basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

QUALITATIVE ANALYSIS OF LEARNER RESPONSES AND EVALUATION OF QUESTION PAPERS: NSC 2019

SUBJECT		**MATHEMATICS**	
PAPER		**2**	
DURATION OF PAPER :		**3 HOURS**	
DATES OF MARKING		**30 NOVEMBER TO 14 DECEMBER 2019**	

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

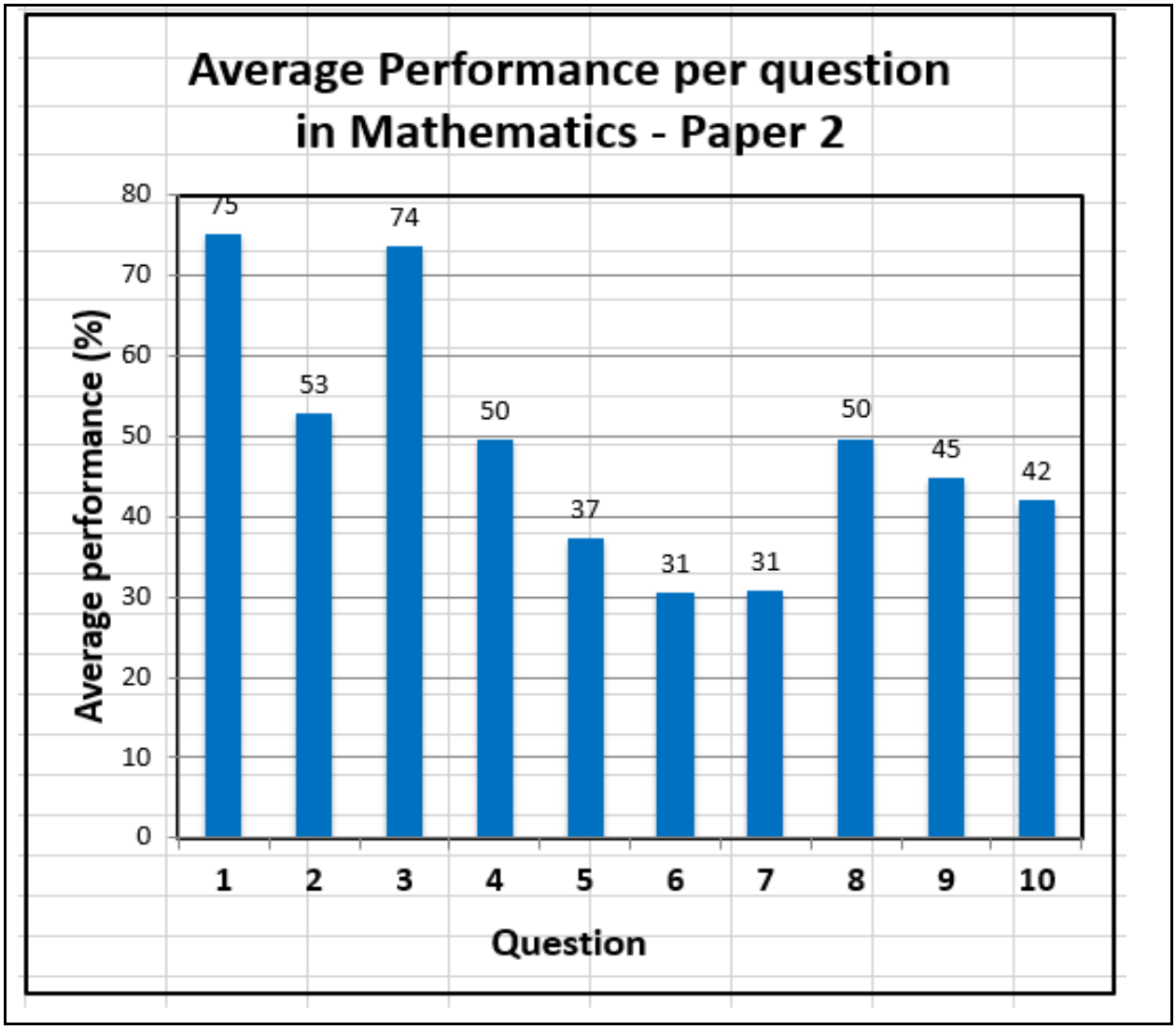
Learner Performance is discussed based on the sample of 100 scripts marked at the centre selected randomly.

Analysis of 100 randomly selected scripts varied from weak, moderate to good candidates. This small sample indicates that candidates performed best in Statistics (Q1 and Q2), Analytical Geometry (Q3 and Q4) and Geometry (Q 8). Performance in Trigonometry was the worst (less than 40 % in all sub questions). Question 9 and 10 which cover topics on Euclidean Geometry were answered very poorly. Learners results ranging from 0% to almost 100 % .The majority of the centres are performing poorly.

SAMPLE OF 100 SCRPTS

Mark	Levels	Number /%
0 – 44	1	23
45 – 59	2	23
60 – 74	3	11
75 – 89	4	11
90 – 104	5	10
105 – 119	6	10
120 - 150	7	12
		TOTAL:100

The Bar graph below shows the average performance from a sample of 100 scripts per question



SECTION 2: Comment on candidates' performance in individual questions

(It is expected that a comment will be provided for each question on a separate sheet).

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

The table below shows the monthly income (in rands) of 6 different people and the amount (in rands) that each person spends on the monthly repayment of a motor vehicle.

MONTHLY INCOME (IN RANDS)	9 000	13 500	15 000	16 500	17 000	20 000
MONTHLY REPAYMENT (IN RANDS)	2 000	3 000	3 500	5 200	5 500	6 000

1.1 Determine the equation of the least squares regression line for the data. (3)

1.2 If a person earns R14 000 per month, predict the monthly repayment that the person could make towards a motor vehicle. (2)

1.3 Determine the correlation coefficient between the monthly income and the monthly repayment of a motor vehicle. (1)

1.4 A person who earns R18 000 per month has to decide whether to spend R9 000 as a monthly repayment of a motor vehicle, or not. If the above information is a true representation of the population data, which of the following would the person most likely decide on:

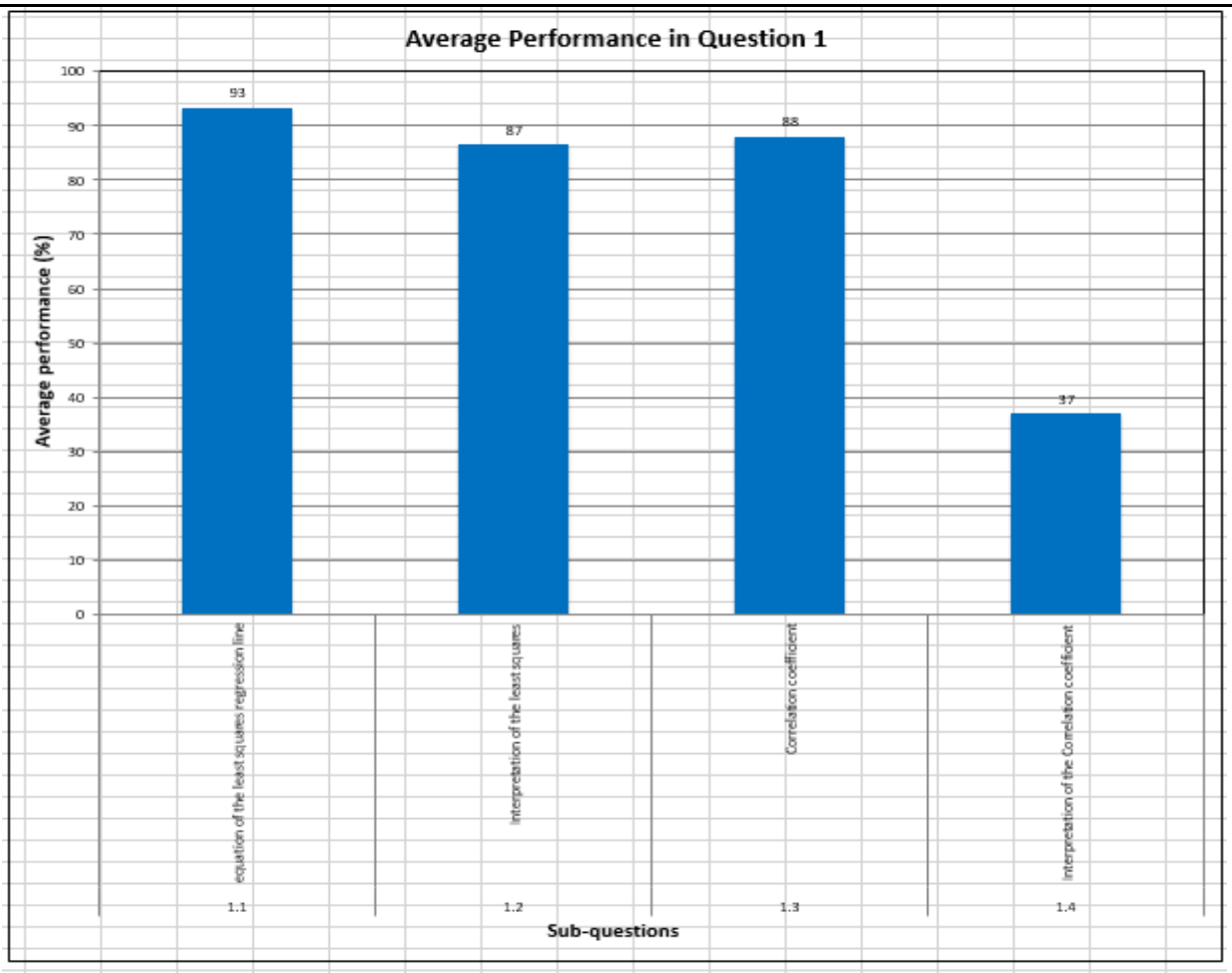
A Spend R9 000 per month because there is a very strong positive correlation between the amount earned and the monthly repayment.

B NOT to spend R9 000 per month because there is a very weak positive correlation between the amount earned and the monthly repayment.

C Spend R9 000 per month because the point (18 000 ; 9 000) lies very near to the least squares regression line.

