S1023
GENERAL MATHEMATICS III
1 hour 45 minutes

Name:.....

Examination 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 *Examination Number*, write your **examination 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, examination number 65432100BD,** and who is taking **General Mathematics III (1023).**

National Examinations Council
SSCE ANSWER SHEET

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

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

Serial Number: 0 0 1 0

Subject Code: 1 0 2 3

Examination Number: 6 5 4 3 2 1 0 0 B D

Turn over

PAPER III

Answer **all** questions

Each question is followed by **five** options lettered **A – E.** Choose the correct option for each question and shade **in pencil** on your answer sheet the answer space which 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.

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

1. Express 0.001025 in standard form.

A. 1.025×10^{-5}
B. 1.025×10^{-4}
C. 1.025×10^{-3}
D. 1.025×10^{-2}
E. 1.025×10^{-1}

$0.\overset{1}{0}\overset{2}{0}\overset{3}{1}025$
$\Rightarrow 1.025 \times 10^{-3}$

2. Find the positive difference between rounding off of 3,847,934,000 to the nearest billion and million.

A. 150,000,000
B. 152,000,000
C. 200,000,000
D. 250,000,000
E. 252,000,000

3,847,934,000
Nearest Billion is 4,000,000,000
Nearest Million is 3,848,000,000
Positive difference
$= 4,000,000,000 - 3,848,000,000$
$= 152,066,000$
$\approx 152,000,000$

3. Evaluate $\dfrac{\left(\frac{1}{81}\right)^{-\frac{1}{2}}}{0.3} \times (0.09)^{\frac{1}{2}}$.

A. 81
B. 9
C. 3
D. $\frac{1}{3}$
E. $\frac{1}{9}$

$\frac{\left(\frac{1}{81}\right)^{-1/2}}{0.3} \times (0.09)^{1/2}$

$\frac{(81^{-1})^{-1/2}}{0.3} \times \left(\frac{9}{100}\right)^{1/2}$

$\frac{81^{1/2}}{0.3} \times (9 \times 100^{-1})^{1/2}$

$\left[\sqrt{81} \times (0.3^{-1})\right] \times \left[9^{1/2} \times 100^{-1/2}\right]$

$\left[9 \times \left(\frac{3}{10}\right)^{-1}\right] \times \left[3 \times \left(\frac{1}{100^{1/2}}\right)\right]$

$\left[9 \times (3 \times 10^{-1})^{-1}\right] \times \left(3 \times \frac{1}{10}\right)$

$(9 \times 3^{-1} \times 10) \times (3 \times 10^{-1})$

$\Rightarrow 3^2 \times 3^{-1} \times 10 \times 3 \times 10^{-1}$

$\Rightarrow 3^{2+(-1)+1} \times 10^{1+(-1)}$

$3^2 \times 1$

9

4. Simplify $(0.027)^{\frac{1}{3}} \times (0.09)^{-\frac{1}{2}}$.

A. $\left(\frac{3}{10}\right)^{-2}$
B. $\left(\frac{9}{10}\right)^{-2}$
C. $\left(\frac{3}{10}\right)^{\frac{1}{2}}$
D. $\left(\frac{3}{10}\right)^{2}$
E. $\left(\frac{3}{10}\right)^{4}$

$(0.027)^{1/3} \times (0.09)^{-3/2}$
$\left(\frac{27}{1000}\right)^{1/3} \times \left(\frac{9}{100}\right)^{-3/2}$
$\left(\frac{3^3}{10^3}\right)^{1/3} \times \left(\frac{3^2}{10^2}\right)^{-3/2}$
$\left(\frac{3^{3/3}}{10^{3/3}}\right) \times \left(\frac{3^{-6/2}}{10^{-6/2}}\right)$
$\left(\frac{3}{10}\right) \times \left(\frac{3^{-3}}{10^{-3}}\right)$
$\Rightarrow \frac{3^{1+(-3)}}{10^{1+(-3)}}$; $\frac{3^{-2}}{10^{-2}}$

5. A particular bank paid 50k dividend per share. What would be the percentage yield for a customer who invested ₦5.00 per share?

