sport results |
| 3. Compound Events | www.mathsisfun.com/data/probability-events-independent.html | Explanation for independent and dependent events |
| | http://waqasmubashir.weebly.com/uploads/2/2/6/7/22677732/independent_vs_dependent_practice_worksheets.pdf | Explanation for independent and dependent events |
| 4. Evaluating Expressions Involving Probability | www.mathsisfun.com/definitions/probability.html | Probability definition |

Task

Question 1

Calculate the probability of getting two heads and one tails when tossing a coin three times.

Question 2

Evaluate and critique the validity of these statements:

- 2.1 80% of women who tried an anti- wrinkle reported an improvement in skin tone. 98 women reported back using self –evaluation.
- 2.2 If it rains today it is more likely to rain tomorrow than if it didn't rain today.
- 2.3 The sports team who lost their game last week will also lose the game this week

Question 3

Are these events dependent or independent? Motivate your answer.

- 3.1 Rolling a 3 on a die and tossing a tails on a coin.
- 3.2 The same athlete winning two marathons run right after one another.

Question 4

The weather service predicts 80% chance for rain tomorrow. Explain which factors may cause this prediction to be incorrect.

Question 5

Black Jack is a card game where the aim is to get a total of 21 by adding the values on playing cards. A king, queen or jack counts 10 while an ace can count 1 or 11. After each game all the cards are collected, shuffled and the game begins again. James makes the following statements:

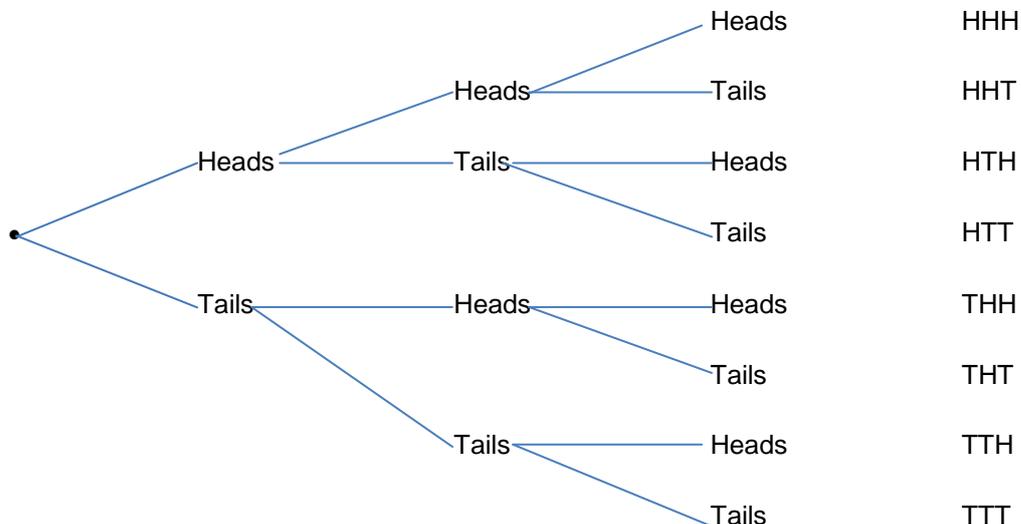
The more you play the game the more likely you are to win and if you play more than one hand at a time during the same game you are more likely to win.

Evaluate these statements and decide whether they are true or false. Refer to independent and dependent events in you explanation of your answer.

Task Answers

Question 1

Heads and tails are equally likely



There are 3 options HHT, HTH and THH

$$\begin{aligned}
 \text{Probability} &= \\
 &= \frac{\text{number of 2H, 1T}}{\text{number of options}} \\
 &= \frac{3}{8} \\
 &= 0,375
 \end{aligned}$$

Question 2

- 2.1 80% of 98 is 78,4. This means that the answer was rounded off. It is also based on self-evaluation which is not necessarily accurate.
- 2.2 This depends on the time of year as well as the kind of rain. If it is rain caused by a cold front which is staying in the area it is more likely to be raining the following day as well as the same weather pattern will be present. However, if the rain was a thunderstorm and the weather system has moved on it will not necessarily rain the next day.
- 2.3 Many factors influence sports teams. The reason for the loss the previous week must be determined before any prediction about the next game can be made. Team morale and injuries as well as travel to the next game must be kept in mind. Teams are also more likely to win if they play on their own field.

Question 3

- 3.1 Independent, the two events have no influence on one another
- 3.2 Dependent, he or she may be tired from the previous race or injured themselves.

Question 4

The weather is influenced by changing wind directions, weather systems moving away or moving in which might stop it from raining or the rain might fall during the night and stop before it is the new day. The rain might only fall after the day is over as well due to wind directions, temperature and humidity changes.

Question 5

The more you play the game the more likely you are to win: This statement is false because the cards are taken in and shuffled which means that playing the game separate times is independent as the results in the previous game have no effect on the next game or any game thereafter.

If you play more than one hand during the same game you are more likely to win: This statement is true as the cards are handed to each player and the number of cards that can be handed out becomes less. The events are dependent as what happens with the one hand influences what can happen to the next one. This also means that multiple players results are dependent on each other.

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