MAJLIS PEPERIKSAAN MALAYSIA

SASBADI

Laporan Peperiksaan STPM 2018

Mathematics (T) (954)

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Mathematics (T) (954)

SASBADI SDN. BHD. (139288-X)
(Anak syarikat milik penuh Sasbadi Holdings Berhad (1022660-T))
PETALING JAYA

MAJLIS PEPERIKSAAN MALAYSIA

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CONTENTS

MATHEMATICS (T) (954/1)

OVERALL PERFORMANCE

In Semester 1, 4 553 candidates sat the examination for this subject and 54.30% of them obtained a full pass.

The percentage of each grade is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	8.10	5.78	5.29	7.99	8.52	9.11	9.51	4.35	4.72	4.96	31.65

CANDIDATES' RESPONSES

General comments

In general, the presentation of the candidates' answers reflects mixed performances of their mathematical ability. Majority of the candidates attempted all the questions and most answers were clearly shown with required and necessary workings. Question 3 was excellently answered by the candidates while achievement in questions 2, 4, 5, 6 and 8 were good. The candidates' performances in questions 1 and 7 were slightly poor. Some candidates did not show the sufficient steps in their working, for examples in questions 1, 4(*b*) and 7. The examiners penalised the omission of essential working in such cases.

High achiever candidates gave well-organised answers with systematic and strategic steps in their answers, showing their full understanding of the questions and concepts. Their performance in questions 2, 3 and 5 were excellent with almost perfect score for these two questions. Likewise, these good candidates also displayed well-presented answers in questions 1, 4, 6, 7 and 8. Systematic steps were presented showing that they fully understood the questions and concepts.

Moderate candidates were able to understand the questions and presented their answers very well for the questions that they were familiar with. Nonetheless, they had the tendency in making careless mistakes and difficulty in answering more challenging questions such as questions 1 and 6. Candidates who attempted question 1 managed to sketch the two graphs correctly but missed out the open point of the piecewise function. Generally, for question 1, these moderate candidates could not provide a proper and complete reason for their answer in part (*c*). Most of these candidates were able to answer partially for questions 2, 4, 7 and 8.

Weaker candidates were unable to utilise the basic concepts learned. These candidates did not know how, why and when to use the concepts. They wrote messy answers, using wrong formula and wrong mathematical principles, such as taking scalar product instead of cross product, using wrong elementary row operations and having problems pertaining to the vector addition. They were also unable to sketch proper graph and determine the correct terms in a series. Hence, they could not apply the concept to solve the problems systematically.

Overall, most candidates failed to answer well for question 1 mainly due to the lack of understanding of piecewise function. Quite a number of the candidates sketched the two function on the same axes, ignoring the domain specified for each function as given in the piecewise function.

A substantial number of candidates did not attempt to answer question 2. Although most of the candidates were able to use $u_n = S_n - S_{n-1}$ to show that $u_n = 8(3^{-2n})$ but the approaches used to reach the final term were wrong. Some candidates attempted to show u_n by assuming that the given sequence was a geometric progression instead of using $u_n = S_n - S_{n-1}$. Many candidates did not express u_{n-1} in terms of u_n although they had reached up to the final step. Due to this mistake, they lost mark for the answer in the next part. Quite a number of candidates attempted to deduce that the sequence was a geometric sequence by reworking on $\frac{u_{n+1}}{u_n}$ as such $\frac{u_{n+1}}{u_n} = \frac{8(3^{-2n-2})}{8(3^{-2n})} = \frac{1}{9}$.

In question 3, few candidates presented improper Elementary Row Operations (ERO) in their attempt to find the inverse of A from the augmented matrix of$(A|I)$. Wrong concepts on operations of ERO were also seen in their given answers. For example, multiplying row with row i.e. $R_1 \times R_2 \rightarrow R_3$, dividing row with row i.e. $\frac{R_3}{R_2} \rightarrow R_1$ or adding row to another row and to a multiple scalar of another row i.e. $R_1 - \frac{1}{5}R_2 - R_3 \rightarrow R_1$.