A. 1
B. 2
C. 5
D. 10
E. 50

% yield = $\frac{\text{Acc. dividend}}{\text{money invested}} \times 100$
Acc. dividend = 50K = ₦0.5
$\Rightarrow$ % yield = $\frac{0.5 \times 100\%}{5}$
$= 10\%$

6. Simplify $\frac{1.6 \times 0.0084}{0.0048}$ and leave your answer in standard form.

A. 2.8×10^{-2}
B. 2.8×10^{-1}
C. 2.8×10^{0}
D. 2.8×10^{1}
E. 2.8×10^{2}

$\frac{1.6 \times 0.0084}{0.0048}$
$\frac{1.6 \times 84}{48} = 2.8$
$= 2.8 \times 10^0$

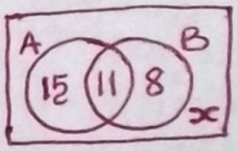
7. The cost of a motorbike is ₦110,000.00. If the value depreciates by 10% yearly, what will be its value at the beginning of the following year?

A. ₦11,000.00
B. ₦88,000.00
C. ₦99,000.00
D. ₦108,900.00
E. ₦121,000.00

10% of ₦110,000
$= \frac{10\% \times ₦110,000}{100\%}$
$= ₦11,000$
Cost of bike following year ₦110,000 − ₦11,000
$= ₦99,000$

8. A and B are sets such that n(A) = 26, n(B) = 19 and n(A∩B) = 11. Find n(A∪B).

A. 30
B. 34
C. 37
D. 45
E. 56



$\Rightarrow 15 + 11 + 8 = x$
$\Rightarrow x = 34$

9. If $2y^{\frac{1}{4}} - 5 = -1$, find the value of y.

A. $\frac{1}{16}$
B. $\frac{1}{8}$
C. $\frac{1}{2}$
D. 16
E. 81

$2y^{1/4} - 5 = -1$
$2y^{1/4} = -1 + 5$
$2y^{1/4} = 4$
$y^{1/4} = 2$

Multiplying both Powers by 4
$y^{1/4 \times 4} = 2^{1 \times 4}$
$y^{4/4} = 2^4$
$\Rightarrow y = 16$

10. Solve the equation $\left(2^{3x}\right)^{\frac{1}{2}} = \frac{1}{0.25}$.

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

$(2^{3x})^{1/2} = \frac{1}{0.25}$
$\left(2^{\frac{3x}{2}}\right) = 0.25^{-1}$
$\left(2^{\frac{3x}{2}}\right) = \left(\frac{2}{8}\right)^{-1}$
$2^{3x/2} = (2 \times 8^{-1})^{-1}$
$2^{3x/2} = [2 \times (2^3)^{-1}]^{-1}$
$2^{\frac{3x}{2}} = (2 \times 2^{-3})^{-1}$
$2^{3x/2} = 2^{-1} \times 2^3$
$2^{\frac{3x}{2}} = 2^2$
$\frac{3x}{2} = 2$; $3x = 4$
$x = 4/3$

11. How many years will ₦100,000.00 amount to ₦180,000.00 at 5% simple interest per annum?

A. 4
B. 16
C. 20
D. 36
E. 50

Simple Interest $I = \frac{PR}{100\%}$
$\Rightarrow I = \frac{100000 \times 5}{100} = ₦5000$
Amount = I + P
$\Rightarrow$ I = Amount − P (i.e total interest)
$\Rightarrow$ total interest I = ₦80,000
$\Rightarrow 80,000 / 5000 = 16$ years

12. If $B = \begin{pmatrix} 2 & 1 & 0 \\ 3 & 0 & -2 \\ 1 & -1 & 3 \end{pmatrix}$, determine the transpose of B.

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

Rows become Columns and Colums become Rows

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

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

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

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

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

13. If y is a whole number such that $3y + 4 \equiv 7 \mod 8$, find the value of y.

A. 1
B. 2
C. 3
D. 4
E. 5

$3y + 4 \equiv 7 \mod 8$
$\Rightarrow 3y = 7 - 4$
$y = 3/3$
$= 1$

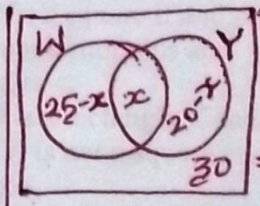
14. The 3rd and 7th terms of a Geometric Progression (G.P.) are 72 and $\frac{8}{9}$ respectively. Find the 1st term.