D NOT to spend R9 000 per month because the point (18 000 ; 9 000) lies very far from the least squares regression line. (2)

[8]



Q 1.1-1.3 Well answered by most of the candidates, with the exception of Q1.4

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

1.1-1.3 Some candidates still have challenges in using Casio Calculators. This is evident in the wrong values of a and b which resulted in an incorrect equation.

Other candidates calculated $\bar{x}$ and δ_x instead of regression line.

Some candidates uses simple interest instead of regression line because of the word monthly repayment.

1.4 Most candidates leave this sub question blank due to a language barrier. They do not understand the meaning of **most likely decide on.**

Most of them choose option A instead of D.

(c) Provide suggestions for improvement in relation to Teaching and Learning
Avoid multiple choice questions as that is encouraging guess work.
Educators could use various approaches in their teaching and assessment .
Educators should also show all candidates how to use the different calculators to determine
the values of a, b and r.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Question 1.4 was confusing to some learners, this is evident the option they choose(option A)

QUESTION 2

A survey was conducted among 100 people about the amount that they paid on a monthly basis for their cellphone contracts. The person carrying out the survey calculated the estimated mean to be R309 per month. Unfortunately, he lost some of the data thereafter. The partial results of the survey are shown in the frequency table below:

AMOUNT PAID (IN RANDS)	FREQUENCY
$0 < x \leq 100$	7
$100 < x \leq 200$	12
$200 < x \leq 300$	a
$300 < x \leq 400$	35
$400 < x \leq 500$	b
$500 < x \leq 600$	6

2.1 How many people paid R200 or less on their monthly cellphone contracts? (1)

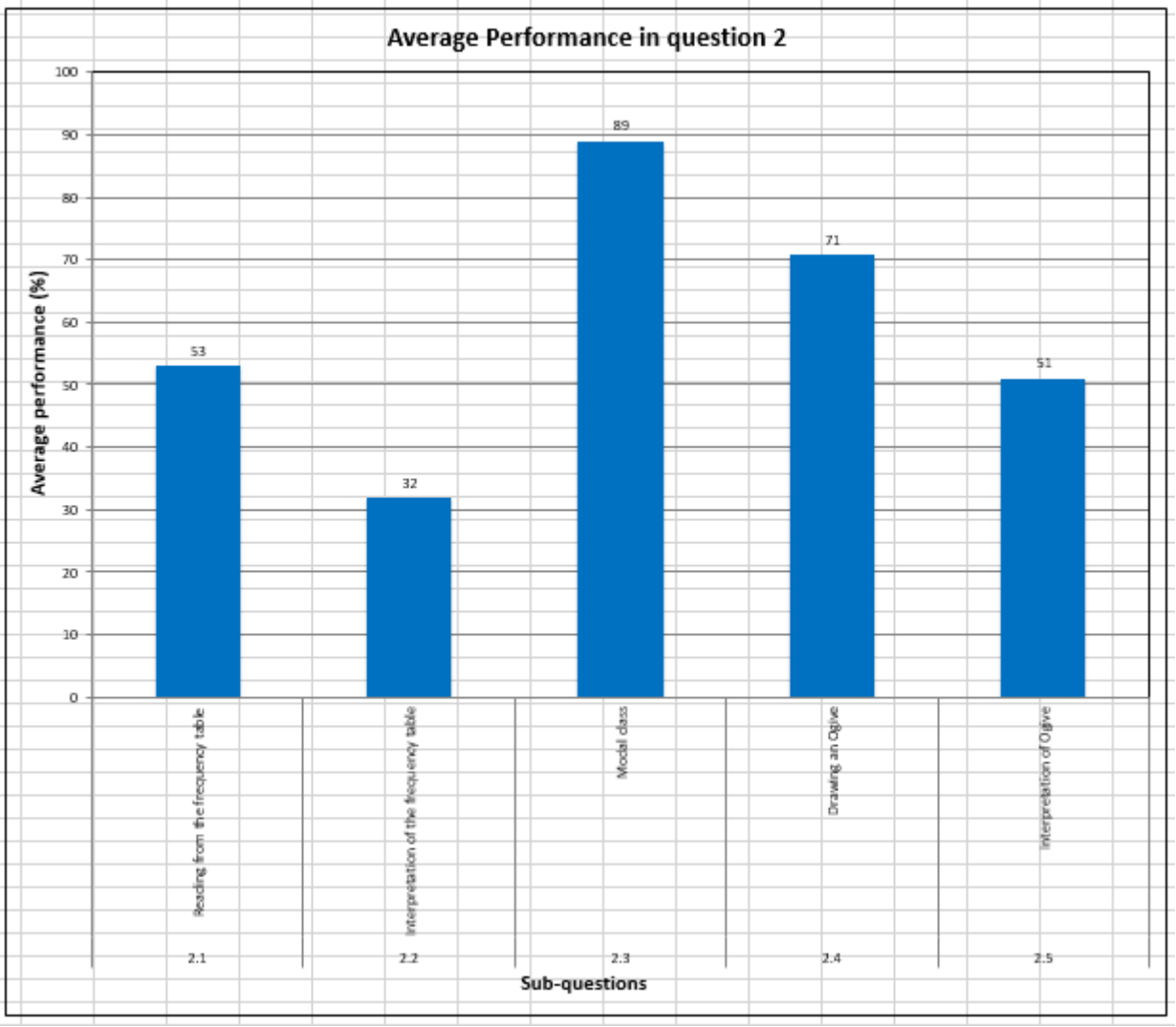
2.2 Use the information above to show that $a = 24$ and $b = 16$. (5)

2.3 Write down the modal class for the data. (1)

2.4 On the grid provided in the ANSWER BOOK, draw an ogive (cumulative frequency graph) to represent the data. (4)

2.5 Determine how many people paid more than R420 per month for their cellphone contracts. (2)

[13]



(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
Q 2.1 & Q 2.3 were well answered by almost all the candidates.
Q 2.2 , 2.4 & 2.5 were not well answered by the majority of the candidates

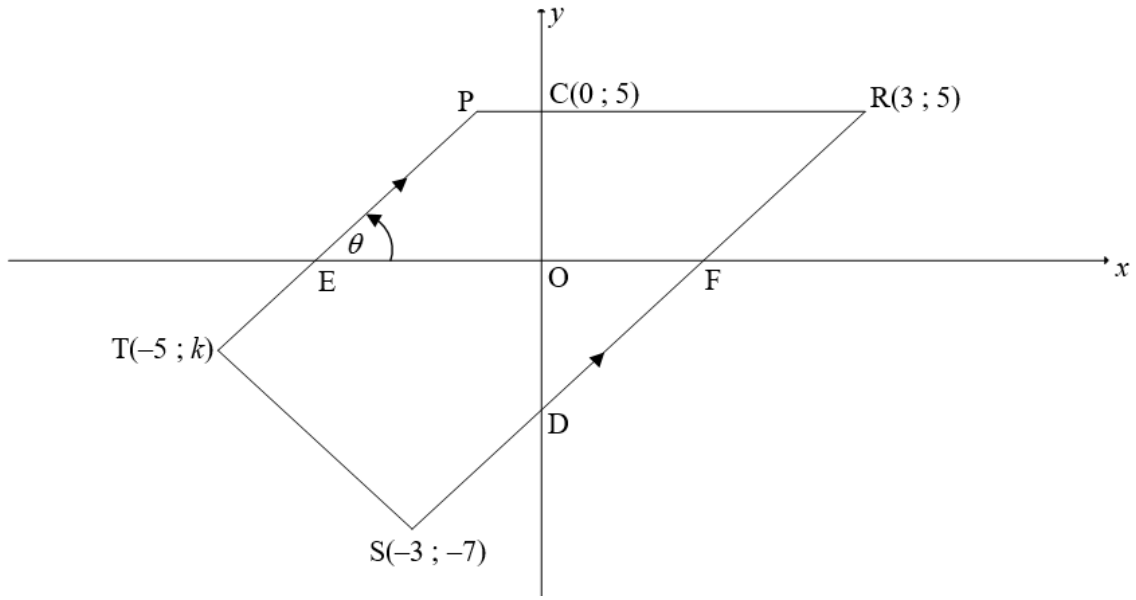
(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
Q 2.2 was not well answered as it involved two equation to be solved simultaneously.
The concept of a mean in grouped data is still a challenge.
Some candidates read the modal class as 35 from the frequency table instead of $300 < x \leq 400$.
Some candidates are still sketching the Ogive by using lower limits instead of upper limits and
ground incorrectly. Many learners also plotted the midpoint against the cumulative frequency.

(c) Provide suggestions for improvement in relation to Teaching and Learning
Expose learners to graph analysis and interpretation. Encourage learners to write down which
points we need to plot to draw an Ogive. Learners must also be encouraged to write down
the steps needed to calculate an estimate of the mean.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Some learners are using a ruler when they are sketching an Ogive.
Grounding of an Ogive should be emphasised.

QUESTION 3

In the diagram, P, R(3 ; 5), S(–3 ; –7) and T(–5 ; k) are vertices of trapezium PRST and PT || RS. RS and PR cut the y-axis at D and C(0 ; 5) respectively. PT and RS cut the x-axis at E and F respectively. $P\hat{E}F = \theta$.