As for question that involves complex numbers, confusion was still seen in some candidates' answer when applying the De Moivre's theorem to find the n^{th} roots of a complex number. Such candidates applied De Moivre's theorem without extending the polar form of its complex number and just dividing the argument with the power without adding $2k\pi$ as well as without taking two consecutive values of k. For example, $z^{\frac{1}{2}} = \sqrt{8}\left[\cos\left(\frac{\frac{2\pi}{3}}{2}\right) + \text{i} \sin\left(\frac{\frac{2\pi}{3}}{2}\right)\right]$. Such candidates would only obtain $z = 2\sqrt{2}\left(\cos\frac{\pi}{3} + \text{i}\sin\frac{\pi}{3}\right) = \sqrt{2} + \text{i}\sqrt{6}$ as the only answer. It also could be seen in weak candidates' solution of writing the polar form for complex numbers without i term to represent the imaginary part. High dependency on calculator in attempting this question was clearly seen when many candidates could not simplify $8^{\frac{1}{2}}$ into $2\sqrt{2}$, whereby after applying De Moivre's theorem on the modulus of the complex number by expressing its modulus as either $\sqrt{8}$ or 2.828. Many of such candidates could not obtain the roots as $2\sqrt{2}\left(\cos\frac{\pi}{3} + \text{i}\sin\frac{\pi}{3}\right)$ and $2\sqrt{2}\left(\cos\frac{4\pi}{3} + \text{i}\sin\frac{4\pi}{3}\right)$ before getting the final answer $\sqrt{2} + \text{i}\sqrt{6}$ and $-\sqrt{2} - \text{i}\sqrt{6}$. Using calculator to obtain the answer also the reason that many candidates failed to obtain the exact value of the imaginary part in question 4(*a*). Instead of giving the answer as $4\sqrt{3}$, those candidates displayed 6.928 as their answer which was not acceptable. Quite a number of candidates failed to provide the answer in the correct form. For instance, in question 4(*b*) many of candidates did not present the roots in proper Cartesian form i.e. $a + b\text{i}$ but they presented the roots in decimal form.

Some candidates were also penalised heavily in finding the exact area of parallelogram for question 8(*b*) by giving answers either in decimal (6.928) or in not fully simplified surd form ($\sqrt{48}$). A common poor presentation of finding magnitude of vectors in the process of finding area in this question also could be seen where the coefficient of unit vector has a negative value. The working should be $\left|\overrightarrow{AB} \times \overrightarrow{AD}\right| = \sqrt{(-4)^2 + 4^2 + 4^2}$ instead of $\left|\overrightarrow{AB} \times \overrightarrow{AD}\right| = \sqrt{4^2 + 4^2 + 4^2}$. A few candidates confused with the formula between finding the area of a triangle and a parallelogram. They used $\frac{1}{2}\left|\overrightarrow{AB} \times \overrightarrow{AD}\right|$ instead of $\left|\overrightarrow{AB} \times \overrightarrow{AD}\right|$. Another mistake found in calculating the area was misunderstanding the formula of $\left|\overrightarrow{AB} \times \overrightarrow{AD}\right| = \left|\overrightarrow{AB}\right|\left|\overrightarrow{AD}\right|$.

In section B, most candidates generally answered only one question as instructed. Slightly better presentations and performances were seen in candidates that attempted question 8. On top of that, there were also no obvious preferences of choice of questions in Section B as the total number of candidates who answered question 7 was more or less the same as the total candidates who chose question 8. In general, the performance of candidates of Term 1 2018 were better than those repeating candidates of Term 1 2017. The use of language were good and clear. Almost all scripts were answered in English. All candidates answered only one question as instructed. Candidates who chose question 8 performed better compared to those who chose question 7.

However, some candidates still used two columns in presenting their working and presenting their solution with two or more questions in one page, which made the examiners found it difficult to mark. Some candidates still produced small and unorganised set of answers. Consequently, their scripts were totally packed and difficult for marking purposes.

Comments on individual questions

Question 1

Almost all candidates attempted this question and managed to obtain at least 2 marks out of 6 marks. Good candidates were able to sketch the graph excellently. They included the open point and labelled the x and y intercepts. Most candidates drew the horizontal line on the graph to show that the graph cut at two points for the reason of a not one-to-one function. In sketching, some candidates missed the open point of -5 and did not show the x and y intercepts. A few candidates wrote $y > -9$ for the range and gave a wrong reason for the "not a one-to-one function".

