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

Mauritius Examinations Syndicate

PSAC 2023

MATHEMATICS

Subject Code: P120
Examiners' Report

April 2024

MATHEMATICS

(Subject Code P120)

Introduction

The sixth edition of the Primary School Achievement Certificate (PSAC) Mathematics Assessment was held in October 2023. In line with the *Mathematics Teaching and Learning Syllabus Grades 1-6*, the Mathematics Assessment set out to measure candidates' acquisition of key mathematical proficiencies in the different strands of the curriculum. The assessment was based on the three assessment objectives outlined below:

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

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

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

General Comments

The performance of candidates in the PSAC Mathematics Assessment 2023 was fair. A decline in the overall results was noted. 79.3 % of the candidates achieved numerical grade 5 or better in 2023 compared to an overall performance of 83.2 % in 2022.

While the statistical analyses indicate that the paper was accessible to the vast majority of candidates, item analyses showed that candidates developed shallow understanding of key concepts such as fractions, percentages, area and volume. A good number of candidates have

not quite developed fluency in performing operations involving time, fractions and decimal numbers. A few candidates demonstrated firm acquisition of logical reasoning, number sense and problem-solving skills.

Key messages:

- Mental mathematics helps greatly to develop candidates' fluency when working with numbers, their ability to make estimations and to develop number sense. The use of mental mathematics is, therefore, strongly encouraged. However, it is vital that pupils show all their workings during the assessment. A good number of candidates lost partial marks because of a lack of evidence of how they arrived at their final answers during the last assessment.

- Pupils should be encouraged to replace any erased work to avoid loss of marks during the assessment. Whether legible or not, examiners do not mark erased work. It is to be highlighted that a good number of candidates erased their workings but included their final answers (sometimes correct and sometimes incorrect) on the answer line. It is important that pupils understand that when they erase their work, they indirectly tell the examiners not to consider any included answers. For this reason, it is better for pupils to cross out their work rather than erasing it.

- Moreover, it is important that pupils be trained to use the answer lines. Some candidates tend to fiddle with the values given in a question. In so doing, the correct answer is sometimes seen in their workings. However, unless they clearly indicate that this is the answer they have obtained by writing it on the answer line provided, examiners would not select the correct answer from the numerous possible answers found in their workings.

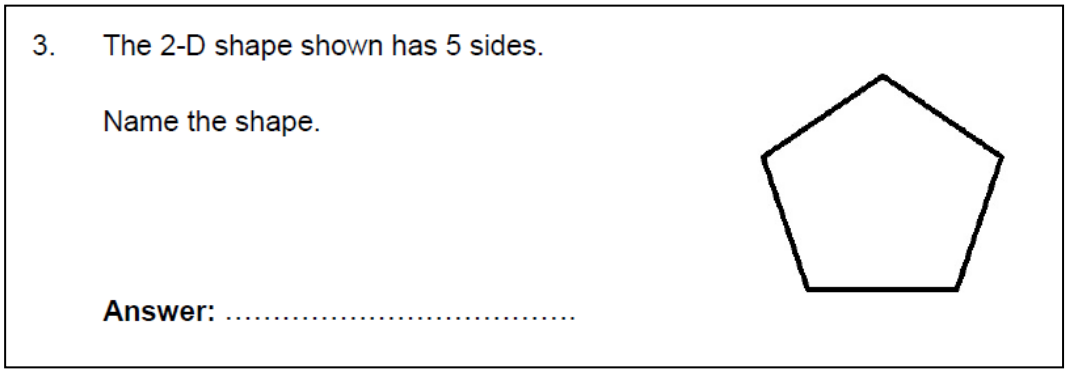
- An additional point to be noted is that 'Trial and error' is an acceptable method in Mathematics. However, this method is generally not encouraged. For candidates to score marks when they are using the 'Trial and error' method, they have to get the final correct answer. If they do not get the final correct answer, they cannot be awarded partial marks. This is in contrast to the use of other problem-solving strategies where candidates' intermediate work can be considered and rewarded.

Comments on Specific Questions

Very-short Answer Questions

Questions 1 – 18 were mostly one-mark questions. They primarily served to assess candidates' knowledge and comprehension of the concepts taught at a basic level. Performance in these questions was very good on the whole. Nevertheless, a few candidates had difficulties answering **Qu. 3**, **Qu. 8**, **Qu. 13**, and **Qu. 17**.

