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S1023
GENERAL MATHEMATICS III
1 hour 45 minutes

Name:.....

Registration Number:.....

NATIONAL EXAMINATIONS COUNCIL
Senior School Certificate Examination

1 hour 45 minutes

GENERAL MATHEMATICS
PAPER III

Do **not** open this question booklet until you are told to do so. While waiting, read the following carefully.

1. Use **HB** pencil throughout.
2. **Use of mobile phone is not allowed.**
3. **Use of scientific calculator is allowed.**
4. **All diagrams are not drawn to scale.**
5. Take π to be $\frac{22}{7}$ **except** otherwise stated.
6. Where your answer sheet is **not** customised, provide the following information:
   (a) In the space marked *Candidate's Name,* write your **surname** in capital letters followed by your **other names.**
   (b) In the space marked *School Name,* write the name of your **school**, and in the space marked *Subject Name,* write **General Mathematics III.**
   (c) In the box marked *Subject Code*, write the digits **1023** in the spaces. There are numbered spaces in line with each digit. Shade carefully the space with the same number as each digit.
   (d) In the box marked *Registration Number*, write your **registration number** in the spaces at the top of the box. Shade the corresponding numbered spaces in the same way as for Subject Code.
7. An example is given below. This is for a candidate whose name is **GAMBO Bamidele Uche,** with **serial number 0010, registration number 8765432100BD,** and who is taking **General Mathematics III (1023).**

National Examinations Council ANSWER SHEET

Use HB pencil to complete this form. Mark like this ▬ . Erase errors thoroughly.

Examination Type	Candidate's Serial No. in School	Subject Code	Registration Number
SSCE ▬	0 0 1 0	1 0 2 3	8 7 6 5 4 3 2 1 0 0 B D
BECE (I) (II) ▭ ▭			
Other ▭			
If Other, write exam type in the box below			
Absent ▭			

Candidate's Name	GAMBO Bamidele Uche
School Number	0210231
School Name	Government Secondary School, Minna
Subject Name	General Mathematics III

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PAPER III

Answer **all** questions.

Each question is followed by **five** options lettered **A** to **E.** Choose the correct option for each question and shade in **pencil** on your answer sheet the answer space that bears the same letter as the option you have chosen. Give only **one** answer to each question and erase completely any answer you wish to change. Do **all** your work on this question paper.

An example is given below.

The product of three numbers is 3876. Two of the numbers are 17 and 19. What is the third number?

A. 57
B. 12
C. 6
D. 3
E. 2

The correct option is '12' which is lettered **B** and therefore, answer space **B** would be shaded as shown below:

[A] [B] [C] [D] [E]

1. Decrease 120 by 25%.

A. 108
B. 95
C. 90
D. 86
E. 80

2. Find the product of 10110_{two} and 11_{two}.

A. 1000010_{two}
B. 1000101_{two}
C. 1000110_{two}
D. 1001000_{two}
E. 1001010_{two}

3. Express

$$5 + \frac{2}{100} + \frac{3}{1000} + \frac{4}{100000}$$

as a decimal number.

A. 5.20304
B. 5.02034
C. 5.02304
D. 5.00234
E. 5.20034

4. Simplify $\frac{2\sqrt{5}}{\sqrt{10}}$.

A. 5
B. 2
C. $\sqrt{2}$
D. $\sqrt{5}$
E. $\sqrt{10}$

5. A boy walks 88 paces in a minute. If his average pace length is 0.55 m, what fraction of an hour will it take him to walk 1936 m?

A. $\frac{1}{4}$
B. $\frac{1}{3}$
C. $\frac{1}{2}$
D. $\frac{2}{3}$
E. $\frac{3}{4}$

6. Find x if $3 \times 8 \equiv x \bmod 9$.

A. 2
B. 3
C. 6
D. 8
E. 9

7. If $\log_{10}3 = 0.4771$, evaluate $\log_{10}8.1$.

A. 0.0916
B. 0.4771
C. 0.5229
D. 0.9084
E. 1.9084

8. Given that $2\log y = 8\log p + 4\log q$, expresses y in terms of p and q.

A. $y = p^4 + q^2$
B. $y = p^8 + q^4$
C. $y = p^8q^4$
D. $y = \frac{p^8}{q^4}$
E. $y = p^4q^2$

9. Calculate the compound interest on ₦1,200.00 for 4 years at 8% per annum.

A. ₦120.90
B. ₦384.00
C. ₦432.59
D. ₦1,511.65
E. ₦1,632.59

10. Given sets A, B and C such that
A = { a, 1, c, 4, d},
B = { b, 4, 0, 9, 7, 6} and
C = { a, 4, 8, 9, d, 2, 5}.

Find $(A \cup B) \cap (A \cup C)$.

A. { a, 1, 4, 8, 9}
B. { 4, 8, 9, 2, 5}
C. { b, 4, 2, 5, 8}
D. { a, b, c, d, 2}
E. {a, c, d, 1, 4, 9}

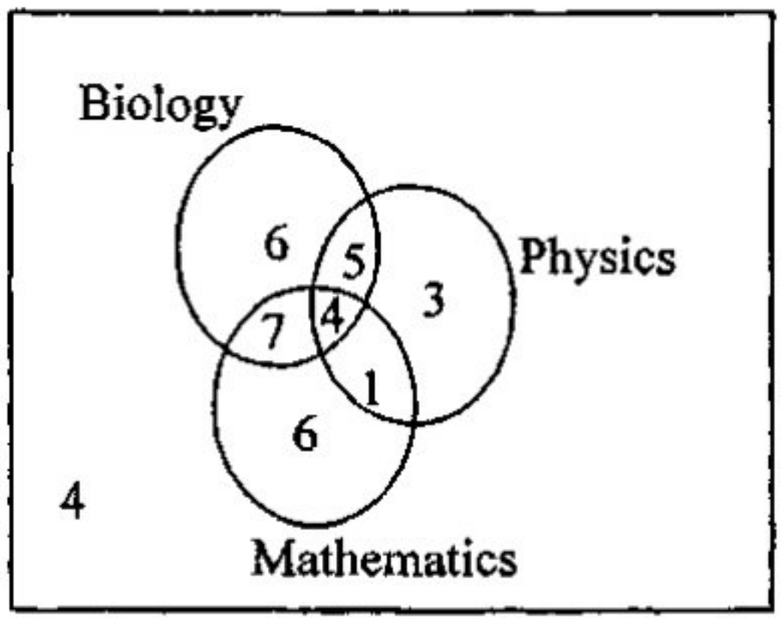
11. In a Chemistry class, a student recorded 21.23 cm^3 for the titre value of 21.32 cm^3. Find the percentage error, correct to one decimal place.

