EXAMINATIONS AND ASSESSMENT CHIEF DIRECTORATE
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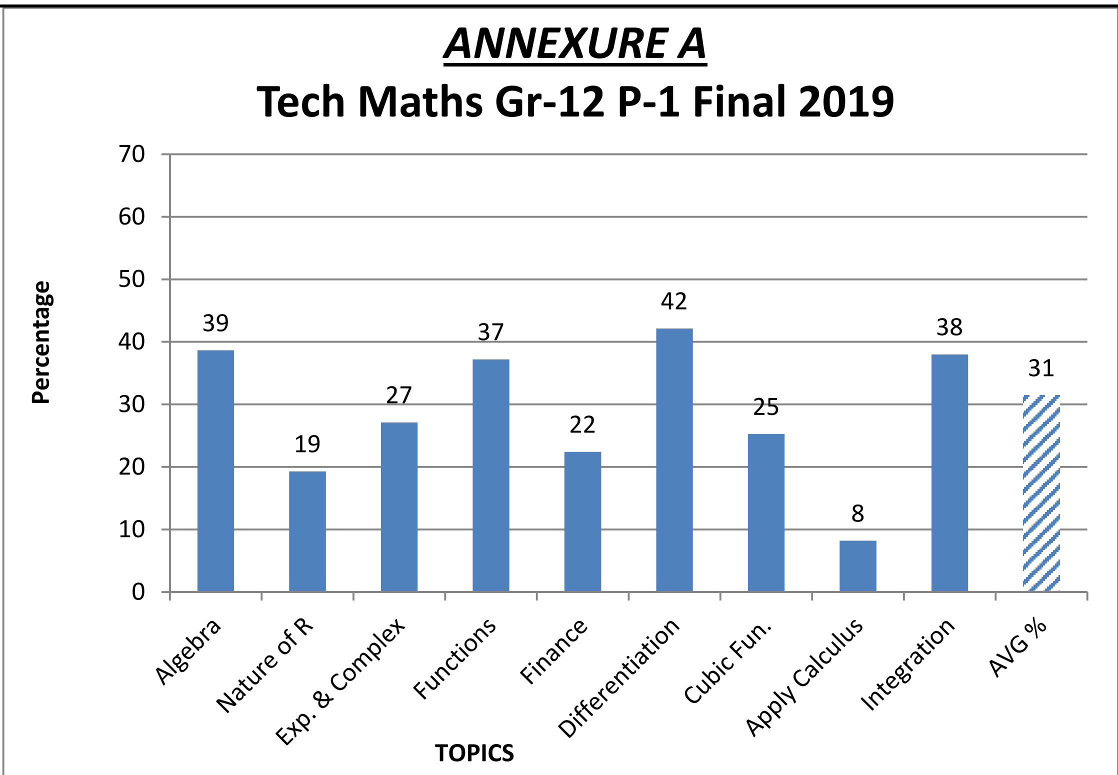
2019 NSC CHIEF MARKER'S REPORT

SUBJECT:		**Technical Mathematics**
PAPER:		**Paper-1**
DURATION OF PAPER:		**3 Hours**
DATES OF MARKING:		**30/11/2019 – 14/12/2019**

SECTION 1: (General overview of Learner Performance in the question paper as a whole)

PERFORMANCE IN THE PAPER
Following is the overall performance of the paper taken from a Rasch Analysis of 100 randomly sampled scripts.

The above graphical representation is a statistical picture of performance in the 2019 Technical Mathematics Paper-1. Deviations may be there for the overall performance of candidates, as the above graph has been developed from a sample of 100 scripts of the entire population of the scripts. The scripts sampled were from High, Middle and Low

performing candidates, so the graph is representative of the total spread across the province.
The range of performance of the topics across the 9 questions is between 8% to 42% as against 31% to 61% of 2018. A huge drop in performance from 2018 to 2019 has been observed in all the topics and on the overall performance. The overall performance of Technical Mathematics Paper-1 from the Rasch Analysis is at 31% from a performance of 47,4%. This indicates a drop of 16,4% in performance.
Various reasons and causes that led to the 2019 performance across the questions were identified by the entire team of 2019 markers. The findings will be discussed in **section 2** under each question, however the following are the challenges that cut across all questions: 1. Challenges on the use a calculator in simplification. This could be attributed to candidates using calculators they are not familiar with. They do not buy calculators of their own from the beginning of the year. 2. Substitution problem which was noticed to have been caused by candidates not using brackets when substituting. 3. Teaching methods which result to candidates' inability to expand a mere monomial over a binomial expression. This is caused by distributive challenges. 4. Not following instructions in each sub-question. Where candidates are required to give conclusions, supported by calculations, they simply calculate and leave their solutions without making conclusions at the end. 5. Treating each topic as a separate entity without integrating it with other topics. A number of candidates managed to score marks in question 1 but fail to score marks on interpretation in functions, yet these are interrelated aspects. 6. Writing duplicate solutions for one sub-question. There is a growing tendency of candidates giving to conflicting solutions for the same question. This caused some candidates to loose marks, if the first solution was incorrect. 7. Candidates copying formulas incorrectly from the formula sheet resulting to incorrect notation by candidates. 8. Questions requiring applications and interpretation were poorly answered by the candidates. 9. Technical Mathematics as a subject does not conform to contrived scenarios, it is based on real-life contexts and so candidates should take note of solutions which are mathematically impossible.

SECTION 2: Comment on candidates' performance in individual questions

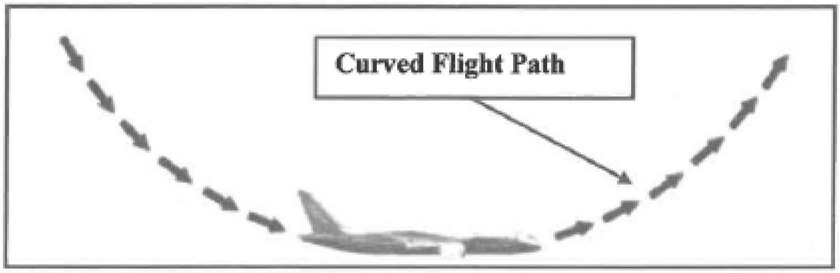
(It is expected that a comment will be provided for <u>each question</u>).

QUESTION 1
(a) General comment on the performance of candidates in the specific question. Was the question well answered or poorly answered?