Answer: (b) $y \geqslant 9$

Question 2

Very few candidates scored full marks for this question. Many candidates used the S_∞ formula and successfully obtained 3 marks for part (c). Quite a number of candidates managed to answer the first part correctly but mostly lose marks in part (b). Almost all candidates who attempted this question managed to gain marks in part (c), using the $S_\infty = \dfrac{a}{1-r}$ formula. Only a number of candidates were able to express u_{n+1} in terms of u_n. Nevertheless, those who were able to get the expression, $u_{n+1} = \dfrac{1}{9}u_n$ successfully deduced that $\dfrac{u_{n+1}}{u_n} = \dfrac{1}{9}$ is a constant and hence the sequence is a geometric sequence.

The candidates did not use the correct relationship for u_n. Quite a number of them used wrong relationship such as $u_n = S_{n+1} - S_n$. Candidates should use $u_n = S_n - S_{n-1}$. Most candidates wrongly wrote $\dfrac{u_{n+1}}{u_n} = \dfrac{1}{9}$ to express u_{n-1} in terms of u_n. Candidates should write $u_{n+1} = \dfrac{1}{9}u_n$.

Answer: (c) $S_\infty = 1$

Question 3

This question was one of the preference and the best performed question. Almost 75% candidates magnificently used the ERO to attain A^{-1} and successfully obtained the full 9 marks. Almost all candidates were able to answer this question perfectly. Very few candidates did not get marks for this question due to careless mistakes while reading the values of the elements in the matrices and performing the ERO calculation. Some candidates used the Gaussian elimination to solve the matrix equation. Quite a number of candidates used incorrect law of multiplication of the inverse matrix to solve the matrix equation. A few candidates wrote the wrong solution, i.e. $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -7 \\ 2 \\ 4 \end{pmatrix} \begin{pmatrix} 1 & -2 & 3 \\ 1 & -1 & 2 \\ -2 & 4 & -5 \end{pmatrix}$ instead of $\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 & -2 & 3 \\ 1 & -1 & 2 \\ -2 & 4 & -5 \end{pmatrix} \begin{pmatrix} -7 \\ 2 \\ 4 \end{pmatrix}$ to get the correct answer for x, y and z.

Answers: $A^{-1} = \begin{pmatrix} 1 & -2 & 3 \\ 1 & -1 & 2 \\ -2 & 4 & -5 \end{pmatrix}$; $x = 1$, $y = -1$, $z = 2$

Question 4

The performance of candidates in this question was moderate. Most candidates were able to use the modulus and argument given to find the real and imaginary parts of the complex number. Many candidates failed to extend their polar form and apply the De Moivre theorem correctly to to find the required roots. Many candidates wrongly gave the Im(z) as $4\sqrt{3}\,\mathrm{i}$. Candidates wrote $z^{\frac{1}{2}} = \left(8\text{cis}\frac{2\pi}{3}\right)^{\frac{1}{2}}$ without the $2k\pi$ and got only one solution, $\sqrt{2} + \mathrm{i}\sqrt{6}$ as their final answer.

Answers: (*a*) $\text{Re}(z) = -4$, $\text{Im}(z) = 4\sqrt{3}$; (*b*) $\sqrt{2} + \mathrm{i}\sqrt{6}$, $-\sqrt{2} - \mathrm{i}\sqrt{6}$

Question 5

Majority of the candidates showed a good performance for this question. Many candidates achieved complete and perfect answers. Candidates were able to do ‘completing the square’ and got the standard form equation of hyperbolic equation. Candidates were able to obtain the coordinates of the centre and vertices. Many candidates succeeded in determining the equations of the asymptotes. Some average level of candidates did not make use of the information given at the back of the question paper regarding the standard form of a hyperbola. A few candidates used wrong method in determining the equations of the asymptotes. Quite a number of candidates failed to sketch the hyperbola approaching towards its asymptotes.

Answers: (*a*) $\frac{(x-2)^2}{4} + \frac{y^2}{4} = 1$; Centre = (2, 0); Vertices = (0, 0), (4, 0)
(*b*) $y = x - 2$, $y = -x + 2$

Question 6

This question was moderately performed by the candidates. Most of the candidates managed to get at least 2 marks. Most candidates were able to get the vector equation of the line and performed the ‘dot’ product with the vector equation of plane to get the value of 3. Quite a number of candidates performed the ‘dot’ product using a point with the plane but did not proceed to check whether the line was perpendicular to the normal of the plane. Some candidates had no idea of how to show the line lied in the plane when they attempted to find the value of λ instead of expressing x, y and z in terms of λ.