3.1 Write down the equation of PR. (1)

3.2 Calculate the:

3.2.1 Gradient of RS (2)

3.2.2 Size of θ (3)

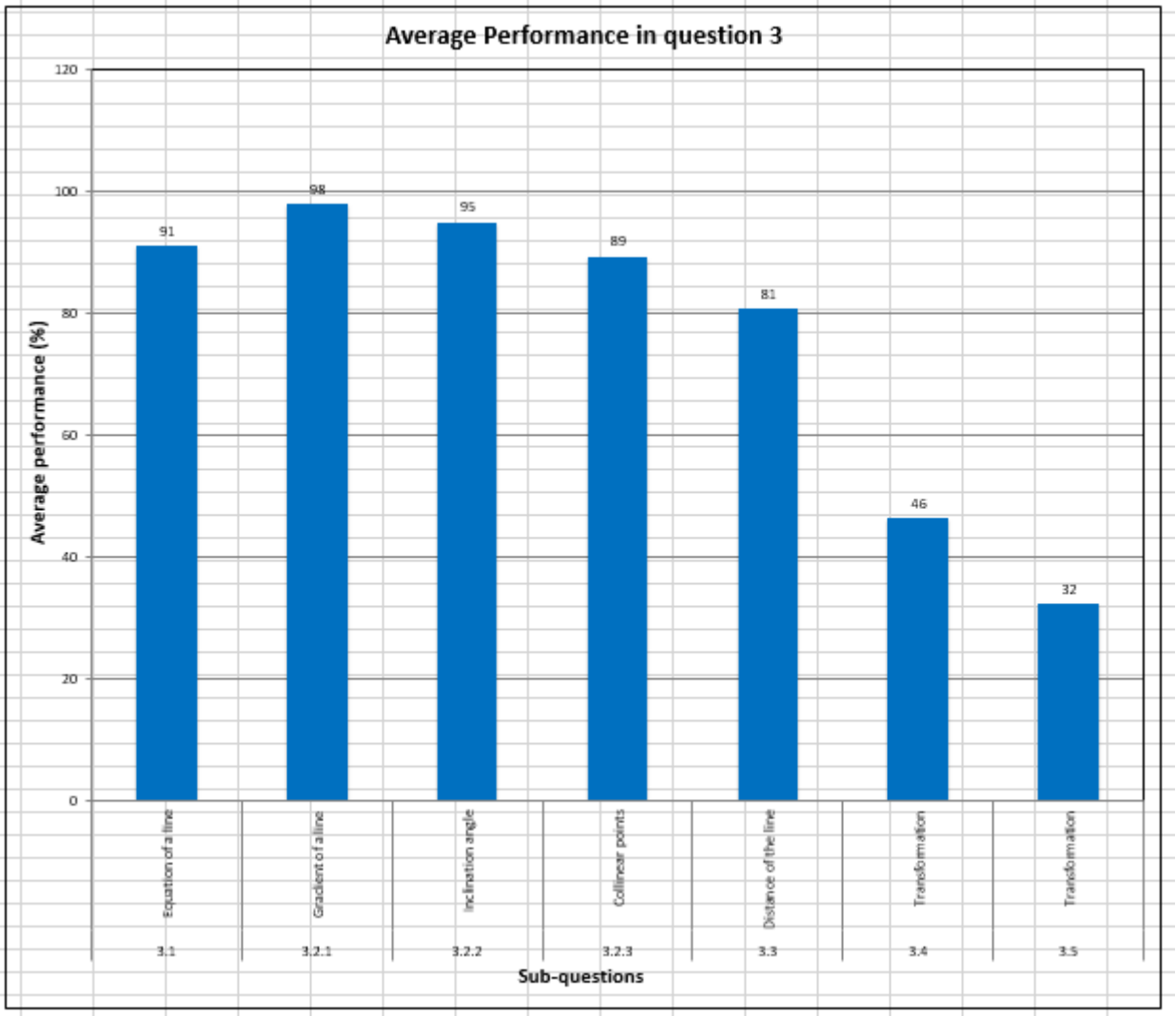
3.2.3 Coordinates of D (3)

3.3 If it is given that $TS = 2\sqrt{5}$, calculate the value of k. (4)

3.4 Parallelogram TDNS, with N in the 4th quadrant, is drawn. Calculate the coordinates of N. (3)

3.5 ΔPRD is reflected about the y-axis to form $\Delta P'R'D'$. Calculate the size of $R\hat{D}R'$. (3)

[19]



(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
Q 3.1 & Q 3.2 were well answered .
Q 3.3 was attempted by many candidates but answered poorly.
Many candidates made mistakes with the substitution of T and S in the distance formula.
Many candidates also expanded $(-k-7)^2$ incorrectly as $k^2-14k+49$ and then used the
quadratic formula to solve the equation.
Q 3.4 and Q 3.5 were poorly answered.

(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
Q 3.1 Even though this question was well answered, few candidates still find it challenging to
calculate the equation of a horizontal line.
Q 3.2.1 there are still some learners who write the formula for the gradient of a line

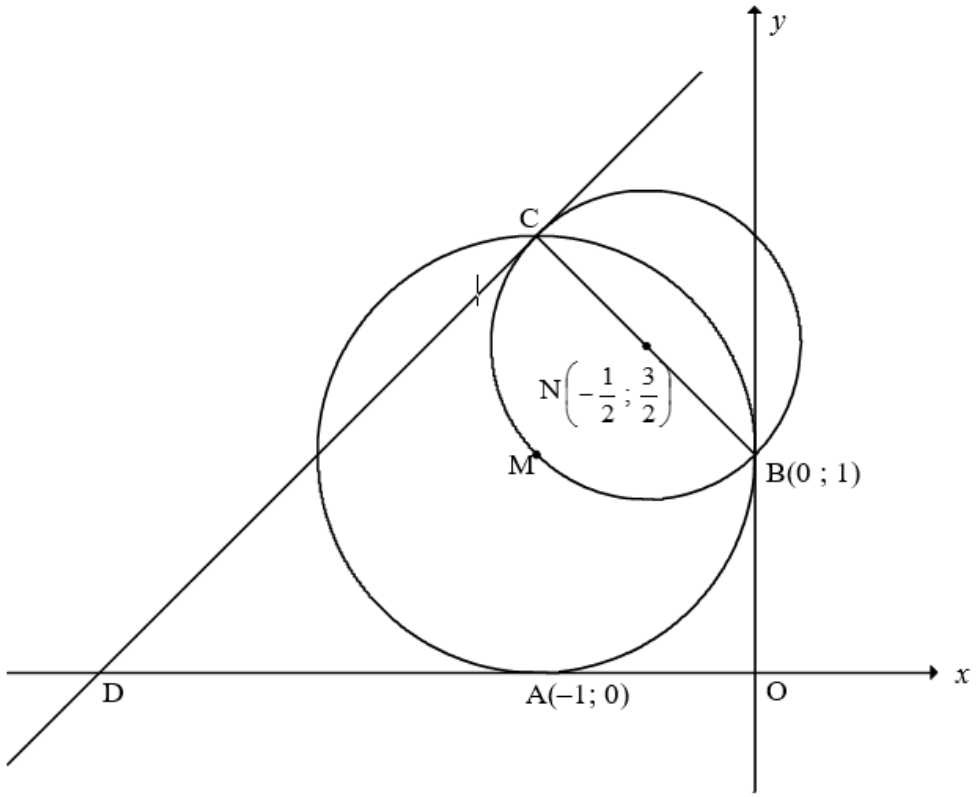
incorrectly $m = \frac{x_2 - x_1}{y_2 - y_1}$ even though it was given in the formula sheet.
Q 3.2.3 this was a CA from Q 3.2.2, where some learners calculated the gradient of RS as -2
Q 3.5 was a challenge due to reflecting points in this sketch. Transformation of this sort, was last
done in grade 9. $D \rightarrow D'$ etc. Therefore this question was not CAPS complaint.

(c) Provide suggestions for improvement in relation to Teaching and Learning
Familiarize all the learners with formula sheets from the beginning of the year.
Properties of quadrilaterals must be used throughout the topic.
Properties of Quadrilaterals must be taught thoroughly in grade 10.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Learners do not write down the coordinates of the two points and do not label the points
as $(x_1; y_1)$ *and* $(x_2; y_2)$. They switch coordinates when substituting in gradient and distance
formula. Teachers must encourage learners to always write down the coordinates of the two
points and to label them neatly and clearly.

QUESTION 4

In the diagram, a circle having centre M touches the x–axis at A(–1 ; 0) and the y-axis at B(0 ; 1). A smaller circle, centred at $N\left(-\frac{1}{2};\frac{3}{2}\right)$, passes through M and cuts the larger circle at B and C. BNC is a diameter of the smaller circle. A tangent drawn to the smaller circle at C, cuts the x-axis at D.



4.1 Determine the equation of the circle centred at M in the form $(x-a)^2+(y-b)^2=r^2$ (3)

4.2 Calculate the coordinates of C. (2)

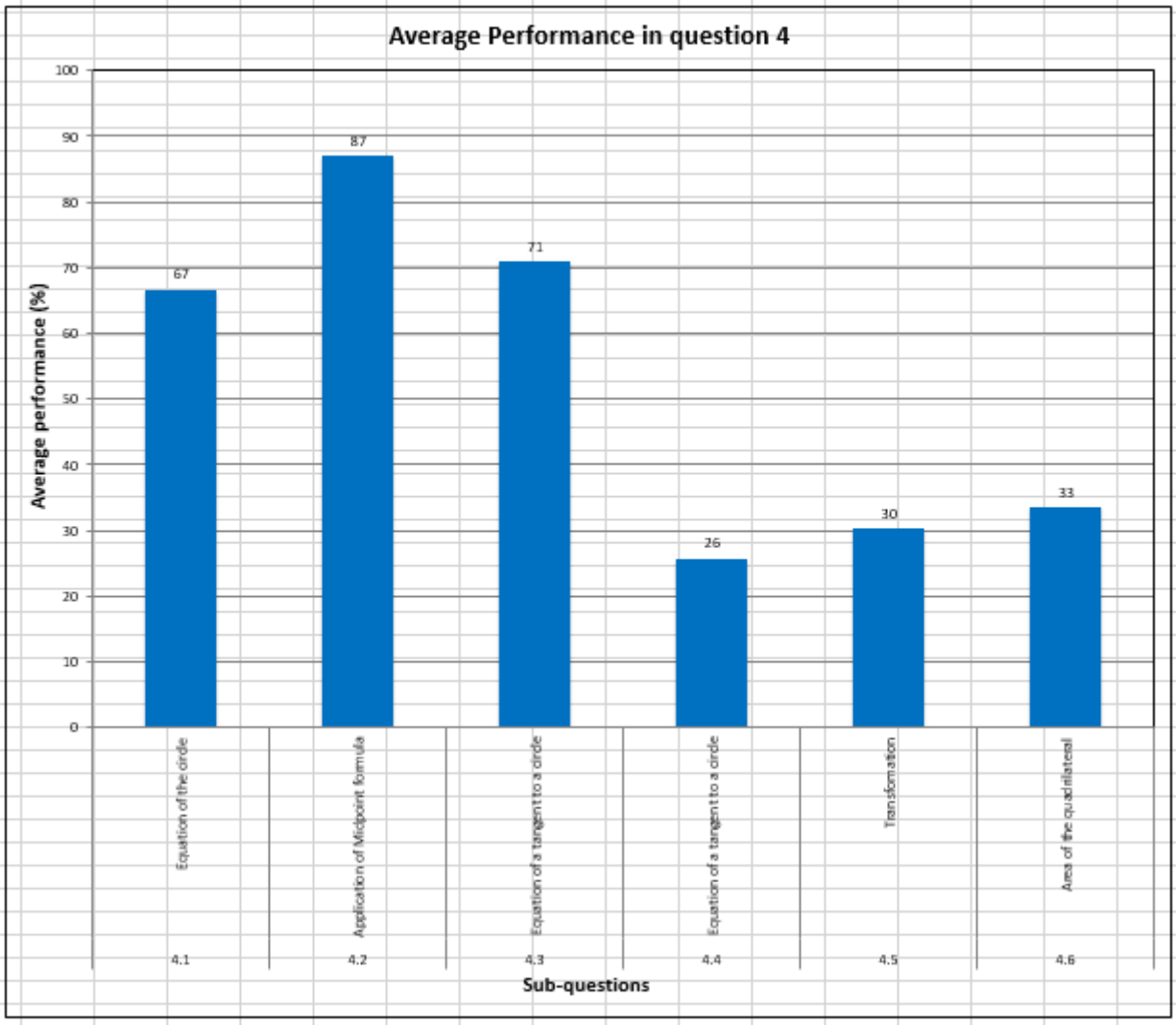
4.3 Show that the equation of the tangent CD is $y-x=3$. (4)

