Let the mind manage the body
Que l'esprit gère le corps

Mauritius Examinations Syndicate

PSAC 2020-2021

MATHEMATICS

Subject Code: P120
Examiners' Report

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MATHEMATICS

(Subject Code No. 120)

Introduction

The Primary School Achievement Certificate (PSAC) Assessment in Mathematics was developed in the context of the implementation of the Nine-Year Continuous Basic Education (NYCBE) reform. Introduced for the first time in 2017, it focuses on measuring the extent to which candidates develop relevant mathematical proficiencies in the different strands of the curriculum.

The PSAC Assessment in Mathematics is based on:

1. the learning outcomes of the *Mathematics Teaching and Learning Syllabus Grades 1-6*;
2. the eight components of mathematical proficiency specified in the *National Curriculum Framework Grades 1 to 6*, namely *Representation*, *Communication*, *Conceptual understanding*, *Logical reasoning*, *Procedural fluency*, *Strategic thinking*, *Modelling* and *Problem solving*; and
3. the three Assessment Objectives defined in the *Annual Programme for the Primary School Achievement Certificate (PSAC) Assessment, namely*:

    - **Knowledge and comprehension (40 %)** – questions formulated to demonstrate candidates' ability to '*recall specific mathematical facts, concepts, rules and formulae; represent simple mathematical statements or information; perform simple mathematical operation and routine procedures*'.

    - **Application (40 %)** – questions that require candidates to demonstrate their ability to '*identify and apply mathematical concepts, rules and formulae, skills and techniques to solve familiar problems*' in given contexts.

    - **Analysis (20 %)** – questions focused on measuring the candidates' ability to '*break down and interpret multi-faceted information and data into their component parts; recognize and use unstated mathematical assumptions in* *problem solving; formulate appropriate strategies to solve non-routine problems*'.

Achieving the required standards in Mathematics at the end of Grade 6, therefore, is about demonstrating a solid understanding of the basic concepts learned, fluency in performing arithmetic calculations correctly, and showing flexibility and mastery in exercising strategic thinking in varied contexts. It also requires a firm acquisition of number sense that allows prompt evaluations of how sensible the solutions to problems obtained are.

General Comments

The outbreak of the COVID-19 pandemic in 2020 and its impact on the school system in general led to the rescheduling of the PSAC Assessment in Mathematics that year. Generally held in October, the assessment was exceptionally held in March 2021 instead.

78.26 % of school candidates achieved numerical grade 5 or better in the PSAC Mathematics Assessment 2020-2021. This is comparable to the performance of candidates in 2019 when the overall performance was 79.82 %.

Statistical analyses and an examination of candidates' scripts indicate that candidates acquired a broad mathematical knowledge-base. In particular, candidates were successful at carrying out basic operations involving whole numbers and at responding to typical questions that they often get to practise. However, they could rarely apply this knowledge acquired to engage in solving more complex problems competently.

Questions involving fractions remain challenging for the large majority of candidates. It appears from the common mistakes left that candidates had not developed an adequate understanding of fractions. They quite readily applied rules for whole numbers they had learned. It is important to highlight that building on pupils' intuitive understanding and making use of objects or contexts rather than rule-based approaches may not only help pupils make sense of the operations involving fractions. Offering concrete experience also helps pupils develop competency and fluency when working with fractions.

Comments on Specific Questions

Very-short Answer Questions

Questions 1 – 18 assessed candidates' knowledge and comprehension mainly. They were well-answered in general. The questions which posed the most difficulty in this series were **Qu. 3**, **Qu. 16**, and **Qu. 17**.

The relatively low performance of candidates in **Qu. 3** and **Qu. 17** revealed that candidates had not developed basic knowledge of 2D and 3D shapes. Performance in **Qu. 16**, on the other hand, highlights the difficulty which a large number of candidates face in carrying out simple operations involving fractions.

Question 3

How many sides does a **hexagon** have?
Answer: ____________ sides [1]

This question was correctly answered by approximately 4 out 10 candidates. It revealed that many candidates did not know what a hexagon is.