A. 0.04
B. 0.40
C. 0.80
D. 1.40
E. 1.80

12. In an Arithmetic Progression (A.P.), the 1st term is 3 and the sum of the 3rd and 12th terms is 38½. What is the 17th term?

A. 45
B. 43
C. 38
D. 33
E. 28

13. The Venn diagram below shows the number of students who wrote Biology, Physics and Mathematics during NECO SSCE in a certain school. Find the number of students who wrote at least two subjects and the total number of students in the school respectively.



A. 13, 32
B. 17, 32
C. 13, 36
D. 17, 36
E. 15, 36

14. The 3rd term of a Geometric Progression (G.P.) is 18 and the 6th term is 486. Find the 1st term.

A. 2
B. 3
C. 5
D. 6
E. 9

15. The area of a rectangular piece of cardboard paper is 104 cm^2. If its width is 8 cm, find its perimeter.

A. 52 cm
B. 42 cm
C. 32 cm
D. 26 cm
E. 21 cm

16. Find the determinant of the matrix

$$\begin{pmatrix} 2 & 3 & 1 \\ 1 & 0 & 2 \\ 0 & 2 & 3 \end{pmatrix}.$$

A. –15
B. –8
C. –1
D. 7
E. 8

17. A helicopter takes 3 hours from Kano to Lagos at a constant speed. How long does the same journey take another helicopter at a quarter of the speed of the first helicopter?

A. 3 hrs
B. 6 hrs
C. 9 hrs
D. 12 hrs
E. 15 hrs

18. If 1 is added to the denominator of a fraction, the fraction becomes $\frac{1}{2}$. When 3 is added to both the numerator and denominator of the fraction, it becomes $\frac{3}{4}$. Find the fraction.

A. $\frac{2}{5}$
B. $\frac{1}{2}$
C. $\frac{3}{5}$
D. $\frac{3}{4}$
E. $\frac{4}{5}$

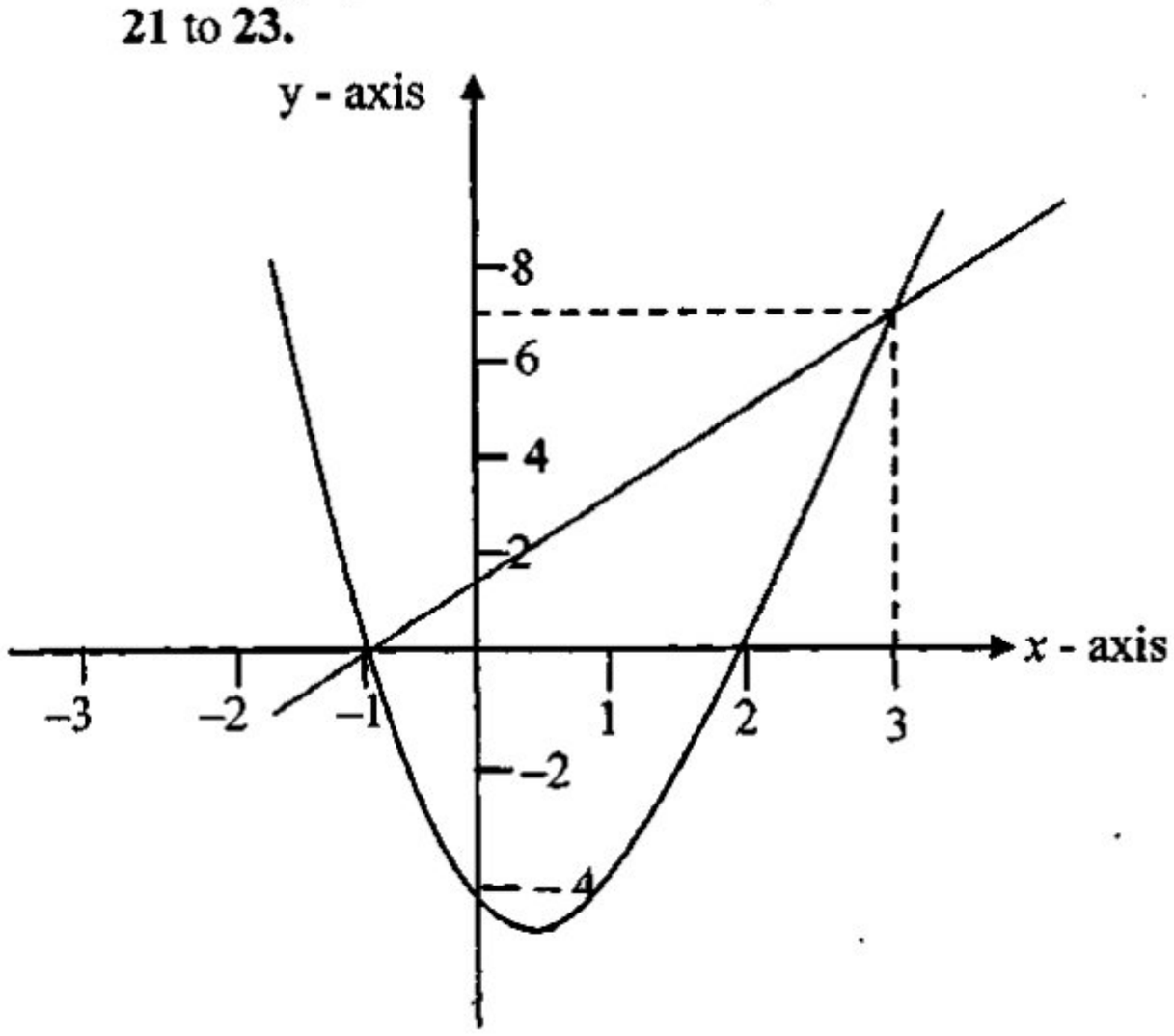
19. y is partly constant and partly varies as x. When $y = 2$, $x = 3$ and when $y = 5$, $x = 6$. Find the relationship between x and y.