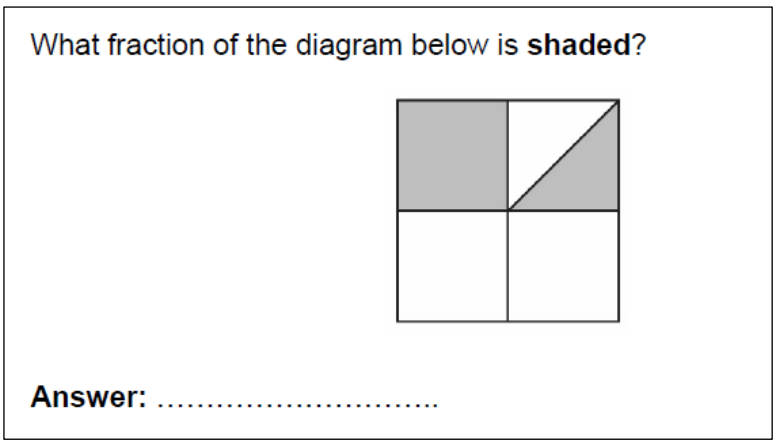
Question 3



The relatively low performance of candidates in **Qu. 3** arose mainly from candidates' apparent inability to differentiate between a pentagon and a hexagon. **Hexagon* was the most common incorrect answer noted. Other less common incorrect answers included the **isosceles* (which was often mis-spelt) and the **kite*.

Answer: *pentagon*

Question 8



Qu. 8 revealed that some candidates did not understand the notion of equal parts that is key in determining the fraction of a shaded figure. Quite a good number of candidates did not recognise that the given figure comprised 8 equal parts or triangles. The most popular incorrect answers were **2/5* and **2/4* which arose mainly from counting the number of shaded and unshaded parts of the figure. Other incorrect answers included **3/2* and **2/3*.

Answer: *3/8*

Question 13

What is the Highest Common Factor (**H.C.F.**) of 12 and 15?

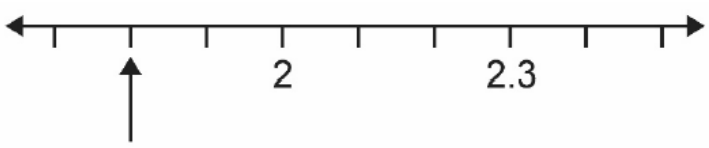
Answer: .....

Finding the H.C.F. and L.C.M. of two given numbers remains problematic for a significant number of candidates. Although a basic concept, fewer than half of the candidates answered **Qu. 13** successfully. Correct answers were obtained either after finding the prime factors of 12 and 15 and then choosing the *highest common factor* or after listing the factors of 12 and 15 to identify which was common to both. Incorrect answers, on the other hand, sprang from finding the L.C.M. of 12 and 15 instead. Some candidates successfully found the prime factors of 12 and 15 but, because the prime factor 3 was common to both 12 and 15 (it appeared twice), they multiplied 3 by 3 and gave 9 as answer.

Answer: *3*

Question 17

Which decimal fraction is shown by the arrow on the number line below?



Answer: .....

A wide range of incorrect answers was recorded for this question. About a quarter of the candidates rightly recognised that each small division on the number line increased by 0.1 from left to right. Performance in this question provided clear evidence of candidates' lack of confidence to count backwards especially when decimal numbers are involved. Greater opportunities to do so might alleviate this apparent difficulty.

Answer: *1.8*

Multiple-Choice Questions

Questions 19 to 28 were multiple-choice questions carrying 1 mark each. Performance on these questions was very good. Candidates scored 8 out of 10 marks on average. The least well-answered questions in the series were **Qu. 21**, **Qu. 23**, and **Qu. 24**.

Question 21

Which one of the following is a **prime number**?

A 33

B 35

C 37

D 39

Some candidates could not identify the prime number from the list of numbers given. For recall, a prime number is a positive integer that is greater than one and that has only two factors namely, 1 and the number itself. Option **A**, **33* was the most common incorrect answer given.

Answer: ***C***

Question 23

What is $\frac{2}{5}$ expressed as a percentage?

A 20 %

B 25 %

C 40 %

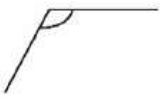
D 50 %

Performance in **Qu. 23** indicates that percentages remain an abstract concept for a good number of candidates. Option **B**, **25* was the most popular distractor in this case.

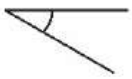
Answer: ***C***

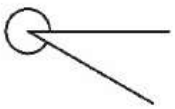
Question 24

Which one of the following is an **obtuse** angle?

A 

B 

C 

D 

Qu. 24 was a common question that is often set in the PSAC Mathematics Assessment. However, the same mistakes seem to recur each time. Candidates got confused between obtuse and reflex angles.