Answer: –

Question 7

Candidates who chose this question scored less marks compared to candidates who chose question 8. Candidates who chose this question managed to express $\sqrt{3}\ \sin x - \cos x = 2\sin\left(x - \frac{\pi}{6}\right)$ and determine the maximum and minimum values together with and the corresponding values using $2\sin\left(x - \frac{\pi}{6}\right)$.

Only a handful of candidates successfully sketched a shifted one cycle sine curve starts and ends at $(0, -1)$ for $0 \leqslant x \leqslant 2\pi$. A few candidates missed out the corresponding x values when the equation was at minimum and maximum even though the values were later indicated in the sketched graph. Candidates eliminated the modulus in part (*c*), and solved only with one value, i.e. 1. They also wrongly indicated the maximum and minimum values in the graph sketching.

When solving $\left|\sqrt{3}\ \sin x - \cos x\right| = 1$, most candidates left out the value of 0 in the answer. Only a few candidates wrote 'or' or used $\cup$ in the final answer.

Answers: $\sqrt{3}\ \sin x - \cos x = r\sin\left(x - \frac{\pi}{6}\right)$

(*a*) Min = -2 and max = 2; min when $x = \frac{5\pi}{3}$, max when $x = \frac{2\pi}{3}$

(*c*) $0, \frac{\pi}{3}, \pi, \frac{4\pi}{3}, 2\pi$; $\left\{x: 0 < x < \frac{\pi}{3} \text{ or } \pi < x < \frac{4\pi}{3}\right\}$

Question 8

Candidates who attempted this question mostly succeeded in getting good marks. Most candidates were able to show that *ABCD* was a parallelogram using two opposite vectors. Candidates performed the operations of cross product on two adjacent vectors of the parallelogram correctly and succeeded in calculating the area of parallelogram by taking the magnitude of the vector obtained. Candidates used ratio theorem to find the position vector of *P*. Using the $\overrightarrow{OP}$ obtained, candidates managed to get the pair of vectors, either $\overrightarrow{PA}$ and $\overrightarrow{PB}$, or $\overrightarrow{AP}$ and $\overrightarrow{BP}$ to find the angle of *APB*. Many candidates failed to see that $\overrightarrow{AB} = \overrightarrow{DC}$ was enough to show that *ABCD* was a parallelogram.

Quite a number of candidates performed the cross product on wrong direction of pair vectors such as $\overrightarrow{AB} \times \overrightarrow{BC}$, which resulting the area outside of the parallelogram, whilst some candidates did not find answer in the exact form as requested by the question. Candidates performed the dot product on wrong direction of pair vectors such as $\overrightarrow{AP} \times \overrightarrow{PB}$, which resulting in the exterior angle of *APB* instead. Some candidates even did not know how to find the position vector of *P*.

Answer: (*b*) $4\sqrt{3}$; (*c*) $\overrightarrow{OP} = \frac{7}{3}\mathbf{i} + \mathbf{j} - \frac{2}{3}k$; $\angle APB = 111.05°$

SEMESTER 1

MATHEMATICS (T) (954/2)

OVERALL PERFORMANCE

In Semester 2, 4 537 candidates sat the examination for this subject and 58.27% of them obtained a full pass.

The percentage of each grade is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	8.68	7.41	8.51	8.82	8.68	8.13	8.04	3.26	1.70	3.20	33.57

CANDIDATES' RESPONSES

General comments

Most of the candidates wrote their answers in English even though there were spelling mistakes. Generally, the concept and notation for limits were poorly presented.

Good candidates were able to present their answers systematically and used suitable reasons, descriptions or explanations required by the questions. Their answers were well planned. They could write the solutions in a systematic way which lead to the answers. They used the correct formula in problem solving and used intelligently of scientific calculator.

Moderate candidates were able to complete some questions and answered other questions partially. They lacked the depth of understanding to answer the questions fully, especially the questions that required further knowledge and application of the topics. The solutions given by the candidates were less accurate and a bit disorganised.