A. 720
B. 648
C. 576
D. 288
E. 216

3rd and 4th terms are
$ar^{3-1} = 72$ (i)
$ar^{7-1} = 8/9$ (ii)
from 3rd term
$ar^2 = 72$
$a = 72/r^2$
a into (ii)
$(72/r^2)r^6 = 8/9$
$72r^4 = 8/9$
$r^4 = 8/648$
$r = (1/81)^{1/4}$
$r = 1/3$
$\Rightarrow ar^2 = 72$
$a(1/3)^2 = 72$
$a \frac{1}{9} = 72$
$\Rightarrow a = 648$

15. In a class of 30 students, every student has at least a ruler. If 25 students have white rulers and 20 students yellow rulers, how many students have rulers of both colours?

A. 55
B. 50
C. 45
D. 15
E. 10



U = class
$25 - x + 20 - x + x = 30$
$\Rightarrow 45 - x = 30$
$\Rightarrow -x = 30 - 45$
$-x = -15$
$\Rightarrow x = 15$

16. Five numbers form a Geometric Progression (G.P.). If the 2nd and 5th numbers are 9 and 243 respectively, find the common ratio.

A. −9
B. −3
C. 2
D. 3
E. 5

from 2nd term
$ar^{2-1} = 9$
$ar = 9$
$a = 9/r$
a into 5th term
$ar^{5-1} = 243$
$ar^4 = 243$
$(9/r)r^4 = 243$
$9r^3 = 243$
$\Rightarrow r^3 = \frac{243}{9}$
$r^3 = 27$
$\Rightarrow r = \sqrt[3]{27}$
$\Rightarrow r = 3$

17. The first and last terms of an Arithmetic Progression (A.P.) are –2a and 38a respectively. Determine the number of terms if its common difference is 5a.

A. 7
B. 8
C. 9
D. 8a
E. 9a

$l = a + (n-1)d$
$38a = (-2a) + (n-1)5a$
$38a + 2a = (n-1)5a$
$40a = (n-1)5a$
$\Rightarrow (n-1) = \frac{40a}{5a}$
$\Rightarrow n - 1 = 8$
$n = 9$

18. On Clara's tenth birthday, she began to save ₦2,000 .00 every year in a kidsave account with an annual interest rate of 20% compounded annually. What will be the worth of the account when she turns 18?

A. ₦8,599.63
B. ₦20,799.00
C. ₦32,998.17
D. ₦41,597.80
E. ₦46,000.00

$A = P(1 + \frac{r}{100})^n$
$P = 2000, n = 8, r = 20\%$
$\Rightarrow A = 2000(1 + \frac{20}{100})^8$
$= 2000(1.2)^8$
$= 2000(4.2998)$
$= 8,599.63$

19. The cost (C) of a car service is partly constant and partly varies with the time (T) it takes to do the work. If it costs ₦500.00 for a 2-hour service and ₦300.00 for an hour service, find the cost of a 3-hour service.

A. ₦600.00
B. ₦650.00
C. ₦680.00
D. ₦700.00
E. ₦800.00

$C = a + Tb$
$500 = a + 2b$ (i)
$300 = a + b$ (ii)
(i) – (ii)
$200 = b$
200 for b in (ii)
$300 = a + 200$
$\Rightarrow a = 300 - 200$
$a = 100$
$\Rightarrow C = a + Tb$
$C = 100 + 3(200)$
$= 100 + 600$
$= 700$

$3r = ar^2$
$3 = ar$
$a = \frac{3}{r}$
$\frac{8}{9} = (\frac{3}{r})r^6$
$\frac{8}{9}$

