

PAPER II

PART I

Attempt all questions in this part.

1. A boy measures the length of a square object as 5.8 cm instead of 6 cm. He uses his measurement to calculate the area of the object. Find the percentage error in the:

- (a) Length of the side
(b) Area of the square

Correct your answers to 2 decimal places.

(8 marks)

2. (a) Simplify $\frac{x-5}{6} - \frac{6}{x-5}$.

- (b) Find the gradient of a line joining the points A(-4,-6) and B(6,8).

(8 marks)

3. A sphere has a volume of 300 cm^3 . Another sphere has a radius which is one-third the radius of the first sphere. Find the volume of the second sphere.
(Take $\pi = \frac{22}{7}$)

(8 marks)

4. **Table 2.1: Weights of Students**

Weight (kg)	50	68	X	55	62
No. of students	3	5	1	2	4

- (a) If the mean weight of students in Table 2.1 is 59.3 kg, determine the value of X to the nearest kg.

- (b) Calculate the:
(i) Mode
(ii) Median

(8 marks)

5. (a) A particle moves along x-axis so that its distance x metres from the origin after t seconds is given by $x = 7t + 12t^2$. Find its:

- (i) Velocity after 2 seconds
(ii) Acceleration

- (b) Simplify $\frac{m^2 - 2mn + n^2}{m^2 - n^2}$.

(8 marks)

PART II

Attempt five questions only in this part.

6. Use the logarithm tables to evaluate $\frac{0.08034 + 0.02473}{\sqrt{0.8643} \times \sqrt[3]{0.9562}}$. (12 marks)
7. (a) If $T = 2\pi\sqrt{\frac{L}{G}}$, make G the subject of the formula.
Hence, find the value of G to the nearest whole number when $T = 45$, $L = 8$ and $\pi = 3.142$.
- (b) In a particular guest house, the cost per person (C) for an accommodation is partly constant and partly varies inversely as the number of guests (N). If the cost per person, for 24 persons is ₦800.00 and the cost per person, for 18 persons is ₦1200.00, find the cost per person, for 42 persons to the nearest naira. (12 marks)
8. Two ships M and N take off from a port T at the same time. M moves on a bearing of $S25^\circ W$ while N moves on a bearing of $N60^\circ E$. If both travel a distance of 20 km each from T , determine the:
- (a) Distance between M and N , correct to 1 decimal place
(b) Bearing of N from M (12 marks)
9. (a) A function $y = 2x^4 - Px^3 + 2x$, where P is a constant, has a stationary value $x = -1$. Find the value of P .
- (b) The motion of a particle along a straight line is defined by the equation $x = 5t^3 - 4t^2$. Find after 4 seconds, the:
- (i) Velocity
(ii) Acceleration
- (c) Evaluate $\int_0^3 6x^2 - 4x + 2 \, dx$. (12 marks)

10. (a) Towns P(lat. 40°N , long. 20°W) and Q(lat. 40°N , long. 70°W) are two places on the Earth's surface. Calculate, correct to 2 decimal places, the:

- (i) Radius of the parallel of latitude on which P and Q lie
- (ii) Shortest distance PQ along the parallel of latitude
- (iii) Time taken for an aeroplane to cover the shortest distance PQ at an average speed of 800 km/h. (Use $\pi = \frac{22}{7}$ and $R = 6,400$ km)

- (b) Simplify $\frac{2(x^2+x-6)}{3x^2-27} \div \frac{x^2-x-2}{x-3}$. (12 marks)

11. (a) Copy and complete Table 2.2 for the relation $y = \frac{1}{4}(2x^2 - 3x - 2)$.

Table 2.2: $y = \frac{1}{4}(2x^2 - 3x - 2)$.

x	-2	-1.5	-1	-0.5	0	1	1.5	2	2.5	3
y	3				-0.5			0	0.75	

- (b) Draw the graph of $y = \frac{1}{4}(2x^2 - 3x - 2)$, using 2 cm to represent 1 unit on both axes.

