C704
MAY 2016
MATHEMATICS **1**
Objective
1 ¼ hours

Name of Candidate.....

Index Number .....

NATIONAL BOARD FOR PROFESSIONAL AND TECHNICIAN EXAMINATIONS (NABPTEX)

Certificate II Core Subjects Examination for Technical & Vocational Institutions in Ghana

Monday 2nd May, 2016 | **MATHEMATICS** | **2:00am – 3:15 pm**

OBJECTIVE & WRITTEN TEST

Please read the instructions carefully.

Write your **name, index number**, and other particulars in **ink** while you shade the last 5-digits of your **index number** on the scannable answer sheet with **2B** pencil before you are told to turn over to start the test. An example is given below:

SCHOOL OR INSTITUTION: BAWKU TECHNICAL INSTITUTE
NAME OF CANDIDATE: AMOAH IRENE AFUA
GENDER: M [ ] F [√]
EXAMINATION: CERT II CORE SUBJECTS (MAY/JUNE)
SUBJECT: MATHEMATICS I
DAY 02 MONTH 05 YEAR 2016

CANDIDATE NUMBER							
			0	2	7	3	9
0	0	0	●	0	0	0	0
1	1	1	1	1	1	1	1
2	2	2	2	●	2	2	2
3	3	3	3	3	3	●	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	●	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	●

This booklet consists of **objective test paper only** which last for 1hour 15 minutes.

Shade the correct letter to the answer in **2B pencil**. When you want to change your answer make sure that you erase the previous answer. You will lose the whole mark if you shade more than one option.

When you finish and there is still some time left, go over your work.

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OBJECTIVE QUESTIONS

Time: 1¼ hours

[40 marks]

Answer **all** *the questions*

Each question is followed by **four** *options* **A** *to* **D**. *Find the correct option for each question and* **shade in pencil** *on your answer sheet the space which bears the same letter as the option you have chosen. Give only one answer to each question.*

Think carefully before you shade the answer spaces. Erase completely any answer(s) you wish to change.

Do all rough work on this question paper

Now answer the following questions.

1. Express $100 + \frac{1}{100} + \frac{3}{1000} + \frac{27}{10000}$ in standard form.

A. 1.001057×10^2

B. 1.0001327×10^2

C. 1.001327×10^2

D. 1.000157×10^2

2. Find the value of x if $121_x = 41(x+2)$, where x is the base of the number.

A. 3

B. 4

C. 5

D. 6

3. Which of the following is not the size of an exterior angle of a regular polygon?

A. 15^0

B. 18^0

C. 20^0

D. 21^0

4. If P= {3,7,11,13} and Q = {2,4,8,16}, which of the following is correct?

A. $(P \cap Q)^{I}$

B. $\cap(P \cup Q) = 4$

C. $P \cup Q = \emptyset$

D. $P \cap Q = \emptyset$

5. Factorize $\frac{1}{x^2} - 169$ completely.

A. $(x - \frac{1}{13})(x + \frac{1}{13})$

B. $(\frac{1}{x^2} - 13)(\frac{1}{x^2} + 13)$

C. $\frac{1 - 169x^2}{x^2}$

D. $(\frac{1}{x} - 13)(\frac{1}{x} + 13)$

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6. I am $(x - 1)$ years old and my sister is 4 years older. How old was my sister last year?
   A. $(x - 2)$ years
   B. $(x + 2)$ years
   C. $(x + 3)$ years
   D. $(x - 3)$ years

7. The sum of 6 and $\frac{1}{3}$ of x is one more than twice x. Find the value of x
   A. $x = 7$
   B. $x = 5$
   C. $x = 3$
   D. $x = 2$

8. The mean age of R men in a club is 30 years. Two men, aged 55 and 63 left the club and the mean age reduced by 1 year. Find the value of R.
   A. 18
   B. 20
   C. 22
   D. 28

9. A box contains black, white and red identical balls. The probability of picking a ball that is black at random from the box is $\frac{3}{10}$ and the probability of picking a white ball at random is $\frac{2}{5}$. If there are 30 balls in the box, how many of them are red?
   A. 3
   B. 7
   C. 9
   D. 12

10. How many times, correct to the nearest whole number, will a man run round a circular track of diameter 105m to cover a distance of 11km?
    A. 3
    B. 4
    C. 5
    D. 6

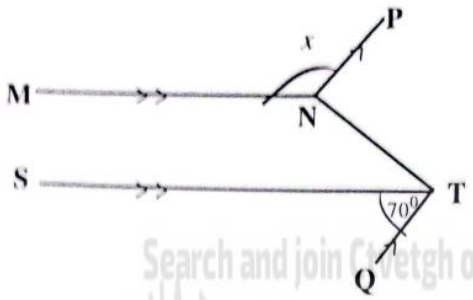
11. The bearing S 40° E is the same as
    A. 040°
    B. 050°
    C. 130°
    D. 140°

12. A man makes a profit of 15% by disposing an article at ₵ 1725. What is his actual profit?
    A. ₵ 221.00
    B. ₵ 258.75
    C. ₵ 1466.25
    D. ₵ 1500.00

13. The ratio of the number of men to the number of women in a 20 – member committee is 3:1. How many women must be added to the committee so as to make the ratio of men to women 3:2?
    A. 2
    B. 5
    C. 7
    D. 9

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14. In the diagram, MN//ST, NP//QT and < STQ = 70°. Find x

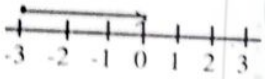


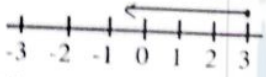
A. 105°
B. 110°
C. 115°
D. 120°

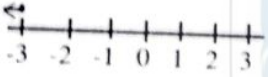
15. Simplify $3\sqrt{12} + 10\sqrt{3} - \frac{6}{\sqrt{3}}$

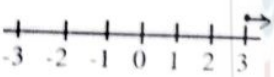
A. $7\sqrt{3}$
B. $10\sqrt{3}$
C. $14\sqrt{3}$
D. $18\sqrt{3}$

16. Which of the following represents the solution to the inequality $\frac{x}{3} - (\frac{x-3}{2}) \leq 1$

A. 

B. 

C. 

D. 

17. For what values of x is the expression $\frac{3x-2}{4x^2+9x-9}$ undefined?

A. $\frac{-3}{4}$ or 3
B. $\frac{-2}{3}$ or -3
C. $\frac{2}{3}$ or 3
D. $\frac{3}{4}$ or -3

18. If $P = \sqrt{QR\,(1 + \frac{3t}{R})}$, make R the subject of the formula.

A. $R = \frac{P^2 - 3t}{Q+1}$
B. $R = \frac{3Qt}{P^2 - Q}$
C. $R = \frac{P^2 - 3t}{Q-1}$
D. $R = \frac{P^2 - 3t}{Q}$

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19. The probabilities of a boy passing English and Mathematics tests are x and y respectively. Find the probability of the boy failing both tests.

A. $1 - (x - y)$
B. $1 - (x + y) - xy$
C. $1 - (x + y) + xy$
D. $1 - (x - y) - xy$

20. In constructing an angle, Obo draws the line OX, with centre O and a convenient radius, he draws an arc intersecting OX at P. With centre P and the same radius, he draws an arc intersecting the first arc at Q and finally joins OQ. What is the measure of angle POQ so constructed?

A. 90^0
B. 75^0
C. 60^0
D. 45^0

21. The square root of a number is 2K. What is half of the number?

A. $\sqrt{\frac{K}{2}}$
B. K
C. $\frac{1}{2} K^2$
D. $2 K^2$

22. The bearing of P from Q is *x*, where $270^0 \leq x \leq 360^0$. Find the bearing of Q from P.

A. $(x - 90)^0$
B. $(x - 270)^0$
C. $(x - 135)^0$
D. $(x - 180)^0$

23. A boy walks 800m in 20 minutes. Calculate his average speed in km per hour.

A. 2.4
B. 4
C. 16
D. 24

The table below gives the scores of a group of students in a test. Use the information to answer questions **24** and **25.**

Scores	0	1	2	3	4	5
Frequency	2	3	4	2	7	2

24. How many students scored above the mean score?

A. 7
B. 9
C. 11
D. 15

25. Find the median score.

A. 2.5
B. 3.0
C. 3.5
D. 4.0

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26. If $\log_a 270 - \log_a 10 + \log_a \binom{12}{9} = 2$, what is the value of a?

A. 3
B. 4
C. 5
D. 6

27. The volume of a cylinder of radius 14 cm is 210 cm^3. What is the curved surface area of the cylinder?

A. 15 cm^2
B. 30 cm^2
C. 616 cm^2
D. 1262 cm^2

28. Find the image of the point (2, 3) under a reflection in the line $x = 4$.

A. (2, 7)
B. (3, 6)
C. (6, 3)
D. (8, 3)

29. A sector of a circle with radius 14 cm subtends an angle of 135° at the centre of the circle. What is the perimeter of the sector? [Take $\pi = \frac{22}{7}$]

A. 47 cm
B. 61 cm
C. 88 cm
D. 231 cm

30. If y varies $\alpha \frac{1}{x^2}$ and $y = 1\frac{1}{4}$ when $x = 4$, find the value of y when $x = \frac{1}{2}$

A. $2\frac{1}{2}$
B. 5
C. 10
D. 80

31. A seller allows 20% discount for cash payment on the marked price of his goods. What is the ratio of the cash payment to the marked price?

A. 1:4
B. 1:5
C. 3:4
D. 4:5

32. A man spotted an aeroplane overhead. At the same time, a man 5 km away estimated its angle of elevation to be 60°. Find the height of the plane from the ground.

A. $2\frac{1}{2}$ km
B. $\frac{5\sqrt{3}}{3}$ km
C. $5\sqrt{2}$ km
D. $5\sqrt{3}$ km

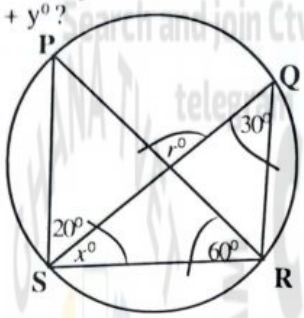
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33. The following periods of time are to be represented on a pie chart: 1h, $1\frac{1}{4}$ h, $1\frac{1}{2}$ h, 2h, $2\frac{1}{4}$ h. Find the angle of the sector representing $1\frac{1}{4}$ h.

A. 450
B. 56.25
C. 67.50
D. 900

34. In the diagram, P, Q, R, S are points on the circle. $\hat{RQS} = 30^0$, $\hat{PRS} = 50^0$ and $\hat{PSQ} = 20^0$. What is the value of $x^0 + y^0$?

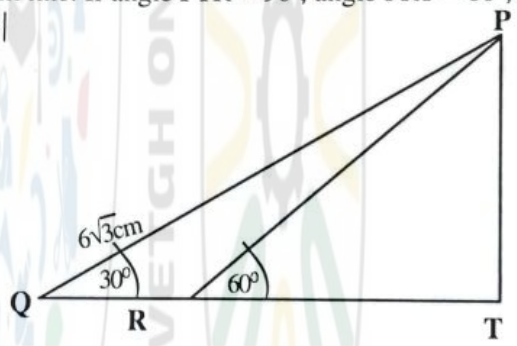


A. 260^0
B. 130^0
C. 100^0
D. 80^0

35. The common ratio of a Geometric Progression (GP) is 2. If the 5th term is greater than the 1st term by 45, find the 5th term.

A. 46
B. 48
C. 56
D. 58

36. In the diagram, QRT is a straight line. If angle PTR = 90^0, angle PRT = 60^0, and angle PQR = 30^0 and $|PQ| = 6\sqrt{3}$ cm, calculate $|RT|$



A. 0.3 cm
B. $\frac{\sqrt{3}}{2}$ cm
C. 3 cm
D. $3\sqrt{3}$ cm

37. Solve the inequality $\frac{4}{x} - 10 \geq -6$

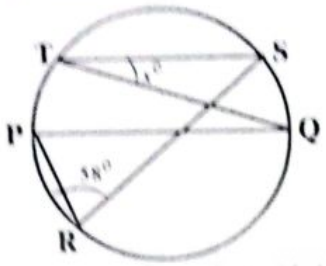
A. $x \leq -1$
B. $x \geq -1$
C. $x \leq 1$
D. $x \geq 1$

38. Expand $(2x - 3)^2$

A. $4x^2 - 12x + 9$
B. $4x^2 + 12x - 9$
C. $4x^2 - 12x - 9$
D. $4x^2 + 12x + 9$

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39. In the diagram, PQ is a diameter of the circle and < PRS = 58°. Find < STQ.



A. 29°
B. 32°
C. 42°
D. 58°

40. Two opposite sides of a square are each decreased by 10% while the other two are each increased by 15% to form a rectangle. Find the ratio of the area of the rectangle to that of the square.
A. 201:200
B. 203:200
C. 207:200
D. 209:200

41. If $2^{3x} = 4^{3x-3}$ find the value of x.
A. 3
B. $\frac{5}{3}$
C. $\frac{3}{5}$
D. 3

42. Convert 43_{ten} into binary number
A. 101011_2
B. 101001_2
C. 110011_2
D. 101101_2

43. A binary operation * is defined on the set of real numbers by $x * y = \frac{x+y}{1-xy}$, find the value of 3 * - 2.
A. – 7
B. – 5
C. $-\frac{1}{7}$
D. $\frac{1}{7}$

44. What is the equation of the line which is perpendicular to the line $y + 3x - 2 = 0$ and which passes through the point (- 1, 2)?
A. $3y - x - 7 = 0$
B. $3y + x + 7 = 0$
C. $3y - x + 7 = 0$
D. $3y + x - 7 = 0$

45. P, Q and R are points in the Cartesian plane. $\overrightarrow{QP} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$ and $\overrightarrow{PR} = \begin{pmatrix} 5 \\ 8 \end{pmatrix}$, find $\overrightarrow{QR}$.
A. $\begin{pmatrix} 9 \\ -5 \end{pmatrix}$
B. $\begin{pmatrix} 8 \\ -4 \end{pmatrix}$
C. $\begin{pmatrix} 10 \\ 6 \end{pmatrix}$
D. $\begin{pmatrix} 10 \\ 12 \end{pmatrix}$

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46. Evaluate $\frac{x^4 - 3x + 1}{2x^3(1 - x)}$ at $x = -1$

A. $-1\frac{1}{4}$

B. $-\frac{3}{4}$

C. $-\frac{1}{4}$

D. $\frac{1}{4}$

Use the information below to answer questions **47**, **48** and **49**.

If $U = \{3,6,9,12,15,18,21,24,27\}$, $P = \{3,6,9,12,15\}$ and $Q = \{3,9,27\}$.

47. Find $P \cap Q'$

A. $\{6, 12, 15, 18\}$

B. $\{6, 12, 15\}$

C. $\{24, 27\}$

D. $\{\ \}$

48. Find $P' \cap Q'$

A. $\{18, 21, 24\}$

B. $\{24, 27\}$

C. $\{3\}$

D. $\{\ \}$

49. Find $P \cap P'$

A. $\{\ \}$

B. $\{6\}$

C. $\{15, 18\}$

D. $\{12, 15, 24\}$

50. Simplify $\frac{6}{2\sqrt{2}} - \frac{2\sqrt{2}}{4}$

A. $\frac{\sqrt{2}}{2}$

B. $\sqrt{2}$

C. $\frac{\sqrt{2}}{4}$

D. $2\sqrt{2}$

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END OF OBJECTIVE TEST

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Certificate II Core Subjects Examination for Technical & Vocational Institutions in Ghana

Monday 2nd May, 2016 | **MATHEMATICS** | **9:00am – 11:30 am**

WRITTEN TEST

Please read the instructions carefully. DO **NOT** turn over **this page** until you are told to do so by the invigilator.