QUESTION 1

1.1 The picture below shows the curved flight path of an aircraft. The flight path, as indicated by the arrows, is parabolic in shape and is defined by the equation:

$$p(x) = 2x^2 - \frac{8}{81}$$



1.1.1 Factorise $p(x)$ completely. (2)

1.1.2 Hence, solve for x if $p(x) = 0$ (1)

1.2 Solve for x in EACH of the following:

1.2.1 $(3x-5)(x+2) = -13$ where $x \in$ {Complex numbers} (5)

1.2.2 $(4-x)(x+3) < 0$ (3)

1.3 Solve for x and y if:

$$y = 3x - 8 \text{ and } x^2 - xy + y^2 = 39$$ (6)

1.4 The following formula represents the relationship between the voltage, the current and the impedance in an alternating current circuit: $V = I \times Z$

Where:

V = Voltage (in volts)
I = Current (in amperes)
Z = Impedance (in ohms)

1.4.1 Express I as the subject of the formula. (1)

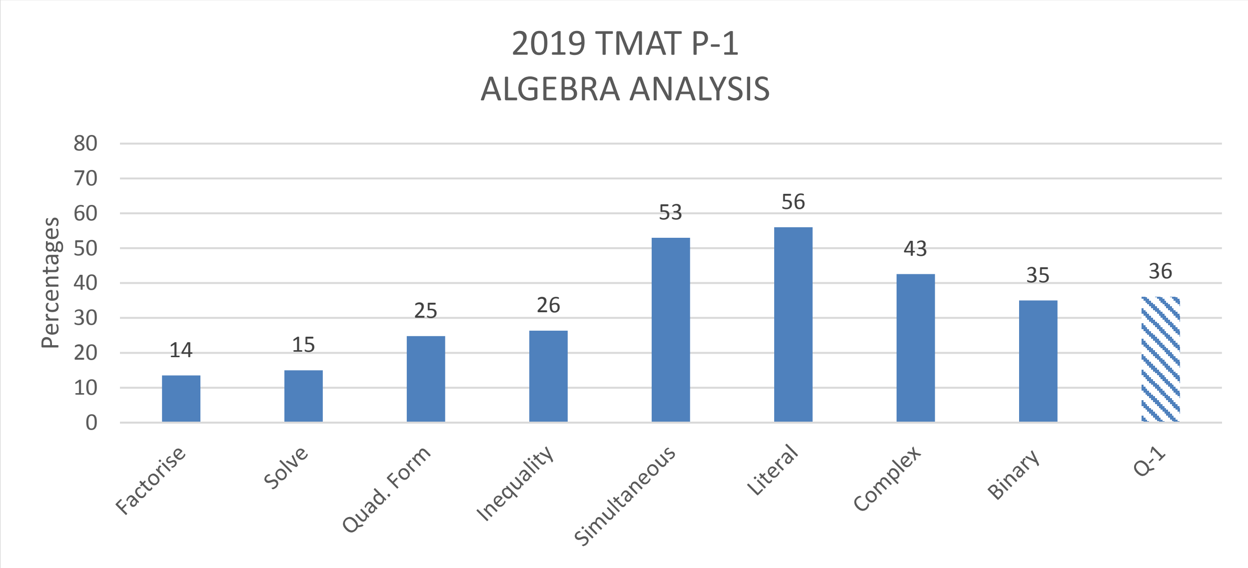
1.4.2 Hence, determine in simplified form the value of I (in amperes) if:

$$V = 7i \text{ and } Z = 3 - i$$ (5)

1.5 Simplify: $101_2 \times 11_2$ (2)

[25]

The performance of 100/1463 candidates in this question was as follows:



Question 1.1.1 was the worst performed question in question 1 because candidates did not follow the instructions of factorising. They instead mostly used the quadratic formula to solve the function as if it was equal to zero.

When it came to 1.1.2, where they were required to solve for *x*, they left it without solving as they had already solved for *x* in 1.1.1. That led to the underperformance in the first two sub-questions of question 1.

This two sub-questions 1.1.1. and 1.1.2. should have been combined to one sub-question in order to avoid many candidates loosing marks from them. Generally the question was poorly performed at 36%, though it was expected that candidates can score marks as the cognitive distribution of it favoured lower levels.

(22 marks /25 marks)

(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by candidates in this question, and any misconceptions.

(c) And provide suggestions for improvement in relation to Teaching and Learning

(d) Describe any other specific observations relating to responses of candidates and comments that are useful to teachers, subject advisors, teacher development etc.

COMMON CHALLENGES/ MISCONCEPTIONS COMMITED BY CANDIDATES

QUESTION 1

(b) COMMON QUESTION CHALLENGES	**(c) and (d) POSSIBLE CORRECTIVE MEASURES**
1. Most candidates did not know the basic principle of factorization in 1.1.1.	1. the first step of factorization is taking out the common factor from all the terms of the expression to be factorized, then re-factorize the remaining factor. In the teaching of factorization this principle must be over emphasized.
2. Candidates solving the factor form equation not equal to zero the same as a factor form equation equal to zero. E.g. 1.2.1. (3x-5)(x+2) = -13 and (3x-5)(x+2) = 0	2. This challenge is related to methodology in class. Teachers must make sure they teach one principle extensively, giving exercises of such kind to learners in class. Different forms

cannot be solved the same, but candidates equated each factor to -13.	must not be mixed when teaching. THIs will help learners know the distinction between the different forms of solving equations.
(b) COMMON QUESTION CHALLENGES	**(c) POSSIBLE CORRECTIVE MEASURES**
3. Transposition errors were a common occurrence by the 2019 candidates. E.g. in 1.2.1, candidates translated -13 without changing the sign of 13. This led to loss of a mark as the standard form was incorrect.	3. Candidates have a tendency of doing numerous steps at once. Most candidates who had transposition errors were those who would expand and transpose in one step. This created confusion in their minds. Teachers when teaching learners should have an algorithm/ steps to simplifying or solving problems.
4. Distributive law over monomials to binomials and over exponents has proven to be a challenge for the candidates in questions: 1.2.1 (5 mark), 1.2.2 (3 marks), 1.3 (6 marks), 1.4.2 (5 marks), 3.1 (2 marks), 3.2 (4 marks), 3.5 (2 marks) 4.1.3 (3 marks), 6.2.2 (4 marks), 8.2 (3 marks).	4. When simplifying $x(x+2)$ there should be an intermediate step, which most teachers ignore by simply skipping to the solution of $x^2 + 2x$ (Telling Method), instead of writing the intermediate step of: $x.x + 2.x$ then $x^2 + 2x$ later.
5. Confusing undefined solutions with non-real solutions was a common occurrence amongst candidates in this paper.	5. Teachers must that undefined solution occurs when there is a division by 0 otherwise if there is a negative under the square root sign, roots are **non-real** and not **undefined**. This misconception must be removed emphatically. Secondly, in Technical Mathematics we have imaginary roots, which Grade 12 learners must be reminded about, as it is a Grade 10 work.
6. Incorrect substitution is a major challenge.	6. The root cause challenges to substitution was substituting using the multiplication sign, without using brackets. Brackets must always be used when substituting.
7. Conflicting graphical notation to other forms of notations in solution sets of inequalities prevailed. 8. Binary operations proved to be a challenge.	7. Link to all notations must be taught to learners. 8. Binary operations must be revised in grade 12. Candidates struggled to answer 1.5

QUESTION 2

(a) General comment on the performance of candidates in the specific question. Was the question well answered or poorly answered?

