# 2023 PROBABILITY

Questions ○ Memos ○ Diagnostic Report

THE ANSWER SERIES *Your Key to Exam Success*

# PROBABILITY (30%): DBE NOVEMBER 2023

## QUESTION 10

10.1 A and B are independent events. $P(A) = \frac{1}{3}$ and $P(B) = \frac{3}{4}$

52%

Determine:

10.1.1 P(A and B) (2)

10.1.2 P(at least ONE event occurs) (2)

### Memo

10.1.1 For **independent events**, A and B:

**P(A and B) = P(A) x P(B)** . . . *The formula!*

$= \frac{1}{3} \times \frac{3}{4}$

$= \mathbf{\frac{1}{4}}$ ✓

10.1.2 **P(at least ONE event occurs)**

**= P(A or B)** . . . *The formula!*

$= P(A) + P(B) - P(A \text{ and } B)$

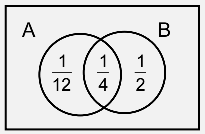
$= \frac{1}{3} + \frac{3}{4} - \frac{1}{4}$

$= \mathbf{\frac{5}{6}}$ ✓

OR: P(at least ONE event occurs)

$= \frac{1}{12} + \frac{1}{4} + \frac{1}{2}$

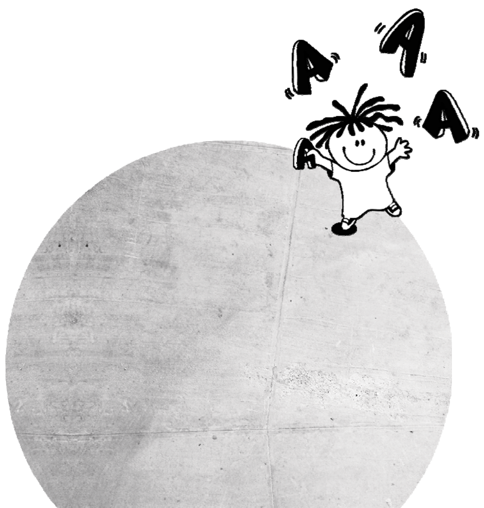
$= \mathbf{\frac{5}{6}}$ ✓




## Common Errors and Misconceptions

(a) In **Q10.1.2** many candidates **did not use** the **probability rule correctly** to answer this problem. The theory of P(at least one) = 1 – P(A and B) was incorrectly used.

(b) Most candidates who calculated a probability that was greater than 1 did not realise that this could **not** be **correct**.







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10.2 The probability that it will snow on the Drakensberg Mountains in June is 5%.

**28%**

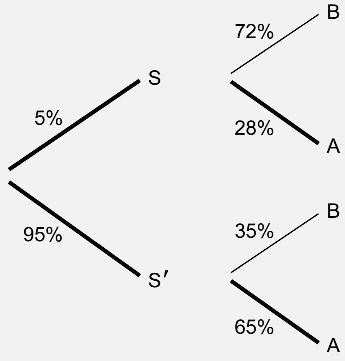
- When it snows on the mountains, the probability that the minimum temperature in Central South Africa will drop below 0ºC is 72%.
- If it does not snow on the mountains, the probability that the minimum temperature in Central South Africa will drop below 0ºC is 35%.

10.2.1 Represent the given information on a tree diagram. Clearly indicate the probabilities associated with EACH branch. (3)

10.2.2 Calculate the probability that the temperature in Central South Africa will NOT drop below 0ºC in June 2024. (3)

## Memo

10.2.1




**Temperature**

B : below 0ºC

A : above 0ºC

10.2.2 $P(A) = P(S \text{ and } A) + P(S' \text{ and } A)$

$= 5\% \times 28\% + 95\% \times 65\%$

$= 1{,}4\% + 61{,}75\%$

$=$ **63,15%** ✓

## Common Errors and Misconceptions

(c) In answering **Q10.2.1** many candidates were unable to correctly draw the tree diagram.