Write your **name, index number,** and **other particulars** at the space provided in the answer booklet. An example is given below:

CENTRE NUMBER	CANDIDATE'S FULL INDEX NUMBER
817020	02739

Candidate's Full Name: AMOAH IRENE AFUA
Candidates's Signature: aiafua Date: 2ND MAY, 2016
Title of Examination: CERT II CORE SUBJECTS (MAY/JUNE)
Subject: MATHEMATICS Paper: TWO (2)

This booklet consists of **written questions** which last for 2½ hours. Answer all questions in the answer booklet.

Write the numbers of your answers in the order in which they have been answered in the space provided at cover page of your answer booklet

When you finish and there is still some time left, go over your work.

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MATHEMATICS 2

May 2016 [60 marks] Time: 2½ hours

Answer **nine** *questions in all.* **All** *the questions in section* **A** *and four questions from section* **B**. *Unless otherwise stated all answers should be corrected to* **two** *decimal places.*

Graph papers are provided for your use in the examination.

The use of non-programmable, silent and cordless calculator is allowed unless otherwise stated.

SECTION A

Answer **all** *questions from this section.*

All questions carry equal marks.

1. (*a*) The heights of three Carpentry and Joinery students of a Technical Institute are 1.50m, xm and 1.45m. If the arithmetic mean height of the three students is 1.60m, calculate the value of x.

(*b*) (i) State **three** main ways of describing sets.

(ii) Find n (E $\cap$P) if E is the set of all even numbers and P is the set of all prime numbers.

2. (*a*) (i) Express 216 as a product of prime factors.

(ii) Evaluate $(216)^{\frac{2}{3}}$

(*b*) Solve for x in the inequality $\frac{1}{2}(x+1) \geq \frac{1}{2}(2x+2)$ and illustrate your answer on the number line.

3. (*a*) Construct a table for multiplication $\textcircled{x}$ modulo 11 on the replacement set T = {1, 5, 9, 10}.

(*b*) Using your table in (*a*), find the truth set of the following equations:

(i) $10 \textcircled{x} t = 2$

(ii) $t \textcircled{x} t = 4$

(*c*) Evaluate $(5 \textcircled{x} 9) \textcircled{x} 10$ from the table in (*a*).

4. Agbeke, Katume, Dalaba, Dramani and Quainoo contested for the position of SRC President of a Vocational School. The number of votes each of them acquired is represented on the table:

CONTESTANT	AGBEKE	KATUME	DALABA	DRAMANI	QUAINOO
NO OF VOTES	14	11	19	52	24

(*a*) Draw a pie chart to illustrate the information

(*b*) What percentage of the total votes did the winner of the contest obtain?

5. (*a*) The diagonals of a rhombus are 12cm and 16cm. Calculate the perimeter of the rhombus.

(*b*) The hypotenuse of a right angled triangle is 13cm. If one other side of the triangle is 1cm shorter than the hypotenuse, calculate the third side of the triangle.

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SECTION B

[60 marks]

PART 1

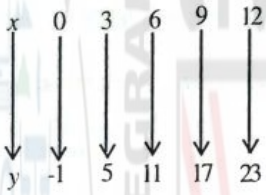
Answer **two** *questions* **only** *from this section.*

6. (*a*) A trader sold 1,750 articles for GH¢5,250.00 at a profit of 20%.

(i) Calculate the cost price of each article;

(ii) If he had wanted 45% profit on the cost price, how much should he have sold each of the articles?

(*b*) Consider the mapping:



What linear equation relates y to x?

7. (*a*) Copy and complete the table of values for the relation $y = x^2 + x - 2$ for $-4 \leq x \leq 3$

x	-4	-3	-2	-1	0	1	2	3
y	10					0		

(*b*) Using a scale of 2cm to 1 unit on the x –axis and 2 cm to 2 units on the y –axis, draw the graph of the relation $y = x^2 + x - 2$ for $-4 \leq x \leq 3$.

(*c*) Use the graph in (*b*) to solve:

(i) $x^2 + x - 2 = 0$.

(ii) $x^2 - x - 3 = 0$.

8. (*a*) Without using calculator or four –figure tables, simplify:

(i) $\sqrt{50} - 3\sqrt{2}\,(2\sqrt{2} - 5) - 5\sqrt{32}$

(ii) $\dfrac{\log 27}{\log 6 - \log 2}$

(*b*) Using a ruler and a pair of compasses only, construct:

(i) triangle ABC such that AB = 8cm, angle ABC $=30^0$ and angle BAC = 120^0;

(ii) locus, l_1 of points equidistant from A and B;

(iii) locus, l_2 of points equidistant from B and C.

Turn over

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(*c*) (i) Locate P the meeting point of l_1 and l_2 and use it to circumscribe the triangle.

(ii) Measure and write down the radius of the circle.

9. (*a*) The distance round a rectangular café is 35m. The ratio of the length of the café to its width is 3: 2. Calculate the dimensions of the café.

(*b*) The cost of an electrical gadget and the cost of a plumbing material were in the ratio 8:6, last year. This year, each cost was reduced by GH¢4.00 and their ratio has changed to 7:5, respectively. Taking the initial cost of the electrical gadget to be GH¢*p* and that of the plumbing material to be GH¢*q*, calculate the values of *p* and *q*.

PART 11

STATISTICS AND PROBABILITY

Answer **one** *question only from this section*

Both questions carry equal marks.

10. The following data shows marks obtained by students in a mathematics test:

6, 9, 5, 0, 5, 3, 7, 5, 5, 2, 7, 10, 2, 9, 8

0, 6, 2, 6, 6, 5, 6, 9, 7, 7, 4, 1, 6, 6, 8

(*a*) Construct a frequency distribution table for the data, using discrete values 0, 1, 2, ... 10.

(*b*) (i) State the modal score of the distribution.

(ii) If a student is chosen at random, what is the probability that he or she scored more than 5 marks?

(*c*) Using an assumed mean of 6, calculate the arithmetic mean score of the distribution.

11. (*a*) Two genuine ludo dice have been rolled together and the scores recorded in pairs.

(i) display the sample space for the experiment.

(ii) Calculate the probability of recording :

(α) a sum of 9 or 11

(β) the same number on both dice;

(χ) no six.

(*b*) The probability of Adjoa hitting a target is $\frac{1}{2}$. The probability of Ama hitting the same target is $\frac{4}{5}$

(i) What is the probability of both ladies hitting the target when they both shoot at it?

(ii) Calculate the probability that at least one of the ladies hits the target.

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PART 111

VECTORS

Answer **one** *question only from this section*

All questions carry equal marks.

12. (*a*) The bearing of a Technical Institute P from another Technical Institute K is 315^0.

(i) Sketch the relative positions of the two institutes;

(ii) Calculate the bearing of K from P.

(*b*) Three artisans Paul, Quansah and Rosemond work at three different points on a horizontal plane.
Quansah is on a bearing of 065^0 from Paul and Rosemond is on a bearing of 335^0 from Paul. The distance between Paul and Quansah is 12m and the distance between Rosemond and Quansah is 20m.

(i) Calculate the distance between Rosemond and Paul.

(ii) Calculate the bearing of Rosemond from Quansah.

13. (*a*) Given that $p = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$, $q = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $r = \begin{pmatrix} 1 \\ -5 \end{pmatrix}$, calculate the values of m and n from the equation $r = mp + nq$, where m and n are scalars.

(*b*) The coordinates of the vertices of a triangle are P (3, 1), Q (-3, 4) and R (1, 2).

(i) Calculate $\overrightarrow{PQ}$, $\overrightarrow{QR}$ and PR

(ii) hence determine whether triangle PQR is equilateral, obtuse or scalene.

THE END OF PAPER

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C704
MAY 2017
MATHEMATICS 1
Objective
1¼ hours

Name of Candidate.....

Index Number .....

NATIONAL BOARD FOR PROFESSIONAL AND TECHNICIAN EXAMINATIONS (NABPTEX)

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Certificate II Core Subjects Examination for Technical & Vocational Institutions in Ghana

Monday, 8th May, 2017 | **MATHEMATICS** | **2:00am – 3:15 pm**

OBJECTIVE

Please read the instructions carefully.

Write your **name**, **index number**, and other particulars in **ink** while you shade the last 5-digits of your **index number** on the scannable answer sheet with **2B** pencil before you are told to turn over to start the test. An example is given below:

SCHOOL OR INSTITUTION: BAWKU TECHNICAL INSTITUTE

NAME OF CANDIDATE: AMOAH IRENE AFUA

GENDER: M [ ] F [√]

EXAMINATION. CERT II CORE SUBJECTS (MAY/JUNE)

SUBJECT: MATHEMATICS I

DAY 08 MONTH 05 YEAR 2017

CANDIDATE NUMBER							
			0	2	7	3	9
0	0	0	●	0	0	0	0
1	1	1	1	1	1	1	1
2	2	2	2	●	2	2	2
3	3	3	3	3	3	●	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	●	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	●

This booklet consists of **objective test paper only** which last for 1 hour 15 minutes.

Shade the correct letter to the answer in **2B pencil**. When you want to change your answer make sure that you erase the previous answer. You will lose the whole mark if you shade more than one option.

When you finish and there is still some time left, go over your work.

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OBJECTIVE QUESTIONS

Time: 1¼ hours

[40 marks]

Answer **all** *the questions*

Each question is followed by **four** *options* **A** *to* **D**. *Find the correct option for each question and* **shade in pencil** *on your answer sheet the space which bears the same letter as the option you have chosen. Give only one answer to each question.*

Think carefully before you shade the answer spaces. Erase completely any answer(s) you wish to change.

Do all rough work on this question paper

Now answer the following questions.

1. Irene, Evelyn and Akyeama shared 120 oranges in the ratio 2 : 3 : 5. By how much is the least share less than the greatest ?

A. 24
B. 30
C. 36
D. 48

2. Evaluate $3\sqrt{5}\left(\frac{3}{\sqrt{5}} + \sqrt{5}\right)$

A. $9\sqrt{5}$
B. $12\sqrt{5}$
C. 24
D. 31

3. A chord is 6 cm from the centre of a circle with radius 10 cm, calculate its length.

A. 4 cm
B. 16 cm
C. 32 cm
D. 64 cm

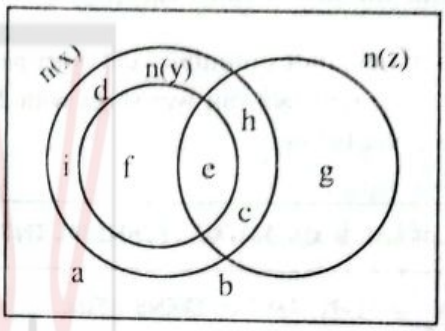
4. If $\frac{1}{R} = \frac{1}{6} + \frac{1}{9}$, find the value of R.

A. 0.278
B. 0.180
C. 3.600
D. 7.500

5. Simplify: $(3x - y)(3x + y) - (3x + 2y)(3x - 2y)$

A. y
B. 2y
C. y^2
D. $3y^2$

Sets x, y and z are represented in the Venn diagram below. Use the diagram to answer questions **6** and **7**.



6. Find $x \cap y \cap z$.

A. {e}
B. {h, c}
C. {e, h, c}
D. {e, f, h, c}

7. Find $n(y' \cap z)$

A. 2
B. 3
C. 4
D. 6

8. The table below shows the sizes of shoes produced by a factory.

Size	5	6	7	8	9	10	11
Frequency	4	6	9	15	14	7	5

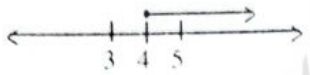
Calculate, correct to the nearest whole number, the mean size of the shoes.

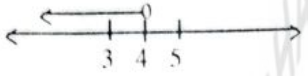
A. 6
B. 7
C. 8
D. 9

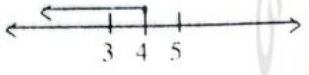
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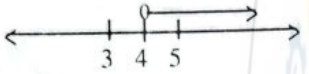
9. If $x = 2$, $y = -3$ and $z = -4$, evaluate $(y - x)(x - z)(z - y)$
   A. -210
   B. -30
   C. 30
   D. 210

10. Which of the following number lines represents the solution to the inequality $6x + 1 \geq 8x - 7$?

A 

B. 

C. 

D. 

11. If $(a^n)2 = a^4$, find n
   A. -6
   B. -2
   C. 2
   D. 6

12. Simply: $1\frac{1}{8} \times 1\frac{1}{3} - 5 \div 2\frac{1}{2}$
   A. $\frac{1}{2}$
   B. $\frac{11}{25}$
   C. $\frac{39}{140}$
   D. $-\frac{1}{2}$

13 From a point on the ground, the angle of elevation of the top of a flagpole is 35°. If the flagpole is 200 m away from the point, find, correct to two decimal places the height of the pole.
   A. 111.47 m
   B. 115.40 m
   C. 124.42 m
   D. 140.04 m

14. A regular polygon of n sides has each exterior angle equal to 45°. Find the value of n.
   A. 6
   B. 8
   C. 12
   D. 15

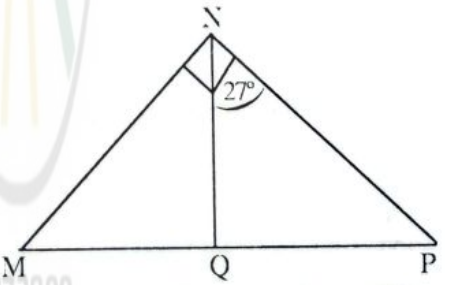
15. If $3\log(2 + x) = \log 27$, find x.
   A. -1
   B. 1
   C. 5
   D. 6

16. The complement of a given set is the set of all elements in the:
   A. set but not the universal set.
   B. set and also in the universal set
   C. universal set but not in the given set
   D. empty set but not in the given set.

17. If $\sqrt{75} + \sqrt{27} + k\sqrt{3} = 0$, find the value of k.
   A. -16
   B. -8
   C. 8
   D. 16

18. The inequality for distance d which is more than 18 m but not more than 23 m is :
   A. $18 \leq d \leq 23$
   B. $18 < d \leq 23$
   C. $18 \leq d < 23$
   D. $18 < d < 23$

19. Find the values of x for which $\frac{1+x}{4-x^2}$ is underfined.
   A. 2, - 1
   B. 2, -2
   C. 0, -1
   D. 0, -2

20. 

In the figure above, NQ is perpendicular to MP, $\angle PNM = 90°$ and $\angle QNP = 27°$. Find $\angle NMQ$
   A. 27°
   B. 30°
   C. 54°
   D. 63°

Turn over

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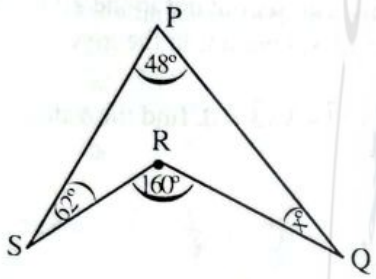
21. Factorize $2xy - 3qy - 2px + 3pq$

A. $(y + 2q)(2x - 3p)$
B. $(y + q)(2x - 3p)$
C. $(y - 2q)(2x - 3p)$
D. $(y - p)(2x - 3q)$

22. A fair die is tossed twice. What is the probability that the sum of the digits is a perfect square ?

A. $\frac{1}{12}$
B. $\frac{1}{6}$
C. $\frac{7}{36}$
D. $\frac{2}{9}$

23.



In the diagram above $\angle PSR = 62°$, $\angle SPQ = 48°$, $\angle SRQ = 160°$ and $\angle RQP = x°$, calculate the value of x.