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QUESTION 2

2.1 Given: $G = \sqrt{\dfrac{p+1}{2p-1}}$

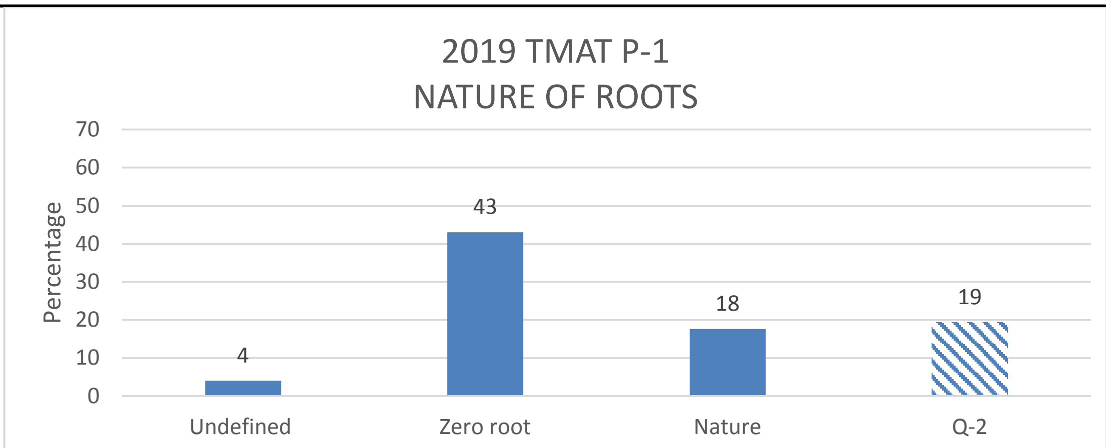
Determine the value(s) of p such that G will be as follows:

2.1.1 Undefined (1)

2.1.2 Equal to zero (1)

2.2 Determine for which value(s) of k the equation $x^2 - k + 4 = 5x$ will have real roots. (5)
[7]

The performance of 100/1463 candidates in this question was as follows:



The performance by candidates in this question was poor, all the sub questions were mostly performed below 20%. Candidates had a challenge of describing the nature of roots

(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by candidates in this question, and any misconceptions.

(c) And provide suggestions for improvement in relation to Teaching and Learning

(d) Describe any other specific observations relating to responses of candidates and comments that are useful to teachers, subject advisors, teacher development etc.

COMMON CHALLENGES/ MISCONCEPTIONS COMMITED BY CANDIDATES

QUESTION 2:

(b) COMMON QUESTION CHALLENGES	(c) and (d) POSSIBLE CORRECTIVE MEASURES
1. Various conditions for the nature of roots is not known by the candidates. Most candidates equated the discriminant to 0 in both cases, yet there were different conditions asked in the three sub-questions.	1. Number system must be done as early as Grade 10.

2. Misconception of thinking a constant is a numerical value still exists with the candidates. Some candidates opted to make k the subject and used the expression without k to determine the nature of roots.	2. Various equations with parameters must be given as class exercises to the learners so as to get them used to the meaning of a constant term in equations.
3. Transposition challenge was noted.	3. Grade 8, 9 and 10 basics on solving equations must be visited regularly by teachers.

QUESTION 3
(a) General comment on the performance of candidates in the specific question. Was the question well answered or poorly answered?

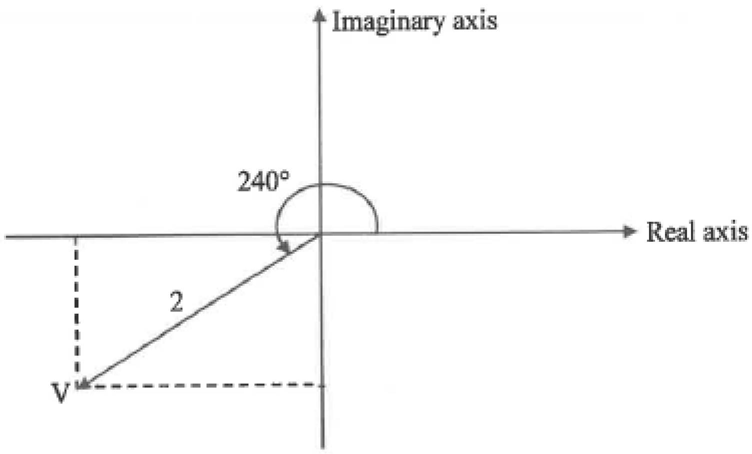
QUESTION 3

3.1 Simplify: $\left(-2\sqrt[4]{a^3}\right)^8$ (2)

3.2 Solve for x: $\log_2(3x-2)+\log_2 0{,}5=3$ (4)

3.3 If $\log 2=a$ and $\log 3=b$, determine the value of $\log\sqrt{0{,}6}$ in terms of a and b. (5)

3.4 The voltage (V) in an alternating current circuit is represented by the Argand diagram below.



3.4.1 Use the Argand diagram above to write down the voltage in the form $V=r(\cos\theta+i\sin\theta)$ (1)

3.4.2 Hence, or otherwise, express V in rectangular form. Leave your answer in simplified surd form. (3)

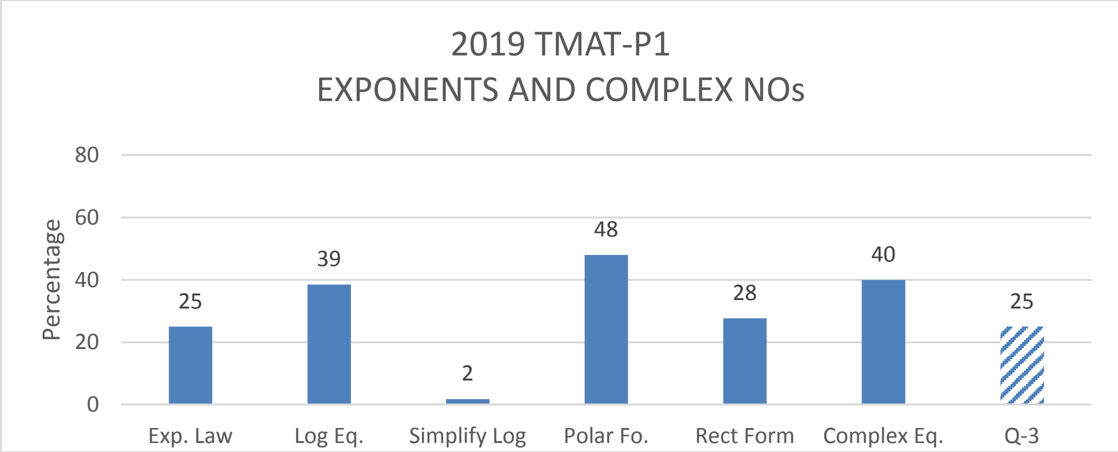
3.5 Determine the numerical values of m and n if $m+ni=2(6-4i)-(-7i)$ (2)

[17]

EASTERN CAPE

Please turn over

The performance of 100/1463 candidates in this question was as follows:



Candidates performed extremely bad in 3.3 which needed them to simplify expressions and equations mixed with a radical, decimal numbers and logarithms.

Complex numbers manipulation was not well performed though overall candidates tried to answer all the sub-questions with complex numbers.

This question was poorly answered.

(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by candidates in this question, and any misconceptions.

(c) And provide suggestions for improvement in relation to Teaching and Learning

(d) Describe any other specific observations relating to responses of candidates and comments that are useful to teachers, subject advisors, teacher development etc.

