PRINCIPAL EXAMINER'S REPORT

BOTSWANA
EXAMINATIONS
COUNCIL

BGCSE MATHEMATICS

2023

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Paper 1: Written Paper

GENERAL COMMENTS

1. Most of the candidates attempted all questions, although there were many cases of erased or cancelled working which led to loss of marks. Candidates need to be advised not to erase or cancel their working.
2. Candidates lacked computational skills, e.g multiplication: they resorted to adding repeatedly, which also had numerical errors.
3. There was evidence of use of pencil in diagrams which is an improvement compared to previous years. Use of free hand in drawing linear graphs or histograms still evident, there is need to advice candidates that they lose marks when they use free hand.
4. although there was a noticeable pattern of students leaving blank spaces, indicating potential gaps in understanding or issues with time management. This was particularly evident in both the questions where students either did not attempt or partially completed them.

Section 2: Comments on Individual Questions

1		The question was generally poorly done as most of the candidates failed to solve the indices. They had common errors in indices such as multiplying the powers $13 \times 9 = 117$, or subtracting the powers $13 - 9 = 4$. This suggests a need to ensure that candidates grasp the laws of indices.
	Answer:	**22**
2.		Most of the candidates performed well in this question as they were able get the 5th term as 9 by subtracting 5 from 14. The weaker candidates had 34, obtained by adding 5 to 29 whereas some had the expression for the nth term.
	Answer:	**9**
3.		The question was poorly done and some of the responses from the candidates were: $q = \sqrt{p - 2r}$, $q = p^2 - 2r^2$, $q = p^2 - 2r$, $q = 2r - p$, $q = p^2 - 4r^2$ and $\sqrt{q} = \sqrt{p - 2r}$.
	Answer:	$\boldsymbol{q = (p - 2r)^2}$

4		This question was fairly done. Some candidates managed to express the number in standard form but failed to correct it to 2 significant figures whereas some managed to correct it to 2 significant figures but failed to express it in standard form.
	Answer:	**1.9×10^5**
5		This question was poorly done as most of the candidates were adding and subtracting 5 from 325, some further dividing the result by 5 , in an attempt to get the upper bound and lower bound respectively. Fewer candidates who managed to get upper bound and lower bounds, were not able to write them in a proper format (limits statement) ,that is , the lower bound was written at the upper and upper at the lower. Common wrong answers were, 320 ≤w≤330, 60≤w≤65
	Answer:	**$322.5 \leq w < 327$.**
6		The question was poorly done as most of the candidates divided the volume by length of the side instead of dividing by the area, 180÷6=30. Those who managed to find the area failed to make *h* the subject, that is, they subtracted 36 instead of dividing by 36 both sides. Some of the candidates used volume of pyramids $\frac{1}{3} \times 36 \times h = 180$
	Answer:	**5**
7		Majority of the candidates performed fairly on this question as they were able to find the lowest common denominator and multiplied the numerators by the correct factors but failed to resolve the brackets, that is, 3(x+1) was resolved as 3x+1.
	Answer:	$\frac{\boldsymbol{8x+3}}{\boldsymbol{x(x+1)}}$
8		Most of the candidates performed well in this part of the question, they multiplied 200 by 150 and divided the result by 10 to get 3000. The few who failed the question had the correct method but the arithmetic skills failed them.
	Answer:	**3000**

9	(a)	This part of the question was well done as majority of the candidates were able to find the total amount the customer had to pay save for the weaker candidates who either added P12.00 and P1.50 to get P13.50 or added P12.00 to P5.50 to get P17.50.	
	(b)	This part of the question was well done as most the candidates subtracted their answer in part (a) from P50.	
	Answers:	**(a) 31.00**	**(b) 19.00**
10		The question was well done as most of the candidates were able to substitute correctly in the formulae but just a few were not able to resolve having wrong answers as 5.4 or 5.2.	
	Answers:	**5.8**	
11		This question was well done. Most of the candidates were able to calculate the percentage increase. The weaker candidates had $\frac{5000}{15000} \times 100 = 33.3\%$ *or* $\frac{15000}{20000} \times 100 = 75\%$.	
	Answers:	**25**	
12		This part of the question was fairly done as most of the candidates managed to divide 360 by 15 but failed to resolve. The weaker candidates calculated the size of interior angle, that is, $\frac{13\times180}{15} = 156$ while others had $\frac{180}{15} = 12$ *or* $180 - 15 = 165$ *or* $13 \times 180 = 2340$.	
	Answers:	**24**	
13		Fairly done. Most of the candidates were able to add the part ratios(11+14+5) and use their result (5/30× 18) to find the smallest area though they failed to resolve it correctly. Those candidates who got it wrong mostly wrote 5/18× 30 = 108, 5/30× 100, 5/18× 100	
	Answers:	**3**	