A. 70°
B. 62°
C. 58°
D. 50°

24. The universal set $\cup = \{1, 2, 3, ... 13\}$. If T = {even numbers} and R = {multiples of 3} are subsets of $\cup$, find $(R \cup T)'$.

A. {1, 5, 7, 11, 13}
B. {2, 3, 4, 6, 8, 9, 10, 12}
C. {1, 5, 7}
D. {2, 3, 4, 6}

25. The nth term of the sequence 5, 8, 11, ..., is 383, find n.

A. 125
B. 126
C. 127
D. 194

26. A petrol tank will take a factory 30 weeks when it uses 150 litres per day. How many weeks will it take the factory if it decides to use 500 litres per day ?

A. 30 weeks
B. 25 weeks
C. 15 weeks
D. 9 weeks

27. What is the gradient of the line joining (2, 5) and (5, 14).

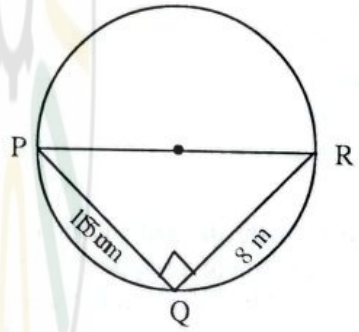
A. 5
B. 4
C. 3
D. 2

28. If $(x - 3)$ and $(2x + 3)$ are factors of $2x^2 + mx + n$, find the value of $(m + n)$.

A. -18
B. -15
C. -12
D. -6

29. Solve the equation $x^2 - \frac{13}{2}x + \frac{15}{2} = 0$

A. $x = 1$ or $\frac{5}{2}$
B. $x = -\frac{3}{2}$ or 5
C. $x = -\frac{1}{2}$ or $\frac{5}{2}$
D. $x = \frac{3}{2}$ or 5



In the diagram above, PR is a diameter, PQ = 15 m and QR = 8 m. Use the information to answer questions **30** and **31.**

30. Calculate the area of the triangle PQR.

A. 120 cm^2
B. 68 cm^2
C. 60 cm^2
D. 23 cm^2

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43. Express the speed of 1 km/min to the speed of 10m/s in ratio

A. 5 : 3
B. 5 : 4
C. 3 : 4
D. 3 : 5

44. If y varies directly as (2x + 3) and x = 5 when y = 52, what is the value of x when y = 36 ?

A. 1
B. 2
C. 3
D. 4

45. If $\frac{3x}{2} + \frac{15}{2} < 0$, solve for x.

A. $x < -5$
B. $x > -5$
C. $x \leq -5$
D. $x \geq -5$

46. If $4m\,4_{five} = 119_{ten}$. What is the value of m ?

A. 1
B. 2
C. 3
D. 4

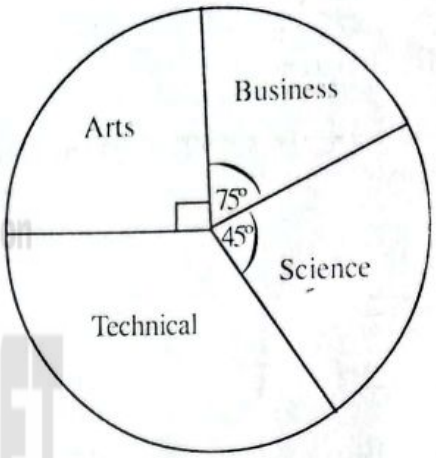
47. The interior angles of a hexagon are 2r, 3r, 2r, 5r, r and 2r. Find the value of r.

A. 36°
B. 48°
C. 80°
D. 96°

48. If the bearing of R from Q is 135°. Find the bearing of Q from R.

A. 045°
B. 270°
C. 225°
D. 315°

The pie chart shows the distribution of 600 mathematics textbooks for Science, Arts, Business and Technical classes. Use it to answer questions **49** and **50**.



49. How many text books are for technical class?

A. 100
B. 150
C. 200
D. 250

50. What percentage of the total number of textbooks belongs to science class ?

A. $12\frac{1}{2}\%$
B. $20\frac{5}{6}\%$
C. 20%
D. $41\frac{2}{3}\%$

END OF OBJECTIVE TEST

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C704
MAY 2017
MATHEMATICS
Written
2½ hours

2

Name of Candidate .....

Index Number .....

NATIONAL BOARD FOR PROFESSIONAL AND TECHNICIAN EXAMINATIONS (NABPTEX)

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Certificate II Core Subjects Examination for Technical & Vocational Institutions in Ghana

Monday 8th May, 2017 | **MATHEMATICS** | **9:00am – 11.30 am**

WRITTEN TEST

Please read the instructions carefully. DO **NOT** turn over **this page** until you are told to do so by the invigilator.

Write your **name, index number**, and **other particulars** at the space provided in the answer booklet. An example is given below:

CENTRE NUMBER	CANDIDATE'S FULL INDEX NUMBER
817020	02739

Candidate's Full Name: AMOAH BERNICE EFUA
Candidates's Signature: aiafua Date: 8TH MAY, 2017
Title of Examination: CERT II CORE SUBJECTS (MAY/JUNE)
Subject: MATHEMATICS Paper: TWO (2)

This booklet consists of **written questions** which last for 2½ hours. Answer all questions in the answ booklet.

Write the numbers of your answers in the order in which they have been answered in the space provided on t cover page of your answer booklet

When you finish and there is still some time left, go over your work.

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MATHEMATICS 2

May/June 2017 — Time: 2½ hours

Answer **nine** *questions in all.* **All** *the questions in section* **A** *and* **four** *questions from section* **B**, *unless otherwise stated. All answers should be corrected to* **two** *decimal places.*

Graph papers are provided for your use in the examination.

The use of non programmable, silent and cordless calculator is allowed unless otherwise stated.

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SECTION A

[40 Marks]

Answer **all** *questions from this section.*

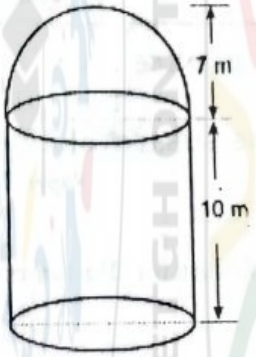
All questions carry equal marks.

1. (*a*) Given that $P = \frac{x^2 - y^2}{x^2 + xy}$,

(i) express p in its simplest form.

(ii) find the value of p if x = -4 and y = - 6

(*b*) A regular polygon of n sides is such that each interior angle is 120° greater than the exterior angle. Find the value of n.



The solid is a cylinder surmounted by a hemispherical bowl. Calculate its:

(*a*) Total outer surface area.

(*b*) Volume. [Take $\pi = \frac{22}{7}$]

3. Without using calculator or mathematical table, simplify:

(*a*) $3 - \frac{(\frac{1}{6} \times \frac{3}{7})}{(\frac{1}{2} \div \frac{3}{5})} + \frac{7}{8}$

(*b*) Evaluate: $\frac{3}{\sqrt{3}}\left(\frac{2}{\sqrt{3}} - \frac{\sqrt{12}}{6}\right)$

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4. (a) Find the value of m in the expression

$$\frac{3^{2m+1}}{3^{3m-4} \times 3^{(m-2m)}} = 27^m$$

(b) A tank weighs 8.6 kg when it is $\frac{1}{4}$ filled with water. If it weighs 10.4 kg when it is full, what will be its weight when it is empty ?

5. (a) A boy bought 3 note books and 2 pens for Ghc6.50. His sister bought 1 notebook and 2 pens for Ghc3.50 from the same shop. What was the cost of a notebook and the cost of a pen ?

(b) A man is four years older than his wife and the ratio of their ages is 9 : 8. How old is the man ?

Section B

[40 marks]

Answer **two** *questions* **only** *from this section.*

All questions carry equal marks.

6. The following is an incomplete table of values for the relation $y = 3 + 2x - x^2$

x	-2	-1	0	1	2	3	4
y		0	3				-5

(a) Copy and complete the table

(b) Using a scale of 2 cm to 1 unit on both axes draw the graph of the relation $y = 3 + 2x - x^2$.

(c) On the same axes, draw the graph of the relation $x - y = 0$

(d) Using your graphs,

(i) solve the equation $3 + 2x - x^2 = x$

(ii) find the values of x for which $3 + 2x - x^2 = 2$

7. Towns A, B, C and D are such that $|AB| = |AD| = 60$ km, $|BC| = 100$ km, $\angle DAB = 135°$. $|AD|$ is parallel to $|BC|$.

(a) Using a scale of 10 km to 1 cm, construct:

(i) a quadrilateral ABCD.

(ii) The perpendicular from D to meet BC at N.

(b) Measure:

(i) $|CD|$

(ii) $\angle NDA$

(c) A market is to be located outside a distance of 50 km from D. Shade inside ABCD where the market should not be located.

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11 (a) A bag contains 80 identical balls, some blue and the rest green. If a ball is drawn at random, the probability that the ball is blue is $\frac{1}{5}$.

(i) How many blue balls are there in the bag ?

(ii) How many blue balls must be added to make the probability of a blue ball being drawn to be $\frac{2}{3}$?

(b) The number of students of Dadiaso College detained in the hospital each day is given below for a period of 100 days in 2014.

Number of students	0	1	2	3	4	5	6	7	8	9	10
Frequency	4	12	20	32	18	6	4	1	4	1	2

Estimate the following probabilities in percentage:

(i) That no student was detained in the hospital.

(ii) That more than four students were detained.

(iii) That the modal number was detained.

PART III

VECTORS

Answer **one** *question* **only** *from this section.*

All questions carry equal marks.

12. (a) Given that $\overrightarrow{AB} = \begin{pmatrix} -4 \\ 7 \end{pmatrix}$ and $\overrightarrow{CA} = \begin{pmatrix} 3 \\ -5 \end{pmatrix}$

(i) Find $\overrightarrow{BC}$

(ii) Describe precisely the geometric relationship between $\overrightarrow{BC}$ and $\overrightarrow{DE} = \begin{pmatrix} -3 \\ 6 \end{pmatrix}$

(b) If $\overrightarrow{RS}$ = (5 km, 060°) and $\overrightarrow{ST}$ = (12 km, 150°), with the aid of sketches find $\overrightarrow{RT}$ = (X km, θ°)

3. (a) Ato lives 4 km due East of Ebo's house and Koomson lives 6 km due south of Ebo's house.

(i) Find the distance from Ato's house to Koomson's house.

(ii) Find the bearing of Koomson's house from Ato's house.

(b) Given that $a = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$, $b = \begin{pmatrix} 5 \\ 6 \end{pmatrix}$ and $c = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$

(i) Evaluate $|2a + 3b|$

(ii) Evaluate $|a + b - c|$

END OF PAPER

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C704/1
MAY 2018
MATHEMATICS
Objectives
1¼ Hours
1

Name of Candidate .....

Index Number .....

NATIONAL BOARD FOR PROFESSIONAL AND TECHNICIAN EXAMINATIONS (NABPTEX)

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Certificate II Core Subjects Examination for Technical and Vocational Institutions in Ghana

MONDAY **MATHEMATICS** **2:00pm – 3.15pm**

30th April, 2018 **OBJECTIVES**

Please read the instructions carefully.

Write your **name, full index number** and other particulars in **ink** on the scannable answer sheet. Then shade the index number with a **2B pencil** [e.g. **6-digit** Centre number, followed with the last **4-digit** of your index number]. An example is given below:

SCHOOL OR INSTITUTION: KUMASI TECHNICAL INSTITUTE

NAME OF CANDIDATE: AMOAH IRENE AFUA

GENDER: M [ ] F [√]

EXAMINATION: CERT II CORE SUBJECTS (MAY/JUNE)

SUBJECT MATHEMATICS I

DAY 30 MONTH 04 YEAR 2018

CANDIDATE NUMBER

8	1	7	0	5	6	0	7	1	8

This booklet consists of **objective questions** which last for 1 hour 15 minutes.

Answer **all questions** by shading the letter of the correct answer to **each** question on your scannable answer sheet.

When you want to change your answer make sure that you erase the previous answer. You will lose the whole mark if you shade more than one option.

When you finish and there is still some time left, go over your work.

Do not turn to the next page **until you are told** to do so by the invigilator.

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OBJECTIVE QUESTIONS

Time: $1\frac{1}{4}$ hours

[40 Marks]

Answer all questions

Each question is followed by four options A to D. Find the correct option for each question and shade in pencil on your answer sheet the space which bears the same letter as the option you have chosen. Give only one answer to each question.

Think carefully before you shade the answer spaces. Erase completely any answer(s) you wish to change.

Do all rough work on this question paper.

Now answer the following questions.

1. What property of set is shown by $A\cap(B\cup C)=(A\cap B)\cup(A\cap C)$?
   A. Commutative
   B. Associative
   C. Distributive
   D. Identity

2. Find the rule for the mapping below:

x	1	2	3	4	5
↓	↓	↓	↓	↓	↓
y	5	3	1	-1	-3

   A. $x:x\rightarrow 7-2x$
   B. $x:x\rightarrow 2x+1$
   C. $x:x\rightarrow 5x+1$
   D. $x:x\rightarrow 2x+13$

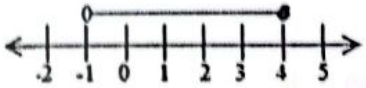
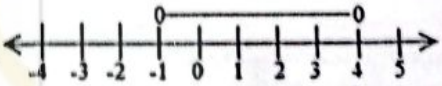
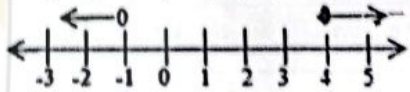
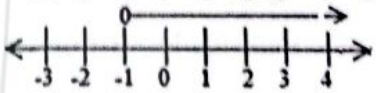
3. If $x^2=61_{eight}$, find the value of x
   A. 9
   B. 8
   C. 7
   D. 6

4. Which of the following mapping is undefined when x = -3?
   A. $x\rightarrow\frac{4}{x+3}$
   B. $x\rightarrow\frac{4}{x-3}$
   C. $x\rightarrow x-3$
   D. $x\rightarrow x+3$

5. Find the solution set of $6x+2>\frac{2x}{3}+6$, where x is an integer.
   A. {1,2,3,4,...}
   B. {2,3,4,5,...}
   C. $\{\frac{3}{4},1,2,3,....\}$
   D. {4,5,6,7,...}

6. If 264 + 442= 716, what number base has been used?
   A. 8
   B. 9
   C. 10
   D. 11

7. If y =3 satisfies the equation 1.3– ky = 0.2y+ 0.3, find the value of k leaving your answer to 2 decimal places.
   A. 0.11
   B. 0.12
   C. 0.13
   D. 0.14

8. On which of the given number lines is the solution set $\{(x:x\leq 4)\cap(x:x>-1\}$ illustrated?
   A. 
   B. 
   C. 
   D. 

9. Simplify $\frac{3\frac{1}{5}-4\frac{3}{5}}{4\frac{2}{5}}$, leaving your answer to two decimal places
   A. 0.03
   B. 0.13
   C. 0.38
   D. 0.50

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10. Which of the following mapping is a function?