4.4 Determine the values of t for which the line $y=x+t$ will NOT touch or cut the smaller circle. (3)

4.5 The smaller circle centred at N is transformed such that point C is translated along the tangent to D. Calculate the coordinates of E, the new centre of the smaller circle. (3)

4.6 If it is given that the area of quadrilateral OBCD is $2a^2$ square units and $a>0$, show that $a=\frac{\sqrt{7}}{2}$ units. (5)

[20]



(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
Many candidates attempted this question but did not do well.
Candidates displayed arrays of misconceptions and errors in solving this question.
Q 4.1, Q 4.2 & Q 4.3 were well answered.
Q 4.4, Q 4.5 & Q 4.6 was poorly answered.

(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
A mixture of procedural, conceptual errors and misconceptions could be attributed to the
poor performance from Q 4.4 to Q 4.6
Q 4.1 Candidates struggle to find the coordinates of M and they could not see tangent AO
and OB. Since the radius $\perp$ tangent it implies that M(-1;1).
Q.4.3 candidates used the given equation in the question to get the gradient instead of

proving that, using $m_{rad} \times m_{\tan} = -1$ in order to get the gradient of CD.
Q 4.4 Candidates do not have the insight to visualize tangents drawn at a circle with $m = 1$.
Candidates needed to draw $y = x + 3$ and $y = x + 1$ as tangents to the circle.
Q 4.5 Many candidates could not see that point C has been translated to D, meaning 2 units
to the left and 2 units down. Transformation seems to be a challenge to many candidates.
Q 4.6 Candidates that divided OBCD into smaller different shapes e.g. triangles, squares,
rectangles or even trapezium answered this question well.

(c.) Provide suggestions for improvement in relation to Teaching and Learning
Educators are examination bound, too often they only teach what they saw in previous
papers .They should teach according to the outline in CAPS document to give learners all the
necessary theory that is required for the grade 12 examination.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
All the necessary theory for all topics need to be written down neatly in learners' books and
only then should learners look at previous years' question papers. Learners must learn the art
of answering question according to the different cognitive levels. Most learners should answer
level 1 and 2 questions comfortably to obtain a minimum pass. They attempt level 3 and 4
questions without having a good foundation of level 1 and level 2.

QUESTION 5

5.1 Simplify the following expression to ONE trigonometric term:

$$\frac{\sin x}{\cos x \,.\tan x} + \sin(180° + x)\cos(90° - x) \qquad (5)$$

5.2 **Without using a calculator**, determine the value of: $\dfrac{\sin^2 35° - \cos^2 35°}{4\sin 10°\cos 10°}$ (4)

5.3 Given: $\cos 26° = m$

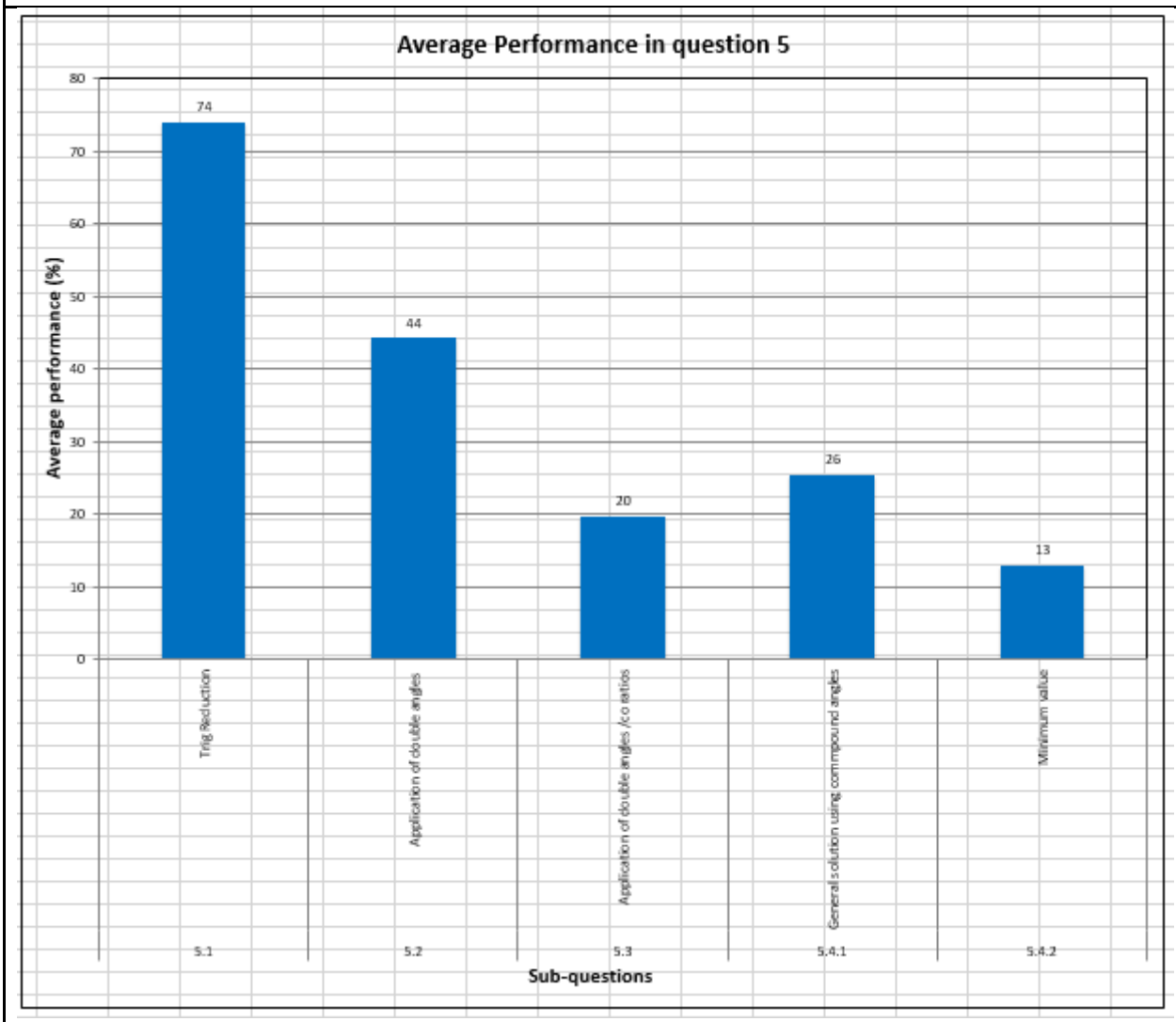
Without using a calculator, determine $2\sin^2 77°$ in terms of m. (4)

5.4 Consider: $f(x) = \sin(x + 25°)\cos 15° - \cos(x + 25°)\sin 15°$

5.4.1 Determine the general solution of $f(x) = \tan 165°$ (6)

5.4.2 Determine the value(s) of x in the interval $x \in [0°; 360°]$ for which $f(x)$ will have a minimum value. (3)

[22]



(a) General comment on the performance of learners in the specific question.

Was the question well answered or poorly answered?

Q 5.1 This question was well answered by almost all candidates. Candidates understand
reduction formulae, co-functions and expressing $\tan x$ in terms of $\frac{\sin x}{\cos x}$
Q 5.2, Q 5.3 and Q 5.4 were poorly answered, most candidates could not even attempt it.

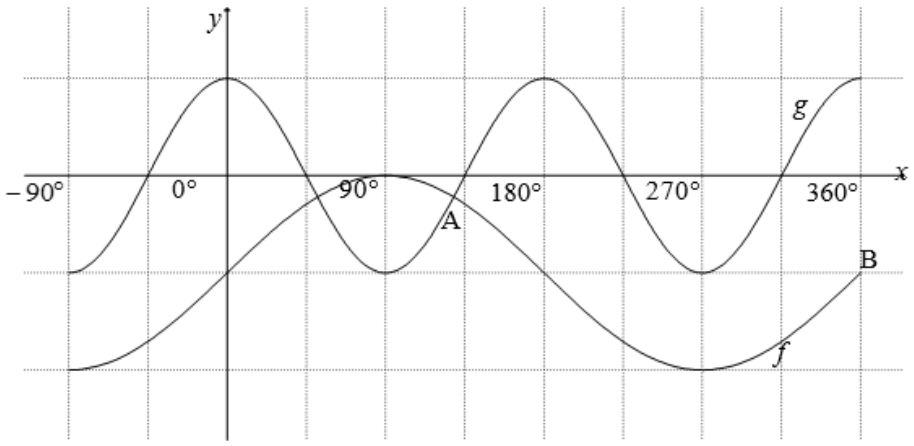
(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
Q 5.2 : Candidates could not identify the double angle for $\cos 2x$ and $\sin 2x$
Q 5.3 It is a higher order question which needs a very good understanding of double angles.
Candidates were supposed to use either reduction formulae or co functions then double
angles which still is a challenge to them.
Q 5.4.1 Candidates are struggling with compound angles and general solutions as they are
higher order questions. If the question was rephrased as "Find the general solution of
$\sin(x+10°) = \tan 165°$ "candidates would be able to solve the equation. In Q5.3 the learners
were asked to determine the solution without the use of a calculator.
However, in Q5.4.1 where the use of a calculator was allowed
many learners attempted to find the general solution without the use of a calculator.
Q 5.4.2 is a continuation from 5.4.1 of which candidates failed to write $f(x) = \sin(x+10)$.