14		Poorly done. Most of the candidates failed to account for all the details provided in the question.They only managed to get either the amount of medicine given to one puppy in a day . i.e (2 x5ml x2 =20ml), leaving out the 10 puppies, OR the 10 puppies x 2 x 5ml =100ml, leaving out twice a day. Some of the few candidates who managed to get all the details provided, they failed to convert matric units between litres and millilitres. Common wrong methods which include the following:1L=100ml , leading to 100/20,(amount for 1 puppy, same as 1000/20= 50 $days$ instead of 1000/200). Other common wrong methods were, 1000/100 = 10 $days$, , 10/5= 2 $days$,		
	Answers:	**5**		
15	(a)	This part of the question was well done. Majority of the candidates were able to calculate distance travelled by the car in the first hour.		
	(b)	This part of the question was fairly done as most of the candidates were able to draw the first part and second part of the journey correctly but failed to draw the third part of the journey correctly. The third part of the journey was plotted at (3,100) as they failed to add the distance of the first part of the journey. Majority of the candidates performed poorly on this part of the		
	(c)	question as they did not include the time the car stopped as evidenced by dividing 160 by 2.5 instead of 160 divided by 3.		
	Answers:	**(a) 60**	**(b) correct lines drawn**	**(c)** $53\frac{1}{3}$
16.		This question was fairly done as most of the candidates were able to identify the transformation as translation but failed to give the correct vector. Most of them either had $\begin{pmatrix}5\\-3\end{pmatrix} or \begin{pmatrix}-3\\5\end{pmatrix} or \begin{bmatrix}-5 & 3\end{bmatrix}$ as the column vector.		
	Answer:	**Translation column vector** $\begin{pmatrix}-5\\3\end{pmatrix}$		

17.	(a)	This part of the question was fairly done; Weaker candidates could not relate the coordinates with position vector. Some candidates divided ($-8,6$) by 2 to get $(-4,3)$ and some had $(6,-8)$	
	(b)	The part question was fairly done, most of the candidates were to use the correct method, common errors included mostly 8 + 6 =14, 8 + -6 = 2/-2, 8*6 = 48, not putting values under the square root, alongside errors in misunderstanding the application of the square root function for those who managed to score the method mark as having square root of 100 as 5,50,25.	
	Answers:	**(a) (-8 , 6)**	**(b) 10**
18		This question was fairly done as most of the candidates were able to state the transformation enlargement and the centre of enlargement but failed to get the scale factor. Most of the candidates stated the scale factor as -3 and 3 instead of $\frac{1}{3}$.	
	Answer:	**Enlargement, Scale factor = 1/3, centre (1 , 2)**	
19.		The question was well done though a few candidates used free hand instead of ruler to draw a histogram, some shifted the bars five units to the right, only shaded the area where bars of the histogram were supposed to be without drawing bar boundaries. It was also noticed that a few drew frequency polygons. Some candidates used frequency 9 instead of 7 in second class, and frequency 2 instead of 3 in third class.	
	Answer:	**correct histogram drawn (12 :7: 10 :3 or 1.2: 0.7 :1.0: 0.3)**	
20	(a)	This part of the question was fairly done; Weaker candidates could not relate the direction of the directed line segment, that is, they had column vectors($\begin{matrix}8\\-6\end{matrix}$) or ($\begin{matrix}8\\6\end{matrix}$).	
	(b)	This part of the question was fairly done as most of the candidates were able to substitute the vector components correctly in the magnitude formula but failed to resolve, that is, $\sqrt{-8^2+6^2}$ = $\sqrt{-64+36}$ or $\sqrt{8^2+6^2}$ = $\sqrt{16+12}$	
	Answers:	**(a)** $\begin{pmatrix}-8\\6\end{pmatrix}$	**(b) 10**

Paper 2: Written Paper

Section 1: General Comments

There were significant number of cases where candidates prematurely approximated in the working stages leading to answers that were often out of range. The expectation is that the final **answers** should be approximated to three significant figures. Answers to angles should be approximated to one decimal place.

There were significant number of cases where candidates omitted working.

In questions involving ratio, some candidates will give the ratio then the final answer without showing working. A ratio by itself is not a method, its interpretation is the method. Candidates need to be encouraged to adequately interpret how they obtain answers from a ratio.

The issue of accuracy was especially observed in questions involving money. Although the required accuracy to the nearest thebe was given, candidates very often wrote their amounts to the nearest five thebe. A lot of numerical answers that were not involving money were approximated to two significant figures leading to loss of marks.

The cohort was especially challenged in the lowest common factors of fractional expressions and fractional equations. There was a tendency to just collect like terms in the numerators and denominators in algebraic expressions. The expression $\frac{2x+5}{3}+\frac{x}{1.5}$ was very often simplified as $\frac{2x+5+x}{3+1.5}=\frac{3x+5}{4.5}$. In the solving of simultaneous equations, the multiplying out of the equations by constants was often punctuated by numerical errors such as 2 × 3 = 9 or 2 × 3 = 10

There is still use of free hand in drawings, especially in transformations, in this case translation. In the construction of the triangle, it was rare to see evidence of the use of a pair of compasses. The cumulative frequency curve was sometimes drawn with a free hand at the bottom, a straight edge from the point (175, 28) to the point (180, 58) and then free hand to the end. Some candidates drew a cumulative frequency polygon first and then overwrote with free hand leading to grossly thick curves. The scale of the vertical axis posed a serious challenge to the interpretation of the curve.