Answer: ***A***

Short-Answer questions

The short-answer questions carry 2 to 3 marks in general and assess both candidates' procedural fluency and ability to apply their mathematical knowledge in familiar contexts.

Questions on which candidates fared least well in this series were **Qu. 29**, **Qu. 31** and **Qu. 33 (a)**.

Question 29

Work out:

$$\frac{5}{8} \div \frac{15}{32}$$

Less than 40 % of the candidates answered this question correctly. It highlights the fact that a considerable number of candidates did not understand how to go about dividing fractions. If at times, candidates omitted to replace the division sign by the multiplication sign, at other times, they omitted to take the reciprocal of the second fraction or used the reciprocal of the first fraction instead. All these misunderstandings should be clarified with emphasis laid on the proper procedure to divide fractions as a means to improve performance in the future.

Answer: *4/3*

Question 31

Susan sleeps for $8\frac{1}{2}$ hours daily.

For how many hours does she sleep in **one week**?

The performance in **Qu. 31** was below expectation. It showed that candidates had erroneous notions of how to convert hours into minutes and how to multiply time:

1. Many candidates mistook ½ hour to be equal to 50 minutes. This possibly came about from drawing on the knowledge that ½ of a metre is 50 cm or that ½ of a litre is equal to 50 cL and extrapolating this to the conversion of hours into minutes.

2. Many candidates have not developed fluency in applying the procedure to multiply time. It was very common to see candidates multiplying 8 h 30 min or 8 h 50 min in the same way they would multiply the number 830 by 7. In this way, the incorrect intermediate answers **58 h 10 min* and **59 h 50 min* were often seen.

The need to draw pupils' attention to these common mistakes is important and is strongly advised.

Answer: *591/2 h*

Question 33 (a)

> Safira buys 1 L of juice.
> She gives 0.2 L of juice to Monique and 0.35 L of juice to Dev.
>
> How much juice does she have left?

Question 33 (a) highlighted again candidates' lack of confidence to work with decimal numbers. It did not serve to assess conversion of litres into centilitres or millilitres. Rather it assessed candidates' ability to add and subtract decimal numbers in a given context.

It is to be noted that although candidates were expected to give their answers in litres, many converted all the given capacities into cL or mL so that they did not have to add and subtract decimal numbers.

Candidates who worked with the decimal numbers as required often misplaced the values in the hundredth and/or tenth column properly. Thus, a common incorrect intermediate answer seen was **0.37* which resulted from adding 0.2 L to 0.35 L.

Answer: *0.45 L*

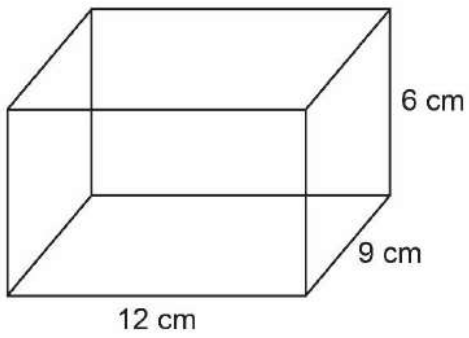
Long-answer questions

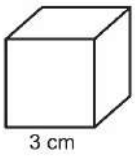
Long-answer questions usually carry 3 or more marks. They assess candidates' ability to reason independently and to select appropriate concepts or methods to find the solution to a given familiar or unfamiliar mathematical problem.

The long-answer questions which were found to be particularly challenging in 2023 were **Qu. 37**, **Qu. 40**, **Qu. 44**, **Qu. 45** and **Qu. 46**. It is to be pointed out that candidates are familiar with these types of questions.

Question 37

A cuboid has length 12 cm, width 9 cm and height 6 cm.





How many cubes of side 3 cm can fit in the cuboid?

Few candidates obtained full marks in this question. A good number of candidates lost marks for not showing their work. Others worked with the area of the cube instead of its volume. Still others calculated the volume of the cuboid by adding its length, breadth and height (as if calculating perimeter).

Since there was no mention of volume or area or perimeter in the question, it appeared that a large number of candidates could not decide by themselves which concept applied to the context given.

A good number of candidates divided the volume of the cuboid by the volume of the cube and obtained the correct answer. However, it is important to highlight that this method does not

always lead to the correct answer (especially when the volume of the cuboid is not exactly divisible by the volume of the cube) and is, therefore, discouraged.