A. i only
B. iii only
C. i and iii only
D. i and ii only

11. Find x in terms of y and z, if $\frac{1}{x}-\frac{1}{y}=\frac{1}{z}$

A. $\frac{yz}{y-z}$
B. $\frac{y-z}{yz}$
C. $\frac{yz}{y+z}$
D. $\frac{y+z}{yz}$

12. Express 0.0008816 in standard form.
A. 8.16×10^{6}
B. 8.16×10^{5}
C. 8.816×10^{-4}
D. 8.16×10^{-6}

13. The sum of two numbers is 20. One of the numbers is $\frac{3}{2}$ times the other. Find the smaller number.
A. 6
B. 8
C. 10
D. 12

14. A straight line which intersects with the curve $Y=5x^2-5x+5$ gives the solution of $5x^2-x-1=0$. Find the equation of the line.
A. Y= 6 - 4x
B. Y= 1-5x
C. Y= 5x-1
D. Y= -5x-1

15. A man is twice as old as his son. Five years ago, the ratio of their ages was 9:4. Find the ratio of their current ages.
A. 4:9
B. 3:2
C. 3:1
D. 2:1

16. Evaluate $\frac{a}{3}-\frac{a-1}{2}$, when a=1
A. -2
B. $-\frac{2}{3}$
C. 0
D. $\frac{1}{3}$

17. Find 15% of GH¢3000.00
A. GH¢ 400.00
B. GH¢ 420.00
C. GH¢ 450.00
D. GH¢ 480.00

18. If A={18,19,20} and B={14,15,16,17}are subsets of the universal set U={14,15,16,17,18,19,20}, find $(A\cup B)^{1}$
A. { }
B. {18,19}
C. {15,16,18,20}
D. {14,15,16,17,18,19}

Use the information below to answer questions 19, 20 and 21.
The marks of eight students in a class test are: 31,47,42,39,24,13,13,and 27

19. Find the mean mark
A. 13
B. 29.5
C. 34
D. 39.5

20. Find the modal mark
A. 13
B. 29.5
C. 34
D. 39.5

21. Find the range of the marks
A. 13
B. 29.5
C. 34
D. 39.5

22. On the ogive, what score of the decile scale equals the third quartile score?
A. 2.5
B. 5.0
C. 7.5
D. 10.0

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23. If the common difference of an arithmetic sequence is -3 and the sum of the first five terms of the A.P. is -10, find the first term.
A. 3
B. 4
C. 6
D. 9

24. Find the 11^{th} term of the sequence; 8,4,0,-4…, $n \geq 2$
A. -32
B. -22
C. -12
D. -8

25. If $\log_2 \sqrt[3]{2} = x$, find the value of x
A. $\frac{1}{4}$
B. $\frac{2}{3}$
C. $\frac{1}{3}$
D. $\frac{2}{5}$

26. The probability of picking a catering student out of 120 students is $\frac{3}{8}$. How many students do not offer catering?
A. 8
B. 45
C. 60
D. 75

27. A car moves with an average speed of 180km/h. If the car covers a distance of K metres in 14 seconds, find the distance covered.
A. 500m
B. 600m
C. 700m
D. 800m

28. The locus of points equidistance from a fixed point is a/an…
A. Ellipse
B. Parabola
C. Sphere
D. Circle

29. How many sides has the regular polygon with interior angle size 150^0?
A. 3
B. 4
C. 12
D. 18

30. The mean of the numbers 25, 21 ,R, 26, and 18 is 21. Find the value of R
A. 4
B. 15
C. 25
D. 26

31. If x and y are complementary angles and $x=30^0$ while $y=60^0$;
Evaluate $\frac{2\sin x+\cos x}{\sin y}$, leaving your answer in surd form.
A. $2+\sqrt{3}$
B. $3+2\sqrt{3}$
C. $1+\sqrt{3}$
D. $1+\frac{2}{3}\sqrt{3}$

32. A number is selected at random from the set K={1,2,3,….15}. What is the probability that the number is a prime number?
A. $\frac{1}{3}$
B. $\frac{2}{5}$
C. $\frac{7}{15}$
D. $\frac{3}{5}$

33. If the height of a square pyramid of volume $500cm^3$ is 15cm, find the side of its base.
A. 10cm
B. 15cm
C. 20cm
D. 25cm

34. Given that $\log_{10}4 = 0.6021$ and $\log_{10} k = \overline{2}.6021$, find value of k.
A. 0.004
B. 0.04
C. 0.4
D. 4

35. Given that A (-6, 5) and B(5,-2), find the length of the line joining the points A and B.
A. 13.04
B. 15.04
C. 16.04
D. 16.08

36. The area of a rectangular plot of length is $36m^2$. If the length is 6m more than the width, find the width to the nearest whole number.
A. 3m
B. 4m
C. 5m
D. 6m

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23. If the common difference of an arithmetic sequence is -3 and the sum of the first five terms of the A.P. is -10, find the first term.
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C. 6
D. 9

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B. 45
C. 60
D. 75

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Evaluate $\frac{2\sin x+\cos x}{\sin y}$, leaving your answer in surd form.
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A. 13.04
B. 15.04
C. 16.04
D. 16.08

36. The area of a rectangular plot of length is $36m^2$. If the length is 6m more than the width, find the width to the nearest whole number.
A. 3m
B. 4m
C. 5m
D. 6m

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37. Simplify: $a^2\left(\frac{3b^{-2}}{ab^{-2}}\right)^2$
A. 9
B. 8
C. 7
D. 6

38. Given that x varies as y and that x=3, when y=5, Find the constant of proportionality.
A. $\frac{1}{5}$
B. $\frac{2}{5}$
C. $\frac{3}{5}$
D. $\frac{4}{5}$

39. If W=0.0000000019, Express W in standard form.
A. $0.19x10^{-2}$
B. $0.19x10^{-4}$
C. $1.9x10^{-5}$
D. $1.9x10^{-9}$

40. Factorize $9x^2-4y^2$
A. (3x-2y)(3x+2y)
B. (3x-3y)(2x-2y)
C. (3x+3y)(2x-2y)
D. (3x-2y)(3x-2y)

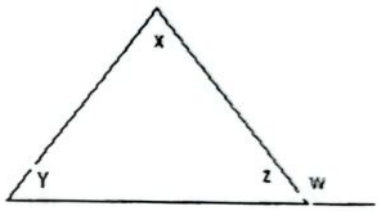
41. Write $\frac{3}{a+1}-\frac{2}{a-1}$ as a single fraction.
A. $\frac{a-1}{a^2-1}$
B. $\frac{a+1}{a^2-1}$
C. $\frac{5a+1}{a^2+1}$
D. $\frac{a-5}{a^2-1}$

42. Solve for x and y, given that 3x- 4y=10 and 5x+7y=3
A. x=2, y = -1
B. x=-2, y =1
C. x=3, y =2
D. x=3, y =3

43. Express the following in symbols only: The area A of a circle varies directly as the square of its radius r
A. $A \propto r$
B. $A \propto r^2$
C. $A \propto \sqrt{r}$
D. $\sqrt{A} \propto r$

44. The angles 190^0, 70^0 and 100^0 are respectively.
A. reflex, obtuse and acute angles
B. acute, reflex, and obtuse angles
C. reflex, acute and obtuse angles
D. obtuse, acute and reflex angles

45. In the figure below w=120^0 and y =70^0. Find the value of x



A. 50^0
B. 60^0
C. 70^0
D. 140^0

46. Find the length of the arc that subtends on angle of 60^0 at the centre of a circle of radius 6cm.
A. $2\pi cm$
B. $4\pi cm$
C. $6\pi cm$
D. $12\pi cm$

47. If $\overrightarrow{AB}$=(7cm,310^0), find $\overrightarrow{BA}$
A. (7cm,050^0)
B. (7cm,130^0)
C. (7cm,22^0)
D. (7cm,230^0)

48. The point T(6,4) on the x-y plane is reflected on the line y = -2. Find the co-ordinate of the image $\rightarrow T^1$
A. (-10,4)
B. (6,-6)
C. (-6,8)
D. (6,-8)

49. The angle of elevation of the top of a building from a point on the ground 80m from its base is 30^0. Find the height of the building to the nearest meter.
A. 35m
B. 40m
C. 46m
D. 69m

50. Under a translation, the image of the point (5,4) is (7,1). What is the image of the point (1,-4) under the same translation?
A. (3,-7)
B. (3,7)
C. (2,-3)
D. (-1,-1)

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C704/2
MAY 2018
MATHEMATICS
Written
2 ½ Hours
2

NATIONAL BOARD FOR PROFESSIONAL AND TECHNICIAN EXAMINATIONS (NABPTEX)

Certificate II Core Subjects Examination for Technical and Vocational Institutions in Ghana

MONDAY **MATHEMATICS** **9:00am – 11.30am**

30th April, 2018 **WRITTEN TEST**

NAME OF CANDIDATE..... .....

INDEX NUMBER ....

Please read the instructions carefully. DO **NOT** turn over **this page** until you are told to do so by the invigilator.

Write your **name, index number** and other particulars at the space provided in the answer booklet. An example is given below:

CENTRE NUMBER	CANDIDATE'S FULL INDEX NUMBER
817056	00218

Candidate's Full Name: AMOAH IRENE AFUA
Candidates's Signature: aiafua Date: 30TH APRIL, 2018
Title of Examination: CERT II CORE (MAY/JUNE)
Subject: MATHEMATICS Paper: TWO (2)

This booklet consists of **theory questions** which last for 2½ hours.

Answer all questions in the answer booklet.

Write the numbers of your answers in the order in which they have been answered in the space provided at cover page of your answer booklet

When you finish and there is still some time left, go over your work.

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MATHEMATICS 2

Time: 2½ hours

May/June

*Answer **nine** questions in all: all the questions in section A and **four** questions from section B. Unless otherwise stated, all answers should be corrected to two decimal places.*

Graph papers are inserted in the answer booklet for your use in the examination.

The use of non-programmable, silent and cordless calculators are allowed unless otherwise stated.

SECTION A

[40 Marks]

*Answer **all** questions from this section.*

All questions carry equal marks

1 a) If $\mu=\{0,1,2\}$ list all the subset of μ.

b) Given that $(125)^{(x+2)}=5^{2y}$, find x in terms of y

2 A(-1,5), B(5,3), C(3,-3) and D(-3,-1) are four points in the plane

a) Determine the relationship between the following pairs of vector:

i $\overrightarrow{AC}$ and $\overrightarrow{BD}$

ii $\overrightarrow{AD}$ and $\overrightarrow{BC}$

b) If M is the midpoint of AD. Find the length of BM

3 Without using calculator

a) Evaluate $\frac{2x-y}{z}+\frac{z+2y}{x}$, where x=2, y = -3, z = 4

b) Find Q if $3Q+13^2=16^2$

4 a) Multiply 2102_{three} by 122_{three} and leave the answer in base three.

b) Without using calculator or tables, evaluate $\frac{7.25x\ 0.16^2}{0.004}$

5 If $3^m x 3^n = 243$ and $3^m \div 3^{2n} = 9$. Write down two equations connecting m and n. Hence find the values of m and n

SECTION B

PART I

[30 marks]

*Answer **two** questions only from this section*

All questions carry equal marks.

6. In a certain country, the annual income tax payable by an individual is as follows.

	Amount	Rate of Tax
First	Gh¢140,700	Free
Next	Gh¢100,000	5%
"	Gh¢150,000	15%
"	Gh¢200,000	25%
"	Gh¢300,000	35%
"	Gh¢350,000	45%
"	Gh¢400,000	55%

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Mr. Hamond's annual salary is ₵1,396,796.35

Calculate

a) His taxable income
b) His annual income tax
c) The percentage of his income that went into tax, correct to two significant figures

7 a) Simplify $\frac{2}{4}\sqrt{128}-\sqrt{50}$, leaving your answer in surd form

b) solve the equation $(x-2)(x-3)=12$

c) Given that $R=\frac{W(P-t)}{2PP}$

i. Make R the subject of the formula

ii. Find the value of R, correct to three significant figures when t=12, P=60, W=1024 and $P=\frac{5}{6}$

8 a) Copy and complete the following table for the relation $y=x^2-5x+3$ for $0\leq x\leq 5$

x	0	0.5	1	1.5	2	2.5	3	4	4.5	5
y	3		-1							3

b) Using a scale of 2cm to represent 1 unit on both axes, draw the graphs of the relations

i. $y=x^2-5x+3$

ii. $y-1=\frac{1}{4}x$

c) From your graphs, find;

i. the truth set of $x^2-5x+3=\frac{1}{4}x+1$

ii. the least point on the graph of the relation $y=x^2-5x+3$

iii. The equation of the line of symmetry of the equation $y=x^2-5x+3$

9 a) Ama bought 600 oranges at 5 for GH¢3.00 to be sold at the Kaneshie market in Accra. On arrival 5% of the oranges got rotten and she sold the rest at one for GH¢1.00

i. How many oranges did she finally sell?

ii. Find her loss or profit percent

b) Simplify $2\log_{10}5+4\log_{10}4-2\log_{10}8+1=3$

10 Using a scale of 2cm to 2units on each axis, draw on a sheet of graph paper two perpendicular axes OX and OY for the intervals $-10\leq x\leq 10$ and $-10\leq y\leq 10$

a) Draw ΔABC with co-ordinates A(6,8), B(2,5) and C(7,2)
b) Draw the image $\Delta A^1B^1C^1$ of ΔABC under an enlargement with scale factor -1 from origin where $A\rightarrow A^1$, $B\rightarrow B^1$, and $C\rightarrow C^1$. Label the vertices and co-ordinates clearly.
c) Draw the image of $\Delta A^2B^2C^2$ of ΔABC under a clockwise rotation of 270^0 about the origin where $A\rightarrow A^2$, $B\rightarrow B^2$, and $C\rightarrow C^2$
d) i What transformation maps $\Delta A^1, B^1, C^1$ unto $\Delta A^2, B^2, C^2$?
ii What is the equation of BB^1?

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PART II
[15 marks]

STATISTICS AND PROBABILITY
*Answer **one** question **only** from this section*
All questions carry equal marks.

11. The data below shows the distribution of marks obtained by 50 students in a test.

10	73	19	78	24	78	34	34	35	35
37	59	41	63	41	65	45	55	55	58
48	49	49	53	53	55	45	55	65	67
58	38	59	43	61	44	48	68	79	83
70	14	74	29	76	31	48	68	65	90

a) Using class interval of 10-19, 20-29, etc, construct a frequency distribution table
b) i. Draw a histogram for the distribution
   ii. Use your histogram to estimate the mode
c) Calculate the mean mark of the distribution

12. A bag contains 12 white balls and 8 black balls; another contains 10 white balls and 15 black balls. If two balls are drawn, without replacement, from each bag, find the probability that
   i. all four balls are black
   ii. exactly one of the four balls is white

PART III
[15 marks]

VECTORS
*Answer **one** question **only** from this section*
All questions carry equal marks

13 a) if $k=\begin{pmatrix}2\\3\end{pmatrix}$, $i=\begin{pmatrix}10\\27\end{pmatrix}$ and $\underline{r} = \frac{3}{8}(i-k)$ find
   i. $\underline{r}$
   ii. $|\underline{r}|$

b) A (4, 7) is the vertex of triangle ΔABC, $\overrightarrow{BA}=\begin{pmatrix}5\\3\end{pmatrix}$ and $\overrightarrow{AC}=\begin{pmatrix}4\\-3\end{pmatrix}$
   i. Find the co-ordinates of B and C
   ii. If M is the midpoint of the line $\overrightarrow{BC}$, find $\overrightarrow{AM}$

14 Two ships A and B start from port P at the same time. Ship A sailing at 35km/hr is on a bearing of 335^0 and ship B, sailing at 22km/hr on a bearing of 065^0

a) Find after 3 hours
   i. the distance between the two ship
   ii. the bearing of A from B

b) If $p=\begin{pmatrix}4\\-3\end{pmatrix}$ and $q=\begin{pmatrix}-5\\7\end{pmatrix}$
   i. calculate |q-p|, correct to one decimal place
   ii. find the vector $\underline{r}$ such that $\underline{p}+\underline{r}=2\underline{q}$

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1 [085/1] MAY 2019 **MATHEMATICS** Objective Test 1½ Hours	**1**

Name of Candidate .....