- (c) From your graph, find the:

- (i) Equation of the line of symmetry of the curve
- (ii) Gradient of the curve at $x = 2.5$
- (iii) Roots of the equation $\frac{1}{4}(2x^2 - 3x - 2) = 1$ (12 marks)

12. Table 2.3: Frequency distribution

Class interval	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Frequency	5	8	17	38	59	44	25	4

- (a) Draw the ogive for Table 2.3.
- (b) Use the ogive to estimate the:

- (i) Median
- (ii) Lower and upper quartiles
- (iii) Semi – interquartile range (12 marks)

**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											
	0	0	1	0	1	0	2	3	8	7	6	5	4	3	2	1	0	0	B	D
SSCE ☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
BECE ☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other ☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
If Other, write each 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																			

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 rough 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. Therefore, answer space B would be shaded as shown below:

[A]

☒

[C]

[D]

[E]

1. What must be added to the expression $x^2 + \frac{8x}{3}$ to make it a perfect square?

- A. $\frac{16}{9}$
- B. $\frac{16}{3}$
- C. $\frac{4}{3}$
- D. $\frac{64}{9}$
- E. $\frac{8}{3}$

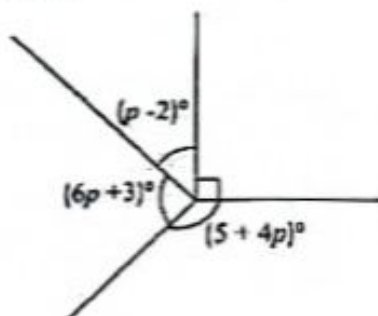
2. Evaluate $\frac{\log 8}{\log \frac{1}{4}}$.

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

3. A fair die is rolled once. What is the probability of obtaining a 3 or 4?

A. $\frac{2}{3}$
 B. $\frac{1}{2}$
 C. $\frac{5}{6}$
 D. $\frac{3}{5}$
 E. $\frac{1}{3}$

4. Find the value of p in the figure below.



- A. 88
 B. 26
 C. 24
 D. 48
 E. 96
5. If $P = \{3, 5, 6\}$ and $Q = \{1, 2, 4\}$, find $P \cap Q$.
- A. $\{2\}$
 B. $\emptyset$
 C. $\{1, 2, 3, 4, 5, 6\}$
 D. $\{1, 6\}$
 E. $\{2, 5\}$

6. Find the cardinality of the set $A = \{x: -3 < x < 33\}$.

A. 33
 B. 34
 C. 36
 D. 37
 E. 35

7. Find the distance between the points $A(3, -3)$ and $B(4, -3)$.

A. 1
 B. $3\sqrt{3}$
 C. $\sqrt{85}$
 D. $\sqrt{35}$
 E. $\sqrt{7}$

8. Solve for y if $4y^3 = 500$.

A. 15
 B. 10
 C. 25
 D. 35
 E. 5

9. Convert 1011.11_{two} to base 10.

A. $3\frac{13}{16}$
 B. 47
 C. $11\frac{3}{4}$
 D. 3
 E. 11

10. Solve the equation $x = \frac{5}{3x+2}$.

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

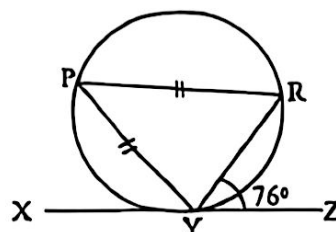
11. Simplify $3\frac{1}{4} - \frac{1}{2} + 1\frac{1}{3} \times \frac{8}{9}$.

- A. $1\frac{5}{6}$
- B. 4
- C. 3
- D. 2
- E. $2\frac{11}{12}$

12. Calculate the volume of a sphere whose diameter is 6.5 cm, correct to one decimal place.

- A. 143.9 cm^3
- B. 44.3 cm^3
- C. 143.8 cm^3
- D. 44.6 cm^3
- E. 144.9 cm^3

13. In the figure below, XYZ is a tangent to the circle at Y, $|PR| = |PY|$ and $\angle RYZ = 76^\circ$. Calculate $\angle PRY$.



- A. 104°
- B. 52°
- C. 46°
- D. 76°
- E. 126°

14. A bag contains 3 green and 2 brown identical balls. If 2 balls are picked at random from the bag one after the other without replacement, find the probability that they are of the same colour.