10.3 Ten learners stand randomly in a line, one behind the other.

**15%**

10.3.1 In how many different ways can the ten learners stand in the line? (1)

10.3.2 Calculate the probability that there will be 5 learners between the 2 youngest learners in the line. (4)

**[15]**

**TOTAL: 150**

## Common Errors and Misconceptions

(d) In **Q10.3.2** most candidates did not understand that there were 4 positions for the 5 learners to be seated between the 2 youngest learners.

The most common error was $5! \times 2!$.

## Memo

10.3.1 No. of ways: $\underline{10}\ \ \underline{9}\ \ \underline{8}\ \ \underline{7}\ \ \underline{6}\ \ \underline{5}\ \ \underline{4}\ \ \underline{3}\ \ \underline{2}\ \ \underline{1}$

$\therefore\ 10! = \mathbf{3\ 628\ 800}$ ✓

10.3.2 The youngest learners with 5 learners in between.

$\underline{2}\ \ \underline{8}\ \ \underline{7}\ \ \underline{6}\ \ \underline{5}\ \ \underline{4}\ \ \underline{1}$

Think of the two youngest learners and 5 learners in between as one unit. So arrange 4 "groups", i.e. 4!

no. of ways $= 4! \times (2 \times 8 \times 7 \times 6 \times 5 \times 4 \times 1)$
$= 322\ 560$

$\therefore$ PROBABILITY $= \dfrac{322\ 560}{3\ 628\ 800}$ . . . $P(E) = \dfrac{n(E)}{n(S)}$

$= \mathbf{\dfrac{4}{45}}$ ✓

OR:

$\underline{(2)} \times \underline{8} \times \underline{7} \times \underline{6} \times \underline{5} \times \underline{4} \times \underline{(1)} \times \underline{3} \times \underline{2} \times \underline{1}$

$\underline{8} \times \underline{(2)} \times \underline{7} \times \underline{6} \times \underline{5} \times \underline{4} \times \underline{3} \times \underline{(1)} \times \underline{2} \times \underline{1}$

$\underline{8} \times \underline{7} \times \underline{(2)} \times \underline{6} \times \underline{5} \times \underline{4} \times \underline{3} \times \underline{2} \times \underline{(1)} \times \underline{1}$

$\underline{8} \times \underline{7} \times \underline{6} \times \underline{(2)} \times \underline{5} \times \underline{4} \times \underline{3} \times \underline{2} \times \underline{1} \times \underline{(1)}$

$\therefore$ PROBABILITY $= \dfrac{4 \times 2 \times 8!}{10!}$ . . . $P(E) = \dfrac{n(E)}{n(S)}$

$= \mathbf{\dfrac{4}{45}}$ ✓

OR:

P(either younger learner) $= \dfrac{2}{10}$

P(second younger learner) $= \dfrac{1}{9}$

Younger learners could be in positions 1 and 7, or 2 and 8, or 3 and 9, or 4 and 10.

$\therefore$ PROBABILITY $= \dfrac{2}{10} \times \dfrac{1}{9} \times 4$

$= \mathbf{\dfrac{4}{45}}$ ✓

## QUESTION 10: Suggestions for Improvement

(a) Teaching **basic concepts** cannot be overlooked. When learners understand the basic concepts well enough, then the more complex concepts are easier to grasp.

(b) It must be stressed that **the probability of an event A lies in the interval** $0 \leq P(A) \leq 1$.

(c) Reading for understanding must be a regular practice in the classroom. This should equip learners with the skills to deal with word problems in assessment tasks.

(d) Teachers need to teach **both tree diagrams** and **Venn diagrams** thoroughly. These concepts should be examined in school-based assessment tasks throughout the FET phase.

(e) Teach learners the ***Fundamental Counting Principle*** in such a way that they will be able to base their answers on their **reasoning**, rather than on the rule.