Index Number .....

Signature .....

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Certificate II Core Subjects Examination for Technical and Vocational Institutions in Ghana

TUESDAY **MATHEMATICS** **2:00pm – 3.15pm**

30th April, 2019 **OBJECTIVES**

Please read the instructions carefully.

Use **BB pencil to** shade your particulars **provided on the** scannable answer sheet before you are told to start the test. An example is given below.

PRINT IN BLOCK LETTERS

Name: AMOAH IRENE AFUA

Examination: CERT II CORE (MAY) Year: 2019

Subject: MATHEMATICS Paper: 1

INDEX NUMBER									
1	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
7	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
0	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
5	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
6	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
0	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
0	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
2	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
3	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
8	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]

SUBJECT CODE									
7	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
0	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
4	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]

For Supervisors only
If candidate is absent shade this space:

This booklet consists of **objective test paper only** which lasts for 1hour 15 minutes.

Shade the correct letter to the answer in **BB pencil**. When you want to change your answer make sure that you erase the previous answer. You will lose the whole mark if you shade more than one option for any question.

When you finish and there is still some time left, go over your work.

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OBJECTIVE QUESTIONS

[40 Marks]

Answer all questions

Each question is followed by four options A to D. Find the correct option for each question and shade in pencil on your answer sheet the space which bears the same letter as the option you have chosen. Give only one answer to each question.

Think carefully before you shade the answer spaces. Erase completely any answer(s) you wish to change.

Do all rough work on this question paper

Now answer the following questions.

1. By how much does (a+2b-c) exceed (2b-a-c)?
   A. 2a
   B. 4b
   C. 2a + 2b
   D. 2a + 4b

2. Simplify $\frac{1\frac{1}{3}\times\frac{2}{3}}{\frac{1}{4}\div 1\frac{1}{2}}$
   A. 5
   B. $5\frac{1}{3}$
   C. 6
   D. 10

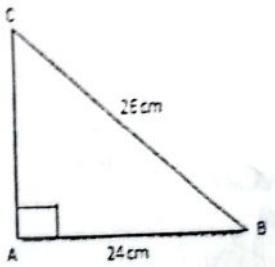
3. Find the value of x if $\frac{x}{5}+3=\frac{x}{3}+5$
   A. -15
   B. -1
   C. 3
   D. 15

4. An isosceles triangle has a base of 10cm. If the other sides are 13cm each, find the height of the triangle?
   A. 5 cm
   B. 8 cm
   C. 12 cm
   D. 13 cm

5. For what value of x is the function $\frac{2x+4}{4x+8}$ undefined?
   A. - 2
   B. $\frac{1}{3}$
   C. $\frac{1}{3}$
   D. 2

6. Ama covered a distance of 45km with his bicycle for 2hours. How long will it take him to cover a distance of 65km at the same speed?
   A. 2.89 hours
   B. 3.00 hours
   C. 3.33.hours
   D. 4.00 hours

7. Calculate the area of the triangle ABC below
   A. 60 cm^2
   B. 68 cm^2
   C. 120 cm^2
   D. 130 cm^2

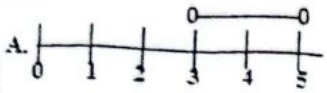


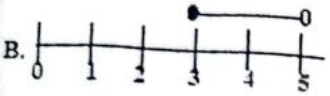
8. Simplify $\frac{\sqrt{50}\times\sqrt{45}}{\sqrt{15}}$ in the form $a\sqrt{b}$
   A. $\sqrt{3}$
   B. 5
   C. $5\sqrt{6}$
   D. $15\sqrt{2}$

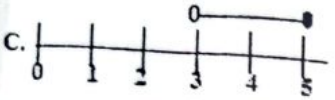
9. If $(3n-1)^{1/3}=2$, find n
   A. 1
   B. 2
   C. 3
   D. 4

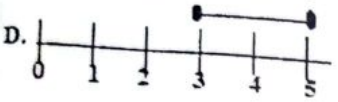
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10. Represent the inequality $3 \leq x < 5$ on a number line

A. 

B. 

C. 

D. 

11. Make 'V' the subject in the relation $T = K + \frac{1}{2}mv^2$

A. $V = \frac{2T-2k}{m}$

B. $V = \frac{\sqrt{T-K}}{m}$

C. $V = \sqrt{\frac{2(T-K)}{m}}$

D. $V = \sqrt{\frac{m}{2(T-K)}}$

12. Find the solution set of $15x^2-8x+1=0$

A. $\{x: x=\frac{1}{2}, \frac{1}{3}\}$

B. $\{x: x=\frac{1}{5}, \frac{1}{2}\}$

C. $\{x: x=\frac{1}{3}, \frac{1}{5}\}$

D. $\{x: x= 5, 3\}$

13. In a given regular polygon, the ratio of the exterior angle to the interior angle is 1:3.
How many sides has the polygon?

A. 6
B. 8
C. 10
D. 11

14. Calculate for x if $43_x = 23$

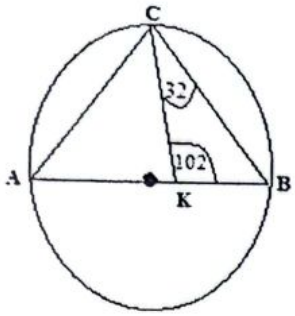
A. 4
B. 5
C. 6
D. 7

15. If p=7, a=16, =4 and c=3 evaluate $p^2 - \frac{(a-b)}{c}$

A. 40
B. 45
C. 48
D. 50

16. In the diagram below line AB is a diameter of the circle ABC. If $\angle KAC = 102^0$, and $\angle KCB = 32^0$, calculate the value of $\angle KAC$

A. 44^0
B. 50^0
C. 60^0
D. 66^0



17. If $\overrightarrow{PQ} = \begin{pmatrix}2\\4\end{pmatrix}$ and $\overrightarrow{PR} = \begin{pmatrix}2\\-1\end{pmatrix}$ find$|\overrightarrow{QR}|$?

A. $\sqrt{8}$
B. 5
C. $\sqrt{26}$
D. 6

18. Change $\overrightarrow{QP} = (10km, 065^0)$ to a Column vector.

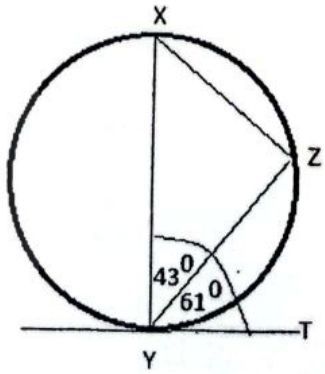
A. $\begin{pmatrix}11\\15\end{pmatrix}$
B. $\begin{pmatrix}10\\5\end{pmatrix}$
C. $\begin{pmatrix}9.16\\4.25\end{pmatrix}$
D. $\begin{pmatrix}9.06\\4.23\end{pmatrix}$

19. Which of the following is not a measure of dispersion?

A. Mean deviation
B. Variance
C. Range
D. Mean

20. In the diagram below triangle XYZ is inscribed in a circle. YT is a tangent to the circle at Y. Find $< XZY$

A. 70^0
B. 76^0
C. 100^0
D. 104^0



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If A = {0,1,2,3} and B= {2,3,4,5} are subsets of the universal set U= {0,1,2,3,4,5,...9}
Use the information to answer questions 21 and 22.

21. Find $A^1 \cap B$
    A. {4}
    B. {5}
    C. {4,5}
    D. { 1, 4, 5}

22. Find $A^1 \cup B^1$
    A. {0,1,6,7,8,9}
    B. {0,1,4,5,6,7,8,9}
    C. {4,5,6,7,8,9}
    D. {0,1,4,5,8,9}

23. The fourth term of a linear sequence is 19 and the eleventh term is 54. Find the eighth term.
    A. 30
    B. 39
    C. 40
    D. 51

24. Simplify $(27x3^{-2})\ (8x2^{-3})$
    A. 1
    B. 3
    C. 4
    D. 5

25. Find x if $3^{x-2} = \frac{1}{81}$
    A. -2
    B. 0
    C. 2
    D. 3

26. If $\sin x = \frac{1}{k}$, find $\tan x$
    A. $\frac{1}{k+1}$
    B. $\frac{1}{\sqrt{k^2-1}}$
    C. $\sqrt{k^2-1}$
    D. $\sqrt{k^2+2}$

27. Simplify $\frac{(\log 16)\ (\log 27)}{(\log 9)\ (\log 64)}$
    A. 1
    B. 5
    C. 10
    D. 21

28. If $\sin\theta = \frac{3}{5}$, find the value of $2\sin\theta + 3\cos\theta$
    A. 3
    B. $3\frac{1}{3}$
    C. $3\frac{3}{5}$
    D. $5\frac{1}{3}$

29. A set M= {2,1,0,3,4,7}. Calculate the total number of subsets of set M.
    A. 6
    B. 18
    C. 32
    D. 64

30. y varies inversely as x. When y = 8, x = 3. Find the value of x when y=12
    A. 2
    B. 8
    C. 10
    D. 12

31. Given that $\log_{10} 2 = 0.431$ and $\log_{10} 3 = 0.682$. Find the value of $\log_{10} 1.5$
    A. 0. 5
    B. 0. 30
    C. 0. 251
    D. 0. 21

The frequency table below gives the age distribution of students who offered core mathematics in school Z. Use the information to answer questions 32 and 33

Age/yrs	15	16	17	18	19	20
No. of students	3	10	8	5	2	2

32. How many students offered core mathematics in school Z?
    A. 27
    B. 28
    C. 30
    D. 33

33. Calculate the mean age of the students.
    A. 15. 7
    B. 16. 21
    C. 16. 97
    D. 17. 11

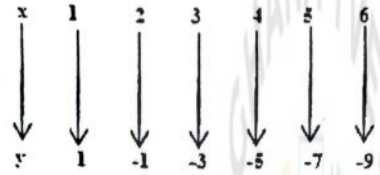
34. The probabilities that Abu, Demsi and Klaye pass a written test are $\frac{5}{7}, \frac{1}{3}, \frac{4}{5}$ respectively. What is the probability that none of them pass the test?
    A. 0. 003
    B. 0. 038
    C. 0. 112
    D. 0. 434

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35. A school presented 200 candidates for the 2010 certificates II Core Examination. The ratio of boys to girls was 5: 3. How many boys were presented for the examination?
A. 125
B. 120
C. 75
D. 60

36. What is the rule for the mapping below

A. $y=1-2x$
B. $y=3-2x$
C. $y= 1+2x$
D. $y= 3+2x$



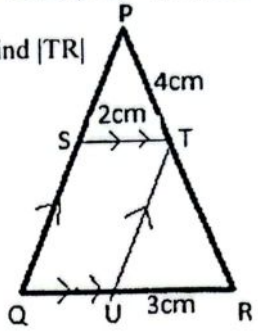
37. Find the components of the vector AB = (100 km, 150^0)
A. $\begin{pmatrix} -86.6 \\ 50.0 \end{pmatrix}$
B. $\begin{pmatrix} 86.6 \\ -50.0 \end{pmatrix}$
C. $\begin{pmatrix} 50.0 \\ 86.6 \end{pmatrix}$
D. $\begin{pmatrix} 50.0 \\ -86.6 \end{pmatrix}$

38. Express 98000 in standard form.
A. $9.8x10^{-4}$
B. $9.8x10^{3}$
C. $9.8x10^{4}$
D. $9.8x10^{5}$

39. A man divides his 360 cattle among his sons in the ratio 7:6:5. Find the smallest share
A. 100
B. 120
C. 130
D. 140

40. A sector of angle 120^0 is removed from a thin circular sheet of radius 14cm. The remaining portion is then folded, with the straight edges coinciding to form a right circular cone. Calculate for its outer surface area. [$\pi = 3.142$]
A. $400cm^2$
B. $410.41cm^2$
C. $510.41cm^2$
D. $600cm^2$

41. In the diagram below, |ST|= 2cm, |PT|= 4cm, and |UR|= 3cm
If ST || QU and QS || UT, find |TR|



A. 4 cm
B. 5 cm
C. 6 cm
D. 10 cm

42. In a class of 40 students, 30 do Biology and 20 do chemistry. Find the probability that a student chosen at random from the class does Biology only.
A. $\frac{1}{10}$
B. $\frac{1}{4}$
C. $\frac{1}{3}$
D. $\frac{1}{2}$

43. If $\overrightarrow{AB}= \begin{pmatrix} 3 \\ -5 \end{pmatrix}$ and $\overrightarrow{CB}= \begin{pmatrix} 2 \\ 1 \end{pmatrix}$, find the bearing of C from A to the nearest degree.
A. 80^0
B. 90^0
C. 161^0
D. 171^0

44. Find the gradient of the line joining the points $(-2, 6)$ and $(3, 2)$
A. $\frac{4}{5}$
B. $\frac{3}{5}$
C. $\frac{2}{5}$
D. $\frac{4}{-5}$

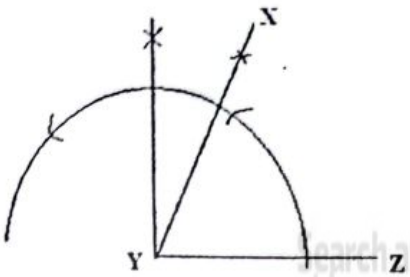
45. Simplify $(27^{\frac{1}{3}})^2$
A. 4
B. $5\frac{1}{2}$
C. 9
D. 18

46. Find the solution set of
$x + y = 7$ and $x - y = 3$
A. {x=5,y=3}
B. {x=2,y=5}
C. {x=5,y=2}
D. {x=2,y=6}

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47. What is the size of $< XYZ$ in the construction above?

A. 60^0
B. 65^0
C. 70^0
D. 75^0



48. Mr. Agorsu bought a television set for GH¢1500 from a supermarket and sold it in the open market for GH¢1750. Calculate his profit percent.

A. 16%
B. 16.66%
C. 17%
D. 18%

49. If $a = \begin{pmatrix} 2 \\ 3 \end{pmatrix} and\ b = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$, find a - 3b

A. $\begin{pmatrix} -2 \\ 5 \end{pmatrix}$
B. $\begin{pmatrix} -2 \\ -11 \end{pmatrix}$
C. $\begin{pmatrix} -10 \\ 9 \end{pmatrix}$
D. $\begin{pmatrix} -10 \\ -3 \end{pmatrix}$

50. Consider the statements below
p: Dede trains hard
q: Dede scored a goal.
If $p \rightarrow q$, which of the following statements is valid?

A. Dede scored a goal then he trained hard
B. Dede did not score a goal then he did not train hard
C. Dede did not train hard then he did not score a goal
D. Dede will never score if he trains hard.

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NATIONAL BOARD FOR PROFESSIONAL AND TECHNICIAN EXAMINATIONS (NABPTEX)

Certificate II Core Subjects Examination for Technical and Vocational Institutions in Ghana

C 704/1 AUGUST 2020 **MATHEMATICS** Objective Test 1¼ Hours	**1**

Name of Candidate.....

Index Number.....

Signature .....

MONDAY **MATHEMATICS** **2:00pm – 3.15pm**

3rd August, 2020 **OBJECTIVES**

Please read the instructions carefully.

Use **BB pencil to** shade your particulars **provided on the** scannable answer sheet before you are told to start the test. An example is given below:

PRINT IN BLOCK LETTERS

Name: AMOAH IRENE AFUA

Examination: CERT II CORE (MAY/JUNE) Year: 2020

Subject: MATHEMATICS Paper: 1

INDEX NUMBER	
1	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
7	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
0	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
5	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
6	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
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2	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
1	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
8	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]

SUBJECT CODE	
7	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
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4	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
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	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]

For Supervisors only
If candidate is absent shade this space: ☐

This booklet consists of **objective test paper only** which lasts for 1hour 15 minutes.