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

20. Find a quadratic equation whose roots are 2 and $-\frac{1}{3}$.

A. $3x^2 + 6x - 1 = 0$
B. $3x^2 - 5x - 2 = 0$
C. $3x^2 - 5x + 2 = 0$
D. $6x^2 - x + 15 = 0$
E. $3x^2 - 2x - 5 = 0$

Use the graph below to answer questions **21** to **23.**



21. Which of the following gives the points of intersection of the linear graph and the quadratic graph above?

A. (0,2), (–1,0)
B. (–1, 0), (7,3)
C. (–1, 0), (0,2)
D. (0, –1,) (3,7)
E. (–1, 0), (3,7)

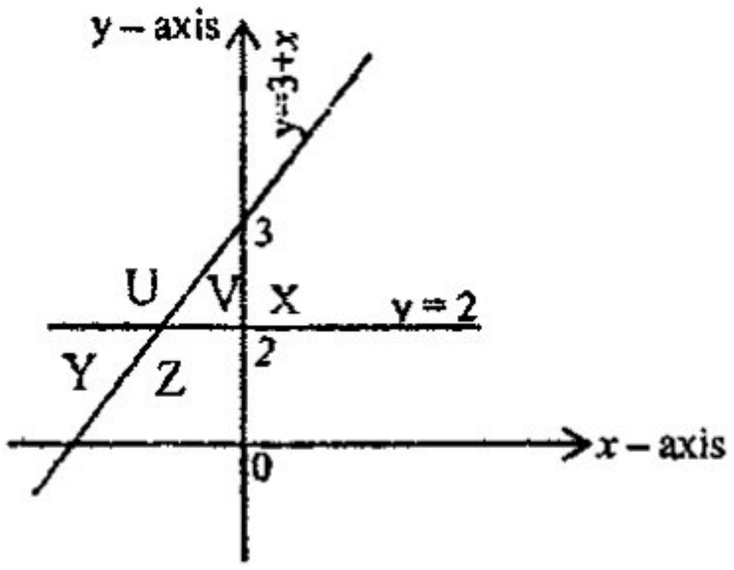
22. The equation of the line of symmetry is

A. $x = -1$.
B. $x = 0$.
C. $x = 0.5$.
D. $x = 1$.
E. $x = 1.5$.

23. Find the equation of the quadratic graph.

A. $x^2 - x - 2 = 0$
B. $x^2 - 3x - 2 = 0$
C. $x^2 - 2x - 3 = 0$
D. $x^2 - x + 2 = 0$
E. $x^2 - 3x + 2 = 0$

24. Which of the regions U,V,X,Y,Z shown below satisfies the inequalities:
$0 < y < 2, y < 3 + x, x < 0$?



A. U
B. V
C. X
D. Y
E. Z

25. Which of the following inequalities is represented by the number line shown below?

A. $x < -1$
B. $x \leq 3.5$
C. $x \leq -1$
D. $x \geq 3.5$
E. $x \geq -1$

26. Solve the equation $2x + 8 = 21x^2$.

A. $x = \frac{2}{3}$ *or* $x = \frac{4}{7}$
B. $x = \frac{2}{3}$ *or* $x = \frac{-4}{7}$
C. $x = \frac{-2}{3}$ *or* $x = \frac{4}{7}$
D. $x = \frac{-2}{3}$ *or* $x = \frac{-4}{7}$
E. $x = \frac{2}{3}$ *or* $x = \frac{-6}{7}$

27. In an examination, a candidate was asked to draw the graph of $y = x^2 + 6x - 27$ and a linear graph on the same axis such that their intersections will give the solutions to the quadratic equation $x^2 + 5x - 29 = 0$. What is the equation of the linear graph?

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

28. What must be added to $2y^2 + 7y$ to make it a perfect square?

A. 49
B. 14
C. $\frac{49}{4}$
D. $\frac{49}{8}$
E. 4

29. Solve the simultaneous equations:
$x + 2y = -4$
$2x + 3y = -5$

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

30. Factorize $12a^2 - 3(a - 3b)^2$ completely.

A. $9(a + 3b)(a - b)$
B. $9a(a + 2b) - 27b^2$
C. $9[a(a + 2b) - 3b^2]$
D. $9a^2 + 9b(2a - 3b)$
E. $9[a^2 + b(2a - 3b)]$

31. Given that $T = 2\pi\sqrt{\frac{l}{g}}$, find the value of T when $\pi = \frac{22}{7}$, $l = 16$ and $g = 10$.

A. 1.26
B. 1.60
C. 3.14
D. 7.95
E. 10.00

32. Expand $(x - 2)(x + 6)$.

A. $x^2 + 4x - 12$
B. $x^2 + 4x + 12$
C. $x^2 - 4x + 12$
D. $x^2 - 8x - 12$
E. $x^2 - 4x - 12$

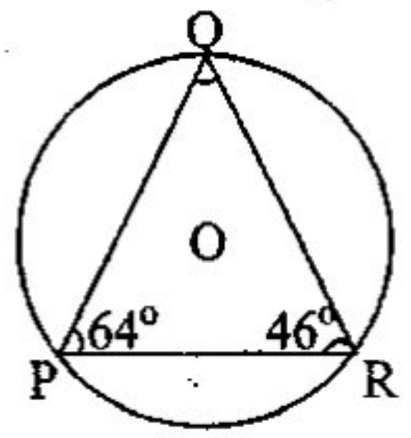
33. Simplify $\frac{x^2 - 8x + 12}{3(x^2 + x - 6)} \times 9(x + 3)$.

A. $x + 6$
B. $3(x - 2)$
C. $3(x - 3)$
D. $3(x - 6)$
E. $3(x + 6)$

34. What is the angular difference in longitude between town A (Lat. 47°S, Long. 54°E) and town B (Lat. 47°S, Long 147°E)?

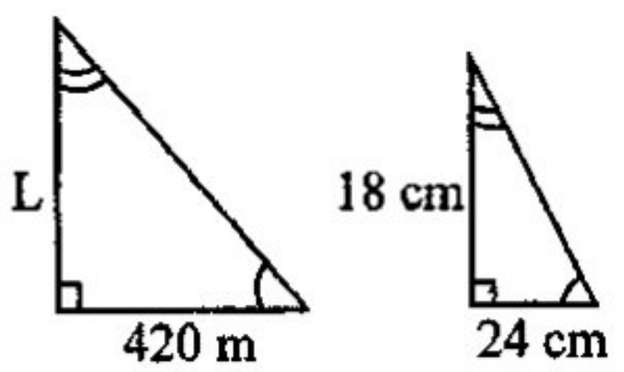
A. 93°
B. 94°
C. 100°
D. 101°
E. 201°

35. In the diagram below, O is the centre of the circle PQR. If $\angle QPR = 64°$ and $\angle QRP = 46°$, calculate $\angle POQ$.