20. Find the gradient of a line joining the points (–5, –6) and (5, –2).

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

Using the Two-point-form
$\frac{(y-y_1)}{(y_2-y_1)} = \frac{(x-x_1)}{(x_2-x_1)}$
$\frac{[y-(-6)]}{[(-2)-(-6)]} = \frac{[(x-(-5)]}{[5-(-5)]}$
$\frac{y+6}{4} = \frac{x+5}{10}$
$10y + 60 = 4x + 20$
$\Rightarrow y = \frac{4x-40}{10} = \frac{4x}{10} - \frac{40}{10}$
$\Rightarrow m = 4/10$

21. Given that e: ABCD is a rhombus.
f: ABCD is a rectangle.
h: ABCD is a square.
Which of the following statements represents $e \wedge f \Leftrightarrow h$?

A. ABCD is a rectangle if it is a square and rhombus.
B. ABCD is a square if and only if it is a rhombus and rectangle.
C. ABCD is a square if and only if it is not a rhombus and rectangle.
D. ABCD is a rectangle if and only if it is not a square and rectangle.
E. ABCD is a rhombus if it is not a rectangle and square.

22. Solve the simultaneous equations $2a+3b=5,\ 2a+b=1$.

A. $a=\frac{-1}{2},\ b=-2$

(B.) $a=\frac{-1}{2},\ b=2$

C. $a=\frac{1}{2},\ b=-2$

D. $a=-1,\ b=2$

E. $a=2,\ b=\frac{1}{2}$

(i) $2a+3b=5$
(ii) $2a+b=1$
(i)−(ii)
$2b=4$
$b=2$
2 for b in equ (ii)
$2a+3(2)=5$
$2a=5-6$
$a=-1/2$
$\Rightarrow a=-1/2,\ b=2$

23. Solve the equation $\frac{2x-1}{2}-\frac{3x-2}{3}=\frac{x}{2}$.

A. -3

B. $-\frac{7}{3}$

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

(D.) $\frac{1}{3}$

E. 3

$\frac{2x-1}{2}-\frac{3x-2}{3}=\frac{x}{2}$
$\frac{3(2x-1)-2(3x-2)=3x}{6}$
$\Rightarrow 6x-3-6x+4=3x$
$-3+4=3x$
$1=3x$
$\Rightarrow x=1/3$

24. Determine the equation whose product and sum of the roots are -4.5 and -3.2 respectively.

A. $10x^2-32x-45=0$

B. $10x^2+32x+45=0$

(C.) $10x^2+32x-45=0$

D. $10x^2+16x-9=0$

E. $10x^2-16x-9=0$

Let the roots be α β. Then
$\alpha\beta=-4.5$ (i)
$\alpha+\beta=-3.2$ (ii)
from (ii)
$\beta=-3.2-\alpha$
Substituting β in (i)
$\alpha(-3.2-\alpha)=-4.5$
$-\alpha(3.2+\alpha)=-4.5$
$-\alpha(4.2)=-4.5$
$\Rightarrow \alpha=4.5/4.2=1.07$
$\Rightarrow \beta=-3.2-1.07=-4.27$
$\Rightarrow \alpha=1.07,\ \beta=-4.27$
$\Rightarrow x=1.07$ or $x=-4.27$
$x-1.07=0$ or $x+4.27=0$
$(x-1.07)(x+4.27)=0$
$x^2+4.27x-1.07x-4.6=0$
$x^2+3.2x-4.6=0$
Multiplying through 10
$10x^2+32x-46=0$

25. If p: x is an even number.
q: x is a multiple of 3.
What does $\sim(p\wedge q)$ stand for?

A. x is an even number and a multiple of 3

B. x is an even number or a multiple of 3

C. x is not a multiple of 3 and is even

D. It is false that x is even and a multiple of 3

(E.) x is not an even number and not a multiple of 3

26. Solve the inequality $x<\frac{x}{3}+4$.

A. $x<12$

(B.) $x<6$

C. $x<4$

D. $x<3$

E. $x<-12$

$x<\frac{x}{3}+4$
$\frac{3x<x+12}{3}$
$3x<x+12$
$\Rightarrow 3x-x<12$
$2x<12$
$x<6$