Shade the correct letter to the answer in **BB pencil**. When you want to change your answer make sure that you erase the previous answer. You will lose the whole mark if you shade more than one option for any question.

When you finish and there is still some time left, go over your work.

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OBJECTIVE QUESTIONS

[40 marks]

Answer all questions

*Each question is followed by **four** options **A** to **D**. Find the correct option for each question and **shade in pencil** on your answer sheet the space which bears the same letter as the option you have chosen. Give only one answer to each question.*

Think carefully before you shade the answer spaces. Erase completely any answer(s) you wish to change.

Do all rough work on this question paper.

Now answer the following questions

1. A function f is given by $f: x \rightarrow \frac{x}{2x+1}$. For what value of x is f undefined?
   A. -½
   B. 0
   C. ½
   D. 1

2. Consider the following statements
   p:Atanga works hard
   q: Atanga is rich
   If $p \Rightarrow q$ which of the following statements are **not** valid?
   i) If Atanga is rich then he works hard
   ii) If Atanga does not work hard then he is not rich
   iii) If Atanga is not rich then he does not work hard
   A. Only i and ii
   B. Only i and iii
   C. Only ii and iii
   D. Only iii

3. The point P (3, 1) is rotated about the origin through an angle of 270° in a clockwise direction. Find the image of P.
   A. (3,1)
   B. (1,3)
   C. (-1,3)
   D. (-1,-3)

4. Evaluate $(0.13)^2$ correct to three significant figures.
   A. 0.02
   B. 0.00219
   C. 0.00220
   D. 0.0169

5. Simplify $\sqrt{6}\left(2\sqrt{2}+\frac{1}{\sqrt{2}}\right)$
   A. $3\sqrt{3}$
   B. $5\sqrt{3}$
   C. $6\sqrt{3}$
   D. $8\sqrt{3}$

6. A hemispherical bowl is 0.27 cm thick. If its inner radius is 4 cm, find its outer surface area. (Take π t be 3.14).
   A. 114.50 cm^2
   B. 133.97 cm^2
   C. 267.95 cm^2
   D. 325.95 cm^2

7. The exterior angles of a pentagon are x, $2x$, $3x$, $4x$ and $2x$. What is the size of the largest angle?
   A. 60°
   B. 90°
   C. 180°
   D. 150°

8. Evaluate $\frac{49^{\frac{2}{3}} \div 49^{\frac{1}{6}}}{\left(\frac{1}{7}\right)^{-\frac{7}{6}} \times \left(\frac{1}{7}\right)^{\frac{1}{6}}}$
   A. 0
   B. 1
   C. 7
   D. 49

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9. The sum of two numbers is 15 and their product is 54. Find the numbers
   A. 7 and 8
   B. 2 and 27
   C. 6 and 9
   D. 3 and 18

10. A cone is made from a sector of a circle of radius 14cm and angle 90°. What is the area of the curved surface of the cone? (Take $\pi = \frac{22}{7}$)
   A. $154cm^2$
   B. $77cm^2$
   C. $38cm^2$
   D. $36cm^2$

11. If x = {2, 3}, how many subsets has x?
   A. 2
   B. 3
   C. 4
   D. 8

12. Solve for y $\frac{3}{8}(y-2) = \frac{1}{4}(2y-3)$
   A. $y = 0$
   B. $y = 1$
   C. $y = 2$
   D. $y = 3$

13. Safura, Charity and Naomi shared some apples in the ratio 4:5:6 respectively. If Naomi got 24, find Safura's share.
   A. 20
   B. 32
   C. 36
   D. 60

14. To construct a circle (inscribed circle) to touch the three sides of a given triangle you have to .....
   A. bisect any two sides of the triangle.
   B. bisect any two angles of the triangle.
   C. construct any two perpendicular bisectors.
   D. circumscribed.

15. If $\log_{10} 3 = x$ and $\log_{10} 5 = y$, write an expression for $\log_{10} 75$ in terms of x and y.
   A. $x + y^2$
   B. $x + 2y$
   C. $2xy$
   D. xy^2

16. If $8\text{Cos}\ x = 3$, Calculate x to the nearest degree.
   A. 67°
   B. 68°
   C. 83°
   D. 97°

17. Find the truth set of the inequality $5x + 1 > 10x - 9$
   A. $\{x : x < 2\}$
   B. $\{x : x > 2\}$
   C. $\left\{x : x < \frac{8}{5}\right\}$
   D. $\left\{x : x > \frac{8}{5}\right\}$

Use the diagram to answer questions 18 – 20

Marks	1	2	3	4	5	6	7	8	9
No. of students	11	12	10	17	16	15	14	13	12

18. What is the mean mark?
   A. 3
   B. 4
   C. 5
   D. 6

19. What is the modal mark?
   A. 3
   B. 4
   C. 5
   D. 6

20. If a student is selected at random, what is the probability that the student obtained at most 7 marks?
   A. $\frac{19}{24}$
   B. $\frac{5}{24}$
   C. $\frac{1}{5}$
   D. $\frac{7}{40}$

21. If $(9 \times 3) = 2 \bmod x$, find x
   A. 2
   B. 3
   C. 4
   D. 5

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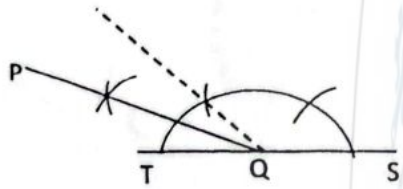
22. Solve for x the equation $\left(\frac{1}{3}\right)^{3x} = 81^{-\frac{3}{4}}$

A. -2
B. -1
C. 1
D. 2

23. Make u the subject of the relation $v = \frac{\sqrt{25-u^2}}{4}$

A. $u = \sqrt{25+16v^2}$
B. $u = \sqrt{25v^2+16}$
C. $u = \sqrt{16v^2-25}$
D. $u = \sqrt{25-16v^2}$

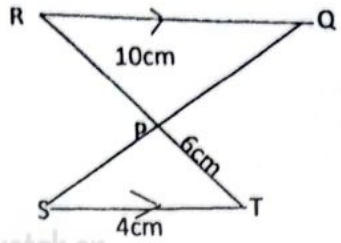
24. What is the size of < PQS in the construction?



A. 45°
B. 120°
C. 135°
D. 150°

25. Mr. Addah bought a T.V set for Gh¢1500.00. After one year the cost depreciates by 20%. What is the value after one year?
A. GhC300.00
B. GhC1200.00
C. GhC1800.00
D. GhC1875.00

26. If $x = 2$, $y = -3$ and $z = -4$, evaluate $(y-x)(x-z)(z-y)$
A. 210
B. 30
C. -30
D. -210



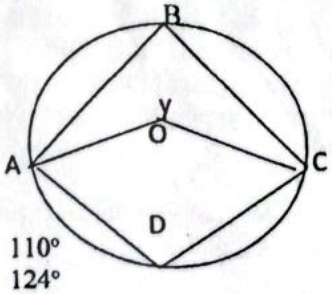
In the diagram, ΔPQR is an enlargement of ΔPST. $\overline{RQ} // \overline{ST}$, $|ST| = 4$cm, $|RQ| = 10$ cm, and PT $= 6$ cm. Use the information to answer Questions 27 and 28.

27. What is the scale factor?
A. $\frac{2}{5}$
B. $\frac{2}{3}$
C. $\frac{5}{3}$
D. $\frac{5}{2}$

28. Find $|PR|$
A. 25cm
B. 15cm
C. 10cm
D. 6cm

29. Find the image of $(5,-8)$ under the mapping $\begin{pmatrix} x \\ y \end{pmatrix} \rightarrow \begin{pmatrix} -y \\ x+2y \end{pmatrix}$
A. (8,21)
B. (8,11)
C. (8,3)
D. (8,−11)

30. In the diagram, O is the centre of the circle ABCD. If angle ABC = 55°. Find the value of y.



A. 110°
B. 124°
C. 250°
D. 305°

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31. Which of the following vectors is parallel to $\begin{pmatrix}2\\5\end{pmatrix}$?

A. $\begin{pmatrix}-2\\5\end{pmatrix}$

B. $\begin{pmatrix}-2\\-5\end{pmatrix}$

C. $\begin{pmatrix}10\\6\end{pmatrix}$

D. $\begin{pmatrix}25\\10\end{pmatrix}$

32. Solve the simultaneous equations $2x + y = 7$ and $x + 3y = 1$

A. $x = 4, y = -1$
B. $x = 3, y = 1$
C. $x = 2, y = 3$
D. $x = -4, y = 1$

33. Find the vector whose image is $(5,3)$ translated by the point $(2,4)$

A. $(1,1)$
B. $(7,7)$
C. $(-3,1)$
D. $(3,-1)$

34. The bearing of Navrongo town from Bawku town is 258°. Find the bearing of Bawku town from Navrongo town.

A. 12°
B. 78°
C. 102°
D. 168°

35. $\underset{\sim}{a} = \begin{pmatrix}-4\\-8\end{pmatrix}, \underset{\sim}{b} = \begin{pmatrix}1\\4\end{pmatrix}$ and $\underset{\sim}{S} = \underset{\sim}{b} - \underset{\sim}{a}$, Find $|\underset{\sim}{S}|$.

A. 5.0
B. 10.9
C. 12.0
D. 13.0

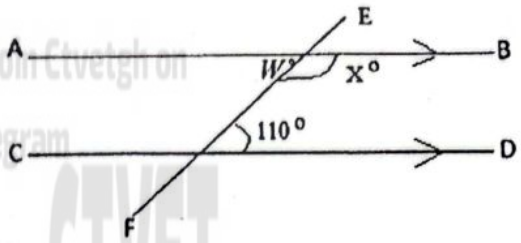
36. Find the image of $A(2,3)$ under a reflection on the line $x = 4$.

A. $(2,7)$
B. $(3,6)$
C. $(6,3)$
D. $(8,3)$

37. Find the truth set of $x^2 - 7x + 6 = 0$

A. $\{-2, -3\}$
B. $\{-6, -1\}$
C. $\{1, 6\}$
D. $\{2, 3\}$

Use the diagram to answer questions 38-39.



38. What is the value of W?

A. 70°
B. 90°
C. 110°
D. 290°

39. What is the value of X?

A. 70°
B. 90°
C. 110°
D. 120°

40. Given that the vector $a = (1, 2)$, write $5a$ as a column vector.

A. $\begin{pmatrix}1\\2\end{pmatrix}$

B. $\begin{pmatrix}5\\9\end{pmatrix}$

C. $\begin{pmatrix}2\\10\end{pmatrix}$

D. $\begin{pmatrix}5\\10\end{pmatrix}$

41. Evaluate $3\frac{5}{8} - \left(3\frac{2}{3} \div 2\frac{4}{9}\right)$

A. $\frac{3}{8}$

B. $2\frac{1}{8}$

C. $3\frac{1}{2}$

D. $5\frac{3}{8}$

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42. Find the value of x such that $2x + 5 = 1 \pmod 7$

A. 2
B. 3
C. 4
D. 5

43. Arrange 1011_{two}, 111_{four}, and 20_{ten} in descending order of magnitude.

A. 20_{ten}, 111_{four}, 10011_{two}
B. 111_{four}, 20_{ten}, 10011_{two}
C. 1011_{two}, 20_{ten}, 111_{four}
D. 10011_{two}, 20_{ten}, 111_{four}

44. Express 0.000345 in standard form.

A. 3.45×10^{-5}
B. $3\text{-}45 \times 10^{-4}$
C. 3.45×10^{4}
D. 3.35×10^{5}

45. Find the rule of the mapping

X	1	2	3	4	5
↓	↓	↓	↓	↓	↓
Y	2	5	8	11	14

A. $y=2x+1$
B. $y=2x+3$
C. $y=3x+1$
D. $y=3x-1$

46. What property of operations on sets is illustrated in the statement?

$P \cup (Q \cup R) = (P \cup Q) \cup R$

A. Closure
B. Communicative
C. Distributive
D. Associative

47. What is the image, if the point $P(-3,4)$ is reflected in the line y = 2?

A. (-3, 0)
B. (-3, -4)
C. (3, 4)
D. (7, 4)

48. If $A(3,7)$ and $B(-4,8)$, Calculate $|AB|$.

A. $5\sqrt{2}$ units
B. 5 units
C. $2\sqrt{5}$ units
D. 2 units

49. The ratio of the number of sheep to the number of goats on a farm is 7:5. If there are 910 sheep, how many goats are on the farm?

A. 1560
B. 650
C. 530
D. 260

50. How much interest would the Government of Ghana pay if it borrowed GH¢5,000.00 from the World Bank at a rate of 24% per annum for 6 months?

A. Gh¢600.00
B. Gh¢650.00
C. Gh¢700.00
D. Gh¢800.00

END OF PAPER

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NATIONAL BOARD FOR PROFESSIONAL AND TECHNICIAN EXAMINATIONS (NABPTEX)

Certificate II Core Subjects Examination for Technical and Vocational Institutions in Ghana

C704/2
AUGUST 2020
MATHEMATICS **2**
Written Test
2½ Hours

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MONDAY **MATHEMATICS** **9:00am – 11.30am**

3rd August, 2020 **WRITTEN TEST**

NAME OF CANDIDATE.....

INDEX NUMBER ..... **SIGNATURE**.....

Please read the instructions carefully. DO NOT turn over **this page** until you are told to do so by the invigilator.

Write your name, index number, and other particulars at the space provided in the answer booklet. An example is given below:

CENTRE NUMBER	CANDIDATE'S FULL INDEX NUMBER
817056	02739

Candidate's Full Name: AMOAH IRENE AFUA
Candidates's Signature: aiafua Date 3RD AUGUST, 2020
Title of Examination. CERT II CORE (MAY/JUNE)
Subject: MATHEMATICS Paper: TWO (2)

This booklet consists of **theory questions** which last for 2½ hour.

Answer all questions in the answer booklet.

Write the numbers of the questions you answered in the order in which they have been answered in the space provided at the bottom of the cover page of your answer booklet

When you finish and there is still some time left, go over your work.

YOU WILL BE PENALISED SEVERELY IF YOU ARE FOUND LOOKING AT THE NEXT PAGE BEFORE YOU ARE TOLD TO DO SO

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MATHEMATICS 2

Section A (40 marks)

Answer **all** questions from this section

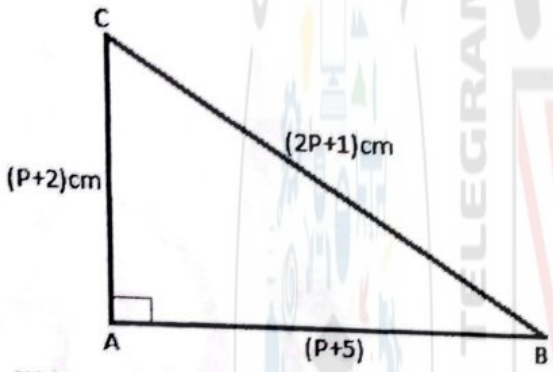
All questions carry equal marks

1. a. Calculate the number that makes the expression $t^2 - 6t$ a perfect square.

   b. If $\propto$ and β are the roots of the equation $y^2 - 3y - 54 = 0$, calculate the numerical strength of $(\propto + \beta)$, by first solving the equation.

   c. Calculate the truth set of $2x^2 + 5x = 3$.