- A. $\frac{1}{2}$
- B. $\frac{1}{10}$
- C. $\frac{3}{10}$
- D. $\frac{1}{4}$
- E. $\frac{2}{5}$

15. If the equation $4x^2 - 4\sqrt{P}x + 3 = 0$ has equal roots, find the value of P .

- A. 1
- B. 0
- C. 2
- D. 3
- E. 4

16. Consider the truth table below:

P	Q	Y
T	T	T
T	F	F
F	T	F
F	F	F

Which of the following represents Y?

- A. $P \wedge Q$
- B. $\sim (P \wedge Q)$
- C. $P \vee Q$
- D. $P \Rightarrow Q$
- E. $\sim (P \vee Q)$

17. Two fair dice are tossed together once. Find the probability that the sum of the outcome is at least 10.

- A. $\frac{1}{9}$
- B. $\frac{1}{6}$
- C. $\frac{1}{5}$
- D. $\frac{1}{8}$
- E. $\frac{1}{7}$

18. The table below shows the scores obtained by 20 students in a Mathematics test.

Scores	8	10	12	15	18	20
No. of Students	3	5	6	3	2	1

Find the median score.

- A. 8
- B. 12
- C. 20
- D. 10
- E. 15

19. Given the sequence 7, 14, 21, ..., 84. Find the number of terms.

- A. 9
- B. 8
- C. 10
- D. 12
- E. 7

20. Find the number of terms of the sequence $1 + 2 + 3 + \dots$ needed for the sum to be 820.

- A. 41
- B. 40
- C. 51
- D. 12
- E. 14

21. Evaluate $\frac{2x^2yz}{2y-z}$,

when $x = 3$, $y = -4$ and $z = -5$.

- A. 120
- B. -360
- C. -120
- D. -300
- E. 360

22. If $L = \frac{3rh^2}{4\lambda}$, find the value of λ when $r = 0.4$, $L = 0.6$ and $h = 1.5$.

- A. 0.412
- B. 1.125
- C. 2.234
- D. 3.125
- E. 6.201

23. Solve the equation $\log_x 2 + \log_x 8 = 4$.

- A. 2
- B. 8
- C. 16
- D. 12
- E. 4

24. In a school of 45 teachers, 30 have blue pen and 28 red pen. How many teachers have both colours?

- A. 103
- B. 13
- C. 20
- D. 50
- E. 10

25. Make x the subject of the formula $b = \frac{1}{2}(\sqrt{a+x^2})$.

- A. $x = \sqrt{a - b^2/4}$
- B. $x = \sqrt{a - 4b^2}$
- C. $x = \sqrt{4b^2 - a}$
- D. $x = \sqrt{a + b^2/4}$
- E. $x = \sqrt{4a + b^2}$

26. The table below shows the scores obtained by 20 students in a Mathematics test.

Scores	8	10	12	15	18	20
No. of Students	3	5	6	3	2	1

Find the modal score.

- A. 20
- B. 10
- C. 18
- D. 12
- E. 15

27. An aircraft flies from Q (25°N , 38°E) to R (72°S , 38°E). Calculate the distance QR along the line of longitude, correct to the nearest kilometre.

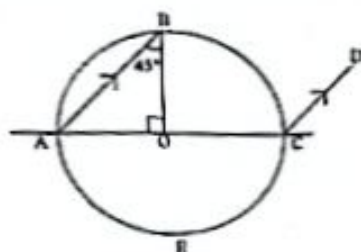
(Take $R = 6,400 \text{ km}$, $\pi = \frac{22}{7}$)

- A. 3,930
- B. 1,039
- C. 9,810
- D. 10,839
- E. 29,839

28. Simplify $32^{-3/5}$.

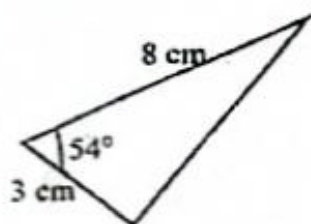
- A. 8
- B. 16
- C. $\frac{1}{4}$
- D. $\frac{1}{8}$
- E. 4

29. In the figure below, O is the centre of the circle ABCE and $AB \parallel CD$. If $\angle ABO = 45^\circ$, calculate $\angle OCD$.