A lot of candidates were not able to use the calculator efficiently as evidenced by long multiplication punctuated by numerical errors.

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Section 2: Comments on Individual Questions

QUESTN	PART QUESTN	COMMENTS ON INDIVIDUAL QUESTIONS

1	(a)	This part of the question was poorly done. Indeed, very few candidates scored all the marks. Some candidates scored the method mark but had numerical errors from long multiplication. The most common wrong answers were 6517 because of 1.75 × 3724 and went no further, and 2128 because of 3724 ÷ 1.75.
	(b)	A fair proportion of the candidates were able to access the method mark by multiplying their total number of tickets by the cost of a ticket. Some candidates correctly calculated the total number of tickets and went further to calculate the total amount of ticket sales. The most common wrong answers were P429 796.15 because of 6517 × 65.95 and P245 597.30 because of 3724 × 65.95.
	Answers	**(a) 10 241 (b) P675 393.95**
2	(a)	A large proportion of the candidates converted P3000 correctly into Rands. The most common wrong answers were R2189.78 because of 3000 ÷ 1.37 and 3001.37 because of 3000 + 1.73.
	(b)	A few candidates were able to calculate the required percentage change. A fair proportion were able to correctly calculate the percentage change but got 2.2% owing to premature approximation. Numerical answers should given correct to three significant figures. The most common wrong answers were 97.8% owing to $\frac{1.34}{1.37} \times 100$; 2.24% owing to $\frac{0.03}{1.34} \times 100, and \frac{1.34-1.37}{1.37} \times 100 = -2.19\%$. Some candidates had -97.8%, some had 3% while other calculated the difference and went no further.
	Answers	**(a) R4 110 (b) 2.19%**
3		A few candidates correctly calculated the total surface area of the cone. Some candidates correctly wrote the addition of the surface area but were unsuccessful in using the calculator to work out the sum. Some candidates had premature approximation of the areas in the working stage and had sums out of range. Some candidates were successful in calculating the area of the circle but used the perpendicular height of 11.44 to calculate the curved surface. The most common wrong answers were 58 974 owing to $\pi \times 7.58 \times 7.58 \times \pi \times 7.58 \times 13.72$ and 223.7 owing to $\pi \times 7.58 \times 7.58 + \frac{1}{2} \times 7.58 \times 11.44$. Some calculated the area of the dotted triangle and went no further.
	Answer	**507**
4	(a)	A fair proportion of the candidature was successful in identifying the angle CAB. However, the geometrical reasons advanced for the size of angle were not true. The most common wrong answers were 55°and the phrase “right angle”. The most common reasons were a right-angled triangle, the angle between a tangent and radius add to 90°, and the angle between a tangent and circumference and in some instances chord.
	(b)	Poor performance was observed on this part of the question. A third of the candidature successfully used either the Tan ratio or the Sine rule to calculate the length of the tangent. The most common wrong answers

		were 1.61 owing to 2.3 Tan 35° and 6.57 owing to 4.6 ÷ Tan 35°. Some candidates did not attempt this part question.
	Answers	**(a) 90°. The radius is perpendicular to the tangent at the point of contact.** **(b) 3.22 [Grads 3.16, 2.82]**
6	(a)(i)	A fair proportion of the candidature was able to write down the expression for the time taken to walk the distance of $(2x + 5)$ m. Some candidates had $x = \frac{2x+5}{3}$, from confusing an expression with an equation. The most common wrong answers were $\frac{3}{2x+5}$, $\frac{2x+5}{x}$, and $3(2x + 5)$.
	(a)(ii)	Poor performance was observed on this part of the question. Only a third of the candidature had the required expression for the total time. Some candidates had $x = \frac{2x+5}{3} + \frac{x}{1.5}$ while others had $\frac{3}{2x+5} + \frac{1.5}{x}$. The other third had $\frac{2x+5+x}{3+1.5}$ owing to adding the numerators together and the denominators together. The last expression was often simplified to obtain $\frac{3x+5}{4.5}$.
	(b)	Poor performance was also observed on this part of the question. The mixed fraction was converted into vulgar fraction $\frac{13}{4}$, the whole number 15 and the decimal fraction 3.45. These conversions and expressions from part (a)(ii) resulted in the equations $\frac{2x+5}{3} + \frac{x}{1.5} = 3.45$ resulting in $x = 1.3375$, $\frac{2x+5}{3} + \frac{x}{1.5} = 15$ resulting in $x = 10$, and $\frac{3x+5}{4.5} = 3.75$ resulting in $x = 3.96$. Some candidates successfully formed the required equation, $\frac{2x+5}{3} + \frac{x}{1.5} = 3\frac{3}{4}$, but simplified it to $6x + 7.5 = 3.75$ and obtained $x = -0.625$. Distance cannot be negative it is a scalar quantity.
	(c)	A fair proportion of the candidature was able to successfully substitute their distance obtained in part (b) in the required expression of $(2x + 5)$ and resolved correctly. Some candidates had 2,71 from substituting the correct answer of $x = 1.5625$ into the expression $\frac{2x+5}{3}$.
	Answers	**(a)(i)** $\frac{2x+5}{3}$ **(a)(ii)** $\frac{2x+5}{3} + \frac{x}{1.5}$ **(b) 15625** **(c) 8.125**
7		A large proportion of the candidature were successful in solving the simultaneous equations by elimination. Some candidates were successful in multiplying both equations by the constants but then added instead of subtracting. Some candidates attempted to eliminate both variables and had $10x + 15y = 55$ and $10x + 15y = 28$ by fortuitously multiplying 3 by 2 and obtaining 15 instead of $6y$.
	Answers	$x = 1, y = 3$
8		A fair proportion of the candidature was able to translate the given triangle. A few candidates translated the point (2, 4) to (-4, 0). Some candidates translated the objects using small divisions instead of the expected units. A third of the candidature rotated the object through different centres through