QUESTION 3:

(b) COMMON QUESTION CHALLENGES	**(c) and (d) POSSIBLE CORRECTIVE MEASURES**
1. Exponential laws were a problem in 3.1. Most candidates could not simplify the radical to exponential form.	1. Previous grades work must be revised much earlier with the learners. It must not be assumed that all Grade 12 learners know the previous grades' basics.
2. The second exponential law they missed in 3.1 was the distributive law over exponents. Most candidates only distributed exponent 8 over the power a and not over -2.	2. Same as 1 above.
3. Log properties get mixed up, leading to incorrect solutions.	
4. Incorrect use of Negative angles for complex numbers, thought they are not prescribed for Technical Mathematics CAPS.	
5. Solving factor equations equal to zero the same as solving factor equations not equal to zero. E.g.	
6. $(x+1)(x+2) = 0$ and $(x+1)(x+2) = 3$	

7. Many did not get 3.3. 8. Candidates not following instruction in 3.4.1, they wrote in CIS form.	

QUESTION 4

(a) General comment on the performance of candidates in the specific question. Was the question well answered or poorly answered?

QUESTION 4

4.1 Given functions k and q defined by $k(x)=(x-5)(x+3)$ and $q(x)=\frac{12}{x}-2$ respectively.

4.1.1 Write down the x-intercepts of k. (1)

4.1.2 Determine the x-intercept of q. (2)

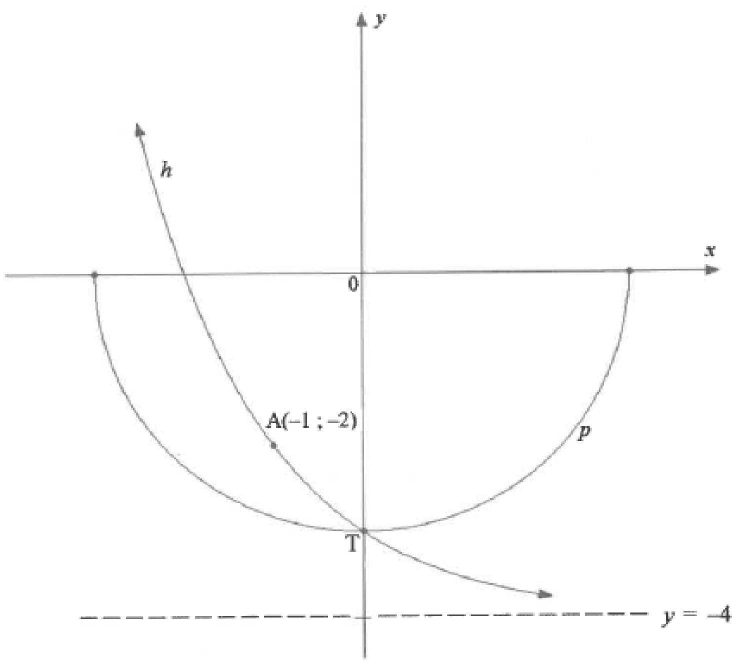
4.1.3 Determine the coordinates of the turning point of k. (3)

4.1.4 Write down the equations of the asymptotes of q. (2)

4.1.5 Sketch the graphs of k and q on the same set of axes provided on the ANSWER SHEET. Clearly show the asymptotes, the intercepts with the axes, as well as the coordinates of any turning points. (7)

4.2 Sketched below are the graphs of p and h defined by $p(x)=-\sqrt{r^2-x^2}$ and $h(x)=a^x+d$ respectively.

T is the point of intersection of p and h.
A(–1 ; –2) is a point on h.
The asymptote of h is indicated by the dotted line.

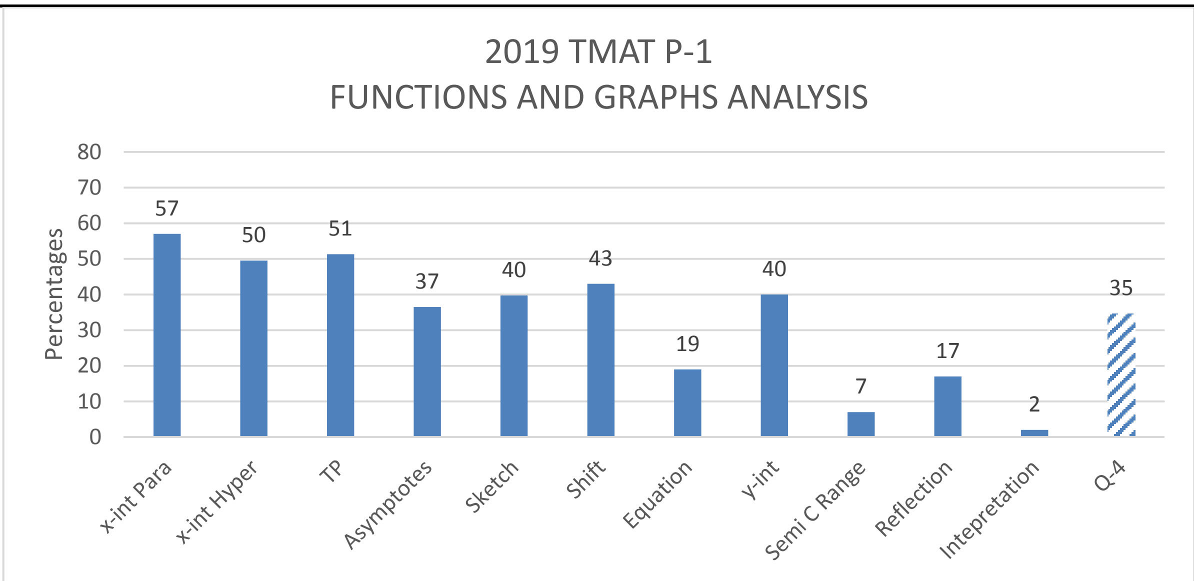


4.2.1 Write down the numerical value of d. (1)

4.2.2 Show that $h(x)=\left(\frac{1}{2}\right)^x-4$ (2)

4.2.3	Hence, determine the coordinates of T.	(2)
4.2.4	Write down the range of p.	(1)
4.2.5	Hence, determine the defining equation $w(x)$ of function w, such that w is the reflection of p in the x-axis.	(2)
4.2.6	Determine for which values of x will $h(x) < p(x)$	(2) **[25]**

The performance of 100/1463 candidates in this question was as follows:



Learner performance generally in this question was poor. Candidates failed to interpret the graphs, notational errors and identifying and writing asymptotes of the given functions. Most candidates struggled in drawing the graphs.