A. 44°
B. 70°
C. 92°
D. 110°
E. 140°

36. In the figures below, find the value of L in metres.



A. 295
B. 300
C. 305
D. 310
E. 315

37. Find the gradient of the curve $y = 2x^2 + 5x - 1$ at the point $x = 4$.

A. 8
B. 16
C. 18
D. 20
E. 21

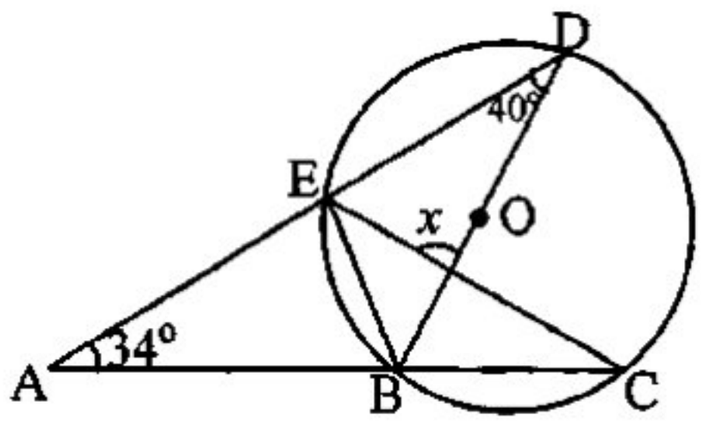
38. An interior angle of a regular polygon is 108°. Find the number of sides of the polygon.

A. 4
B. 5
C. 6
D. 7
E. 8

39. ABC is an isosceles triangle, where E and D are points on AC and BC respectively such that BE ⊥ AC and ED ⊥ BC. If $A\hat{B}E = 68°$ and $\hat{A} = \hat{C}$, find $C\hat{E}D$.

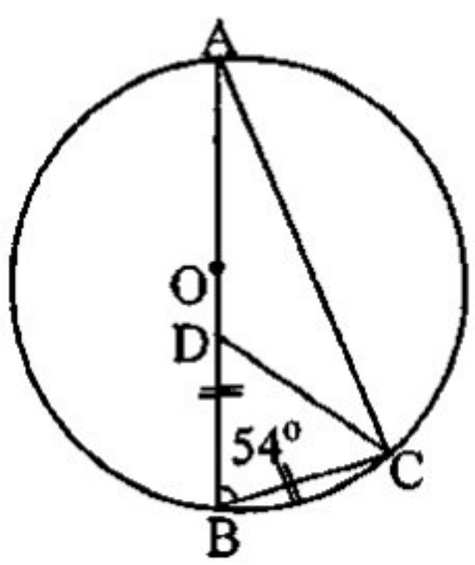
A. 22°
B. 34°
C. 44°
D. 52°
E. 68°

40. In the figure below, O is the centre of the circle. Calculate the value of x.



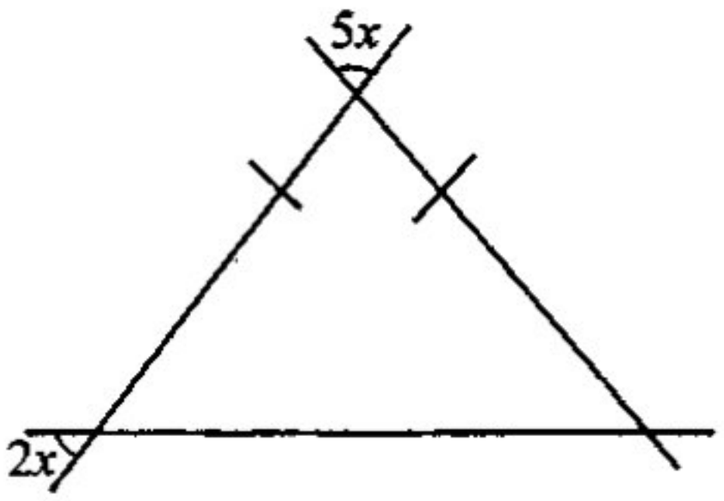
A. 74°
B. 66°
C. 56°
D. 50°
E. 40°

41. In the diagram below, O is the centre of the circle, $|DB| = |BC|$ and $A\hat{B}C = 54°$. Find ∠ACD.



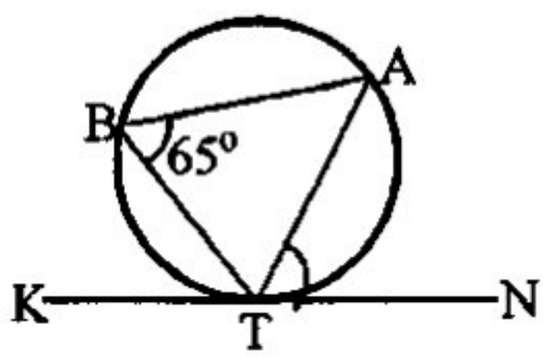
A. 153°
B. 117°
C. 63°
D. 36°
E. 27°

42. Determine the value of $7x$ in the diagram below.



A. 20°
B. 40°
C. 80°
D. 100°
E. 140°

43. In the diagram below, KTN is a tangent to the circle at T. Find the angle NTA.



A. 25°
B. 32°
C. 65°
D. 90°
E. 115°

44. An aeroplane flies from a town P on a bearing of 045° to a town Q, a distance 200 km away. It then changes its course and flies to another town R on a bearing of 120°. If R is directly east of P, calculate $|PR|$, correct to the nearest km.

A. 300
B. 386
C. 400
D. 415
E. 450

45. If the angle of depression of a boy standing on the ground from the top of a house is 72°, what is the angle of elevation of the top of the house from the boy?

A. 18°
B. 36°
C. 72°
D. 90°
E. 108°

46. If $\cos\theta = 0.8$ and $0° < \theta < 90°$, find $\tan\theta$.

A. $\frac{3}{5}$
B. $\frac{3}{4}$
C. $\frac{4}{5}$
D. $\frac{4}{3}$
E. $\frac{5}{3}$

47. A ladder x metres long leans against a vertical pole of 12 m, making an angle 54° with the horizontal ground. Calculate the value of x, correct to three significant figures.

A. 14.7
B. 14.8
C. 20.6
D. 147.0
E. 206.0

48. If 1.109 litres of water is poured into a cylindrical container of base radius 4.2 cm, find the level of water correct to two significant figures.