		180° in either direction. There were a few cases of positive enlargement, especially with scale factors 2 and 3, with different centres as well.
	Answer	**Image with vertices $(-2, 1)$, $(-2, 2)$, and $(0, 1)$**
9		This question was poorly done. A fair proportion of the candidature calculated the number of classrooms using direct proportion and had 22 by truncating $\frac{25\times35}{40}$. Some candidates calculated the total number of learners and had 1400 but went no further. Some candidates had 29 obtained by truncating $\frac{25\times40}{35}$.
	Answer	**56**
10		This question was poorly done. Some candidates calculated the depreciation of the first year and had P32 098.63, multiplied it by 3 years and subtracted the product to obtain P160 493.13 thereby applying simple interest. Some candidates worked out the depreciation using the long method and went as far as the second year and had P196 604.08 while some went further to the third year but truncated to obtain P172 028.56. The working stages were punctuated by a lot of numerical errors involving subtraction and premature approximation. A significant number were able apply the compound interest formula, had $256\,789(1-\frac{12.5}{100})^3$ but were not successful in using the calculator correctly.
	Answer	**P172 028. 57**
11	(a)	Poor performance was observed on this part of the question. Only a third of the candidates were successful in calculating the area of the compound rectilinear cross-section. A fair proportion of the candidature was successful in calculating an area amounting to more than half of the cross-section and obtained areas such as 357 from $\frac{1}{2}(7.5+18)\times28$, 378 from $\frac{1}{2}(14+28)\times18$, and 252 from 18×14. There were a few cases where candidates had 67.5 obtained from adding all the given lengths and 52 920 obtained from $28\times18\times14\times7.5$. A large proportion of the candidates treated the cross-section as a trapezium.
	(b)	A large proportion of the candidates were able to calculate the volume of the kerbstone using their cross-sectional area obtained from part (a). The most common wrong answers were 47 250 obtained from 378×125, 44 625 obtained from 357×125, and 63 000 obtained from $125\times18\times28$. Some candidates confused prisms and pyramids and had $\frac{1}{3}\times18\times28\times125$.
	(c)	A large proportion of the candidature was able to use the volume obtained in part (b) correctly to calculate the mass of the kerbstone. Some candidates had 113 400 obtained from $2.4\times47\,250$, while others had 107

		100 obtained from 2.4 × 44 625. A few candidates had 26 250 resulting from $\frac{63000}{2.4}$.
	Answers	**(a) 430.5 (b) 53812.5 (c) 129150**
12	(a)	A fair proportion of the candidature was able to recognise the order of rotational symmetry. Some candidates' response was "no order", some had order one while some had order 4. It was common to find the term "parallel" as the order of rotational symmetry.
	(b)(i)	Poor performance was observed on this part of the question. Only about a third of the candidature was successful in calculating the size of the interior angle of a heptagon. Some candidates calculated the sum of interior angles of a heptagon and went no further. Other candidates calculated the size of an exterior angle of a heptagon and had 51.4. There was a significant number of candidates that did not attempt the part question.
	(b)(ii)	Poor performance was also observed on this part of the question, save for a third of the candidature. Most of the candidates divided their answer obtained in (b) (i) by 2. Very few candidates used the sum of interior angles of a quadrilateral, ABCG. Some candidates were able to recognise the interior angles in the parallel lines, thereby scoring the method mark. There was a significant number of candidates did not attempt the part question.
	Answers	**(a) 7 (b)(i) 128.6° (b)(ii) 51.4**
13	(a)	Few candidates were able to draw the correct image. A large proportion were able to correctly measure either the angle or the length thereby scoring a mark. There were few cases of free hand and broken lines.
	(b)(i)	A large proportion of the candidates were not able to correctly read the small divisions of a protractor, and as such angles such as 60.3° and 60.4° were common. The most common wrong answer was 33°, the size of angle *UST*.
	(b)(ii)	This part of the question was poorly done. Some candidates constructed the arcs and went no further. Other candidates had the correct construction but had a broken perpendicular bisector. The expectation is that the bisector should be solid because all the points on it are the locus. A few candidates constructed the perpendicular bisector of ST. A good number of the candidates did not attempt this part of the question.
	Answers	**(a) Correct triangle (b)(i) 64 ±2° (b)(ii) Solid perpendicular bisector of TU**
14	(a)	A large proportion of the candidates could express 162 as a product of its prime factors. A few candidates had 1 × 2 × 3 × 3 × 3 × 3 which did not score as one is not prime. Some candidates had 2 × 9 × 9 which also did not score.
	(b)	This part of the question was poorly done. A few candidates determined the required highest common factor (HCF) by expressing the number of vegetables as a ratio in its simplest form. Some candidates listed the