Weak candidates only answered certain part of the questions. Some of them did not know the requirement of the questions. Most of them did not master the basic concept on most of the topics. Some solutions were chaotic and meaningless. There were still a large number of candidates who did not have much foundation in mathematics. Many candidates did not answer according to the requirement of the questions especially when the instruction of the question involved "hence" and "show"**.**

In general, good candidates could provide well-presented and well-planned answers in most of the questions. Some candidates could even give alternative ways in solving the questions correctly. For poor candidates, their planning and presentation were of bad quality, such as missing of "≈" symbols and steps, or skipped certain important workings, and wrote the answers in less than three decimal places. Some of the candidates used wrong equations or methods, and some totally did not understand the questions and could not solve the question as requested.

Comments on individual questions

Question 1

For part (*a*), the candidates were expected to multiply the respected function with its conjugate, and the product would be cancelled out with $(x - 2)$ factor. Many candidates were able to multiply the correct conjugate and obtained the correct answer. However, many of them also failed to perform the expected factorization. For part (b), the candidates' working should factorise the respected function, and then performed the cancellation of $\left(e^{\left(\frac{x-1}{x+1}\right)} - 1\right)$ factor. Some candidates had no idea about the factorisation and just solved the limit nonsensely.

Answers: (*a*) $\frac{1}{2}$; (*b*) 2

Question 2

Many candidates knew how to find the stationary point, the inflexion point and performed the nature test. They also knew how to find inflexion point. Some candidates mistakenly solved $8x^3 + 1 = 0$ to $x = \pm\frac{1}{2}$. Many candidates successfully obtained $x = \frac{1}{\sqrt[3]{4}}$ from $\frac{d^2y}{dx^2} = 0$, but majority of the candidates gave the inflexion point as (0.63, –0.00030) or (0.63, –0.0002984). Only a few candidates could sketch the curve correctly. The rest of the candidates failed to sketch and labelled the points, even though they managed to find the correct answer in (*a*) and (*b*).

Answers: (*a*) $\left(-\frac{1}{2}, -3\right)$; (b) $\left(\frac{1}{\sqrt[3]{4}}, 0\right)$

Question 3

Many candidates were able to perform the completing of square, then transformed the integral and used it. Many candidates were not able to continue the integration after transforming the expression into $\int \frac{dx}{\sqrt{4-(x-1)^2}}$. Then, it resulted the candidates to stop halfway with no solution or with wrong answer.

Answer: $\sin^{-1}\left(\frac{x-1}{2}\right) + c$

Question 4

Majority of the candidates could find the integrating factor (IF) required. Many candidates could perform integration by part correctly, and then solved the particular solution with $y = 2$ when $x = 1$. Some candidates multiplied the IF to the original linear differential equation, but by merely memorising the formula of solving, and had written the left side correctly as $\frac{d}{dx}\left(\frac{1}{x}y\right) = 4x \ln x$. Some candidates carelessly wrote the resulting expression as $y = 4x^2 \ln x - 4x^2 + c$ (after integration by parts) or $y = 4x^2 \ln x - 4x^2 + 6$ (after finding the c value).

Answer: $y = 4x^2 \ln x - 4x^2 + 6$

Question 5

Many candidates could obtain $y' = \frac{1}{1+x^2}$ from the given formulae and were able to use the product, quotient and implicit rule correctly. Majority of the candidates knew how to use the corresponding Maclaurin formula and some of them were able to work the product of series correctly. However, only a few candidates could obtain the third derivative correctly. Many candidates used the expansion of e^x up to only x^3, which resulted an error in the product of the series.

Answer: $x - \frac{1}{3}x^3 + \ldots$; $x + x^2 + \frac{1}{6}x^3 - \frac{1}{6}x^4 + \ldots$

Question 6

Most of the candidates managed to show the opposite signs for f(4.0) and f(4.6) and came up with a conclusion. They were able to use the Newton-Raphson formula to get all the iterations correctly. Steps for iterations were shown by the candidates clearly. Some candidates gave improper or ambiguous or wrong statement in their conclusion such as, "since there is a sign change ...", "since there are opposite signs ...", "since f have different signs ...", "since 4.0 and 4.6 have opposite signs ...", "f has a root between ...", "f(x) has a root between ...", "x – tan x has a root between ...", "f(x) = 0 has at least a root between ..." etc. Some candidates used value in degree to evaluate the iterations. Some candidates left their iterations in either three decimal places or even longer than six decimal places, which then led to the deduction of their marks. Furthermore, many candidates used full calculator evaluation without showing the calculation of the first two iterations, resulted into marks lost because of not showing the essential working. Some candidates failed to observe the standard stopping criteria used in iteration process.