A. 0.02 cm
B. 0.20 cm
C. 2.00 cm
D. 20.00 cm
E. 200.00 cm

49. Calculate the mean deviation of the following scores; 4, 5, 3, 2, 1.

A. 1.2
B. 1.4
C. 1.5
D. 1.9
E. 2.0

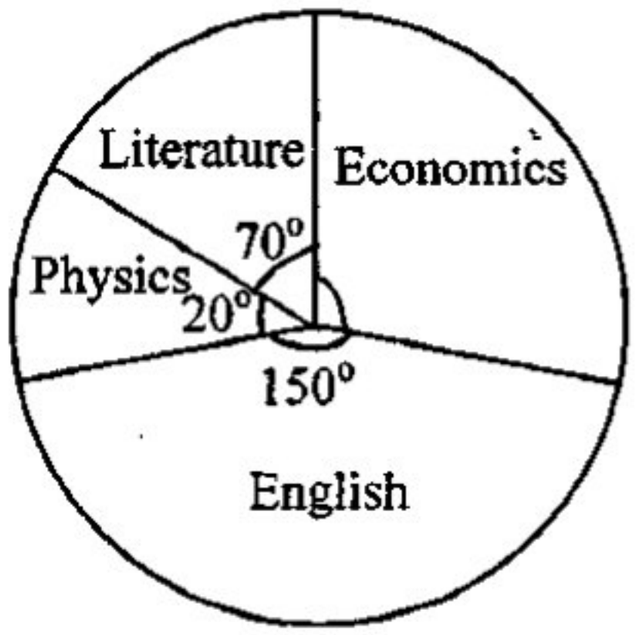
50. What is the probability that an integer selected from the set {1, 2, 3, ..., 27, 28, 29, 30} is a prime number?

A. $\frac{1}{6}$
B. $\frac{1}{5}$
C. $\frac{4}{15}$
D. $\frac{3}{10}$
E. $\frac{1}{3}$

51. Two balls are taken one after the other from a bag without replacement. If the bag contains 4 red and 6 blue balls, what is the probability that they are of different colours?

A. $\frac{3}{5}$
B. $\frac{8}{15}$
C. $\frac{2}{5}$
D. $\frac{4}{15}$
E. $\frac{8}{225}$

The pie chart below shows the distribution of candidates that sat for certain subjects in a school certificate examination. Use the information to answer questions **52** and **53**.



52. What angle represents the students that sat for Economics?

A. 60°
B. 72°
C. 108°
D. 110°
E. 120°

53. What percentage of the students sat for English Language, correct to the nearest whole number?

A. 6
B. 15
C. 19
D. 33
E. 42

54. Find the mean of the frequency distribution below, correct to one decimal place.

Marks	2	5	7	8	9	10
Frequency	9	4	3	7	8	2

A. 4.9
B. 5.6
C. 6.3
D. 23.6
E. 25.1

55. The table below shows the scores of applicants in an interview.

Scores	6	7	8	9	10
Frequency	2	4	2	5	3

If an applicant is chosen at random, what is the probability that he scored at most 8 marks?

A. $\frac{1}{8}$
B. $\frac{1}{4}$
C. $\frac{3}{8}$
D. $\frac{7}{16}$
E. $\frac{1}{2}$

56. A box contains 20 oranges, 14 of them are ripe and 6 unripe. If two oranges are taken one after the other with replacement, find the probability that one is ripe and the other unripe.

A. $\frac{21}{100}$
B. $\frac{3}{10}$
C. $\frac{21}{50}$
D. $\frac{7}{10}$
E. $\frac{21}{25}$

57. The mean of the set of numbers 2, 5, x, 6 is 4. What is the value of x ?

A. 7
B. 6
C. 5
D. 4
E. 3

58. Evaluate $\int_0^2 (2x - x^2)\,dx$.

A. -2
B. $\frac{3}{4}$
C. $1\frac{1}{3}$
D. 2
E. $6\frac{2}{3}$

59. If $y = 3x^2 - 4x - 12$, find the value of x when $\frac{dy}{dx} = 0$.

A. $\frac{1}{3}$
B. $\frac{1}{2}$
C. $\frac{2}{3}$
D. 1
E. 2

60. A particle moves in a straight line such that its velocity after t seconds is $(3t + 4)$ m/s. Find the distance travelled in 4 seconds.

A. 16 m
B. 24 m
C. 40 m
D. 48 m
E. 64 m

S1022
GENERAL MATHEMATICS
2 hours 30 minutes

II

Name:.....

Registration Number:.....

NATIONAL EXAMINATIONS COUNCIL
Senior School Certificate Examination

2 hours 30 minutes

GENERAL MATHEMATICS
PAPER II

Do **not** open this question booklet until you are told to do so. While waiting, read the following carefully.

Write your **Name** and **Registration Number** in the spaces provided at the top right-hand corner of this question booklet.

The paper is in two parts: **I** and **II**, and will last for **2 hours 30 minutes.**

Answer **all** the questions in Part **I** and **five** questions in Part **II**.

Write your answer in blue or black ink in your answer booklet.

You are to give your answers as correctly as the data and tables allow.

Answers are to be written in your answer booklet.

Use of mobile phone is not allowed.

Use of scientific calculator is allowed.

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PAPER II

PART I

Attempt **all** questions in this part.

1. P varies directly as the square of Q and inversely as the cube of Z. When P = 5, Q = 3 and Z = 1.

Find:

(i) The relationship between P, Q, and Z

(ii) Z when P = 3 and Q = 5

(8 marks)

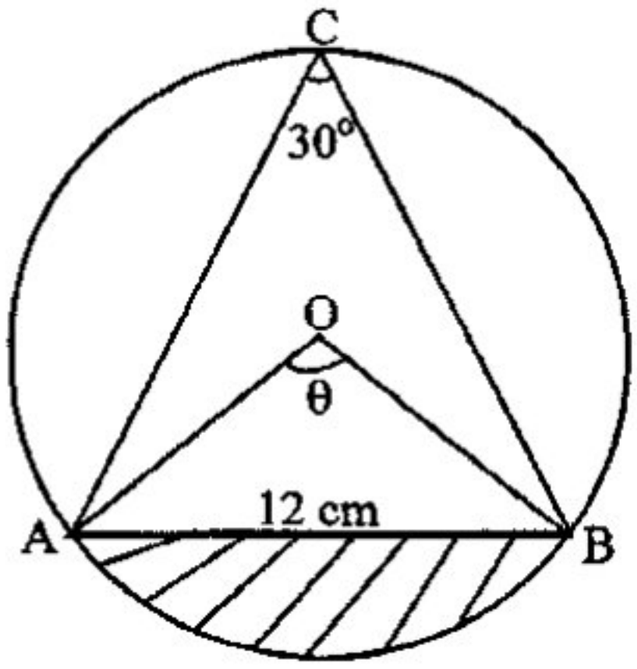
2. (a) The sum of the interior angles of a regular polygon is 1440°.

(i) How many sides has the polygon?

(ii) Find the size of each exterior angle.

(b) Find the principal that will earn ₦29,880.00 in 15 years at 3% per annum simple interest. **(8 marks)**

3. (a) The length of the chord AB in the diagram below is 12 cm with centre O and $\angle ACB = 30^{\circ}$.



Find the:

(i) Value of θ

(ii) Radius of the circle

b(i) Calculate the area of the shaded region, correct to three significant figures.