		factors of 90, 108 and 162 with some errors and omissions and were thus not successful in identifying the HCF. Such candidates had HCF = 9. Some candidates expressed 90 and 108 in prime factor form and went no further. Still some candidates did not attempt this part question.
	(c)	A fair proportion of the candidates were able to obtain the method mark by dividing the number of onions with the largest number of bags. The most common wrong answer was 2.22 because of 360 ÷ 162 and 18 because of 162 ÷ 9.
	Answers	**(a) $2 \times 3 \times 3 \times 3 \times 3$ (b) 18 (c) 9**
15	(a)	A fair proportion of the candidates were successful in calculating the required gradient. Some candidates calculated the gradients but prematurely approximated the answer and had 1.3. Some candidates calculated the distance travelled in the first 15 seconds and had $\frac{1}{2} \times 15 \times 20 = 150$. Other candidates had $\frac{15}{20} = 0.75$, and -1.33.
	(b)	A fair proportion of the candidature was able to calculate area under the graph and had $\frac{1}{2}(25 + 40) \times 20 = 650$. Some candidates used the area of a trapezium correctly but were not able to use the calculator effectively. Other candidates partitioned the area into a triangle and rectangle but often had wrong dimensions for the rectangle. The most common wrong answer was 20 × 40 = 800.
	Answers	**(a) 1.33 (b) 650**
16	(a)	This part of the question was well done. The most common wrong answer was $(-6, -1)$.
	(b)	A third of the proportion of the candidature successfully solved the quadratic equation by graphing. Some candidates had one wrong solution from omitting the negative sign. Some candidates attempted to solve the equation by quadratic formula and were not successful in effectively using the calculator.
	Answers	**(a) $(-1, -6)$ (b)(i) $x = -3.45 \pm 0.05$, $x = 1.45 \pm 0.05$**
17		A fair proportion of the candidature was able to expand and simplify the binomial product correctly. Some candidates were able to remove the brackets but were unsuccessful in collecting like terms and had $m^2 - 7m - 12$ while others had $m^2 - 12$.
	Answer	**$m^2 - m - 12$**
18	(a)	A third of the candidature was successful in plotting and drawing of the curve to the allowed accuracy. Some candidates were successful in plotting the points but had horizontal curves for more than 3 small units. Some candidates plotted the lower bounds against the cumulative frequency while some plotted the class midpoints against the cumulative frequency. There were candidates that drew histograms instead of the curve. Some drew the

		histograms and then a curve through the midpoints of the bars of the histogram
	(b)(i)	A large proportion of the candidates were successful in estimating the number of athletes at a height of 172 cm. Those that were unsuccessful had 8 or 9 owing to the wrong interpretation of the height scale. The candidates read the scale as one small division equivalent to a centimetre of height instead of two small divisions. Candidates who used a straight edge had a common wrong answer of 15.
	(b)(ii)	A large proportion of the candidature were successful in estimating the median height. The most common wrong answers were 173.5 from the use of lower bounds and 171 from the wrong scale.
	Answers	**(a) Correct curve (b)(i) 12 ±2 (b)(ii) 176 ± 2**
19	(a)	A large proportion of the candidature was successful in listing the required triangular numbers. Some candidates had lists with an error of 8 instead of 10, or 18 instead of 15. Some candidates listed odd numbers while others listed multiples of 3.
	(b)	A large proportion of the candidature was able to state the probability of triangular numbers in the box. Some candidates had 4, probably because they had 4 triangular numbers in part (a). The same phenomenon was observed with the answer of 5.
	Answers	**(a) 3, 6, 10, 15 (b) 0.2**

Paper 3: Written Paper

Section 1: General Comments

Performance of candidates this year was generally slightly better than in the past few years. Most of the candidates have shown a great improvement in algebra especially forming and solving simultaneous equations and forming algebraic expressions. On the down side, this year more candidates converted the given fraction into a decimal in forming algebraic equation and ended approximating prematurely. Candidates this year also proved to be having challenges with questions on measures.