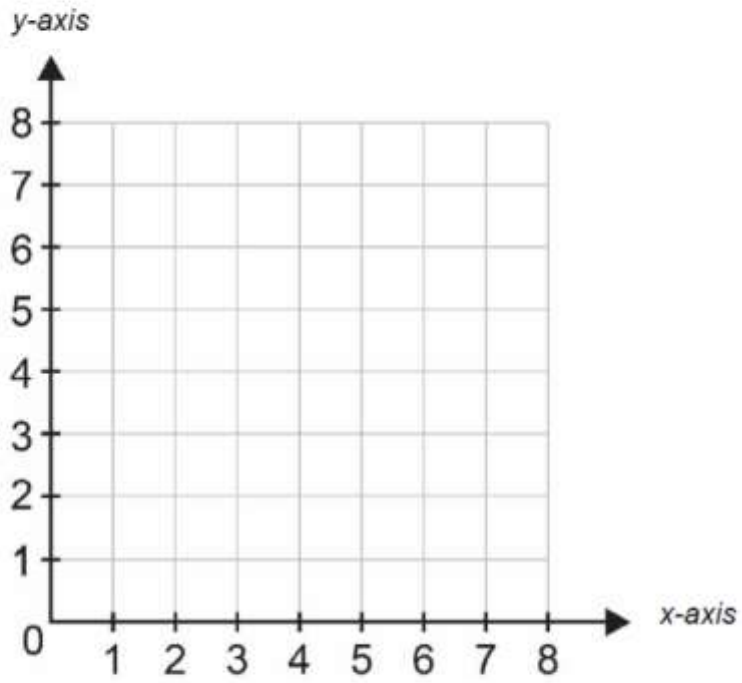
To find the number of cubes that could be fitted into the cuboid, candidates were expected to, firstly, find the number of cubes that would fit along the length of the cuboid (12 ÷ 3 = 4), its breadth (9 ÷ 3 = 3) and its height (6 ÷ 3 = 2) and, secondly, calculate the total number of cubes by multiplying their intermediate answers (that is 4 × 3 × 2).

Answer: *24 cubes*

Question 40

(a) Plot the following points on the graph below.

A (1 , 1) , **B** (1 , 6) and **C** (5 , 1)



(b) (i) Draw triangle **ABC** on the graph.

(ii) What is the **special name** given to triangle **ABC**?

(iii) Calculate the **area** of triangle **ABC**.

Question 40 was, a priori, a straight-forward question which, nevertheless, posed a number of problems to candidates. First and foremost is the persistent confusion candidates have

regarding plotting of points on a graph. They are often unsure about whether to read the *x*-value followed by the *y*-value or to read the *y*-value first. A very common mistake was for candidates to plot point **B** as the point **(6 , 1)* and point **C** as the point **(1 , 5)* instead of (1 , 6) and (5 , 1) respectively. Fortunately, joining these incorrect coordinate points also gave rise to a right-angled triangle which was the correct answer to part (b)(ii) and for which the candidates were not penalised.

Another concern that question 40 revealed was that candidates do not pay attention to labellings. In many instances, candidates plotted the given coordinate points without indicating which was the point **A**, **B** or **C** for which they lost marks. Similarly, some candidates, instead of plotting the points, drew broken lines along $x = 1$, $y = 1$, $y = 6$ and $x = 5$. This gave rise to 4 points of intersection with none of the intersecting points labelled.

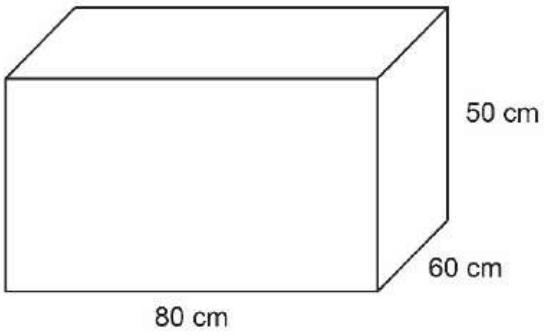
The need to always label a plotted pointed should be encouraged and emphasised in class to avoid such oversight in the future.

In part (b)(iii), partial marks were quite often lost because candidates counted the number of squares on the graph to estimate the area of the triangle they had obtained rather than calculating its area knowing that the area of a triangle is given by the area of rectangle divided by 2).

Answer: *(b)(ii) right-angled triangle , (b)(iii) 10 units^2*

Question 44

A rectangular tank is 80 cm long, 60 cm wide and 50 cm high.



(a) Half of the tank is filled with water.
Find the **volume of water** in the tank.

(b) All the water from the tank is poured into identical buckets, each of capacity 12 litres.
How many such buckets can be filled completely?
(1 L = 1000 cm^3)

Many candidates did not fare well in **Qu. 44** despite the fact that it was a straight-forward and regularly set question. Fewer than a third of the candidates scored full marks.