$\left(Take\ \pi = \frac{22}{7}\right)$

(ii) What type of triangle is ΔAOB? **(8 marks)**

4. (a) Solve the equation $27^{2x-1} \times \left(\frac{1}{3}\right)^{-(3x+2)} = 9^{x+3}$.

(b) Differentiate $(2x^2 + 5)^4$ with respect to x. **(8 marks)**

5. In a certain school, the principal gave the analysis of the qualified subject teachers in the school as follows:

Subject	No. of Teachers
English	10
Mathematics	8
Physics	4
French	6
Biology	12

(a) Draw a pie chart to illustrate this information.

(b) If two teachers are to represent the school in a workshop, what is the probability that both will come from either Physics or Biology? **(8 marks)**

PART II

Answer five questions only in this part.

6. (a) If $135_k = 231_{four}$, find the value of k.

(b) A sector of a circle of radius 21 cm has an angle of 120° at the centre. Calculate its:

(i) Perimeter

(ii) Area

$\left(Take\ \pi = \frac{22}{7}\right)$

(c) Simplify $\frac{3}{\sqrt{5}+\sqrt{2}} - \frac{1}{\sqrt{5}-\sqrt{2}}$, leaving your answer in surd form. **(12 marks)**

7. (a) The sum of the ages of a man and his daughter is 60 years. Six years ago, the man's age was thrice that of his daughter. Find their present ages.

(b) Find the equation whose roots are $\frac{-3}{4}$ and $\frac{5}{6}$.

(c) Evaluate $4\left(1-\frac{144}{169}\right)^{\frac{1}{2}} \times \left(\frac{2}{13}\right)^{-1}$. **(12 marks)**

8. (a) Evaluate without using tables
$5\log 2 + \log 40 - \log 12.8$.

(b) Find the equation of a curve which passes though the point $(-2, 5)$ and has a gradient of $6x^2 + 8x - 3$ at any point on the curve.

(c) Differentiate $y = 3x^2 + 4x - 5$ with respect to x. **(12 marks)**

9. (a) Given that $A = \begin{pmatrix} 3 & 2 & -1 \\ 1 & 0 & 1 \\ 2 & -2 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 2 & -3 \\ 3 & -1 & 1 \\ 0 & -2 & 2 \end{pmatrix}$.

Evaluate:

(i) $3A - 2B$

(ii) $|3A - 2B|$

(b) Mr. Tony took a loan of ₦120,000.00 at 12% per annum compound interest to buy a piece of land.

(i) If he paid the loan in three years, what was the total amount paid?

(ii) Find his profit, if he later sold the land for ₦350,000.00 without incurring any additional expenses. **(12 marks)**

10. A bucket full of water is 40 cm in diameter in the open end, 24 cm in diameter at the bottom end and 32 cm deep. The bucket is then emptied completely into a cylindrical drum of 56 cm in diameter.
Find the level of water in the drum to the nearest whole number.
$\left(Take\ \pi = \frac{22}{7}\right)$ **(12 marks)**

11. Using ruler and a pair of compasses only, construct:

(a) A triangle ABC, such that $|AB| = 5\ cm$, $|AC| = 7\ cm$ *and* $B\hat{A}C = 120°$

(b) (i) The locus l_1 of points equidistant from A and C

(ii) The locus l_2 of points 4.5 cm from C

(c) Locate the points of intersection, N_1 and N_2 of the *l*oci l_1 and l_2

(d) Measure:

(i) $|N_1N_2|$

(ii) $|BC|$ **(12 marks)**

12. The scores of students in a Biology test in a particular school are given as 12, x, 15, $2x$, 25, 12, 30, 15, 25, 12, 16 and 12.
If the mean score is 18, find the:

(a) Value of $2x$

(b) Mean deviation

(c) Standard deviation **(12 marks)**

1

$P \propto Q^2 \propto \frac{1}{Z^3}$

$P = \frac{kQ^2}{Z^3}$ (Where k is constant)

$5 = \frac{k \times 3^2}{1^3}$

$\frac{5}{1} = \frac{k \times 9}{1}$

$9k = 5$

$k = 5/9$

(i) Relationship: $P = \frac{5Q^2}{9Z^3}$

(ii) $Z = ?$ $P = 3$, $Q = 5$

$\frac{3}{1} = \frac{5 \times 5^2}{9Z^3}$

$27Z^3 = 125$

$Z^3 = \frac{125}{27}$

$Z = \sqrt[3]{\frac{125}{27}} = 5/3$

2(a)(i)

Sum of the interior angle = 1440

$\frac{(n-2)180}{180} = \frac{1440}{180}$

$n - 2 = 8$

$n = 8 + 2 = 10$

∴ The number of sides is 10.

2(a)(ii)

Each exterior angle = $\frac{360}{n} = \frac{360}{10} = 36^\circ$

2(b)

Simple interest (I) = $\frac{PRT}{100}$

$\frac{25,880}{1} = \frac{P \times 3 \times 15}{100}$

$\frac{45P}{45} = \frac{2988000}{45}$

$P = ₦66,400$.

3(a)

(i) $\theta = 2 \times 30^\circ = 60^\circ$ (∠ at the centre is 2× ∠ at circumference)

(ii) Length of the chord = $2r \sin\frac{\theta}{2}$

$12 = 2r \sin\frac{60}{2}$

$12 = 2r \sin 30$

$12 = 2r \times \frac{1}{2}$

$r = 12\text{cm}$

3(b)(i)

Area of the shaded portion = $\frac{\theta}{360} \times \pi r^2 - \frac{1}{2} r^2 \sin\theta$

$= \frac{60}{360} \times \frac{22}{7} \times 12^2 - \frac{1}{2} \times 12^2 \times \sin 60$

$= 75.4286 - 62.3538$

$= 13.0748 \approx 13.1\text{cm}^2$

3(b)(ii)

Equilateral triangle i.e all sides are equal

4(a)

$27^{2x-1} \times \left(\frac{1}{3}\right)^{-(3x+2)} = 9^{x+3}$

$3^{3(2x-1)} \times 3^{3x+2} = 3^{2(x+3)}$

$3^{6x-3} \times 3^{3x+2} = 3^{2x+6}$

$3^{6x-3+3x+2} = 3^{2x+6}$

$3^{9x-1} = 3^{2x+6}$

Equate the power:

$9x - 1 = 2x + 6$

$9x - 2x = 6 + 1$

$7x = 7$

$x = 1$.