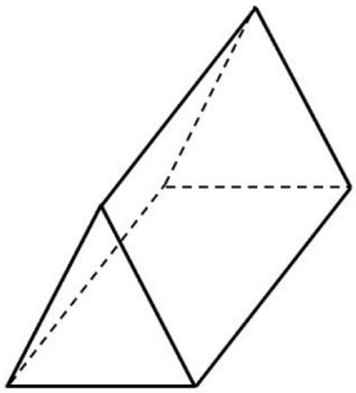
Question 16

Work out $\frac{6}{7} \times \frac{2}{9}$, giving your answer in its **lowest terms**. [2]

Less than half of the cohort was able to carry out the operation successfully. A handful of candidates did not simplify their answers and consequently lost a partial mark.

Question 17

The diagram below shows a 3-D shape.



Study the diagram carefully and answer the questions that follow.

(a) Name the 3-D shape. [1]

(b) State how many **vertices** the shape has. [1]

(c) State how many **edges** the shape has. [1]

About a third of the candidates were able to name the shape. Prism was a common correct answer but was often misspelt. The term 'vertices' seemed more familiar to candidates than 'edges' as the greater number of correct answers recorded in **Qu. 17 (b)** than in **Qu. 17 (c)** indicates.

Multiple-Choice Questions

The Multiple-Choice questions which were found to be most difficult by candidates were **Qu. 23**, **Qu. 26**, **Qu. 27** and **Qu. 28**. They were application-based questions with the exception of **Qu. 27** which required some level of analysis on the part of candidates.

Question 23

This word problem on the sub-topic of 'money' served to assess candidates' acquired number sense.

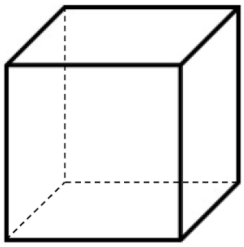
A shopkeeper sells a pen for Rs 27.35, making a **loss** of Rs 1.75.
At what price did he buy the pen?

A Rs 29.10 **B** Rs 28.10 **C** Rs 25.60 **D** Rs 24.60

Candidates were expected to recognise that the buying price would be higher than Rs. 27.35 and to deduce that the answer, therefore, that the answer could be either option **A** (Rs 29.10) or option **B** (Rs. 28.10). However, a considerable number of candidates from all the ability groups gave option **C** as answer (Rs. 25.60) instead. It is possible that candidates did not pay attention to the question asked and stopped at the word 'loss' in the question. As is often the case, the word 'loss' was mechanically associated to a 'subtraction' which led to answer **C**.

Question 26

The volume of the cube below is 64 cm^3.



What is the **length** of one side of the cube?

A 4 cm **B** 8 cm **C** 18 cm **D** 32 cm

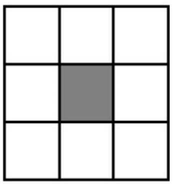
Qu. 26 was a fairly familiar question that often appears in the PSAC Assessment. However, performance in this question was quite low.

A comparable number of candidates chose the correct answer option **A** (4 cm) and option **B** (8 cm). Option **B** (8 cm) thus proved to be a strong distractor. It highlights the possible need to reinforce the difference between the concepts of surface area of a square and the volume of a cube which seems to be the underlying confusion met by candidates.

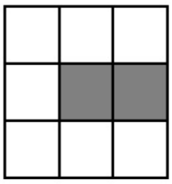
Question 27

Which one of the following diagrams has **only** one line of symmetry?

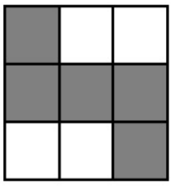
A



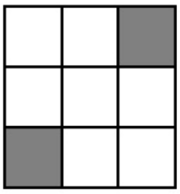
B



C



D



This was the least well-answered multiple choice question.

Similar to **Qu. 22** set in 2017 and **Qu. 15** set in 2019, this question was proposed as a multiple choice question in 2020.

About a third of the candidates correctly identified option **B** as the answer to the question. Option **D** was a visually powerful distractor. A good number of candidates also chose option **A**.

Question 28

The 4th of May 2017 was a Thursday.

On which day was the 25th of April 2017?

A	Tuesday	**B**	Wednesday
C	Thursday	**D**	Friday

The difficulty with this question was that candidates had to count the number of days backwards while recognising that there are 31 days in May.