COMMON CHALLENGES/ MISCONCEPTIONS COMMITED BY CANDIDATES

QUESTION 4:

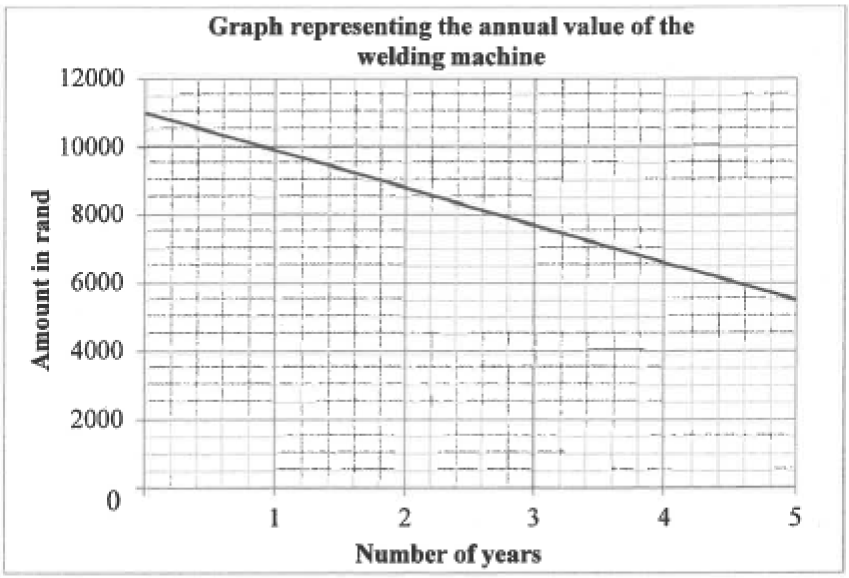
(b) COMMON QUESTION CHALLENGES	**(c) and (d) POSSIBLE CORRECTIVE MEASURES**
1. 4.1.2 Candidates omit $y = 0$ for x-intercept or $= 0$. These were marks lost unnecessarily.	1. Teachers to focus on the basic characteristics of function and graphs. For x- intercept $(y = 0)$, the same goes for y – intercept $(x = 0)$, a mark can be scored for such basic understanding, but if they forget to write that, even when they get the intercept at the end, they are likely to lose a mark.
2. 4.1.4 Some candidates wrote the equations of asymptotes as $p = 0$ and $q = -2$, instead of $x = 0$ and $y = -2$.	2. Equations in CAPS are in two variables x and/ or y.
3. 4.2.2; 4.2.4 and 4.2.5 and 4.2.6, there is a general challenge with interpretation of	

graphs	3. Using a ruler to analyze interpretation questions helps a lot for candidates to visualize the region they are looking for. -Use of dynamic geometric/ graphical software like GeoGebra applets/ graph/ GSP, etc, can help analyze and interpret graphs. -Use of different coloured chalks in drawing graphs can also help candidates compare specific regions of the graphs easily.

QUESTION 5
(a) General comment on the performance of candidates in the specific question. Was the question well answered or poorly answered?

QUESTION 5

5.1 A small engineering business purchased a new welding machine. The value of the welding machine depreciated annually over a period of 5 years, as shown in the graph below.



Use the graph above to answer the following questions:

5.1.1 Write down the value of the welding machine when it was new. (1)

5.1.2 Calculate the annual constant percentage rate of depreciation. (3)

5.2 A mechanic of Model X cars found a data sheet showing that 200 Model X cars had been serviced by the workshop during 2009. The annual compound growth rate of the number of Model X cars serviced by this workshop is 3,5% per annum.

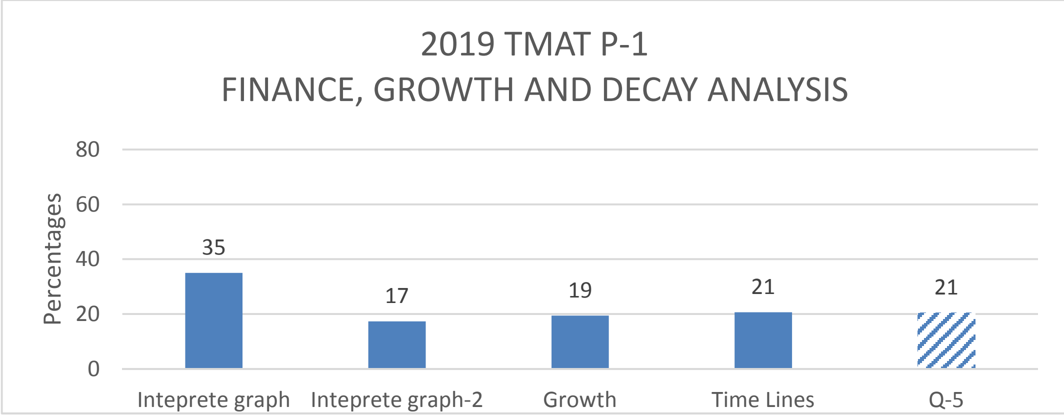
Determine, showing ALL calculations, the year during which 273 Model X cars were serviced by this workshop. (5)

5.3 Anita planned to purchase a truck for her company in 8 years' time and decided to open an investment account to provide for the purchase of the truck. She deposited an initial amount of R293 000 into the account.

At the end of 2 years, Anita made a further deposit of R95 000 into the account. The interest rate for the first 4 years was 6,7% per annum, compounded quarterly, and for the remaining period the interest rate was 7,5% per annum, compounded monthly. The projected value of the truck at the end of 8 years will be R660 580.

Determine, showing ALL calculations, whether her investment would accumulate enough funds for her to purchase the truck at the end of the 8-year investment period. (8)
[17]

The performance of 100/1463 candidates in this question was as follows:



The performance in this question was poor with 5.1.2 as the worst performed sub question at 17%. Most candidates struggled with differentiating the effective and nominal interest rates, identifying and use the correct formula.

COMMON CHALLENGES/ MISCONCEPTIONS COMMITED BY CANDIDATES

QUESTION 5:

(b) COMMON QUESTION CHALLENGES	(c) and (d) POSSIBLE CORRECTIVE MEASURES
1. Identifying and use P and A correctly after interpreting the question. 2. Different compounding periods are a challenge to most candidates. They don't know whether to multiply i or n by the frequency of calculating interests per annum 3. Timelines are problematic. Candidates confuse and mix different methods of analyzing timelines and compounding periods.	1. Financial mathematics is introduced in grade 8 and 9and it is here where the foundation should be laid. Different exercises should be given to the candidates to expose them to different compounding periods. 2. Rounding up or down to the nearest specified decimals or whole numbers should not be overlooked. 3. Teachers need to train candidates on one method until they master it, only then they can employ another approach, if necessary. Furthermore, use different terms which have the similar meaning like depreciating, decreasing, reduced etc. 4. Candidates should be taught to make conclusions based on their findings through calculations. 5. Candidates need to be exposed to a variety of narrative problems involving Finance, growth and decay. A good project can be administrated where the above are used in real-life context upon which candidates can apply what they have learnt in class. 6. Reinforcement of basic concepts of previous grades is important.

(b) Provide suggestions for improvement in relation to Teaching and Learning
Only the final answer must be rounded, hence it is important for candidates to purchase and use the calculators with VIEW SCREEN, to simplify complex Mathematics computations. Different exercises must be given to the candidates to expose them to different compounding periods. Rounding up or down to the nearest specified decimals or whole numbers must not be over looked in order to cater for contextual questions.