(c) Provide suggestions for improvement in relation to Teaching and Learning
Double and compound angles is still challenge to learners.
Educators are encouraged to emphasize that $\sin^2 x - \cos^2 x = -\cos 2x$ and
$4\sin 10°\cos 10° = 2(2\sin 10°\cos 10°) = 2\sin 20°$
Teachers are encouraged to teach compound angles in **reverse** to enable learners to
identify compound angles from the expanded form.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
In Q 5.1 we wanted learners to reduce sin(180+x) and cos(90-x). instead learners multiplied the
the negative sign of sin(180+x) with the plus sign. In this section learners must put the –signs
where they belong and only in the following step they should multiply the signs out. There was
poor use of the CAST diagram and reference.

QUESTION 6

In the diagram, the graphs of $f(x) = \sin x - 1$ and $g(x) = \cos 2x$ are drawn for the interval $x \in [-90°; 360°]$. Graphs f and g intersect at A. B(360° ; –1) is a point on f.

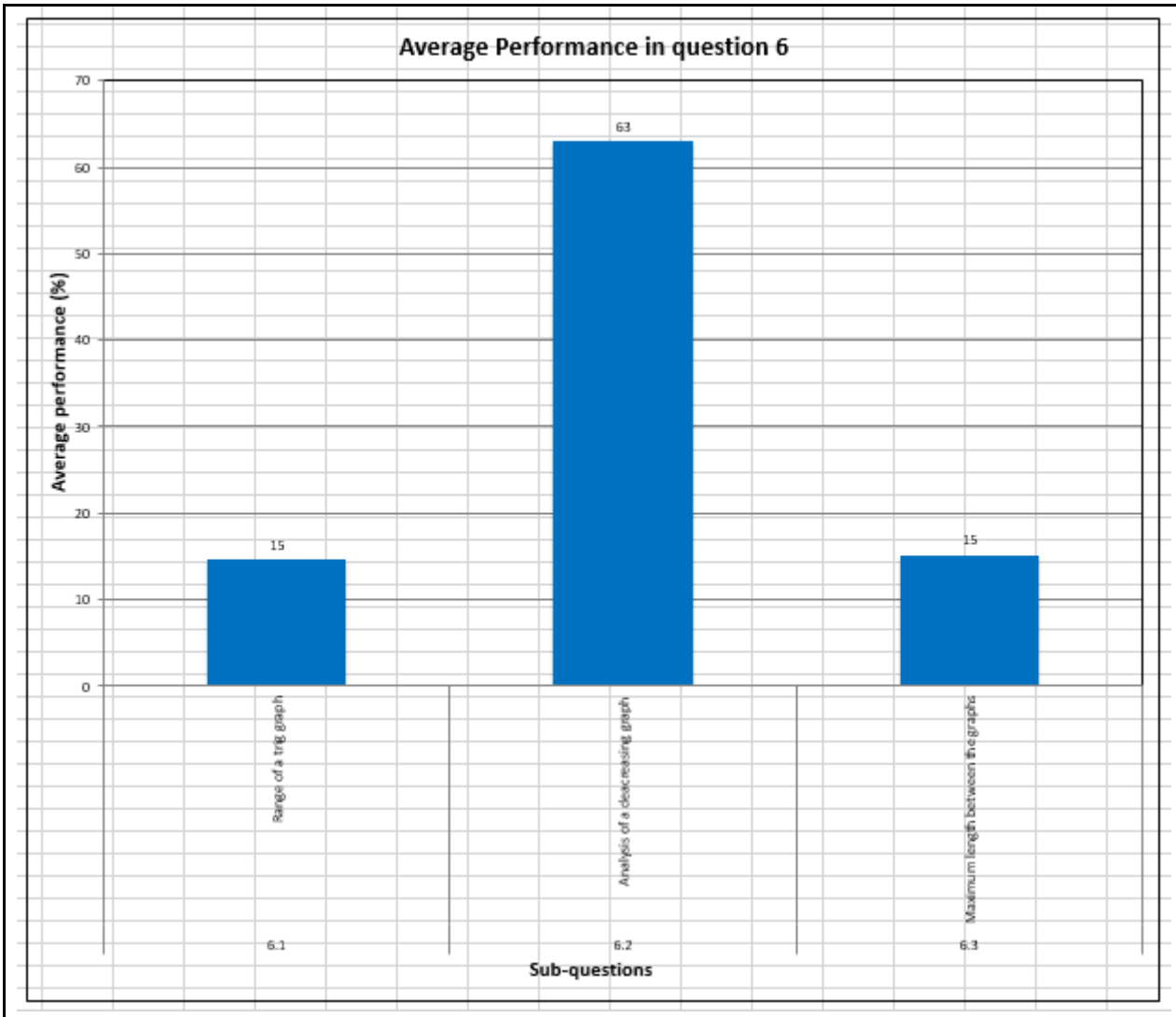


6.1 Write down the range of f. (2)

6.2 Write down the values of x in the interval $x \in [-90°; 360°]$ for which graph f is decreasing. (2)

6.3 P and Q are points on graphs g and f respectively such that PQ is parallel to the y-axis. If PQ lies between A and B, determine the value(s) of x for which PQ will be a maximum. (6)

[10]



(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
Q 6.1. & Q 6.2 well answered
Q 6.3. Poorly answered

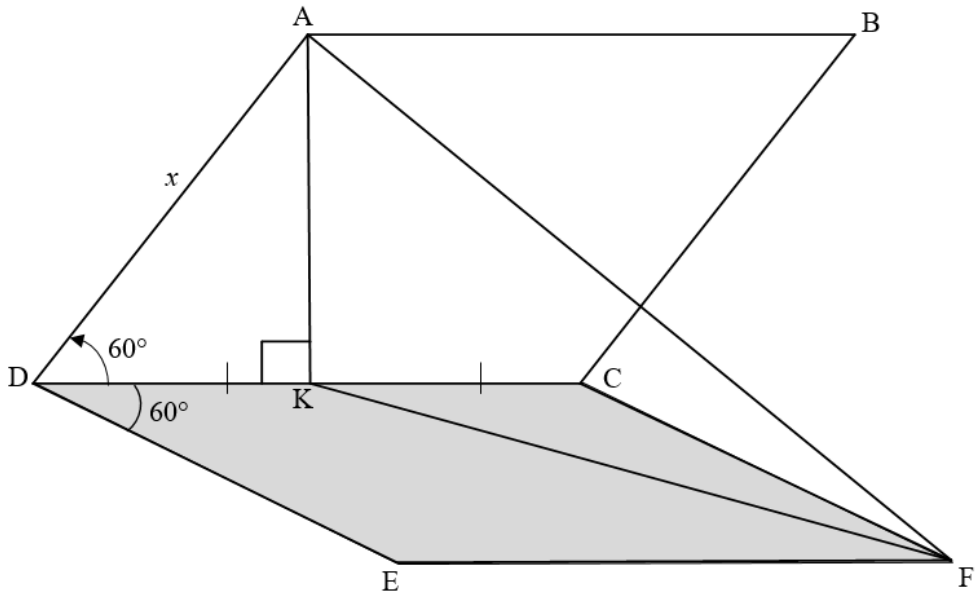
(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
Candidates find it challenging to locate P and Q on the graph which is parallel to the y axis.
Though they subtracted the two graphs correctly, they couldn't go further. This was an
integration of P1 and P2. Although the perpendicular distance between two functions is
usually examined in Paper 1, trigonometric functions cannot be excluded from this.
Many candidates are confused with decreasing and f(x)< 0. F(x) < 0 means they have to look
where the graph lies below the x axis.
6.3 Was a higher order question which needs a thorough understanding of maximum value.

(c) Provide suggestions for improvement in relation to Teaching and Learning
Educators are encouraged to integrate the different topics as this is done increasingly in P1
& P2. Teachers must teach learners the perpendicular distance between any two functions
for P1 and P2. Tell them not to find the derivative of trig functions because it is not in the
syllabus.
Graph interpretation is still a challenge. Educators must explain more the difference between
decreasing and strictly decreasing in their teaching.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
6.1 Candidates incorrectly write interval as $-2 \geq y \leq 0$ or $y \in$(0;-2
6.2 Candidates incorrectly write interval as $180° < x < 270° or\ x \in [-90°; 90°]$
6.3 Equation is differentiated incorrectly for example $-2\sin^2 x - \sin x + 2 = PQ$ $-4\sin x - 1 = PQ^2$
PQ represents a parabolic function. To find the maximum value of a parabolic function,
learners had to find $\sin x = \frac{-b}{2a} = -\frac{1}{4}$ or should have written in the form $PQ = a(x-p)^2 + q$

QUESTION 7

The diagram below shows a solar panel, ABCD, which is fixed to a flat piece of concrete slab EFCD. ABCD and EFCD are two identical rhombuses. K is a point on DC such that $DK = KC$ and $AK \perp DC$. AF and KF are drawn. $A\hat{D}C = C\hat{D}E = 60°$ and $AD = x$ units.