- A. 135
B. 45
C. 120
D. 90
E. 60
30. The base of a triangle is 3 cm longer than its height. If the area is 44 cm^2 , find the length of the base.
- A. 12 cm
B. 11 cm
C. 9 cm
D. 10 cm
E. 8 cm
31. If the mean score of the first 2 students in a Mathematics test is 85%, the next 3 students is 70% and the last 3 students is 60%, find the mean score of the whole class in percent.
- A. 75
B. 74
C. 70
D. 68
E. 72
32. Express $\frac{4x}{3-x} + \frac{3x}{x+2}$ as a single fraction.
- A. $\frac{x(x+17)}{(3-x)(x+2)}$
B. $\frac{17x}{(3-x)(x+2)}$
C. $\frac{x(x-17)}{(3-x)(x+2)}$
D. $\frac{x(x+17)}{(x+2)(x+2)}$
E. $\frac{x(x+17)}{(x-2)(x+2)}$
33. A sector of a circle of radius 14 cm subtends an angle 140° at the centre. Calculate the perimeter of the sector, correct to one decimal place.
- A. 479.3 cm
B. 34.2 cm
C. 1960.4 cm
D. 53.4 cm
E. 62.2 cm
34. The bearing of two points Q and R from a point P are 030° and 120° respectively. If $|PQ| = 12 \text{ m}$ and $|PR| = 5 \text{ m}$, find $|QR|$.
- A. 7 m
B. 9 m
C. 5 m
D. 11 m
E. 13 m
35. If $\left| \frac{4}{5} \frac{x}{3} \right| = 42$, find the value of x .
- A. 11
B. -6
C. 8
D. -4
E. 6

36. Find the area of the figure below, correct to one decimal place.



- A. 14.1 cm^2
 B. 7.1 cm^2
 C. 19.4 cm^2
 D. 9.7 cm^2
 E. 16.5 cm^2
37. Find the range of the following numbers: 7, 2, 8, 6, 11, 9, 4, 5, 2, 3.

- A. 2
 B. 5
 C. 11
 D. 9
 E. 6

38. The radius of a sphere is $5\frac{1}{4} \text{ cm}$. Calculate its volume, correct to one decimal place.
 (Take $\pi = \frac{22}{7}$)

- A. 303.2 cm^3
 B. 115.5 cm^3
 C. 606.4 cm^3
 D. 1212.8 cm^3
 E. 2425.5 cm^3

39. Find the equation of a curve which passes through the point (2, -5) and its gradient at any point is given by $3x^2 - 6x + 5$.

- A. $y = 3x^3 - 6x^2 + 5x - 11$
 B. $y = x^3 - 3x^2 - 5x + 11$
 C. $y = x^3 - 3x^2 + 5x - 1$
 D. $y = x^3 - 3x^2 + 5x - 11$
 E. $y = x^3 - x^2 + 5x - 10$

40. The angle of a sector of a circle with radius 9.1 cm is 100° . Find the perimeter of the sector, correct to the nearest centimetre.

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

- A. 36
 B. 18
 C. 8
 D. 34
 E. 10

41. Given that $\log_{10} 2 = 0.3010$ and $\log_{10} 3 = 0.4771$, evaluate $\log_{10} 7.2$.

- A. 0.9030
 B. 0.8572
 C. 0.5614
 D. 0.9542
 E. 0.8042

42. The figure shows how a man spends his annual income. Use the information to answer question that follow.



If the amount saved during the year is ₦120,000.00, how much was spent on rent and school fees?

- A. ₦256,000.00
 B. ₦240,000.00
 C. ₦224,000.00
 D. ₦302,000.00
 E. ₦296,000.00

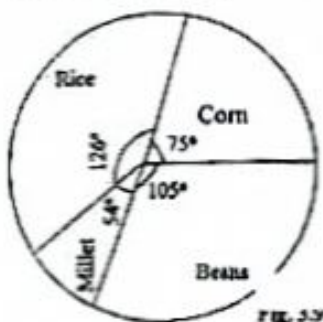
43. If $m = \frac{3}{5}\sqrt{\frac{rq}{p}}$, express q in terms of m , r and p .

- A. $q = \frac{25m^2}{9pr}$
 B. $q = \frac{25pm^2}{9r}$
 C. $q = \frac{25m^2pr}{9}$
 D. $q = \frac{9m^2rp}{25}$
 E. $q = \frac{9pm^2}{25r}$

44. Find the rate percent per annum if ₦36,000.00 is paid as simple interest on ₦240,000.00 in 3 years.

- A. 6
 B. 5
 C. 3
 D. 18
 E. 10

45. The figure below shows the distribution of crops harvested in a farm. The total bags harvested for all the crops is 300.