QUESTION 6

(a) General comment on the performance of candidates in the specific question. Was the question well answered or poorly answered?

Technical Mathematics/P1 8 NSC DBE/November 2019

QUESTION 6

6.1 Determine $f'(x)$ using FIRST PRINCIPLES if $f(x) = 5 - \frac{1}{2}x$ (5)

6.2 Determine the following:

6.2.1 $f'(x)$ if $f(x) = a^3 - 0,5x^3 - x^{-1}$ (3)

6.2.2 $D_x\left[x\left(\sqrt{x}+2\right)\right]$ (4)

6.3 Given: $xy + 2x^3 = 7x^6$

6.3.1 Make y the subject of the equation. (2)

6.3.2 Hence, determine $\frac{dy}{dx}$. (2)

6.4 A factory producing light bulbs makes a daily profit $P(x)$ in rands for x number of light bulbs produced. The formula to calculate the factory's daily profit is given by $P(x) = 0,8x^2 - 200x$, where $x > 0$.

Calculate:

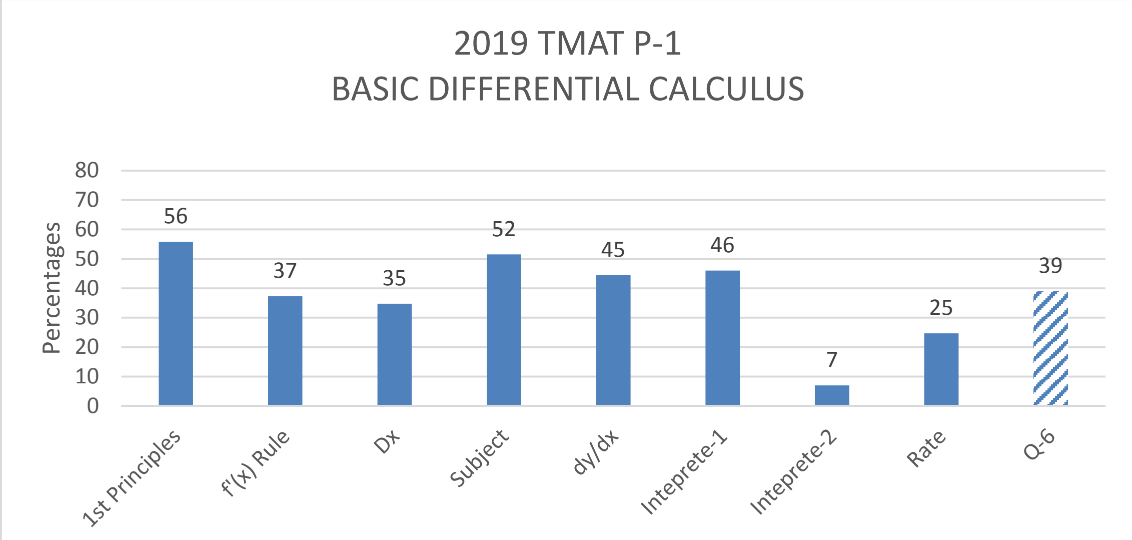
6.4.1 The daily profit if 300 light bulbs are produced in one day (1)

6.4.2 The number of light bulbs produced that will yield a zero daily profit (2)

6.4.3 The rate of change of the daily profit with respect to the number of light bulbs produced, if 200 light bulbs are produced (3)

[22]

The performance of 100/1463 candidates in this question was as follows:



Performance of candidates in this question was fair. Most candidates scored marks in 6.1 however some struggled with substitution and simplification. Some candidates forced matters to get to the solution as they knew prior what outcome is expected. Once again in this question notation challenged the candidates as a result they were penalised by 1 mark. In 6.2.1 most candidates did not realise the a^3 is a constant as a result very few candidates scored a mark in this question. 6.4.2 was poorly performed at 7%.

COMMON CHALLENGES/ MISCONCEPTIONS COMMITED BY CANDIDATES

QUESTION 6:

(b) COMMON QUESTION CHALLENGES	**(c) and (d) POSSIBLE CORRECTIVE MEASURES**
1. 6.1 Following are some of the problems candidates committed in this question: - - Incorrect formula, some candidates fail to copy the formula or definition from the given formula sheet. - Incorrect notation used. - Substitution and simplification not done properly	1. Candidates should be provided with formula sheets during the year so that they can be used to copying formulae correctly. This could help them used to copying formulas from the formula sheet.
2. 6.2.1 Lack of understanding of differentiating a function with respect to a specific variable: - 0 was the expected answer, as a^3 is a constant, but candidates differentiated it as if it was variable x.	2. A routine approach in simplifying expressions for differentiation should be applied. The understanding of dx in calculus should be overemphasized to learners during teaching so that they understand, whatever is not x is a constant.
3. 6.2.2 Candidates struggled to multiply and write the correct notation when an expression differentiate is Dx(…).	3. An **SRFD** (**S**implify by making the **S**ubject, **R**adical, **F**raction then **D**ifferentiate)

<table>
<tr>
<td>4. Mixing simplification and differentiation at the same time.

5. Candidates confused differentiation with integration.
6. Candidates struggled with the subject of the formula, they could not divide by “x”
General applications involving rate of change and optimization as well as drawing conclusion from their findings.</td>
<td>approach called Simplification of Fraction first, followed by a change of surd then Differentiation should be used.
4. Relations should be drawn between Real Life technical aspects and the Application of differentiation.
5. Distinction must be emphasized throughout the year.
6. Learners must be taught to do one principle in one step to avoid mixing and confusing conflicting principles.</td>
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<tr>
<td colspan="2">(d) Describe any other specific observations relating to responses of candidates and comments that are useful to teachers, subject advisors, teacher development etc.</td>
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<tr>
<td colspan="2">Refer to the CAPS document Curriculum Section, under Differential Calculus as well as the Examination Guidelines for Technical Mathematics. All different forms of differentiation rules that are examinable are outlined there. Candidates must be exposed to all of them.</td>
</tr>
</table>

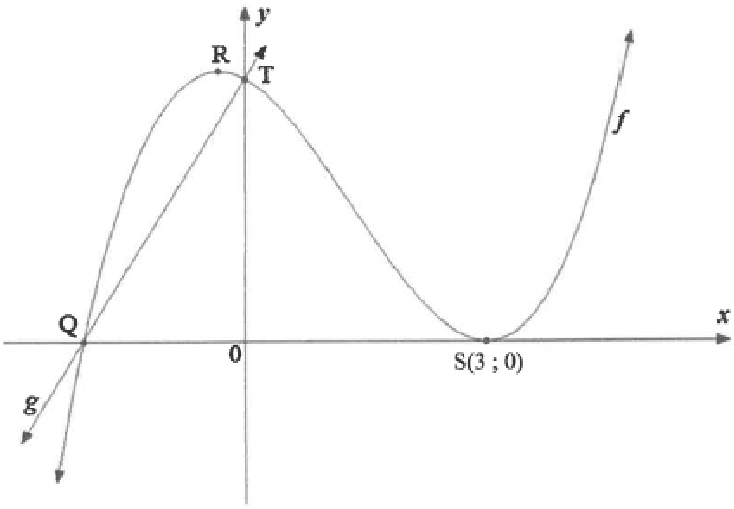
QUESTION 7

(a) General comment on the performance of candidates in the specific question. Was the question well answered or poorly answered?