Section 2: Comments on Individual Questions

Question Number		Comments on individual questions
1	a)(i)	This part of the question was well done by most of the candidates. Those candidates that did not score the 1 mark had an answer of $192\ 600\ 00$ that was a result of $165\ 800\ 000 - 26\ 800\ 000$.
	a)(ii)	This part of the question was fairly done. Most of the candidates who did not score the marks had solutions like $\frac{139\ 000\ 000}{165\ 800\ 000} \times 100 = 83.8$ and $\frac{26\ 800\ 000}{165\ 800\ 000} \times 100 = 16.2$.
	b)	This part of the question was also fairly done. Most common incorrect responses were $580.39 - \frac{14.25}{100} \times 100 = 497.68$ and$580.39 + \frac{14.25}{100} \times 100 = 663.10$.
Answers		**1a)(i) 139 000 000a)(ii) 19.3b) 508**
2	a)	This part of the question was very well done. The candidates that did not score the mark had some responses like 55 as a result of $17 + 40$.
	b)	This part of the question was well done. Most of the candidates who did not score all the marks managed to calculate all the coefficients but did not substitute them all and gave responses like $2n^2 - 3n + c$ or $2n^2 - 3n + 1$, as a result of substituting a wrong value of c, that could not be traced. There were still some candidates who did not recognise that this was a quadratic sequence and hence gave their response as $4n + 1$.
Answers		**2a) 59 b) $2n^2$ - 3*n* + 5**
3	a)	This part of the question was fairly done. Most of the candidates who did not score all the marks managed to either write in standard form and not round off to 3 significant figures or managed to round off to 3 significant figures and did not write standard form, and gave their responses as 2.4×10^6 or 23.5×10^5 2.351627×10^6 or $2\ 350\ 000$. There were also those candidates that did not score any marks as they did achieve any of the objectives in the question and hence gave their responses as 23.5×10^6 or 2352×10^6.

	b)	This part of the question was also fairly done. Almost all the candidates that did not score marks here gave their response as $2.35 \times 10^6 - 1.89 \times 10^5 = 18\,900\,000$.
	c)	This part of the question was poorly done. Most of the candidates gave their response as $\frac{0.169 \times 2.35 \times 10^6}{100} = 3\,972$. There was also a significant number of candidates that changed 0.169% to 16.9%.
Answers		**1a) 2.35×10^6 b) 2.54×10^6 c) 1.39×10^9**
4	a)	This part of the question was fairly done. Most of the candidates that did not get it write had 70 as their angle and reasons like tangent and radius or a triangle in a semi-circle or angles in the same segment
	b)	This part of the question was also fairly done. The candidates that did not get it right had responses like $\frac{70}{2} = 35$ or 90 or 110, with reasons like angle in a semi-circle or angle subtended at the circumference is similar.
	c)	This part of the question was well done. The candidates that did not get it right mostly gave their response as 90, angle in a semi-circle or vertically opposite as their reason.
Answers		**a) 90 b) 70 c) 110**
5	a)	This part of the question was well done. Most of the candidates that did not score the mark had responses like $-5\boldsymbol{p}$ *or* $\frac{5}{6}\boldsymbol{p}$ *or* $2\boldsymbol{p}$ *or* $5TC$.
	b)	This part of the question was also well done. Some of the common incorrect responses were $3\boldsymbol{p} + \boldsymbol{q}$ *or* $-5\boldsymbol{p} + \boldsymbol{p} - \boldsymbol{q}$.
	c)	This part of the question was poorly done. Most of the candidates failed to interpret the given ratio and the most common incorrect response was $-\boldsymbol{q} + \boldsymbol{p} + \frac{-6\boldsymbol{p} + 1.5\boldsymbol{q}}{2} = 6\boldsymbol{p} + \boldsymbol{q}$.
Answers		**a) $5\boldsymbol{p}$ b) $-\boldsymbol{q} + 6\boldsymbol{p}$ c) $2\boldsymbol{p} + \boldsymbol{q}$**
6	a)(i) a)(ii)	This part of the question was very well done. The few candidates that did not score swapped the x and y coordinates and ended up with a wrong triangle. This part of the question was very well done. The few candidates that did not score swapped the *x* and *y* coordinates and ended up with a wrong triangle.
	b)	This part of the question was fairly done. Most of the candidates managed to correctly identify the transformation and the scale factor, even though they left it as an improper fraction instead of simplifying it. There were some candidates who gave the scale factor as -2.5. There were still a lot of

		candidates who swap the coordinates to give the centre of enlargement as $(-1,-6)$.
	c)	This part of the question was poorly done. Most of the candidates did either a clockwise rotation or anti clockwise rotation using the point $(0,0)$ as their centre of rotation.
Answers		**b) Enlargement, centre $(-6,-1)$, scale factor $2\frac{1}{2}$**
7	a)	This part of the question was well done. Most of those who did not score in this part question used 0.5 as the error value an gave their response as 1.3.
	b)(i)	This part of the question was poorly done. Most of the candidates gave their response as $\frac{1}{2}\times 4\times \pi \times 1.8^2 = 20.4$, even those who got lower bound in part (a) correct.
	b)(ii)	This part of the question was also poorly done. Most of the candidates who got part (b)(i) correct were not able to recognise that they needed to just add the curved surface area of the cylinder, instead they added the total surface area. Some of the responses were given as $\frac{1}{2}\times 4\times \pi \times 1.75^2 + 2\pi \times 1.75^2 + 2\times \pi \times 13.75 = 211$. Some had the correct formula just that they did not use the bounds and hence gave their response as $\frac{1}{2}\times 4\times \pi \times 1.8^2 + 2\times \pi \times 13.8 = 107$.
Answers		**a) 1.75 b)(i) 19.2 b)(ii) 170**
8	a)(i)	This part of the question was well done. The candidates who did not score the marks gave their responses as $\frac{180}{360}\times \pi \times 7.25 = 11.4$ or $\pi \times 7.25^2 = 165$ or $\frac{180}{360}\times \pi \times 14.5^2 = 330$.
	a)(ii)	This part of the question was poorly done. It was evident that most of the candidates did not know how to calculate the area of a kite. Some of the incorrect responses were $\pi \times 7.25^2 = 165$ or $21.7\times 32 = 694$ or $\frac{180}{360}\times \pi \times 7.25^2 \times 2 + 21.7\times 32 = 860$.
	b)	This part of the question was well done. Most of the candidates that did not score the marks are those that gave $\frac{512}{8.1} = 63.2$.
Answers		**a)(i) 82 (a)(ii) 512 (b) 4150**
9	a)	This part of the question was well done. Most of the candidates that did not score all the marks did not form an equation but an expression of $41x + 24y$. There was also a significant number of candidates who misread the 41 in the question for a 4, which made them loose marks. Other common incorrect responses were $4x + 25y = 705$.