Solving word problems

In general, word problems require candidates to:

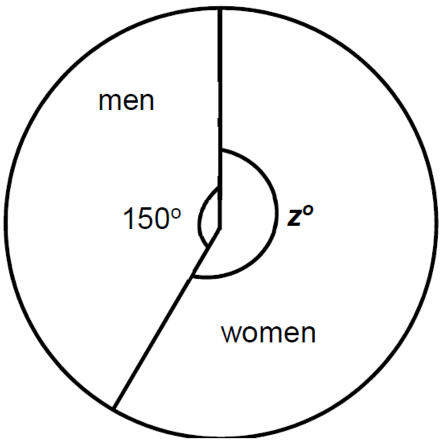
- to think about a given problem rationally,
- identify and choose appropriate methods of finding a solution to the problem, and
- evaluate the solution to the problem.

Such types of word problems usually carry 3 or more marks and may assess a mix of the different Assessment Objectives (AOs). They often vary in terms of difficulty. Examples of such types of questions in the PSAC Mathematics Assessment 2020 include **Qu. 32 – 35**, **Qu. 39**, **Qu. 41 (c)**, **Qu. 43-Qu. 45**.

Candidates find these questions challenging for a number of reasons. They often require candidates to read English with understanding and make sense of the question before they can even start thinking about how to solve a given problem. They warrant a translation of the question into a mathematical representation or model. They demand that candidates sustain their thinking as they process and use the information given. It is important to build pupils' confidence in overcoming their insecurities regarding problem solving questions. This can be achieved by proposing more open-ended than closed questions to pupils on a more frequent basis.

Question 39

There are 300 adults in a cinema hall.
The pie chart represents the number of men and women in the hall.



(a) Calculate the size of angle ***z***.

(b) Calculate the number of men in the hall.

Qu. 39 was, a priori, a straight-forward question.

A little more than half of the candidates were able to calculate the size of angle **z** in part (a). This suggests that a good number of candidates understood were able to apply their knowledge of angle at a point to determine the unknown angle **z**.

However, relatively few candidates were able to calculate the number of men in the hall. In most cases, successful candidates were from the higher ability groups. Some mistakes arose from inaccuracies in calculation or from misreading 300 adults for 360 adults. In other cases, candidates subtracted the angle representing men (210^{o}) from the total number of adults (300) present in the hall, which was a conceptually incorrect calculation. It is important for pupils to understand that adding or subtracting quantities of different units is mathematically not possible.

Question 40

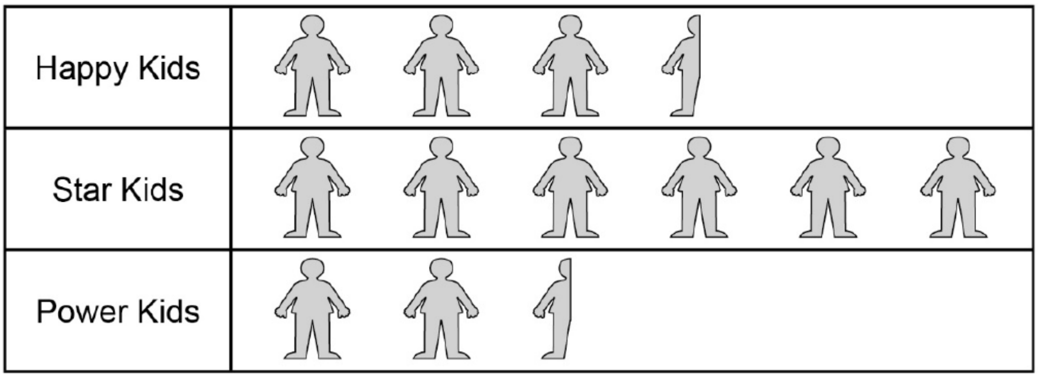
Performance in this question was very low. Some candidates were able to score a partial mark for correctly converting a unit of capacity into another.

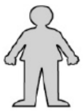
> A baker prepares a mixture by using
>
> 530 mL of milk,
> 2 L of water and
> 40 cL of syrup.
>
> Find the **total volume** of the mixture **in litres**.

Adding up the different capacities while ignoring the units was a common mistake noted. Another quite common mistake, which illustrates candidates' mechanical reaction to words or terms used in a question, was to calculate the total volume by applying the formula: volume = length × width × height. This led to unreasonable answers that went unnoticed by candidates. This highlights pupils' inadequate development of number sense, a weakness that has been mentioned in the past.

Question 41

Three schools participate in a sport competition.
The pictogram below represents the number of participants from each school.



Key  represent 2 pupils

(a) Which school has the **greatest** number of participants?

(b) Find the **total** number of participants in the sport competition.