What percentage of the crops harvested is Beans?

- A. 29.2
 B. 15.1
 C. 33.4
 D. 25.0
 E. 18.0

46. Solve the equation $2x^2 - 32 = 0$.

- A. $x = 0$ or 2
 B. $x = 2$ or -4
 C. $x = -2$ or 4
 D. $x = 4$ or -4
 E. $x = 0$ or -4

47. A man deposited a sum of ₦45,000.00 in a bank at 3% simple interest. Calculate the amount at the end of 7 years.

- A. ₦63,900.00
 B. ₦35,550.00
 C. ₦54,450.00
 D. ₦44,450.00
 E. ₦64,450.00

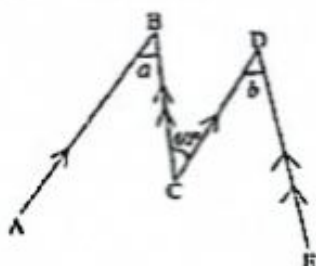
48. Express the square root of 0.000264 in standard form.

- A. 1.62×10^3
 B. 1.62×10^{-2}
 C. 1.62×10^1
 D. 1.62×10^{-1}
 E. 1.62×10^2

49. If $m = \frac{tb^2}{xy} + t$, express t in terms of m , b , x and y .

- A. $t = \frac{b^2 + x}{mxy}$
 B. $t = \frac{mxy}{b^2 + xy}$
 C. $t = \frac{b^2 - xy}{mxy}$
 D. $t = \frac{m - xy}{b^2 + x}$
 E. $t = \frac{mxy}{b^2 - xy}$

50. Find the values of a and b in the figure below, given that $AB \parallel CD$, $CB \parallel ED$ and $\angle BCD = 60^\circ$.



- A. $a = 50, b = 50$
 B. $a = 20, b = 30$
 C. $a = 30, b = 40$
 D. $a = 40, b = 40$
 E. $a = 60, b = 60$
51. Solve for x in the equation $\frac{1}{x} + \frac{2}{3x} = \frac{1}{6}$.

- A. -3
 B. -10
 C. -5
 D. 10
 E. 5

52. Calculate the amount, if a sum of N320,000.00 is invested for 4 years at 5% per annum simple interest.

- A. N648,000.00
 B. N384,000.00
 C. N326,400.00
 D. N584,000.00
 E. N448,000.00

53. A sequence is given by $x + y, 2x + 3y, 3x + 5y, \dots$. If the n th term is $9x + 17y$, find n .

- A. 8
 B. 19
 C. 6
 D. 13
 E. 9

54. Find the area bounded by the curve $y = x^2 + \frac{1}{x^2}$, x -axis and the ordinates $x = 2$ and $x = 3$.

- A. $15\frac{5}{6}$ square units
 B. $9\frac{1}{3}$ square units
 C. $2\frac{5}{6}$ square units
 D. $6\frac{1}{2}$ square units
 E. $12\frac{1}{6}$ square units

55. Expand $(2x - 1)(x + 2)$.

- A. $2x^2 - 3x - 2$
 B. $2x^2 + 3x - 2$
 C. $2x^2 + 5x - 2$
 D. $2x^2 - 5x + 2$
 E. $2x^2 + 3x + 2$

56. Find the sum of the first ten terms of an Arithmetic Progression 18, 12, 6, 0, 6, ...

- A. 450
 B. 90
 C. 450
 D. 90
 E. 30

57. Calculate the value of g in the figure below.

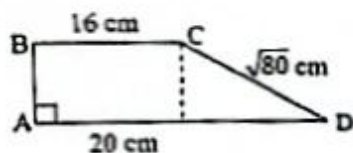


- A. 112°
 B. 34°
 C. 64°
 D. 224°
 E. 61°

58. If the mean of the numbers 2, 5, $(x + 2)$, $(x + 1)$, 7 and 9 is 6, find the value of x .

A. 9
B. 5
C. 7
D. 2
E. 4

59. If $|AD| = 20$ cm, calculate the area of the trapezium ABCD in the figure below.



A. 160 cm^2
B. 164 cm^2
C. 154 cm^2
D. 144 cm^2
E. 104 cm^2

60. Simplify $\left(\frac{9}{16}\right)^{-\frac{1}{2}} \times 3^4 + \left(\frac{1}{6}\right)^{-2}$.

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

MATHS OBJ (TYPE E)