2. The sides of a right angled triangle ABC are shown:



   a. Write an algebraic expression in its simplest form for the perimeter of the triangle.

   b. By using Pythagoras theorem,

      i. Write a relevant equation involving the sides of the triangle

      ii. Hence calculate $|AB|$, $|AC|$ and $|BC|$

3. The sets P = { multiples of 3}, Q = { factors of 72} and R = { even numbers} are subsets of the universal set μ = { $18 \leq x \leq 36$}.

   a. List the elements of P, Q and R

   b. Find each of the following:

   i. $P \cap Q$

   ii. $Q \cap R$

   iii. $P \cap R$

   c. State n $(P \cap Q)$, n $(Q \cap R)$ and n $(P \cap R)$.

4. a. In the form $a + b\sqrt{15}$, simplify the expression $\sqrt{1,500} + 3\sqrt{3} \times 5\sqrt{5} + 2\sqrt{15}(\sqrt{15} - 3)$, where a and b are integers.

   b. Without using mathematical tables or calculators, compute y if $13y = 187^2 - 174^2$

5. The table shows the scores obtained by 25 students in a mathematics test.

Score	3	4	5	6	7	8
Frequency	2	4	5	6	5	3

   a. Calculate the median of the distribution.

   b. Calculate the arithmetic mean for the distribution.

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SECTION B (60 marks)

PART I

Answer **two** questions **only** from this part

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6. a. Find the truth set of the inequality $2-\frac{1}{3}(2x-1) > \frac{2}{3}x$, illustrating the answer on the number line.

b. What principal will amount to GHC 11,600.00 in three (3) years at 15% per annum simple interest?

c. The simple interest on GHC 60,000.00 for $3\frac{3}{4}$ years is GHC 5,625.00. Calculate the rate percent per annum

7. a. Copy and complete the table of values for the relation $y = 2x^2 + 5x - 3$.

X	-5	-4	-3	-2	-1.5	-1	-0.5	0	1	2	2.5
Y	22		0			-6		-3	4		22

b. Using scale of 2cm to 1 unit on the x – axis and 2cm to 5 units on the y- axis, draw the graph of $y = 2x^2 + 5x - 3$, for the internal $-5 \leq x \leq 2.5$

c. Using your graph in (b), find the truth set of

i. $2x^2 + 5x - 3 = 0$

ii. $2x^2 + 6x - 3 = 0$

8. a. Two functions f and g are defined, respectively, as $f(x) = \frac{x-1}{3}$ and $g(x) = 2x + 1$.

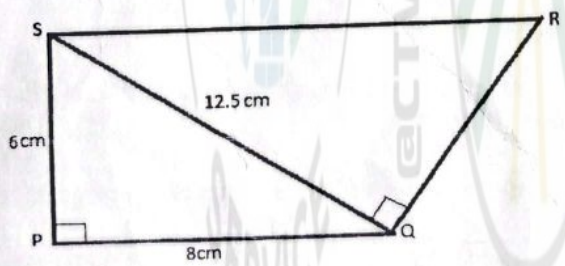
i. Evaluate $f(\frac{1}{3}) + 1$

ii. Solve for the equation; $f(x) = g(2)$

b. If multiplication $(*)$ is defined on the replacement set S = { 1, 2, 3, 4} in modulo five, calculate the value of n for which $2 * (3 * n) = 2$.

9. a. The perimeter of a rectangular plot is 35m. The ratio of the length of the plot to its width is 3: 2. Calculate the dimensions of the plot.

b. Calculate the area of the quadrilateral PQRS as sketched below:



$\angle SPQ = SQR = 90^0$. $|SP| = 6$cm and $|PQ| = 8$cm

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PART II

STATISTICS AND PROBABILITY

Answer **one** question only from this section

Both questions carry equal marks.

10. a. Two fair dice are tossed at the same time.

i. Design the sample space for the possible outcomes

ii. Calculate the probability of

($\propto$) a total of 7 or 9;

(β) the same number on both dice;

(γ) a total of not less than 7.

b. The monthly income of Professor Gbadamosi is GHC 108,000.00. His monthly expenditure is as follows:

Food	GHC 30,000.00
Fuel	GHC 12, 000.00
Wife's Allowance	GHC 21, 000.00
Children's Education	GHC 24, 000.00
Clothing	GHC 10, 500.00
Savings	GHC 10, 500.00

i. Represent the information on pie chart.

ii. Calculate, correct to two decimal places, the percentage of Professor Gbadamosi's monthly income that is spent on his children's education.

11. The table shows the heights, in millimetres of a sample of 250 seedlings on Aveyime farms.

Height of Seedlings (mm)	0 - 4	5 - 9	10 - 14	15 – 19	20 - 24	25 - 29	30 - 34	35 - 39
Number of Seedlings	40	45	60	40	30	20	10	5

a. Construct a cumulative frequency table for the distribution;

b. Using the table in (a), draw a cumulative curve, estimate the first and third quartiles and hence calculate the quartile deviation.

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PART III

VECTORS

Answer **one** question only from this section.

All questions carry equal marks.

12. a. The vectors $\underset{\sim}{p} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$, $\underset{\sim}{q} = \begin{pmatrix} x \\ y \end{pmatrix}$ and $\underset{\sim}{r} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$ are in the OXY plane. If $3\underset{\sim}{q} - 2\underset{\sim}{p} = \underset{\sim}{r}$, Calculate;

i. the vector $\underset{\sim}{q}$;

ii. $\left|\underset{\sim}{S}\right|$ and express the answer in the form $m\sqrt{n}$, where m and n are integers and $\underset{\sim}{s} = \underset{\sim}{q} - \underset{\sim}{r}$

b. Three points P, Q and R are identified in a horizontal plane. Q is on a bearing of 065^0 from P and R is on a bearing of 335^0 from P. If $|PQ| = 12$m and $|RQ| = 20$m, calculate $|RP|$.

13. a. Given that $\underset{\sim}{m} = 2\underset{\sim}{i} - 5\underset{\sim}{j}$ and $\underset{\sim}{n} = -7\underset{\sim}{i} + 17\underset{\sim}{j}$, calculate $\left|\underset{\sim}{m} + \underset{\sim}{n}\right|$

b. If $\underset{\sim}{p} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$, $\underset{\sim}{q} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$ and $\underset{\sim}{r} = \begin{pmatrix} 5 \\ -6 \end{pmatrix}$, calculate:

i. $\left|\underset{\sim}{u}\right|$ if $\underset{\sim}{u} = 3q + r$

ii. the bearing of $\underset{\sim}{u}$

iii. m and n such that $\underset{\sim}{r} = m\underset{\sim}{p} + n\underset{\sim}{q}$ where m and n are scalars.

END OF PAPER

$3\begin{pmatrix} x \\ y \end{pmatrix} - 2\begin{pmatrix} -1 \\ 4 \end{pmatrix} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

$\begin{pmatrix} 3x \\ 3y \end{pmatrix} - \begin{pmatrix} -2 \\ 8 \end{pmatrix} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

$\begin{pmatrix} 3x + 2 \\ 3y - 8 \end{pmatrix} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

$3x + 2 = 3$

$3x = 3 - 2$

$3x = 1$

$x = \frac{1}{3}$

$3y - 8 = 2$

$3y = 2 + 8$

$3y = 10$

$y = \frac{10}{3}$

$\therefore q = \begin{pmatrix} \frac{1}{3} \\ \frac{10}{3} \end{pmatrix}$

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COMMISSION FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (CTVET)

Certificate II Core Subjects Examination for Technical and Vocational Institutions in Ghana

C704/1 SEPTEMBER, 2021 MATHEMATICS OBJECTIVE TEST 1 Hour 15 Minutes	1

Name of Candidate .....

Index Number .....

Signature .....

MONDAY **MATHEMATICS** **2:00pm – 3.15 pm**

6th September, 2021 **OBJECTIVES**

Please read the instructions carefully.

Use **BB pencil to** shade your particulars **provided on the** scannable answer sheet before you are told to start the test. An example is given below:

PRINT IN BLOCK LETTERS

Name: AWUAH FAREEDA AKOSUA

Examination: CERT II CORE (MAY/JUNE) Year: 2021

Subject: MATHEMATICS Paper: 1

INDEX NUMBER	
1	[0] [●] [2] [3] [4] [5] [6] [7] [8] [9]
7	[0] [1] [2] [3] [4] [5] [6] [●] [8] [9]
0	[●] [1] [2] [3] [4] [5] [6] [7] [8] [9]
5	[0] [1] [2] [3] [4] [●] [6] [7] [8] [9]
6	[0] [1] [2] [3] [4] [5] [●] [7] [8] [9]
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0	[●] [1] [2] [3] [4] [5] [6] [7] [8] [9]
2	[0] [1] [●] [3] [4] [5] [6] [7] [8] [9]
1	[0] [●] [2] [3] [4] [5] [6] [7] [8] [9]
8	[0] [1] [2] [3] [4] [5] [6] [7] [●] [9]

SUBJECT CODE	
7	[0] [1] [●] [3] [4] [5] [6] [●] [8] [9]
0	[●] [1] [2] [3] [4] [5] [6] [7] [8] [9]
4	[0] [●] [2] [3] [4] [5] [6] [7] [8] [9]
	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]
	[0] [1] [2] [3] [4] [5] [6] [7] [8] [9]

For Supervisors only
If candidate is absent shade this space: ☐

This booklet consists of **objective test paper only** which lasts for 1hour 15 minutes.

Shade the correct letter to the answer in **BB pencil**. When you want to change your answer make sure that you erase the previous answer. You will lose the whole mark if you shade more than one option for any question.

When you finish and there is still some time left, go over your work.

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OBJECTIVE QUESTIONS
[40 marks]

*Answer **all** questions*

*Each question is followed by **four** options **A** to **D**. Find the correct option for each question and **shade in pencil** on your answer sheet the space which bears the same letter as the option you have chosen. Give only one answer to each question*

Think carefully before you shade the answer spaces. Erase completely any answer(s) you wish to change.

Do all rough work on this question paper.

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Now answer the following questions

1. Which of the following vectors is parallel to the vector $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$, but in the opposite direction?
   A. $\begin{pmatrix} -12 \\ 8 \end{pmatrix}$
   B. $\begin{pmatrix} 8 \\ 12 \end{pmatrix}$
   C. $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$
   D. $\begin{pmatrix} 4 \\ 6 \end{pmatrix}$

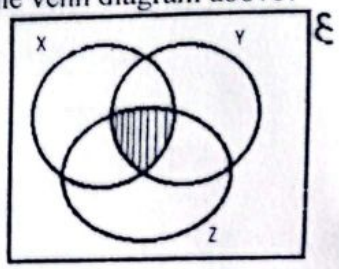
2. Simplify $2\begin{pmatrix} 3 \\ 4 \end{pmatrix} + 7\begin{pmatrix} -1 \\ -2 \end{pmatrix} - 3\begin{pmatrix} -2 \\ -1 \end{pmatrix}$
   A. $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$
   B. $\begin{pmatrix} -7 \\ -9 \end{pmatrix}$
   C. $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$
   D. $\begin{pmatrix} 5 \\ -3 \end{pmatrix}$

3. Four bottles have masses 2, 4, 6, 8 grammes. Calculate, correct to three significant figures, the standard deviation of the masses
   A. 2.00
   B. 2.24
   C. 2.58
   D. 5.00

4. Two fair dice, each of whose faces are numbered 1, 2, 3, 4, 5, 6 are thrown together. What is the probability of obtaining a sum of 7 or 11?
   A. $\frac{2}{9}$
   B. $\frac{1}{6}$
   C. $\frac{1}{9}$
   D. $\frac{1}{13}$

5. P, Q are sets of integers and $P = \{ x : x \geq 8 \}$. $Q = \{ x : x > -7 \}$. Find $P \cap Q$
   A. $\{ -6, -5, -4, \ldots, 6, 7, 8 \}$
   B. $\{ -7, -6, -5, \ldots, 6, 7, 8 \}$
   C. $\{ 6, 7, 8, \ldots \}$
   D. $\{ 8, 9, 10, \ldots \}$

6. Which of the following is illustrated by the shaded portion in the venn diagram above?



   A. $(x \cap Y) \cap Z'$
   B. $(X \cup Y) \cup Z'$
   C. $X \cap Y \cap Z$
   D. $Z' \cap (X \cup Y)$

7. Express 243_{eight} as a number in base ten.
   A. 163
   B. 316
   C. 336
   D. 363

8. Given that $53 = 3 \pmod{x}$, where $0 \leq x \leq 10$, find the values of x that make the statement true.
   A. {2}
   B. {2, 5}
   C. {5, 10}
   D. {5, 12}

9. Gina bought 4000 Omega Company shares at GH¢1. 50 each and sold at GH¢2. 05 each. What was her gain?
   A. GH¢0.55
   B. GH¢300.00
   C. GH¢2000.00
   D. GH¢2200.00

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10. The price of a litre of petrol is increased from GHC 30.00 to GHC 39.00. What is the percentage increase in the cost of a litre of petrol?
    A. 9%
    B. 30%
    C. 34%
    D. 39%

11. A trader sold 10 pair of shoes for Gh¢ 2800.00, a loss of 20% on his cost price. Find his loss as a percentage of his selling price.
    A. $16\frac{2}{3}\%$
    B. 20%
    C. 25%
    D. 75%

12. If the Simple Interest on Gh¢100 for 1 year is Gh¢ x, find the simple interest on Gh¢ p for **q** years at the same rate.
    A. Gh¢ $\frac{pqx}{100}$
    B. Gh¢ $\frac{pq}{100x}$
    C. Gh¢ $\frac{pr}{100q}$
    D. Gh¢ $\frac{100qr}{p}$

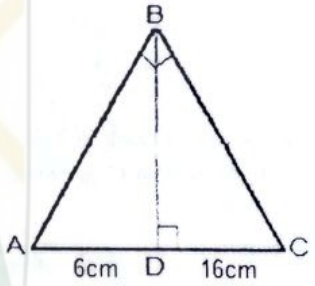
13. Make V the subject of the relation $T = K + \frac{1}{2}mv^2$
    A. $V = \frac{2}{m}(T - K)$
    B. $V = \sqrt{\frac{2}{m}(T - K)}$
    C. $V = \sqrt{\frac{2}{m}(T + K)}$
    D. $V = \left[\frac{2}{m}(T - K)\right]^2$

14. Simplify : $\frac{1}{(x+y)^{-2}} - 2xy$.
    A. $x^2 + y^2$
    B. $x^2 - 2xy + y^2$
    C. $2x^2 + y^2$
    D. $2x^2 + 2y^2$

15. Evaluate $(3.2)^2 - (1.8)^2$
    A. 96.00
    B. 7.00
    C. 2.56
    D. 2.00

16. If $4x^2 - 12x + c$ is a perfect square, find the value of c.
    A. -9
    B. 9
    C. 18
    D. 36

In the diagram below, the angles ABC and BDC are right – angles; AD = 6 cm, AB = 10cm and DC = 16 cm.
Use this information to answer questions 17 and 18.

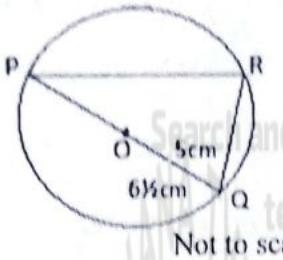


17. Which of these statements is true of triangles ABD and BDC?
    A. Triangles ABD is the reflection of triangle BDC in the line BD
    B. Triangles ABD and BDC are similar
    C. Triangles ABD and BDC are equal in area
    D. None of these statements is true.

18. The length of $|BD|$ is .....
    A. 8 cm
    B. 9 cm
    C. 12 cm
    D. 13 cm

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19. In the diagram below, PQ is the diameter of the circle with centre O, radius $6\frac{1}{2}$ cm and $|QR| = 5$ cm. Which of these is the area of triangle PQR?