27. Simplify $\frac{a^2-4a+3}{a^2-a-6}$.

(A.) $\frac{a-1}{a+2}$

B. $\frac{a+1}{a-2}$

C. $\frac{1-a}{a+2}$

D. $\frac{a-1}{a-2}$

E. $\frac{a+1}{a+2}$

$\frac{a^2-4a+3}{a^2-a-6}$
Both the numerator and denominator are quadratic expressions. So we factorize
$\frac{a^2-3a-a+3}{a^2-3a+2a-6}$
$\frac{a(a-3)-(a-3)}{a(a-3)+2(a-3)}$
$\frac{(a-1)(a-3)}{(a+2)(a-3)}$
$\Rightarrow \frac{a-1}{a+2}$

28. The roots of a quadratic equation are -2 and $\frac{1}{3}$. Find the equation.

$x = -2 ; x = \frac{1}{3}$
$x+2=0 ; 3x-1=0$
$(x+2)(3x-1)=0$
$3x^2-x+6x-2=0$
$3x^2+5x-2=0$

A. $3x^2+5x+2=0$
B. $3x^2-5x+3=0$
C. $3x^2-5x-2=0$
(D.) $3x^2+5x-2=0$
E. $3x^2-5x-3=0$

29. If $x \propto \frac{1}{y^2}$ and $x=4$ when $y=3$, find the value of x when $y=2$.

$x \propto 1/y^2 ; x = \frac{K}{y^2}$
$\Rightarrow 4 = K/3^2 ; 4 = K/9$
$\Rightarrow K = 36$
$\Rightarrow x = K/y^2 = 36/2^2$
$x = 36/4 = 9$

A. 18
(B.) 9
C. 4
D. 3
E. 1

30. Make b the subject of the formula $d = \sqrt{\frac{ab}{c} - c^2 b}$.

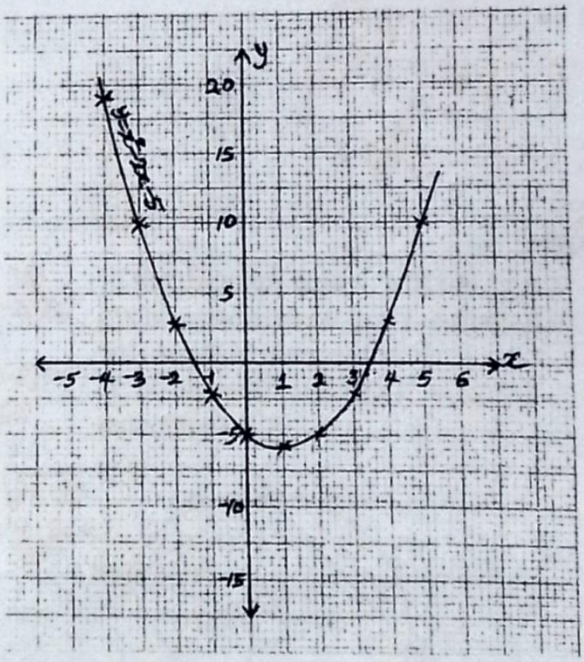
$d = \sqrt{\frac{ab}{c} - c^2 b}$
$d^2 = \left(\sqrt{\frac{ab}{c} - c^2 b}\right)^2$
$d^2 = \frac{ab}{c} - c^2 b$
$\frac{cd^2 = ab - c(c^2 b)}{c}$
$\Rightarrow cd^2 = ab - c^3 b$
$cd^2 = b(a - c^3)$
$\Rightarrow b = \frac{cd^2}{a-c^3}$

(A.) $b = \frac{cd^2}{a-c^3}$
B. $b = \frac{d^2}{a-c^2}$
C. $b = \frac{d^2}{c^2-a}$
D. $b = \frac{cd}{a-c^3}$
E. $b = \frac{a-c^3}{cd^2}$

31. If u: I like bread with butter.
v: I like lemon for tea.
Translate "I like lemon for tea, but not bread with butter" into symbol.