	b)	This part of the question was well done. Most of the candidates that did not score all the marks did not form an equation but an expression of $5x + 3y$. Other common incorrect responses were $5y + 3x = 87$ or $5x - 3y = 87$.
	c)	This part of the question was also well done. Most of the candidates who did not score the marks are those that could not multiply with the right scalars. Some gave their responses as $(41x + 24y = 705) - (5x + 3y = 87)$ and ended with $36x + 21y = 618$. Some multiplied the equation $5x + 3y = 87$ by 4, incorrectly eliminated y from the equations and were left with $21x = 357$ which gave the value of x as 17.
	d)	This part of the question was also well done. Most of the candidates who did not score gave responses like $16 \times 14 = 224$ or $\frac{16}{9} = 1.78$.
Answers		**a) $41x + 24y = 705$ b) $5x + 3y = 87$ c) $x = 9, y = 14$ d) $(P)144$**
10	a)(i) a)(ii)	This part of the question was well done. Most of those candidates that did not get it right gave answers like $0.2 + 0.4 + 0.25 = 0.85$ or $\frac{1}{0.85}$ or $\frac{0.85}{0.85} = 1$. This part of the question was also well done. Most of the candidates that did score marks gave responses like $0.25 + 0.4 = \frac{0.65}{1}$ or $0.25 \times 0.4 = 0.1$ or $\frac{0.25+0.4}{0.85} = 0.765$.
	b)(i) b)(ii)	This part of the question was poorly done. The most common incorrect responses were $0.25 + 0.25 = 0.5$ and $0.25 \times 0.24 = 0.06$. This part of the question was also poorly done. Some of the common responses that did not score were $0.2 \times 0.4 = 0.08$ or $0.2 + 0.4 = 0.6$ or $2(0.2 + 0.4) = 1.2$.
Answers		a)(i) 0.15 a)(ii) 0.65 b)(i) 0.0625 b)(ii) 0.16
11	a)	This part of the question was well done. Most of the candidates that did not score the mark gave responses like $\frac{x}{38}$ or $38x$.
	b)(i) b)(ii)	The part question was also well done. Some of the most common incorrect responses were $38x + 3$ or $\frac{x+3}{38}$ or $\frac{x+3}{38} + 3$. This part of the question was also well done. Those candidates that did not score gave responses like $\frac{38}{x} + 3$ or $\frac{x+3}{38}$.
	c)	This part of the question was poorly done. Most of the candidates failed to convert the 16 minutes into hours and hence the equation they formed was $\frac{38}{x} - \frac{38}{x+3} = 16$. Some of those who managed to convert wrote it into a decimal, that was approximated prematurely and their equation was $\frac{38}{x} - \frac{38}{x+3} = 0.27$.