4(b)

$y = (2x^2 + 5)^4$

Let $u = 2x^2 + 5$, $y = u^4$

$\frac{du}{dx} = 4x$, $\frac{dy}{du} = 4u^3$

$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$

$= 4u^3 \times 4x$

$= 16xu^3$

Recall $u = 2x^2 + 5$

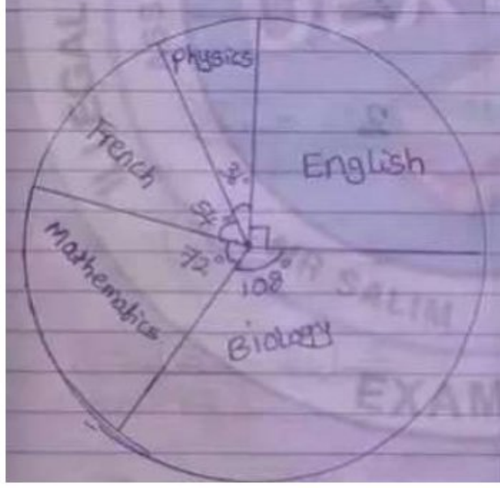
∴ $\frac{dy}{dx} = 16x(2x^2 + 5)^3$

SECTION A

NUMBER 5

SUBJECT	No. of teaches	Degrees
English	10	$\frac{10}{40}\times\frac{360^{\circ}}{1}=90^{\circ}$
Mathematics	8	$\frac{8}{40}\times\frac{360^{\circ}}{1}=72^{\circ}$
Physics	4	$\frac{4}{40}\times\frac{360^{\circ}}{1}=36^{\circ}$
French	6	$\frac{6}{40}\times\frac{360^{\circ}}{1}=54^{\circ}$
Biology	12	$\frac{12}{40}\times\frac{360^{\circ}}{1}=108^{\circ}$
Total	40	

(a)



(b)

Physics = P

Biology = B

Let E_1 be the event that both will come from either Physics or Biology

$Pr(E) = Pr(PP) + P(BB)$

$= \left(\frac{4}{40}\times\frac{3}{39}\right)+\left(\frac{12}{40}\times\frac{11}{39}\right)$

$= \frac{12}{40\times39}+\frac{132}{40\times39}$

$= \frac{144}{40\times39}$

$= \frac{144}{1560}$

$= 0.0923$

(5)(a)

Subject	No. of Teacher	Sectoral angle $=\frac{F}{N}\times\frac{360}{1}$
English	10	$\frac{10}{40}\times\frac{360}{1}=90^{\circ}$
Mathematics	8	$\frac{8}{40}\times\frac{360}{1}=72^{\circ}$
Physics	4	$\frac{4}{40}\times\frac{360}{1}=36^{\circ}$
French	6	$\frac{6}{40}\times\frac{360}{1}=54^{\circ}$
Biology	12	$\frac{12}{40}\times\frac{360}{1}=108^{\circ}$
Total	40	

Draw the pie chart diagram

5(b)

$Pr(\text{Physics or Biology}) = \frac{4}{40}+\frac{12}{40}=\frac{16}{40}=\frac{2}{5}$ //

6(a)

$135_k = 231_4$

$1\times k^2+3\times k+5\times k^0 = 2\times4^2+3\times4^1+1\times4^0$

$k^2+3k+5 = 32+12+1$

$k^2+3k+5 = 45$

$k^2+3k+5-45 = 0$

$k^2+3k-40 = 0$

$k^2+8k-5k-40 = 0$

$k(k+8)-5(k+8)=0$

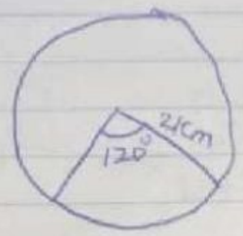
$(k-5)(k+8)=0$

$k-5=0$ or $k+8=0$

$k=5$ or -8

$\therefore k=5$ //

6(b)



(i) Perimeter $= \frac{\theta}{360}\times2\pi r+2r$

$= \frac{120}{360}\times2\times\frac{22}{7}\times21+2\times21$

$= 44+42 = 86cm$

(ii) Area $= \frac{\theta}{360}\times\pi r^2$

$= \frac{120}{360}\times\frac{22}{7}\times21\times21$

$= 462cm^2$

6(c)

$\frac{3}{\sqrt5+\sqrt2}-\frac{1}{\sqrt5-\sqrt2}$

$\frac{3(\sqrt5-\sqrt2)-1(\sqrt5+\sqrt2)}{(\sqrt5+\sqrt2)(\sqrt5-\sqrt2)}$

$\frac{3\sqrt5-3\sqrt2-\sqrt5-\sqrt2}{5-2}$

$\frac{2\sqrt5-4\sqrt2}{3}$ //

7(a)

Let the man be x, Let the daughter be y

$x + y = 60$ ——— (1)

6 yrs ago, $x - 6 = 3(y - 6)$

$x - 6 = 3y - 18$

$x - 3y = -18 + 6$

$x - 3y = -12$ ——— (2)

Subtract eqn (1) & (2)

$$\begin{array}{r} x + y = 60 \\ -(x - 3y) = -12 \\ \hline 4y = 72 \end{array}$$

$y = 72/4 = 18$

Substitute y in eqn (1)

$x + y = 60$

$x + 18 = 60$

$x = 60 - 18 = 42$ //

∴ Their present ages: Man = 42 yrs

Daughter = 18 yrs

7(b)

Sum $= \frac{-3}{4} + \frac{5}{6} = \frac{-9 + 10}{12} = \frac{1}{12}$

Product $= \frac{-3}{4} \times \frac{5}{6} = \frac{-15}{24} = \frac{-5}{8}$ //

$x^2 - (\text{sum})x + \text{Product} = 0$

$x^2 - \frac{1}{12}x + \left(\frac{-5}{8}\right) = 0$

L.C.M = 24

$24x^2 - 2x - 15 = 0$ //

7(c)

$4\left(1 - \frac{144}{169}\right)^{\frac{1}{2}} \times \left(\frac{2}{13}\right)^{-1}$

$4\left(\frac{169 - 144}{169}\right)^{1/2} \times \left(\frac{1}{2/13}\right)$

$4\left(\frac{25}{169}\right)^{1/2} \times \frac{13}{2}$

$4\left(\sqrt{\frac{25}{169}}\right) \times \frac{13}{2}$

$2\cancel{4} \times \frac{5}{\cancel{12}} \times \frac{\cancel{13}}{\cancel{2}} = 2 \times 5 = 10$ //