A. $u \wedge v$
B. $v \vee u$
(C.) $v \wedge \sim u$
D. $\sim u \vee v$
E. $u \vee \sim v$

Use the graph below to answer questions **32** and **33.**



32. Determine the solutions of the curve.

A. $x = -1.2$ *or* 3.2
B. $x = -1.3$ *or* 3.4
(C.) $x = -1.4$ *or* 3.5
D. $x = -1.5$ *or* 4.0
E. $x = -1.5$ *or* 5.0

33. Find the least value of y.

(A.) -5.2
B. -5.1
C. -4.5
D. -1.4
E. 3.5

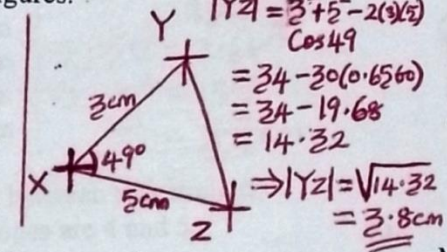
34. If $\cos\alpha = \frac{3}{5}$ and $0° < \alpha < 90°$, evaluate $3\cos\alpha - 2\sin\alpha$.

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

$\cos\alpha = \frac{3}{5}$
$\cos\alpha = 0.6$
$\alpha = \cos^{-1}0.6$
$\alpha = 53.1°$
$\Rightarrow 3(\cos\alpha)$
$3(\cos 53.1) = 1.8$
$2(\sin\alpha)$
$2(\sin 53.1)$
$2(0.7997) = 1.5994$
$\Rightarrow 3\cos\alpha - 2\sin\alpha$
$1.8 - 1.5994$
$= 0.2$
$= 1/5$

35. The bearing of Y and Z from X are 061° and 110° respectively. Calculate |YZ| if |YX| = 3 cm and |XZ| = 5 cm, correct your answer to 2 significant figures.

A. 3.7 cm
B. 3.8 cm
C. 4.0 cm
D. 4.1 cm
E. 5.0 cm



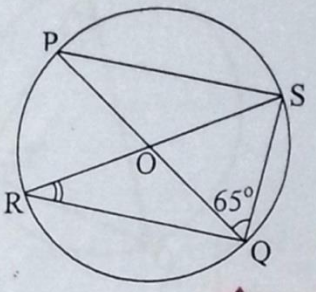
$|YZ|^2 = 3^2 + 5^2 - 2(3)(5)\cos 49$
$= 34 - 30(0.6560)$
$= 34 - 19.68$
$= 14.32$
$\Rightarrow |YZ| = \sqrt{14.32}$
$= 3.8$ cm

36. The curved surface area of a hemisphere is 7,700 cm^2. Find its diameter. (Take $\pi = \frac{22}{7}$)

A. 17.5 cm
B. 35.0 cm
C. 70.0 cm
D. 70.5 cm
E. 87.7 cm

The curved Surface Area of Hemisphere is $2\pi r^2$
$\Rightarrow 7,700 = 2\pi r^2$
$\Rightarrow 7,700 = 2 \times \frac{22}{7} \times r^2$
$7,700 = \frac{44r^2}{7}$
$\Rightarrow 53,900 = 44r^2$
$\Rightarrow r^2 = \frac{53,900}{44}$
$r^2 = 1,225$
$\Rightarrow r = 35$
diameter $= 2 \times r$
$= 2 \times 35$
$= 70$ cm

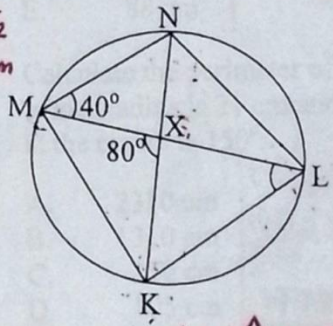
37. In the figure below, $\overline{PQ}$ is a diameter of the circle PSQR with centre O. If $P\hat{Q}S = 65°$, find $Q\hat{R}S$.



A. 115°
B. 90°
C. 65°
D. 40°
E. 25°

$P\hat{S}Q = 90°$ (∠ in semi circle)
$Q\hat{P}S = 180 - (90 + 65)$ (sum ∠)
$= 25°$
$\Rightarrow Q\hat{R}S = 25°$ (∠ in the same segments are equal)

38. In the diagram below, MKLN is a cyclic quadrilateral and the diagonals ML and KN intersect at X. If $N\hat{M}L = 40°$ and $M\hat{X}K = 80°$, calculate $M\hat{L}K$.