The main issues noted were that:

1. a considerable number of candidates did not recall the formula to calculate volume. As in **Qu. 37**, they calculated the volume by adding the length, breadth and height of the tank.

2. a good number of candidates overlooked the fact that the tank was half filled and that they had to calculate the volume of water in the tank rather than the volume of the tank itself.

3. instead of dividing the height of the tank by 2 to calculate the volume of water in the tank, some candidates divided the length and the breadth as well (they did **25 × 40 × 30* instead of calculating 25 × 80 × 30).

4. in part (b) of the question, many candidates did not convert their answer to part (a) in litres prior to divide by 12 L, the capacity of one bucket.

All these suggest that calculating volume was not well understood by the majority of candidates. Understanding of this concept has to be consolidated. In addition, pupils should learn that quantities having different units cannot be added, subtracted, multiplied or divided. This should be regularly emphasised during classroom interactions.

Answer: *(a) 120 000 cm^3 ,* *(b) 10 buckets*

Question 45

> 4 pens and 6 pencils cost Rs 172.
> 2 pens and 2 pencils cost Rs 74.
>
> Find the cost of 1 pencil.

Qu. 45 has become almost a traditional problem-solving question in the PSAC Mathematics Assessment. However, candidates keep struggling with this type of question. A minority of candidates scored full marks. It is to be noted that a good number of candidates erased their workings for which they could not earn partial marks. As pointed out in the key messages, pupils should be encouraged to replace their erased work or to cross-out the work they deem is not relevant to the question to avoid unnecessary loss of marks during the assessment.

To solve problems such as **Qu. 45** successfully, pupils should be encouraged to use diagrams to help them visualise the problem rather than trying to eliminate one of the unknown values (the price of one pen or the price of one pencil) using the 'trial and error' method.

Answer: *Rs 12*

Question 46

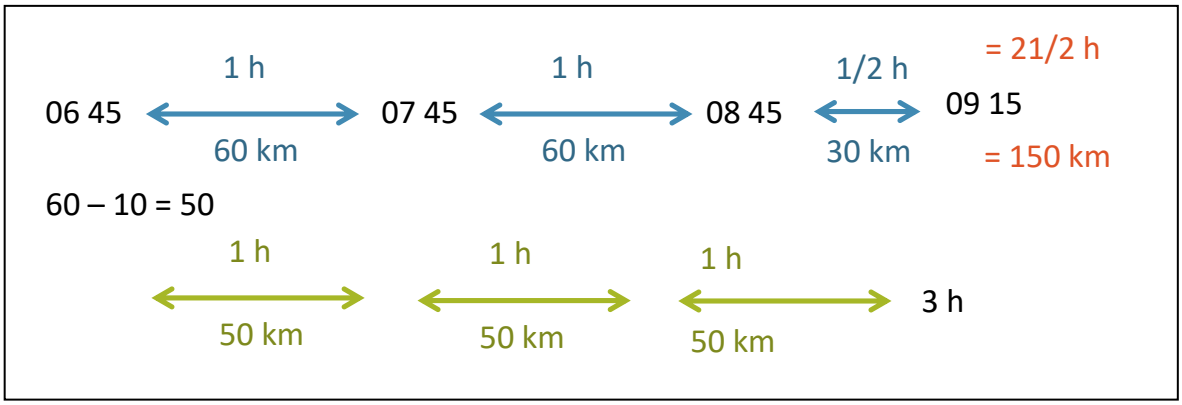
A bus leaves village **X** at 06 45.
It travels at an average speed of 60 km/h.
It reaches village **Y** at 09 15.

How much time will the bus take to return to village **X** if its average speed is **decreased** by 10 km/h?

The performance of candidates in **Qu. 46** was slightly better than in **Qu. 45** but remained low. Like **Qu. 45**, **Qu. 46** often recur in the PSAC Mathematics Assessment. Yet, performance in the question remains comparable to that of previous years.

Many candidates omitted to convert their time into hours before substituting into the formula: speed = distance / time. A good number of candidates made arithmetical mistakes while subtracting the times at which the bus left village **X** and reached village **Y**.

It is important to note that the use of the formula to calculate speed is elusive for the majority of candidates at this level. Many lose marks because they do not know how to apply it in the context given. Building on pupils' understanding of proportion is a far better way to help them solve this kind of problems and is strongly recommended. The use of diagrams is also advocated. It was encouraging to note that a few candidates arrived at the correct answer simply by translating the question into a diagram that, ultimately, required minimal calculations as shown below.



Answer: *3 h*