Answer: 4.493

Question 7

The candidates knew that area is equal to $\int_a^b x \, dy$ or $\int_a^b y \, dx$, and the formula of volume is $\pi\int_a^b x^2 \, dy$ or $\pi\int_a^b y^2 \, dy$. There were very few candidates that could sketch the curves correctly. Without the correct sketch of the curves, almost all candidates failed to identify and define the area and volume required correctly. Many candidates were unable to continue the working after writing $\int_0^1 \sqrt{2 - y^2} \, dy$. Many candidates defined the volume required wrongly by integration with respect to x.

Answers: (*b*) $\frac{\pi}{2} - \frac{1}{5}$, (*c*) $\frac{52}{21}\pi$

Question 8

Many candidates were able to use the product or quotient or implicit rules in attempting to obtain y', y'', y''' and $y^{(4)}$. Most of the candidates knew how to use the Maclaurin formula. Careless mistakes were seen occurred while differentiating higher derivatives after appling product and implicit rule on three factors. Many candidates made some errors in attempting to find $y^{(4)}$. Many candidates mistakenly performed $\int \frac{dx}{\sqrt{1 - x^2}} = -\cos^{-1} x$ without putting "...+ c". Quite a number of candidates mistakenly performed that $\cos^{-1} x = \frac{1}{\sqrt{1 - x^2}}$

Answers: (*b*) $1 + \frac{1}{2}x^2 + \frac{3}{8}x^4 + \ldots$; $\frac{x}{2} - x - \frac{1}{6}x^3 - \frac{3}{40}x^5 - \ldots$; (*c*) 0.658

MATHEMATICS (T) (954/3)

OVERALL PERFORMANCE

In Semester 3, 4 528 candidates sat the examination for this subject and 65.32% of them obtained a full pass.

The percentage of each grade is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	12.41	8.70	10.82	9.03	8.35	7.99	8.02	5.12	4.92	4.24	20.38

CANDIDATES' RESPONSES

General comments

In general, all questions were well attempted in English.

Majority of the candidates were good in answering the quantitative questions but were unable to answer some parts which involved understanding and application of mathematical concepts such as in Question 1, Question 2(*c*), Question 7 and Question 8. Quite a number of candidates did not use symbols and formula correctly.

As usual, good candidates presented the solutions systematically, well-planned working and steps with correct answers. The moderate ones performed well in straight forward questions such as in Question 2(*a*) and (*b*), Question 3, Question 4 and Question 5.

As expected, weak and poor candidates lacked the aptitude and were not able to manage the information given in the question in order to find the solutions. They were weak in many aspects, especially in understanding the question, not knowing or could not remember the formula and their answers were not well presented. They also failed to use related mathematical concepts and appropriate formula in solving problems, for example in Question 1 and Question 2(*c*).

Comments on individual questions

Question 1

Although this was a straightforward question, however quite a number of candidates could not answer part (*a*) correctly. They were not able to find the value of the mean even though they could write the correct mean formula. Some gave their answers in term of a and b. Majority of the candidates were able to apply the formula of mean and variance for ungrouped data.

In part (*b*), some candidates were unable to give the correct variance formula and failed to answer the question. Furthermore, even though the written variance formula was correct, the algebraic manipulation was not properly done and they were unable to get the correct quadratic equation and the correct solutions.

Some candidates left $\dfrac{174 + 2a + 2b}{10}$ as the answer for part (*a*), without substituting $a + b = 18$.

Answers: (*a*) 21; (*b*) $a = 12$, $b = 6$

Question 2

Candidates were expected to use basic probability, combination and conditional probability to answer this question. An overall performance of the candidates on this question was not satisfactory. Some candidates were able to answer parts (*a*) and (*b*), which were quite straightforward, but could not answer part (*c*) very well because they did not use the conditional probability formula correctly or the candidates were unable to find the joint probability or some of them assumed it as independent. In part (*a*), quite a number of candidates did not obtain full mark because they gave their answer as $\frac{8}{20} \times \frac{7}{19}$, instead of $\frac{8}{20} \times \frac{7}{19} \times 1$ or $\frac{8}{20} \times \frac{7}{19} \times \frac{18}{18}$.