A. 100°
B. 80°
C. 60°
D. 40°
E. 20°

$M\hat{N}L = 90°$ (∠ in semi circle)
$N\hat{L}M = 180 - 90 - 40 = 50°$
$M\hat{K}N = 50°$ (∠ in same seg.)
$L\hat{M}K = 90 - 40$ (∠ in semicir.)
$= 50°$
$K\hat{N}L = 50°$ (∠ in same seg.)
$M\hat{N}K = 90° - 50° = 40°$
$\Rightarrow M\hat{L}K = 40°$ (∠ in same seg.)

39. Find the y-intercept of the line $4y + 3x - 2 = 0$.

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

The y-intercept is the value y when $x = 0$. The point where the straight line cuts the y-axis.
$\Rightarrow 4y + 3(0) - 2 = 0$
$4y = 2$
$y = 2/4$; $1/2$

40. The angle of a sector of a circle is 295°. If the area of the sector is $35.2\ cm^2$, calculate its radius to 2 decimal places.
(Take $\pi = \frac{22}{7}$)

A. 2.10 cm
B. 3.45 cm
(C.) 3.70 cm
D. 4.31 cm
E. 5.71 cm

Area of Sector $\frac{\theta}{360}\pi r^2$
$\Rightarrow 35.2 = \frac{295}{360} \times \frac{22}{7} \times r^2$
$352 = \frac{6490 r^2}{2520}$
$\Rightarrow 35.2 = 2.6r^2$
$\Rightarrow r^2 = 13.5$
$r = 3.7\ cm$

41. Find the angle between two straight lines whose slopes are 4 and 5, correct to 1 d.p.

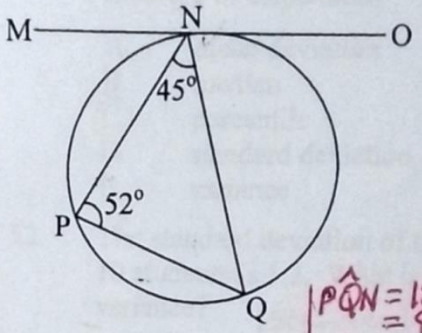
A. 2.5°
B. 2.6°
C. 2.7°
D. 2.8°
E. 2.9°

42. If the radius of a parallel of latitude is 4,500 km, find the latitude correct to the nearest degree.
(Take R = 6,400 km)

A. 45° East or West
B. 45° North or East
(C.) 45° North or South
D. 50° East or West
E. 50° North or South

Radius of parallel of latitude is
$r = R\cos\theta$
$\Rightarrow 4500 = 6400\cos\theta$
$\cos\theta = \frac{4500}{6400}$
$\cos\theta = 0.7031$
$\theta = \cos^{-1}(0.7031)$
$= 45^\circ$
North or South

43. In the diagram below $\overline{MNO}$ is a tangent to the circle. Calculate PN̂O.



A. 135°
B. 128°
(C.) 97°
D. 83°
E. 77°

$P\hat{Q}N = 180 - (52 + 45)$
$= 83^\circ$
$P\hat{N}M = 83^\circ$ (exterior $\angle$ of Δ)
$\Rightarrow Q\hat{N}O = 180 - (83 + 43)$
$= 52$
$\Rightarrow P\hat{N}O = 52 + 45$
$= 97^\circ$

44. A sphere has a radius of 7 cm. Find its surface area.

(A.) $616\ cm^2$
B. $206\ cm^2$
C. $205\ cm^2$
D. $154\ cm^2$
E. $88\ cm^2$

Surface Area $= 4\pi r^2$
$4 \times \frac{22}{7} \times 7^2$
$4 \times 3.14 \times 49$
$= 616\ cm^2$

45. Calculate the perimeter of a sector whose radius is 21 cm and its angle at the centre is 150°.

A. 2310 cm
B. 1310 cm
C. 210 cm
D. 105 cm
(E.) 97 cm

$l = \frac{\theta}{360} 2\pi r$
$\frac{150}{360} \times 2\pi 21$
$\frac{19782}{360} = 55$