1-10: BCECBEAECA

11-20: ECDEDABBDB

21-30: CDABCDDDBB

31-40: CDEEBDDCDD

41-50: BBBBCDCBBE

51-60: BBEDCDCBDD

11:17 AM ✓✓

QUESTION 1

$$\begin{aligned}\textcircled{a} \text{ percentage error in length} &= \frac{\sigma_{\text{error}}}{\text{True Value}} \times 100\% \\ &= \frac{|5.8 - 6|}{6} \times 100\% \\ &= \frac{0.2}{6} \times 100\% \\ &= 3.33\%\end{aligned}$$

$$\begin{aligned}\textcircled{b} \text{ percentage error in the area} &= \frac{|5.8^2 - 6^2|}{6^2} \times 100\% \\ &= \frac{|33.64 - 36|}{36} \times 100\% \\ &= \frac{2.36}{36} \times 100\% \\ &= 6.56\%\end{aligned}$$

QUESTION 2

$$\begin{aligned}\textcircled{a} \quad \frac{x-5}{6} - \frac{6}{x-5} &= \frac{(x-5)^2 - 6^2}{6(x-5)} \\ &= \frac{(x-5+6)(x-5-6)}{6(x-5)} \\ &= \frac{(x+1)(x-11)}{6(x-5)}\end{aligned}$$

$$\text{OR} = \frac{x^2 - 10x - 11}{6(x-5)}$$

$$\begin{aligned}\textcircled{b} \quad \text{Gradient, } m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{8 - (-6)}{6 - (-4)}\end{aligned}$$

$$= \frac{8+6}{6+4}$$

$$= \frac{14}{10}$$

$$= \frac{7}{5} \text{ OR } 1.4$$

QUESTION 3

$$\text{Ratio of volume} = (\text{ratio of radius})^3$$

$$\frac{300}{V_2} = \left(\frac{r}{r/3}\right)^3$$

$$\frac{300}{V_2} = (3)^3$$

$$V_2 = \frac{300}{3^3} = \frac{300}{27} = ~~11.1~~ 11.1 \text{ cm}^3$$

QUESTION 4

(a)

Weight (kg)	no of students	fx
50	3	150
68	5	340
X	1	X
55	2	110
62	4	248

$$\text{Mean} = \frac{\sum fx}{\sum f} = \frac{150 + 340 + X + 110 + 248}{3 + 5 + 1 + 2 + 4}$$

$$= \frac{X + 848}{15} = 59.3$$

$$X + 848 = 889.5$$

$$X = 889.5 - 848$$

$$X = 41.5$$

$$X = 42 \text{ kg}$$

(b) i. Mode = 68 kg (highest frequency)

(ii) Median = $\left(\frac{15+1}{2}\right)^{\text{th}}$ weight

$$= \left(\frac{16}{2}\right)^{\text{th}}$$

$$= 8^{\text{th}}$$

$$= 68 \text{ kg}$$

QUESTION 5

④ Given: $x = 7t + 12t^2$

(i) Velocity, $v = \frac{dx}{dt} = 7 + 12(2)t$
 $= 7 + 24t$

After 2 secs, $v = 7 + 24(2)$
 $= 7 + 48$
 $= 55 \text{ m/s}$

(ii) Acceleration, $a = \frac{dv}{dt} = \frac{d}{dt}(7 + 24t)$
 $= 24 \text{ m/s}^2$

⑤ $\frac{m^2 - 2mn + n^2}{m^2 - n^2} = \frac{m^2 - mn - mn + n^2}{(m+n)(m-n)}$
 $= \frac{m(m-n) - n(m-n)}{(m+n)(m-n)}$
 $= \frac{(m-n)(m-n)}{(m+n)(m-n)}$
 $= \frac{m-n}{m+n}$