Not to scale

A. 30 cm²
B. 32. 5 cm²
C. 60 cm²
D. 65 cm²

20. Simplify $\frac{1}{2}(x-1) - \frac{1}{3}\left(\frac{1}{2}x - 1\right)$

A. $\frac{1}{3}(2x+1)$

B. $\frac{1}{3}(2x-1)$

C. $\frac{1}{6}(2x-1)$

D. $\frac{1}{6}(2x+1)$

21. Jego got 58% in an examination, scoring 348 marks. Her sister scored 330 marks in the same examination. Calculate her sister's percentage score.
A. 55%
B. 60%
C. 62%
D. 64%

22. The length of a piece of stick is 1.75m. A boy measured it as 1. 80m. Find his percentage error.
A. $2\frac{7}{9}\%$
B. $2\frac{6}{7}\%$
C. 2 %
D. $27\frac{7}{9}\%$

23. Change 32_{five} to a number in base three
A. 21_{three}
B. 122_{three}
C. 22_{three}
D. 1011_{three}

24. If $31_{four} = X_{six}$, find X.
A. 12
B. 13
C. 21
D. 31

25. $2^y = 32$, find the value of y
A. 2
B. 3
C. 4
D. 5

26. Umahu borrowed a sum of money at 4% per annum simple interest. The interest at the end of three years was Gh¢54. 00. How much did Umahu borrow?
A. Gh¢ 450. 00
B. Gh¢ 540.00
C. Gh¢ 560. 00
D. Gh¢ 720. 00

27. The simple interest on Gh¢300.00 for 4 months at 5% per annum is.
A. Gh¢ 5.00
B. Gh¢ 8.33
C. Gh¢ 12.50
D. Gh¢ 30.00

28. Find the 23rd term of the Arithmetic Progression, - 7, - 3, 1 …
A. 73
B. 80
C. 81
D. 83

29. If D = {digits in base 6 arithmetic}, what is n(D)?
A. 3
B. 4
C. 5
D. 6

30. The value of $\frac{(-4)^3}{(-2)^6}$ is .....
A. - 2
B. -1
C. 1
D. 2

31. Simplify $\frac{-4 \times -2 \times -3}{-2 \times -6}$
A. – 3
B. – 2
C. $^1/_2$
D. 2

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32. When expressed in its lowest terms, $\frac{ab + a^2}{a^2 - b^2}$ becomes
A. $\frac{a(b + a)}{a^2 - b^2}$
B. $\frac{a}{a + b}$
C. $\frac{a}{a - b}$
D. $\frac{a+b}{b}$

33. Solve for a in $\frac{a}{a-2} - \frac{3}{1+a} = 1$
A. a = - 8
B. a = - 2
C. a = 4
D. a = 8

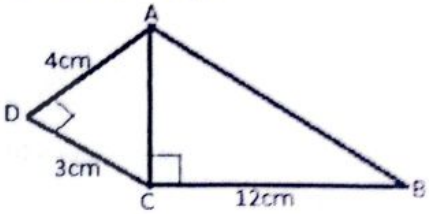
34. If $A = \frac{1}{2} b (a + b)$, make a the subject of the formula.
A. $a = b - \frac{2A}{b}$
B. $a = \frac{2A}{b} - b$
C. $a = \frac{1}{b} - 2A$
D. $a = \frac{2A}{b} + b$

35. If p varies inversely as q and q = 2 when p = 3, find q when p = 6.
A. q = - 5
B. q = - 1
C. q = 1
D. q = 6

36. Factorise $2x^2 + 7x + 6$
A. (x + 3) (x + 4)
B. (x + 2) (2x + 3)
C. 2(x + 1) (x + 3)
D. (x + 2) (2x + 1)

37. For what value(s) of x is $2x^2 - 7x - 2$ negative?
A. x = - 0. 26 or x = 3. 76
B. x = 0. 26 or x = 3 .76
C. x = 0. 27 or x = 3. 66
D. x = - 0. 27 or x = 3. 76.

38. In the figure below, BC = 12 cm, AD = 4 cm and CD = 3 cm.
Find the perimeter of ABCD.
A. 19 cm
B. 30 cm
C. 32 cm
D. 35 cm



39. Find the area of a square field with each diagonal 150m long.
A. 12. $23m^2$
B. 75 m^2
C. 5623 m^2
D. 11250m^2

40. A hollow cuboid measures 60cm by 15cm by 20cm. How many litres can it hold? (1 litre = $1000cm^3$)
A. 8
B. 18
C. 180
D. 1800

41. If $\tan q = \frac{4}{3}$, where $0^0 < q < 90^0$, find the value of $\frac{1+\cos q}{1-\cos q}$.
A. 3
B. 4
C. 5
D. 9

42. The bearing of Q from P is 100^0. What is the bearing of P from Q?
A. 10^0
B. 80^0
C. 190^0
D. 280^0

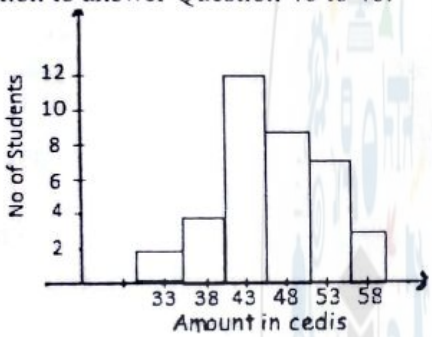
43. A peg A is fixed at a point 2. 4km on a bearing of 120^0 from another peg B. Peg C is placed at a point 1.6km on a bearing of 30^0 from peg A. Find the shortest distance between peg B and peg C
A. 2.08km
B. 2.77km
C. 2.88km
D. 3.20km

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44. The median of the sample: 8, 1, 3, 4, 7, 9, 5, is
    A. 2
    B. 3
    C. 4
    D. 5

45. Which of the following is the odd one?
    A. Range
    B. Average
    C. Sample
    D. Median

The diagram below displays the number of students and the amounts of pocket money they had for a term. Use the information to answer Question 46 to 48.

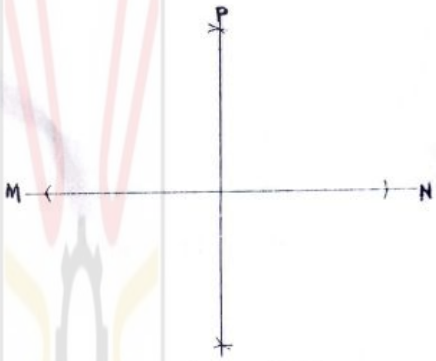


46. The name of the diagram is .....
    A. Bar chart
    B. Pie chart
    C. Pictogram
    D. Histogram

47. How many students are indicated in the diagram?
    A. 25
    B. 30
    C. 35
    D. 37

48. On the frequency distribution table, the modal class has class limits:
    A. 39. 5 – 44. 5
    B. 40 – 44
    C. 41 – 45
    D. 40 .5 – 45. 5

49. Which of the following describes accurately the construction in the figure below?



    A. The mediator of MN.
    B. The angle bisector of angle MPN.
    C. The perpendicular through P to MN.
    D. The line through P parallel to MN.

50. There are three red balls and six white balls in a box and each ball is equally likely to be picked out. The probability of picking a red ball is .....
    A. $\frac{1}{2}$
    B. $\frac{3}{10}$
    C. $\frac{1}{3}$
    D. 4. 2

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END OF OBJECTIVE PAPER

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COMMISSION FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (CTVET)

Certificate II Core Subjects Examination for Technical and Vocational Institutions in Ghana

C704/2
SEPTEMBER, 2021
MATHEMATICS
WRITTEN TEST
2 Hours 30 Minutes

2

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MONDAY **MATHEMATICS** **9:00am – 11.30am**

6th September, 2021 **WRITTEN TEST**

NAME OF CANDIDATE.....

INDEX NUMBER ..... **SIGNATURE**.....

Please read the instructions carefully. DO NOT turn over **this page** until you are told to do so by the invigilator.

Write your name, index number, and other particulars at the space provided in the answer booklet. An example is given below:

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Candidate's Full Name AWUAH FAREEDA AKOSUA
Candidates's Signature *aiafua* Date 6TH SEPTEMBER, 2021
Title of Examination CERT II CORE (MAY)
Subject MATHEMATICS Paper TWO (2)

This booklet consists of **theory questions** which last for 2½ hours.

Answer all questions in the answer booklet.

Write the numbers of your answers in the order in which they have been answered in the space provided at the bottom of the cover page of your answer booklet

When you finish and there is still some time left, go over your work.

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MATHEMATICS 2

SECTION A (40 MARKS)

Answer **all** questions from this section

All questions carry equal marks

1. (a) Copy and complete the Multiplication table for the modulo 7 on the {2, 3, 4, 5, 6}

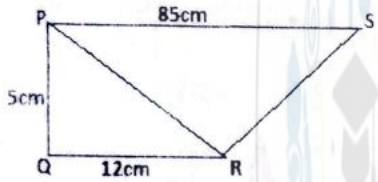
⊗	2	3	4	5	6
2	4	6	1	3	5
3	6		5		4
4	1		2	6	
5	3	1		4	2
6	5	4	3	2	

(b) From your table find

i. the truth set of the equation n ⊗ n = 4

ii. the truth set of K = (4 ⊗ 3) ⊗ 6

2. In the diagram below, PQRS is a quadrilateral, with $<$ PQR = $<$ PRS = 90^0, $|PQ|$ = 5cm, $|QR|$ = 12cm, and $|PS|$ = 85cm. Find the area of the quadrilateral, PQRS.



3. (a) Without using tables or calculators, evaluate $\frac{0.0125\ X\ 6400}{2500\ X\ 0.008}$ leaving your answer in standard form.

(b) A mapping is defined by f: x $\longrightarrow \frac{1}{3}x^2 - 4$ for all real values of x. Find

i. the image of -2

ii. the elements whose image is 8, under the mapping.

4. A trader bought some goods whose marked price was Gh¢100,000. 00 at a discount of 25%. After selling the goods, the trader is required to pay tax at a rate of GH¢ 20% on the profit made in excess of Gh¢1,000.00. How much should the trader sell the goods so that after tax, a net profit of Gh¢2,000.00 would be made?

5. (a) Solve $\frac{1}{16^{x-2}} = 8^{1-x}$

(b) Find the value of q given that $\log q - \log(q - 2) = \log 5$

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SECTION B (60 MARKS)

PART I

Answer **two** questions **only** from this section

6. In a survey conducted at the Kumasi Technical Institute, the percentage of students studying various courses were found to be as follows: Leather works only, 18%, Leatherwork, 26%, Plumbing, 48%, Plumbing and Graphic Design but not Leatherwork, 5%, Leather work not Graphic Design, 23%, Leatherwork and Plumbing, 8%. 24% of the students studied none of these courses. Find the percentage studying the following using Venn Diagram
   (a) Graphic Design only
   (b) Plumbing only
   (c) Leather work and Graphic Design
   (d) All three courses

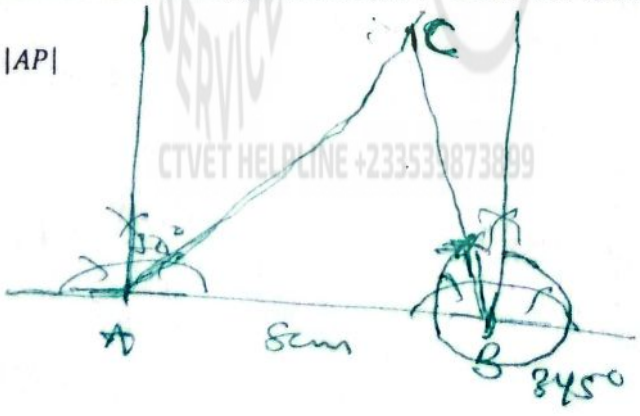
7. A food relief is released from an aeroplane when it is 100m above a certain refugee camp. The height of the food relief above the camp at time, t seconds, is given by the relation $\frac{1}{5}h = 200 - t^2$.
   (a) Copy and complete the following table for the above relation.

t	0	1	3	5	7	9	11	13	15
h				875			395		-125

   (b) Using a scale of 2cm to 2_S on the t – axis and 2cm to 100m on the h – axis, draw a graph of relation between h and t.
   (c) Use your graph to find:
      i. the time the food relief takes to reach the camp, correct to one decimal place.
      ii the time the food relief takes to drop through the first 600m, correct to one decimal place
      iii. the height of the food relief above the camp after falling 10_S, correct to the nearest metre

8. (a) The weight of an object (w) varies inversely as the square of its distance (d) from the centre of the earth. A small satellite weighs 80kg on the earth's surface. Calculate, correct to the nearest whole number, the weight of the satellite when it is 800km above the surface of the earth.
   [Take the radius of the earth to be 6,400 km].
   (b) Find the base y if, $233_y = 57_{eight.}$

9. During the Worlds' Sanitation Day, the Minister of Environment promised the construction of places of convenience at most villages in Ghana. If there should be a place of convenience constructed such that it will be equidistant from three villages A, B, C.
   (a) Using a scale of 1cm to 100m, construct the position of the three villages and locate a point P where the place of convenience need to be, given that $|AB|$ = 800m and town C is on a bearing 030^0 from A and 345^0 from B.
   (b) Find the distance $|AP|$
   (c) Measure < ACB



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PART II

STATISTICS AND PROBABILITIES

Answer **one** questions **only** from this section

10. The table below gives the distribution of marks obtained by candidates in a catering examination.

marks	0 –9	10 - 19	20 –29	30 - 39	40 –49	50 –59	60 –69	70 - 79	80 -89
frequency	18	19	X	12	9	5	2	2	1

If the mean mark for the distribution was found to be 26.06,

(a) Determine the value of x to the nearest whole number

(b)Draw a bar chart for the distribution

11. The numbers ***s*** and ***t*** are chosen at random from the set. A = {0, 2, 4, 6, 8} and B = {1, 3, 5, 7, 9} such that $t \in B, s \in A$.

(a) Construct a table of all the possible ordered pairs (s, t) of the numbers chosen

(b) What is the probability that:

i. $s + t = 7$

ii. $st = 0$

iii. $s - t > 1$

(c) A number is selected at random from each of the sets {2, 3, 4} and {1, 3, 5}. What is the probability that the sum of the two numbers will be less than 7 but greater than 3?

PART III

VECTORS

Answer **one** question **only** from this section

12. The vectors $\overrightarrow{OP}$, $\overrightarrow{OQ}$, and $\overrightarrow{OR}$, are represented by a, b, and c respectively, where $a = \begin{pmatrix} 10 \\ 1 \end{pmatrix}$, $b = \begin{pmatrix} -2 \\ 7 \end{pmatrix}$, $c = a + 3b$, O is the origin. $\overrightarrow{OR}$ and $\overrightarrow{PQ}$ intersect at M, where $\overrightarrow{OM} = K\overrightarrow{OR}$ and $\overrightarrow{PM} = l\overrightarrow{PQ}$, and k, l are constants. Find

i. The equators of the line $\overrightarrow{PQ}$ and $\overrightarrow{QR}$

ii. The coordinates of the point M

iii. The values of the constants k and l.

13. Braimah decided to visit the mother at a town B, 85km due east of A. If Braimah started his journey making a transit at a town C on a bearing 081^0 from A and 351^0 from B respectively.

(a) i. Sketch the route taken by Braimah

ii. Find the distance between towns A and C to the nearest whole number

iii. Find the distance between town B and C

(b) i. Find the bearing of town A from town C.

ii. What is the bearing of A from B?

(c) Write down the path A B in column form.

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