		There were also some candidates who managed to form the equation but failed to eliminate the fraction to simplify the equation.
	d)	This part of the question was well done. Some of the candidates that did not score all the marks did not give their answers to the expected accuracy. There were still some candidates who do not write the quadratic formula correctly, their division line is not long enough, they had $-6 \pm \frac{\sqrt{6876}}{4}$ which gave them incorrect answers like 14.73 and -26.73.
	e)	This part of the question was well done. Some of the candidates lost marks because they substitute both the negative and positive value for a question that expects them to choose. Some of those who substituted the right value gave their answer to 1 decimal place as 1.7.
Answers		**a)** $\frac{38}{x}$ **b)(i)** $x+3$ **b)(ii)** $\frac{38}{x+3}$ **d)** 19.23 **and** -22.23 **e)** 1.71
12	a)	This part of the question was very well done. Most of the candidates that did not score the marks gave their responses as either $15.2(29+17) = 699$ or $\frac{1}{2} \times (29 \times 17) + 15.2 = 262$.
	b)(i)	This part of the question was fairly done. Most of the candidates lost marks because of poor presentation, e.g. $c^2 = 12^2 + 15.2^2$ followed by $c^2 = \sqrt{12^2 + 15.2^2}$, which is mathematically incorrect.
	b)(ii)	This part of the question was poorly done. Most of the candidates calculated the areas of five faces only instead of all the six faces. Some candidates treated the trapezium as if it was a rectangular prism, giving their answer as $2 \times \frac{1}{2} \times (17+29) \times 15.2 + 2 \times 19.4 \times 49.3 + 2 \times 29 \times 49.3 = 5471$.
Answers		**a)** 350 **b)(i)** $\sqrt{15.2^2 + (29-17)^2} = 19.4$ **b)(ii)** 4670
13	a)	This part of the question was well done. Most of the candidates proved that they know the scatter diagram, safe for the few who were struggling with the scale. Some of them did not have a scale at all.
	b)	This part of the question was also well done. Some of the incorrect responses given by the candidates were positive, fluctuating or indirectly proportional.
	c)	This part of the question was well done. The few candidates who failed to draw the line of best were those that joined the plotted points.
	d)	This part of the question was poorly done. There were candidates who calculated the gradient correctly and when they write the equation they leave out the negative sign of the gradient. In attempting to calculate the gradient, some candidates picked some points that they plotted that were not on drawn line of best fit.

	e)	This part of the question was also poorly done. Most of the candidates that did not score gave their answers as a decimal, ignoring the context of the question. Some of their answers were 15.5 or 16.5 or 17.4.
Answers		**d)** $\boldsymbol{y = (-2.7to - 1.5)x + (31to40)}$ **e)** $\boldsymbol{14\ to\ 19}$
14	a)(i) a)(ii)	This part of the question was well done. Most of the candidates that did not score the marks gave responses like $272x$ or $221y$. This part of the question was also well done. Most of the candidates that did not get all the marks were not dividing the right way. They had responses like $\frac{272x+221y\leq3536}{17}$ or $(272x + 221y \leq 3536) \div 17$. There were also those candidates that did not score any marks because they formed an equation $272x + 221y = 3536$ instead of forming an inequality.
	b)	This part of the question was poorly done. Most of the candidates had the inequalities $x \leq 2y$, $y \geq x - 2$, $y \geq 2x, 2y \geq x$ or $x \geq y + 2$ which did not score the mark.
	c)	This part of the question was well done. The most common responses were $x \leq 12, y \geq 12$ or $y < 12$.
	d)	This part of the question was also well done. Most of the common incorrect responses were $x \leq 2, y \leq 2, y \geq 2$ or $x > 2$.
	e)	This part of the question was well done. Most of the candidates had a challenge in drawing the line $16x + 13y = 208$, as for some it was not even straight. Some other candidates drew all the lines correctly but did not shade while others shaded the wrong side of the line.
	f)(i) f)(ii)	This part of the question was poorly done. Most of the candidates did not attempt the question and most of those that did had the points $(3,12)$ and $(6,8)$ listed with other points that did not satisfy the given conditions. This part of the question was also poorly done. Some of the candidates that had the right points substituted in the wrong expression and gave their responses as $3 \times 16 + 12 \times 13 = 204$. Other candidates used the point $(6,8)$ and hence gave their answer as $6 \times 272 + 8 \times 221 = 3400$.
Answers		**a)(i)** $\boldsymbol{272x + 221y}$ **b)** $\boldsymbol{y \geq x + 2}$ **c)** $\boldsymbol{y \leq 12}$ **d)** $\boldsymbol{x \geq 2}$ **f)(i)** $\boldsymbol{(3,8), (3,12), (6,8)}$ **f)(ii)** $\boldsymbol{(P)3\ 468}$
15	**a)**	This part of the question was well done. Most of the candidates that did not score gave the size of the angle as 38 which they got from $90 - 52$ or $180 - (90 + 52)$. There were also other candidates who gave an answer of $180 - 55 = 125$.
	b)	This part of the question was also well done. Most of the candidates that did not score had responses like $\frac{14.2Sin52}{Sin32} = 21.1$ or $\frac{14.2Sin38}{Sin52} = 11.1$.

	c)	This part of the question was poorly done. Most of the candidates calculated the angle $P\hat{Q}R$ instead of the angle $R\hat{P}Q$ and hence gave their answer as 67.3.
	d)	This part of the question was well done. Some of the incorrect responses were $180 - 67.3 = 112.7$ or $360 - (55 + 35 + 62.5) = 207.5$.
	e)	This part of the question was well done. Even those candidates that calculated a wrong angle in part (c) used it correctly. Most of the candidates that did not score gave responses like $\frac{1}{2} \times 18 \times 17.3 Sin 62.5 = 138$ or $\frac{1}{2} \times 15 \times 18 Sin 67.3 = 124.5$.
Answers		**a)** $\mathbf{35}$ ***or*** $\mathbf{40.7}$ **b)** $\mathbf{10.3}$ ***or*** $\mathbf{11.8}$ **c)** $\mathbf{62.5}$ **d)** $\mathbf{152}$ ***or*** $\mathbf{153}$ ***or*** $\mathbf{158}$ **e)** $\mathbf{120}$