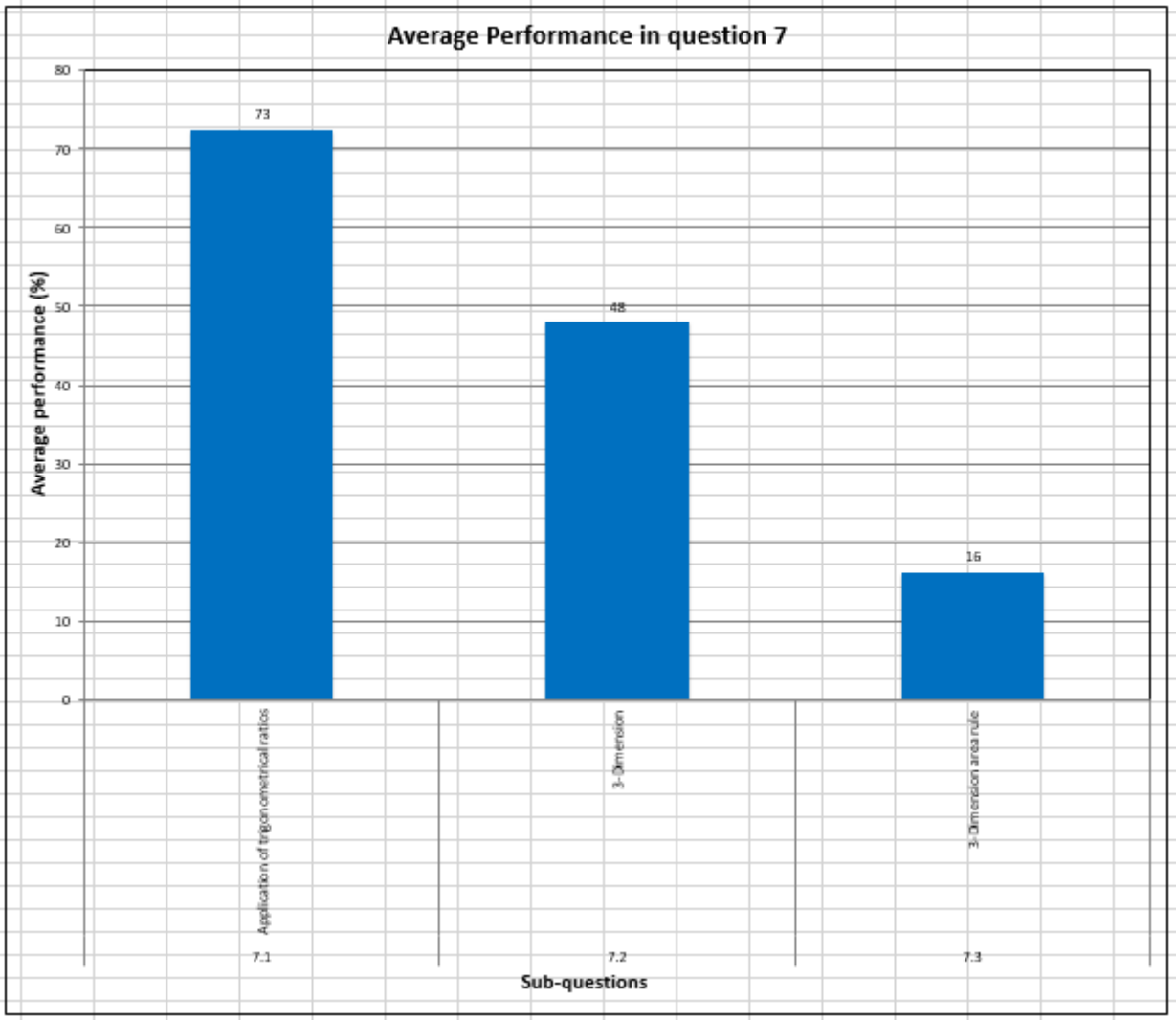


7.1 Determine AK in terms of x. (2)

7.2 Write down the size of $K\hat{C}F$. (1)

7.3 It is further given that $A\hat{K}F$, the angle between the solar panel and the concrete slab, is y. Determine the area of ΔAKF in terms of x and y. (7)

[10]



(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
Q 7.1 and Q7.2 was well answered
Q 7.3 poorly answered

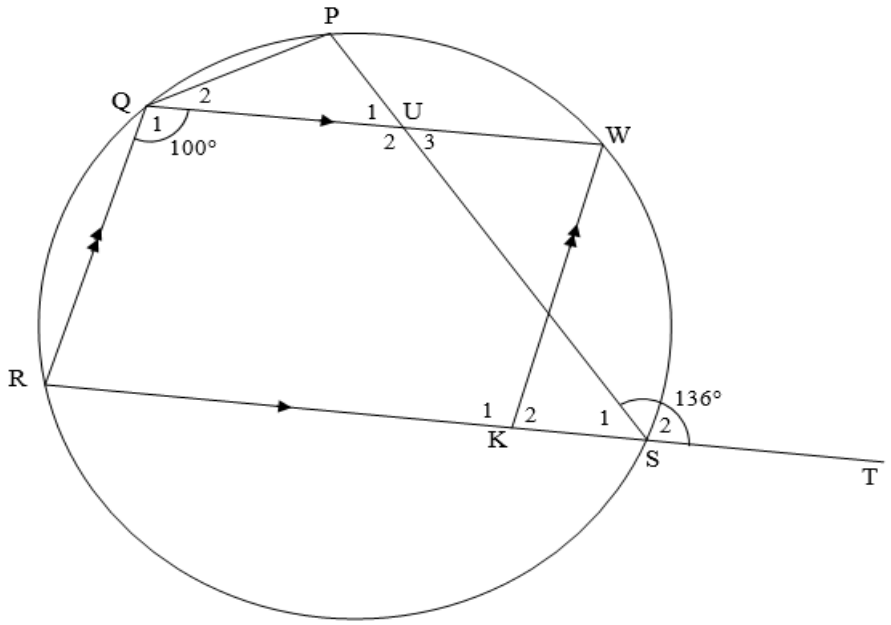
(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
7.3 Was a higher order question with 7 marks. The question was supposed to be broken down
into sub-question to give a hint to the learners.
Candidates have to first use cosine rule to calculate the length of KF and then area rule in
triangle AKF to find the area of the triangle.
Some candidates do not know the difference between 2D and 3D.

(c) Provide suggestions for improvement in relation to Teaching and Learning
Educators are encouraged to do more examples on 2D and 3D in class including using
compound angles and double angles in 3D shapes.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
The solar panel and the concrete slab formed a problem in 3 dimensions. Though $A\hat{K}F = y$
it does not mean that $A\hat{K}C + C\hat{K}F = y$. Many candidates assumed that and calculated
$C\hat{K}F = y - 90°$ which was a breakdown and got zero for that question.

QUESTION 8

8.1 In the diagram, PQRS is a cyclic quadrilateral. Chord RS is produced to T. K is a point on RS and W is a point on the circle such that QRKW is a parallelogram. PS and QW intersect at U. $P\hat{S}T = 136°$ and $\hat{Q}_1 = 100°$.



Determine, with reasons, the size of:

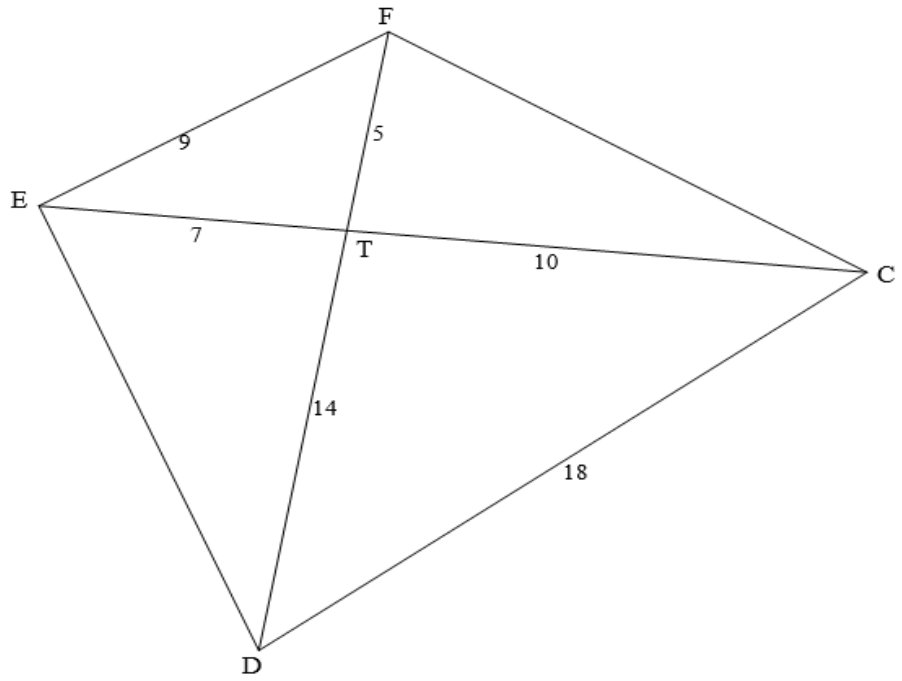
8.1.1 $\hat{R}$ (2)

8.1.2 $\hat{P}$ (2)

8.1.3 $P\hat{Q}W$ (3)

8.1.4 $\hat{U}_2$ (2)