QUESTION 7

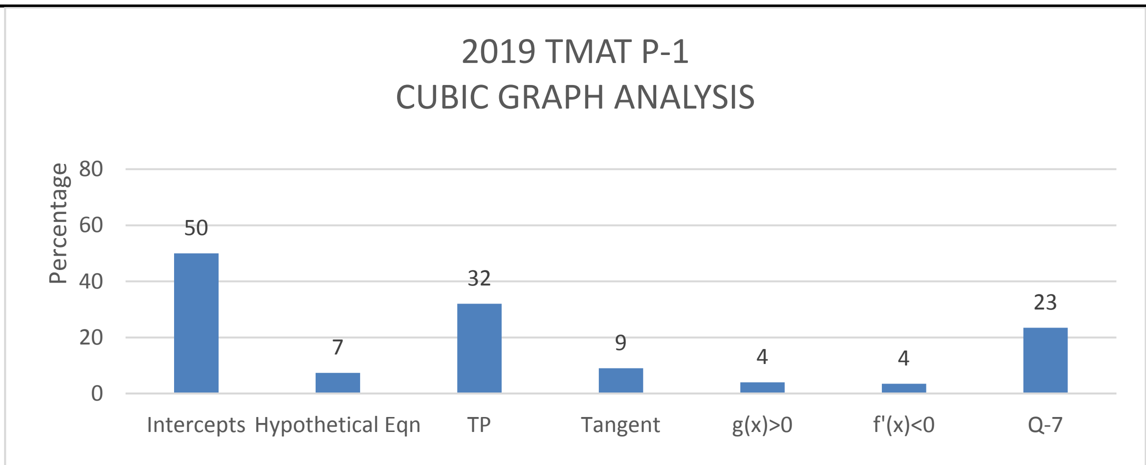
The sketch below represents the graphs of functions g and f defined by $g(x) = 9x + 18$ and $f(x) = x^3 + bx^2 + cx + d$ respectively.

S(3 ; 0) and R are the turning points of f.
T is the y-intercept of both f and g.
Q is the x-intercept of both f and g.



7.1	Determine the coordinates of Q and T.	(3)
7.2	Show that $b = -4$, $c = -3$ and $d = 18$.	(3)
7.3	Hence, determine the coordinates of R.	(5)
7.4	Determine:	
7.4.1	The equation of the tangent to the curve of function f at point R	(1)
7.4.2	The values of x for which $g(x) > 0$	(1)
7.4.3	The values of x for which $f'(x) < 0$	(2)
		[15]

The performance of 100/1463 candidates in this question was as follows:



The performance in this question was third worst in the question paper at 23%. Algebra and graphical interpretation were a major cause of underperformance in this question. Referral to question 1, 2, 3 and 4 for improvement plans for this question.

COMMON CHALLENGES/ MISCONCEPTIONS COMMITED BY CANDIDATES

QUESTION 7:

(b) COMMON QUESTION CHALLENGES	**(c) and (d) POSSIBLE CORRECTIVE MEASURES**
1. 7.2 Most learner did not understand what they were required to use the factor theorem to find the defining equation of the Cubic function. 2. 7.4 The challenge was the interpretation of graphs, candidates did not know how to find the equation of the tangent to the curve at a turning point, values of x where the function is greater than 0 and the derivative less than 0 and some struggled with notation.	1. Teacher should focus on the teaching of the different parameters in cubic functions. 2. Candidates should be exposed to different questioning strategies and then given feedback of what was expected of them and how their responses should have been structured. 3. Questions given to the candidates should vary and cover a wide spectrum of questions including integration of topics. 4. Showing of calculations should be emphasized.

(b) Describe any other specific observations relating to responses of candidates and comments that are useful to teachers, subject advisors, teacher development etc.
•Using a ruler to analyze interpretation questions helps a lot for candidates to visualize the region they are looking for. •Use of dynamic geometric/ graphical software like GeoGebra applets/ graph/ GSP, etc, can help analyze and interpret graphs. •Use of different coloured chalks in drawing graphs can also help candidates compare specific regions of the graphs easily.

QUESTION 8

(a) General comment on the performance of candidates in the specific question. Was the question well answered or poorly answered?

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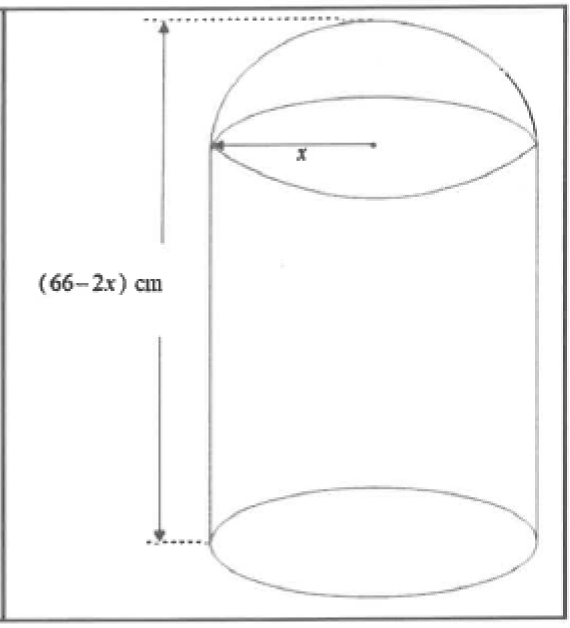
QUESTION 8

A container consists of a right cylindrical part and a hemispherical part at the top, as shown in the picture and diagram below. The radius of both shapes is x cm and the total height of the container is $(66 - 2x)$ cm.



The following formulae may be used:

Volume of a right cylinder $= \pi r^2 h$

Volume of a sphere $= \frac{4}{3}\pi r^3$

8.1 Write down, in terms of x, the height of the cylindrical part of the container. (1)

8.2 Show that the formula for the total volume (in cm^3) of the container is given by:

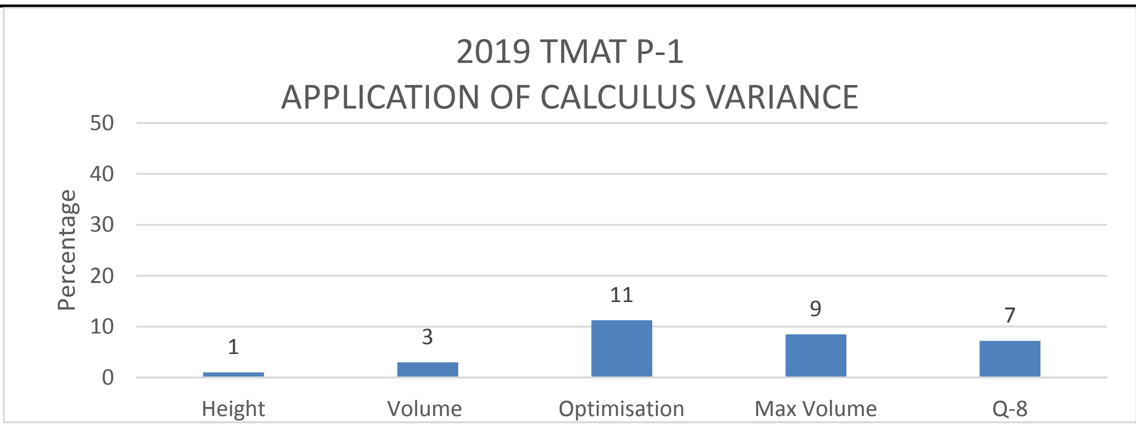
$$V = 66\pi x^2 - \frac{7}{3}\pi x^3$$ (3)

8.3 Hence, calculate the value of x that will maximise the total volume of the container. (4)

8.4 Hence, determine the maximum total volume of the container. (2)

[10]

The performance of 100/1463 candidates in this question was as follows:



This was the worst performed question of the 9 questions. They lost marks by not equating the derivative function to zero which will lead to the value of x where the volume will be maximized.