NUMBER 8

$5\log 2 + \log 40 - \log 12.8$

$5\log 2 + \log 40 - \log\left(\frac{128}{10}\right)$

$5\log 2 + \log 40 - \log\frac{64}{5}$

$5\log 2 + \log(5 \times 8) - \log 64 + \log 5$

$5\log 2 + \log 5 + \log 8 - \log 64 + \log 5$

$5\log 2 + \log 5^2 + \log 2^3 - \log 2^6 + \log 5$

$5\log 2 + \log 5 + 3\log 2 - 6\log 2 + \log 5$

$2\log 2 + 2\log 5$

$\Rightarrow \log 2^2 + \log 5^2$

$\Rightarrow \log 4 + \log 25$

$\Rightarrow \log(4 \times 25)$

$\Rightarrow \log 100$

$\Rightarrow \log 10^2$

$\Rightarrow 2\log 10$

$\Rightarrow 2$ //

8b

$m = \frac{dy}{dx} = 6x^2 + 8x - 3$

$\int \frac{dy}{dx} = \int (6x^2 + 8x - 3)\,dx$

$= \frac{6x^3}{3} + \frac{8x^2}{2} - 3x + c$

$y = 2x^3 + 4x^2 - 3x + c$

at $(-2, 5)$ we have:

$2(-2)^3 + 4(-2)^2 - 3(-2) + c = 5$

$-16 + 16 + 6 + c = 5$

$c = 5 - 6$

$c = -1$

Hence the equation is

$y = 2x^3 + 4x^2 - 3x - 1$

8c

$y = 3x^2 + 4x - 5$

$\frac{dy}{dx} = 6x + 4$

EXAMBURNERS

9(a)

(i) $3A - 2B$

$$3\begin{pmatrix} 3 & 2 & -1 \\ 1 & 0 & 1 \\ 2 & -2 & 0 \end{pmatrix} - 2\begin{pmatrix} 4 & 2 & -3 \\ 3 & -1 & 1 \\ 0 & -2 & 2 \end{pmatrix}$$

$$= \begin{pmatrix} 9 & 6 & -3 \\ 3 & 0 & 3 \\ 6 & -6 & 0 \end{pmatrix} - \begin{pmatrix} 8 & 4 & -6 \\ 6 & -2 & 2 \\ 0 & -4 & 4 \end{pmatrix} = \begin{pmatrix} 1 & 2 & 3 \\ -3 & 2 & 1 \\ 6 & -2 & -4 \end{pmatrix}$$

(ii) $|3A-2B| = 1\begin{vmatrix} 2 & 1 \\ -2 & -4 \end{vmatrix} - 2\begin{vmatrix} -3 & 1 \\ 6 & -4 \end{vmatrix} + 3\begin{vmatrix} -3 & 2 \\ 6 & -2 \end{vmatrix}$

$= 1(-8+2) - 2(12-6) + 3(6-12)$

$= 1(-6) - 2(6) + 3(-6)$

$= -6 - 12 - 18 = -36$

9(b)(i)

$P = ₦120,000$, $R = 12\%$, $n = 3$

Amount $(A) = P\left(1 + \frac{R}{100}\right)^n$

$= 120,000\left(1 + \frac{12}{100}\right)^3$

$= 120,000\,(1+0.12)^3$

$= 120,000\,(1.12)^3$

$= ₦168,591.36$

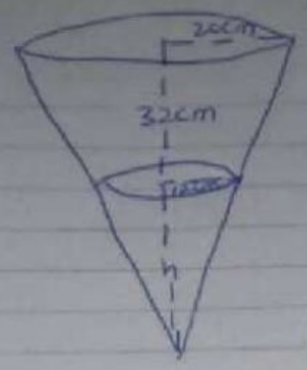
9(b)(ii)

Profit = Saving price − Amount paid

$= ₦350,000 - ₦168,591.36$

$= ₦181,408.64$

(10)



$D = 40cm$

$R = \frac{D}{2} = \frac{40cm}{2} = 20cm$

$d = 24cm$

$r = \frac{d}{2} = \frac{24cm}{2} = 12cm$

By similar $h = h$

$H = 32 + h$

By similar figure:

$\frac{h}{r} = \frac{H}{R}$

$\frac{h}{12} \times \frac{32+h}{20}$

$20h = 384 + 12h$

$20h - 12h = 384$

$\frac{8h}{8} = \frac{384}{8}$

$h = 48cm \therefore H = 32 + 48 = 80cm$

Volume $= \frac{1}{3}\pi(R^2H - r^2h)$

$= \frac{1}{3} \times \frac{22}{7}(20^2 \times 80 - 12^2 \times 48)$

$= \frac{22}{21} \times 25088 = \frac{551936}{21} = 26282.67cm^3$

Diameter $= 56cm$

radius, $r = \frac{D}{2} = \frac{56}{2} = 28cm$

Volume of cylinder = Volume of the bucket

$\pi r^2 h = 26282.67cm^3$

$\frac{22}{7} \times 28^2 \times h = 26282.67$

$\frac{17248h}{17248} = \frac{7 \times 26282.67}{17248}$

$h = 10.667cm \cong 11cm$

∴ The level of the water is 11cm.

(12)a

$\bar{X} = \frac{\Sigma X}{n}$

$18 = \frac{12+x+15+2x+25+12+30+15+25+12+16+12}{12}$

$\frac{18}{1} \neq \frac{174+3x}{12}$

$174 + 3x = 216$

$3x = 216 - 174$

$3x = 42$

$x = 14$

12(b) & (c)

x	$x-\bar{x}$	$\lvert x-\bar{x}\rvert$	$(x-\bar{x})^2$
12	−6	6	36
14	−4	4	16
15	−3	3	9
28	10	10	100
25	7	7	49
12	−6	6	36
30	12	12	144
15	−3	3	9
25	7	7	49
12	−6	6	36
16	−2	2	4
12	−6	6	36
		72	524

(b) Mean Deviation $= \frac{\Sigma\lvert x-\bar{x}\rvert}{n} = \frac{72}{12} = 6$

(c) Standard Deviation $= \sqrt{\frac{\Sigma(x-\bar{x})^2}{n}} = \sqrt{\frac{524}{12}} = \sqrt{43.67}$

$= 6.608$

OBJECTIVE ANSWER

01.C	02.A	03.C	04.C	05.D	06.C	07.D	08.E	09.C	10.E
11.B	12.A	13.D	14.A	15.B	16.A	17.D	18.C	19.B	20.B
21.E	22.C	23.A	24.E	25.E	26.B	27.E	28.D	29.C	30.A
31.D	32.A	33.D	34.A	35.C	36.E	37.E	38.B	39.E	40.B
41.E	42.E	43.C	44.B	45.C	46.B	47.B	48.D	49.A	50.E
51.B	52.E	53.E	54.C	55.E	56.A	57.E	58.C	59.C	60.C