Weak candidates did not understand the meaning of events without replacement. They used combination method to solve it and thus, gave incorrect working and answers. Not many candidates succeeded in answering part (*b*) because they did not grasp the concept of probability well. Although some of them could get the correct answer but they gained no marks as they used permutation to solve the question.

Answers: (*a*) $\frac{14}{95}$; (*b*) $\frac{101}{1\ 140}$; (*c*) $\frac{7}{115}$

Question 3

This question was considered as a direct question. Good candidates could easily score full marks. Majority of the candidates were able use the cumulative distribution function (CDF) to find the median, probability and the relationship between CDF and probability density function (PDF).

Weak candidates could not differentiate between CDF and PDF, and hence, they integrated CDF in order to obtain median. Some candidates used the incorrect function to find median and part (*b*).

Answers: (*a*) $m = 3 - \sqrt{3}$; (*b*) $\frac{13}{14}$; (*c*) $f(x) = \begin{cases} \frac{2x}{3}, & 0 \leqslant x < 1 \\ 1 - \frac{x}{3}, & 1 \leqslant x < 3 \\ 0, & \text{otherwise} \end{cases}$

Question 4

Many candidates were unable to differentiate between population mean (μ) and sample mean ($\overline{x}$) when constructing confidence interval. This confusion led the candidates to obtain zero marks for part (*a*). Most of the candidates were able to solve part (*b*), but they were unable to deduce the percentage of changes.

Answers: (*b*) 1.4196, 41.96%

Question 5

Candidates' performance were moderate. Most of the good candidates were able to read the *z*-value and found the rejection region based on the significance level given. However, there were some candidates who could not apply the correct standard error and correct range of rejection region and failed to answer the question. Some candidates were weak in solving the inequality and led to wrong answer. There were students who carried out hypothesis testing instead of finding the value of *n*.

Answer: 28

Question 6

The question was common and routined where most candidates were able to answer. Even the average candidates could solve this question quite well. An overall performance was good. However, some candidates could not find the value of χ^2 because of careless mistakes in the calculation. A few of the weak candidates did not know how to calculate the probability and the expected frequency, and thus failed to answer it well. Among the common mistakes were stating the hypothesis wrongly and forgetting to combine the adjacent classes when E_i was less than 5 which lead to wrong degree of freedom. Some candidates still used the statement "accept H_o", and some conclusions were not written completely.

Answer: –

Question 7

Majority of the candidates chose to answer this question. Many candidates were able to recognise it as binomial distribution with the correct parameters and solved it accordingly. However, when it came to the suitable approximation in part (*c*), many candidates did not do or carry out the correct continuity correction and used a wrong value of σ^2. Some candidates were unable to solve part (*b*) which involved an inequality. Some candidates made a mistake on the inequality sign, and some candidates forgot to change the inequality sign when divided by a negative number.

Answers: (*a*) 0.0070687; (*b*) n = 377; (*c*) 0.3585

Question 8

A few of the candidates attempted to answer this question. Many candidates could not understand the question properly and some candidates did not know what was meant by the sampling distribution of sample proportion. Hence, they failed to write the distribution correctly. Some candidates did not use the correct symbol for the distribution. Most of the candidates who answered this question failed to answer correctly because they were unable to express the probability needed in the question i.e $P(0 \leqslant Ps - p \leqslant 0.05)$. The candidates could only find σ and failed to state the standard error, $\sigma_{\bar{x}}$. Some candidates were unable to apply the correct standard error, $\frac{\sigma}{\sqrt{100}}$, in the normal distribution. Some candidates were confused between standard deviation of a population and standard error of a sample. Thus, the candidates were unable to solve the question correctly. Mostly, the candidates guessed the answer, which showed that they could not understand what central limit theorem was and how it was used to solve a given problem on sampling.

Answers: (*a*)(ii) 0.34628; (*b*)(i) 1.618

Laporan Peperiksaan STPM 2018

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