QUESTION 6

No	log	
0.08034	$\bar{2}.9049$	
0.02473	$\bar{2}.3932$	
$0.08034 \div 0.02473$	$0.5117 \Rightarrow 0.5117 \Rightarrow 0.5117$	
$\sqrt{0.8643}$	$1.9367 \div 2$	
	$(\bar{2} + 1.9367) \div 2 \Rightarrow 1.9684$	
$\sqrt[3]{0.9562}$	$1.9805 \div 3$	
	$(\bar{3} + 2.9805) \div 3 \Rightarrow 1.9935$	
$\sqrt{0.8643} \times \sqrt[3]{0.9562}$	$\Rightarrow \bar{1}.9619 \Rightarrow 1.9619$	
$0.08034 \div 0.02473$		
$\sqrt{0.8643} \times \sqrt[3]{0.9562}$		0.5498

3.547 (Antilog)

QUESTION 7

(a)

$$T = 2\pi \sqrt{\frac{L}{g}}$$

square both sides

$$T^2 = 4\pi^2 \frac{L}{g}$$

$$g = \frac{4\pi^2 L}{T^2}$$

when: $T = 45$, $L = 8$ and $\pi = 3.142$

$$g = \frac{4 \times (3.142)^2 \times 8}{45^2}$$

$$g = 0.156$$

$$g \approx 0 \text{ (nearest whole number)}$$

(b) Given: $C = a + \frac{b}{N}$ where a & b are constants

Given: $C = 800$ and $N = 24$

$$800 = a + \frac{b}{24} \quad \text{--- (1)}$$

Given: $C = 1200$ and $N = 18$

$$1200 = a + \frac{b}{18} \quad \text{--- (2)}$$

subtract eqn (1) from eqn (2)

$$400 = b \left(\frac{1}{18} - \frac{1}{24} \right)$$

$$400 = b \left(\frac{4-3}{72} \right)$$

$$400 = \frac{b}{72}$$

$$b = 28800$$

put this in eqn (1)

$$800 = a + \frac{28800}{24}$$

$$a = 800 - 1200$$

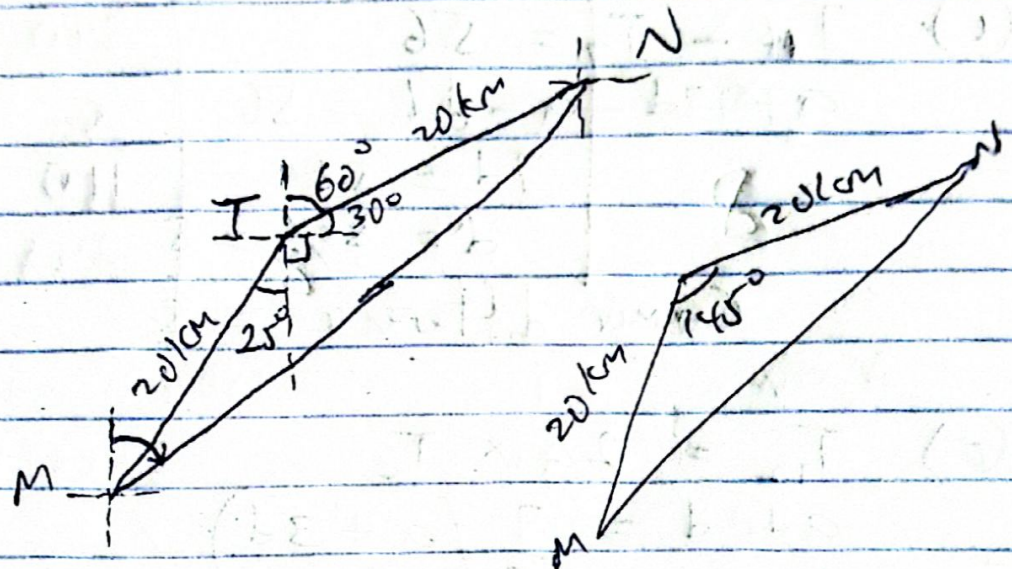
$$a = -400$$

$$\text{Equation: } C = -400 + \frac{28800}{N}$$

When: $N = 42$

$$\begin{aligned} C &= -400 + \frac{28800}{42} \\ &= -400 + 685.71 \\ &= \text{R}286 \text{ (nearest randa)} \end{aligned}$$