(c) The information provided in the pictogram is now represented on a pie chart. Calculate the angle representing the number of participants from **Power Kids**.

Candidates fared well in parts (a) and (b) of the question. This suggests that the basic skills of reading and interpreting of pictograms had been acquired by the majority of candidates.

Part (c) proved challenging to a large percentage of candidates from the average and below average ability groups.

Question 43

Performance in part (a) was satisfactory. Many candidates across the different ability groups were able to answer this part question correctly.

The difficulty met in part (b) arose from quite many candidates either overlooking that Wali ate a quarter of the remaining biscuits or misinterpreting the question. A recurrent observation made was to subtract $\frac{1}{4}$ from the remaining biscuits ($\frac{3}{5}$) instead of multiplying the two fractions.

Wali has a packet of biscuits. He eats $\frac{2}{5}$ of the biscuits on Monday.

(a) What fraction of biscuits is **left**?

Answer: ________________

(b) On Tuesday, Wali eats $\frac{1}{4}$ of the **remaining** biscuits.

What fraction of biscuits is **left** in the box?

The use of bar modelling as a method of solving **Qu. 43** was common and should be further encouraged.

Question 44

Samy buys 3 kg of potatoes, 1 kg of tomatoes and $\frac{1}{2}$ kg of onions for Rs 89.
Rishi bus 9 kg of potatoes and 3 kg of tomatoes from the same seller for Rs 228.

Calculate

(a) the cost of 3 kg of potatoes and 1 kg of tomatoes.

(b) the cost of 1 kg of onions.

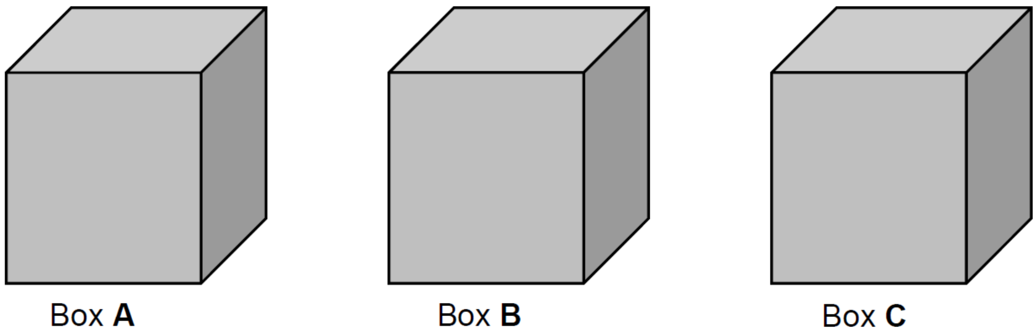
This question on mass was found to be problematic for the large majority. The key to this question was for candidates to identify what was common between the items that Samy and Rishi bought and to devise a strategy to find a solution thereon.

An analysis-based question, **Qu. 44** is an example of the types of questions that seek to assess candidates' ability to *break down multi-faceted information into its component parts*. The performance of candidates in this question reveals that they had little exposure to solve similar questions. As 20 % of the question paper is dedicated to analysis-based questions, it is worth training pupils to overcome their insecurities towards such types of items.

Question 45

Although performance was low in **Qu. 45**, candidates performed slightly better in **Qu. 45** than in **Qu. 44**. They showed a lot of creativity in responding to the question and thus adopted various correct strategies to get to the answer. A shortcoming noted, however, was the limited ability for the large majority of candidates to sustain their thinking when solving complex, multi-part questions. Errors in calculations occurred quite frequently. This gave the impression that candidates were in a hurry to find the solution.

Three boxes, Box **A**, Box **B** and Box **C**, contain balls.



Box **A** contains **3 times** as many balls as in Box **B**.
Box **C** contains **half** as many balls as in Box **B**.

Given that there are 36 **more** balls in Box **A** than in Box **B**, find

(a) the number of balls in Box **B**.

(b) the number of balls in Box **C**.

(c) the **total** number of balls in the three boxes.

Another reason why performance in **Qu. 45** was better than in **Qu. 44** was that candidates scored more intermediate marks in the former than in the latter. Candidates often had a literal reading of the question which led them to do certain calculations that were rewarded. For example, they divided 36 by 3 to get the number of balls in Box **B** (12 in this case), which was incorrect, but rightly recognised that the number of balls in Box **C** would be half the answer obtained in part (a) of the question.