QUESTION 8:

(b) COMMON QUESTION CHALLENGES	**(c) and (d) POSSIBLE CORRECTIVE MEASURES**
1. 8.1.1and 8.2 Finding the height in terms of x use it to find the Volume of the container. 2. Candidates struggled working with a decimal fraction in calculations. 3. 8.3 Few candidates understand finding the value of x that will maximise volume and hence use it to calculate the maximum volume required in 8.4	Provide candidates with various questions involving applications of calculus methods, working with decimal, common fractions and brackets for a specific quantity is expressed with more than one term for adequate practice. Teachers should point out key words to candidates that should be associated with the first derivative.

(d) Describe any other specific observations relating to responses of candidates and comments that are useful to teachers, subject advisors, teacher development etc.

Expose candidates to a variety of real-life and technical applications whereby the concept of maximization and minimization is addressed. Once again, the use of correct notation should be emphasized.

QUESTION 9

(a) General comment on the performance of candidates in the specific question. Was the question well answered or poorly answered?

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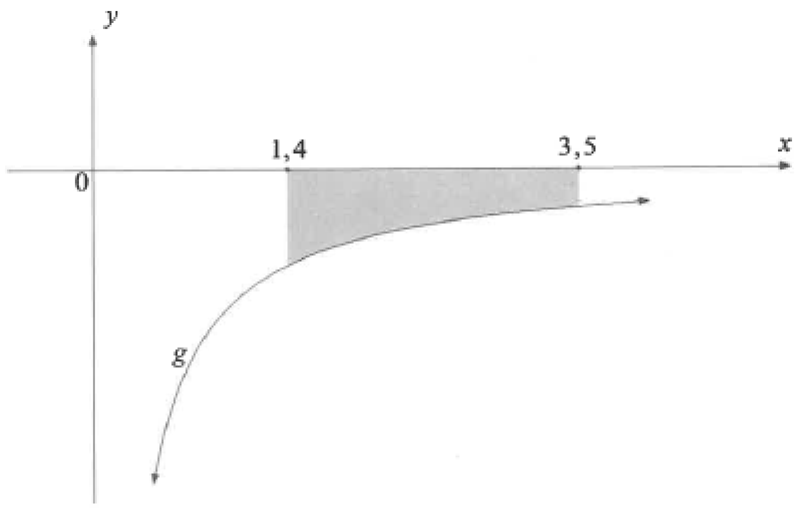
QUESTION 9

9.1 Determine the following integrals:

9.1.1 $\int mx^{p}dx$ where $p \neq -1$ (2)

9.1.2 $\int \left(\dfrac{x^{-3} + x^{2}}{x^{-1}} - 2 \right) dx$ (4)

9.2 The sketch below shows the shaded bounded area of the curve of the function defined by $g(x) = -\dfrac{4}{x}$, where $x > 0$.

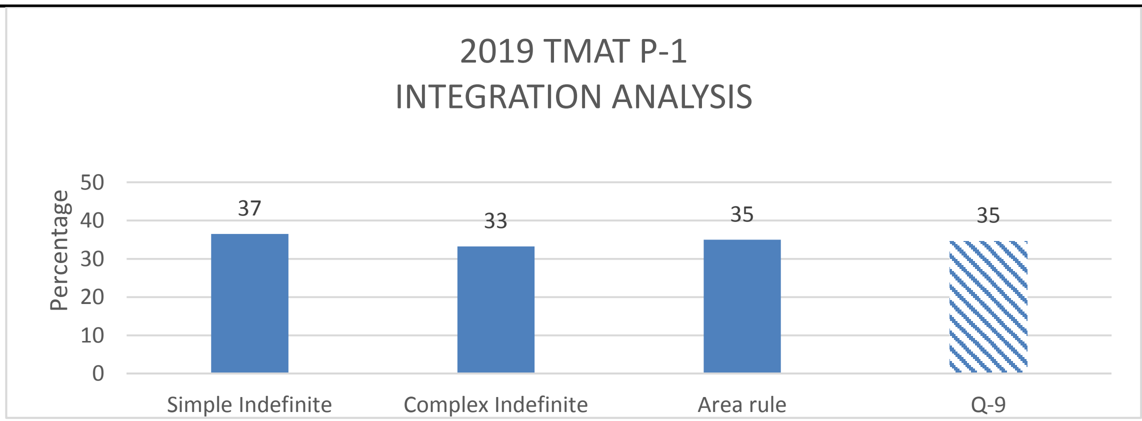


Determine (showing ALL calculations) the shaded area bounded by the curve and the x-axis between the points where $x = 1,4$ and $x = 3,5$. (6)

[12]

TOTAL: 150

The performance of 100/1463 candidates in this question was as follows:



QUESTION 9:	
COMMON QUESTION CHALLENGES	**POSSIBLE CORRECTIVE MEASURES**
1. 9.1.1,9.1.2 and 9.2 Generally, candidates did not get full marks on these questions because the constant, C, was not added and in some cases they were finding the derivative of the integral meaning they do not differentiate between the two. 2. 9.2 Definite integral- setting up of the integral over the given boundary was a challenge to candidates, some forgot the right the x –values of the boundary, finding the derivative instead of the integral lead to a loss of marks. Few candidates writing answer only and not showing all the necessary step to get to the solution as indicated on the instruction in the question paper. 3. Incorrect notation by most candidates even though they were not penalized. Many candidates integrated the function as a fraction instead of a "In" and thus lost marks.	1. The use of correct notation during teaching and learning will lead to candidates using integral notation appropriately. Candidates need to be taught that integration is the reversal of differentiation and more activities be given for adequate practice. 2. SRFI – Simplify, Radical, Fraction and Integrate principle must be upheld to avoid loss of marks.
(d) Describe any other specific observations relating to responses of candidates and comments that are useful to teachers, subject advisors, teacher development etc.	
Answers only will not necessarily be awarded marks and that should be emphasized to candidates. This topic should form part of topics covered in teacher development workshop as some teachers might have forgotten it and most importantly to share with one another best methods of teaching integration like that of splitting boundaries.	