QUESTION 8



(a) $\overline{MN} =$

$$\sqrt{20^2 + 20^2 - 2(20)(20)\cos 145^\circ}$$

$$\overline{MN} = \sqrt{400 + 400 - 800(-\cos 35^\circ)}$$

$$= \sqrt{800 + 800(0.8192)}$$

$$= \sqrt{1455.36}$$

$$\overline{MN} = 38.15$$

$$\overline{MN} = 38.2 \text{ km}$$

(b) Using sine rule: $\frac{20}{\sin M} = \frac{38.15}{\sin 145^\circ}$

$$\sin M = \frac{20 \sin 145^\circ}{38.15}$$

$$\sin M = 0.3007$$

$$M = \sin^{-1}(0.3007)$$

$$M = 17.5^\circ$$

Bearing of N from M = $25^\circ + 17.5^\circ$
 $= 42.5^\circ$

QUESTION 9

a) Given: $y = 2x^4 - 3px^3 + 2x$

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

Since stationary value $x = -1$

$$y'(-1) = 8(-1)^3 - 3p(-1)^2 + 2 = 0$$

$$-8 - 3p + 2 = 0$$

$$-3p = 8 - 2 = 6$$

$$p = \frac{6}{-3} = -2$$

b) Given: $x = 5t^3 - 4t^2$

(i) velocity, $v = \frac{dx}{dt} = 15t^2 - 8t$

After 4 secs, $v = 15(4)^2 - 8(4)$

$$= 240 - 32$$

$$= 208 \text{ m/s}$$

(ii) acceleration $= \frac{dv}{dt} = \frac{d}{dt}(15t^2 - 8t)$

$$a = 30t - 8$$

After 4 secs, $a = 30(4) - 8$

$$a = 120 - 8$$

$$a = 112 \text{ m/s}^2$$

(c) $\int_0^3 6x^2 - 4x + 2 \, dx = \left[2x^3 - 2x^2 + 2x \right]_0^3$

$$= \left[2(3)^3 - 2(3)^2 + 2(3) \right] - 0$$

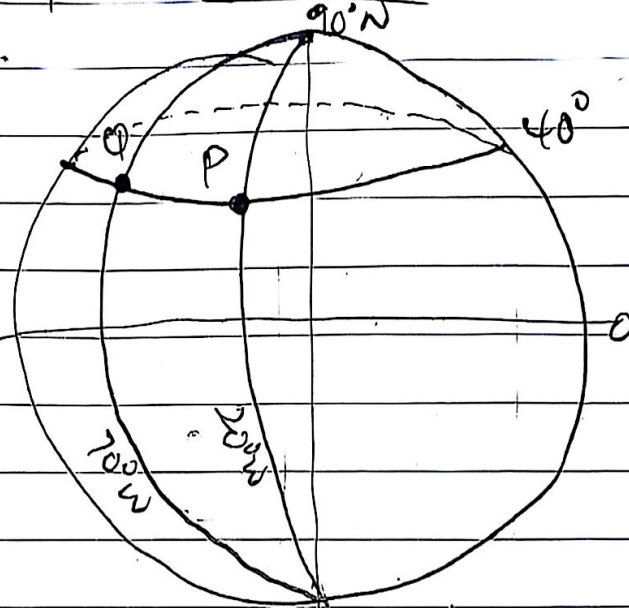
$$= 2(27) - 2(9) + 6$$

$$= 54 - 18 + 6$$

$$= 42$$

QUESTION 10

(a)



(i) Radius of parallel of latitude, $r = R \cos \theta$
 $= 6400 \times \cos 40^\circ$
 $= 4902.68 \text{ km}$

Simulate solution to 2017

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

$= \frac{70-20}{360} \times 2 \times \frac{22}{7} \times 4902.68$

$= 4280.12 \text{ km}$

(iii) time, $t = \frac{\text{distance } \theta}{\text{speed}} = \frac{4280.12}{800} = 5.35 \text{ hours}$

(b) $\frac{2(x^2+x-6)}{3x^2-27} \div \frac{x^2-x-2}{x-3}$

$= \frac{2(x+3)(x-2)}{3(x^2-9)} \div \frac{(x-2)(x+1)}{x-3}$

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

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

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