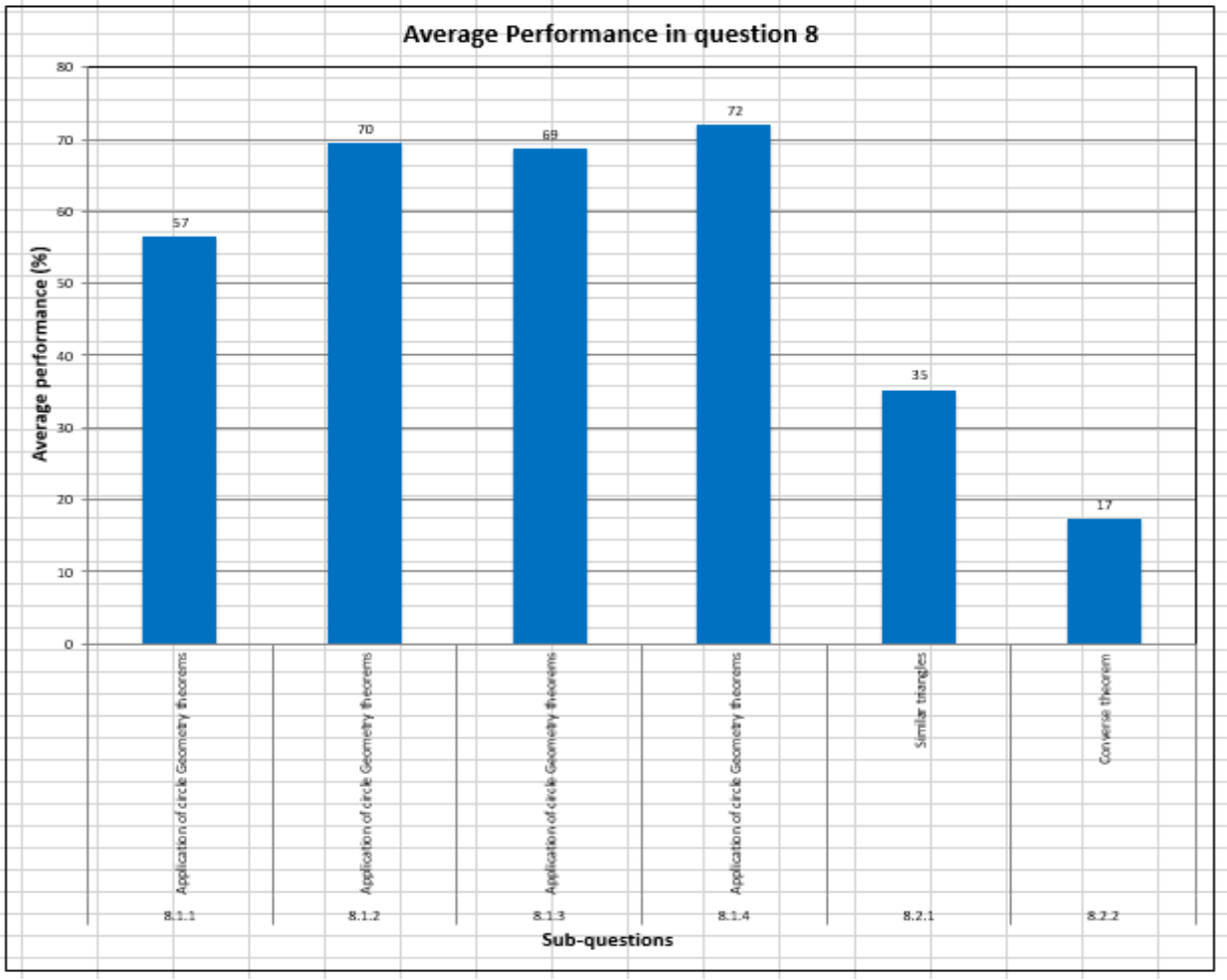
8.2 In the diagram, the diagonals of quadrilateral CDEF intersect at T.
EF = 9 units, DC = 18 units, ET = 7 units, TC = 10 units, FT = 5 units and TD = 14 units.



Prove, with reasons, that:

8.2.1 $E\hat{F}D = E\hat{C}D$ (4)

8.2.2 $D\hat{F}C = D\hat{E}C$ (3)
[16]



(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
Q 8.1.1 to Q 8.1.4 Were attempted correctly by almost all the candidates even though
some reasons were not correct.
Q 8.2 Was poorly answered.

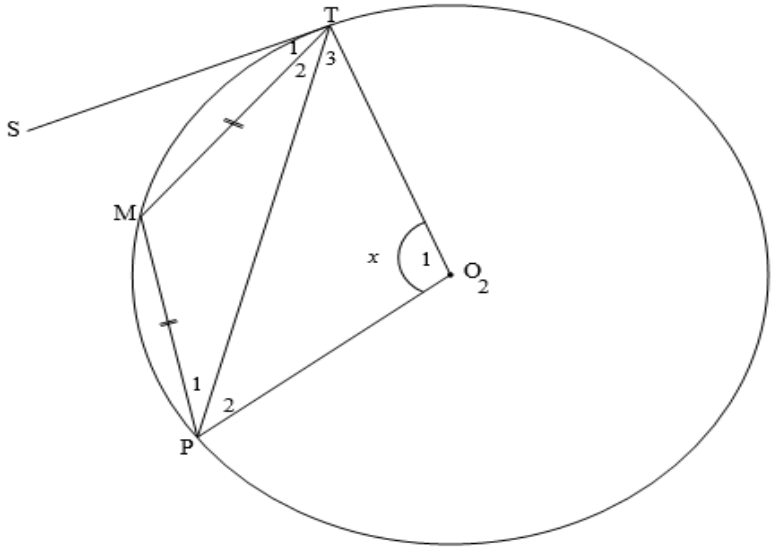
(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
Basic application of theorems is lacking in some learners.
Some candidates who attempted the question lost marks for reasons and making assumptions
Candidates struggle to prove triangles similar by using sides that are proportional.
Q 8.2.2 Candidates could not conceptualize that they first had to prove that EFCD is a
a cyclic quadrilateral.

(c) Provide suggestions for improvement in relation to Teaching and Learning
Educators are encouraged to help learners on how to identify theorems to use in a given
diagram as well basic application of those theorems.
Educators must emphasize the correct and acceptable way of proving why a figure is a
cyclic quadrilateral. Using converse of particular theorems as a reason is still a challenge to
many candidates. Compared to the last few years, there has been an improvement in using
the word **converse** as part of the reason. Teachers should teach similar triangles by
proving corresponding angles equal **and** corresponding sides in proportion.
There has also been an improvement in including the parallel lines with alternate,
corresponding and co-interior angles.

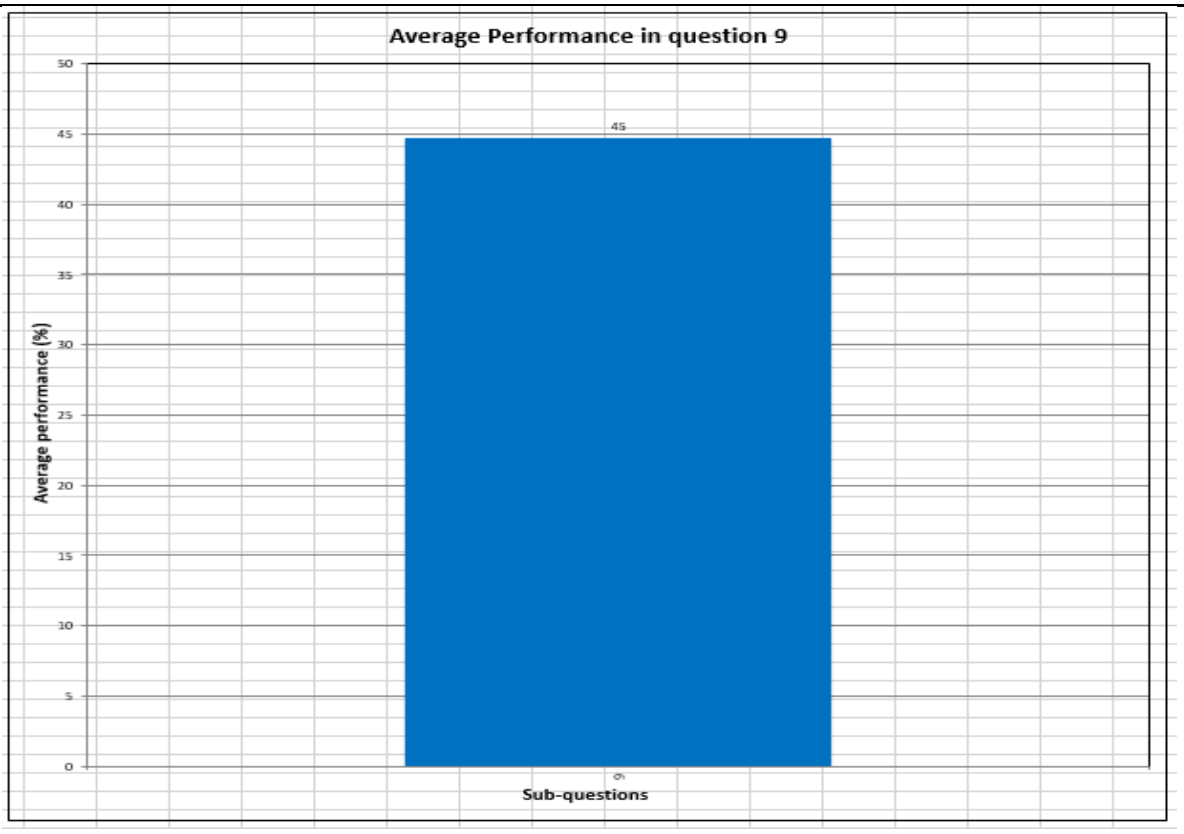
(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Though there is an improvement in the responses of learners in Euclidean Geometry,
there are some learners and teachers who still struggle with this topic.

QUESTION 9

In the diagram, O is the centre of the circle. ST is a tangent to the circle at T. M and P are points on the circle such that TM = MP. OT, OP and TP are drawn. Let $\hat{O}_1 = x$.



Prove, with reasons, that $S\hat{T}M = \frac{1}{4}x$. [7]



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

Q 9: Was attempted by many learners but answered poorly.

(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
Many basic geometric concepts were needed. Combining them was really a problem.
Angles around a point , angles at the centre, angles opposite equal sides,
tangent and chord theorem and tangent $\perp$ radius were the key theorems in this question.
The fraction complicated the question even more. Candidates have challenges in working
with fractions.
Candidates wrongly assumed that TMPO is a cyclic quadrilateral of which it is not.
They calculated $\hat{M} = 180° - x$ and could therefore not prove that angle $S\hat{T}M = \frac{1}{4}x$.

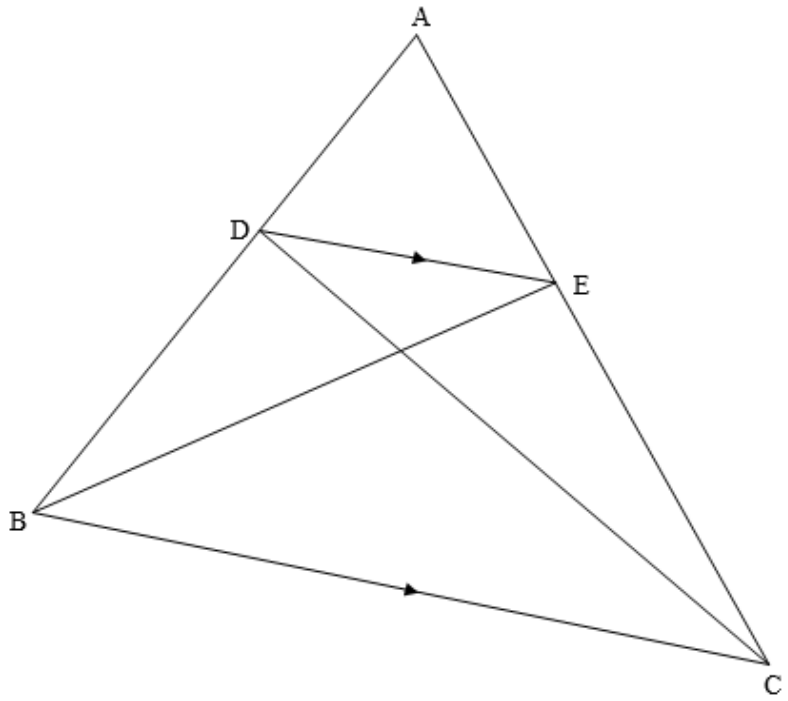
(c) Provide suggestions for improvement in relation to Teaching and Learning
Candidates are still struggling to use the acceptable reasons. All teachers and learners should
have a copy of examination guidelines that highlight the acceptable reasons for Euclidean
geometry.
Examples of incorrect reasons:
• centre theorem instead of angle at centre = 2x angle at circumference.
• Isosceles triangles instead of angles opposite = sides
• Prop theorem instead of Prop theorem ;AB//CD.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Regular Euclidean workshops for teachers that have challenges with this topic , is
recommended.
Schools are encouraged to have regular subject meetings every week to discuss different
teaching strategies.

QUESTION 10

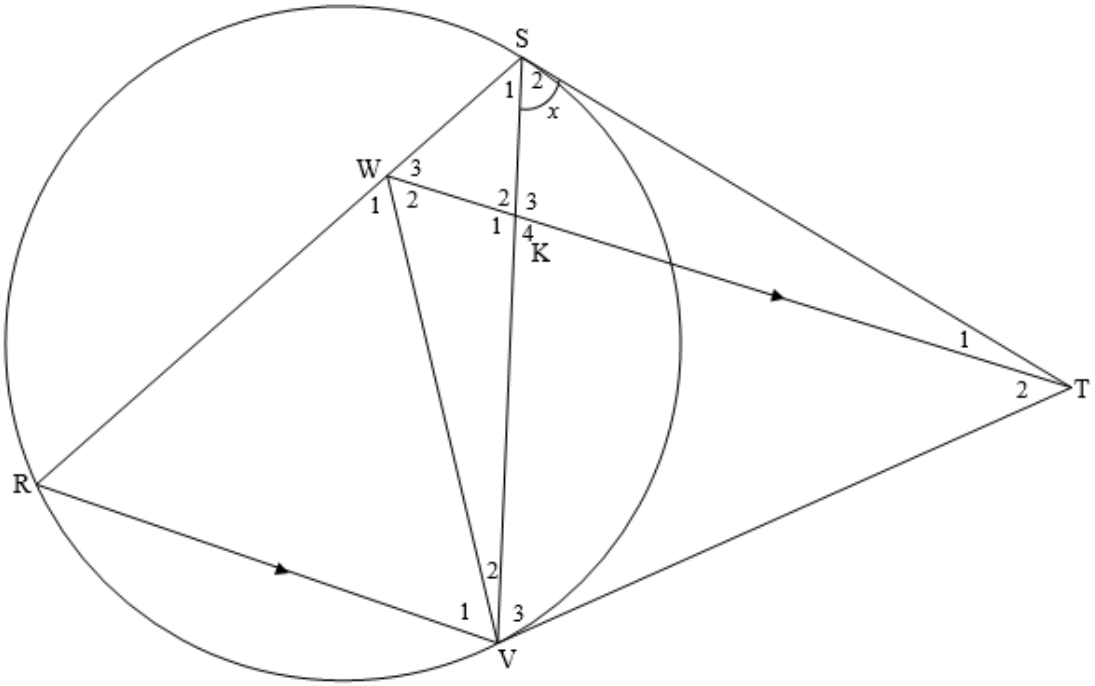
QUESTION 10

10.1 In the diagram, ΔABC is drawn. D is a point on AB and E is a point on AC such that DE || BC. BE and DC are drawn.



Use the diagram to prove the theorem which states that a line drawn parallel to one side of a triangle divides the other two sides proportionally, in other words prove that $\frac{AD}{DB} = \frac{AE}{EC}$ (6)

10.2 In the diagram, ST and VT are tangents to the circle at S and V respectively. R is a point on the circle and W is a point on chord RS such that WT is parallel to RV. SV and WV are drawn. WT intersects SV at K. Let $\hat{S}_2 = x$.



10.2.1 Write down, with reasons, THREE other angles EACH equal to x. (6)

10.2.2 Prove, with reasons, that:

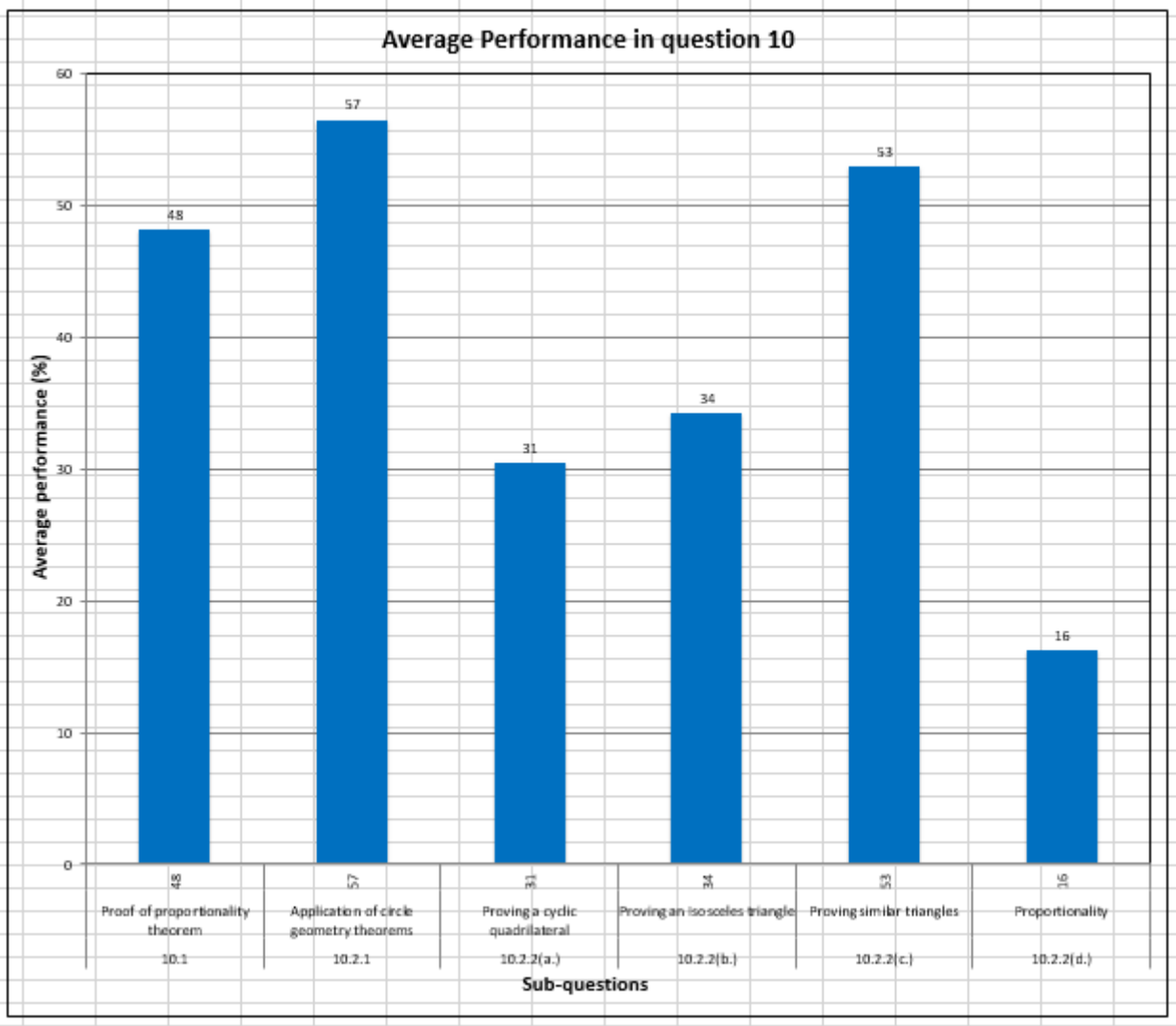
(a) WSTV is a cyclic quadrilateral (2)

(b) ΔWRV is isosceles (4)

(c) $\Delta WRV \,|||\, \Delta TSV$ (3)

(d) $\frac{RV}{SR} = \frac{KV}{TS}$ (4)

[25]



(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
Q 10.1 Was answered reasonable.
Q 10.2.1 well answered
Q 10.2.2(a) relatively well answered
Q 10.2.2(b)not well answered though attempted by most learners
Q 10.2.2(c) was not answered well
Q 10.2.2(d) very poorly answered

(b) Why the question was poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
Q 10.2.1 Candidates give statements with wrong reason, eg. Instead of using tangents from the
common point they use angles opposite equal sides without mentioning the tangents are
equal. The order in which three angles equal to x were mentioned, was important.

Candidates started incorrectly by stating that $\hat{S}_2 = \hat{W}_2$, assuming that WSVT is a cyclic
quadrilateral. This was considered as a breakdown.
Q 10.2.2(c) Many candidates simply matched up the angles correctly but struggled to reason
correctly. e.g $\hat{W} = \hat{T}, \hat{R} = \hat{S}$ and $\hat{V} = \hat{V}$ (common) which was a breakdown.
Q 10.2.2(d) Candidates had to use a combination of similarity and proportionality. Many
candidates could not choose the correct ratios and the two correct triangles to prove that
$\frac{RV}{SR} = \frac{KV}{TS}$.

(c) Provide suggestions for improvement in relation to Teaching and Learning
Educators must frequently make an appointment with subject advisor for assistance.
Geogebra could be used to provide visual reinforcement of how the theorems work and how
they are applied in various situation.
Geogebra helps learners to discover for themselves the different theorems. This helps them to
to remember theorems for longer without the teacher telling them.

(d) Describe any other specific observations relating to responses of learners and comments that are useful to teachers, subject advisors, teacher development etc.
Educators must alert candidates to a combination of similar triangles and parallel lines in one
diagram. Usually, both of these will be combined for a higher order question.
Educators must also alert candidates to equal lines in a diagram that can lead to
replacement in equal ratios.
Educators need to consult subject advisor if they need training and apply for teacher
development quarterly
THE SECRET TO SUCCESS IS PRACTISE.
Practice, practice, practice from the beginning of the year till the end of the year!!!