Perimeter $= l + 2r$
$\Rightarrow Per. = l + 2r$
$= 55 + (2 \times 21)$
$= 55 + 42$
$= 97\ cm$

46. Find the equation of a line that passes through the point (1, 2) whose gradient is $\frac{1}{3}$.

A. $3y + x = 7$
B. $3y - x = -5$
C. $3y - x = 7$
(D.) $3y - x = 5$
E. $y - 3x = 7$

From gradient-one-point form
$(y - y_1) = m(x - x_1)$
$(y - 2) = \frac{1}{2}(x - 1)$
$y - 2 = \frac{x}{3} - \frac{1}{3}$
$\frac{3(y-2) = x - 1}{3}$
$\Rightarrow 3y - 6 = x - 1$
$3y - x = -1 + 6$
$3y - x = 5$

47. Calculate the area of a circle of radius 3.69 cm, leaving your answer in 2 significant figures.

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

Area of circle πr^2

$\frac{22}{7} \times 3.69^2$

$= 42.8$

$\approx 43 cm^2$

A. 11 cm²
B. 12 cm²
C. 23 cm²
D. 42 cm²
(E.) 43 cm²

48. Calculate the circumference of the parallel of latitude 60°S correct to 3 significant figures.

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

A. 20,000 km
(B.) 20,100 km
C. 20,110 km
D. 20,114 km
E. 40,200 km

Length of the circumference of the parallel of latitude is $2\pi r$ where $r = R\cos\theta$

$\Rightarrow r = 6400 \times \cos 60 = 3200$

$\Rightarrow 2\pi 3200 \approx 20,100$

49. Find the mean score of ten students if the variance of their scores is 8 and $\sum x^2 = 2040$.

A. 2.82
B. 11.83
C. 14.00
D. 45.14
E. 64.00

50. The mean of five numbers is 6. If the numbers are 1, 6, x, 8, 7, what is the mode?

Mean $\bar{x} = 6 = \frac{1+6+x+8+7}{5}$

$6 = \frac{x+22}{5}$

$\Rightarrow 30 = x + 22$

$x = 8$

$\Rightarrow$ mode $= 8$

A. 1
B. 5
C. 6
D. 7
(E.) 8

51. Which of the following is **not** a measure of dispersion?

A. mean deviation
B. median
(C.) percentile
D. standard deviation
E. variance

52. The standard deviation of the ages of 10 students is 1.2. What is the variance?

Standard deviation $= \sqrt{\text{variance}}$

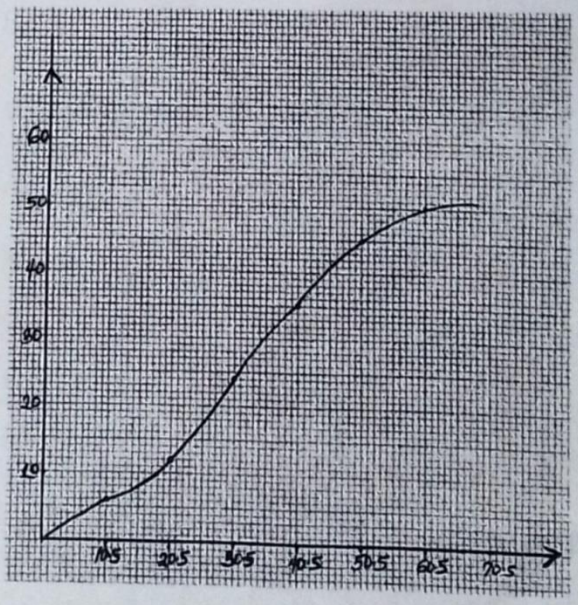
$\Rightarrow 1.2 = \sqrt{\text{variance}}$

$\Rightarrow 1.2^2 = (\sqrt{\text{variance}})^2$

$\Rightarrow 1.44 = \text{variance}$

A. 3.46
B. 3.16
C. 2.80
D. 1.86
(E.) 1.44

Use the cumulative frequency curve below to answer questions **53** to **55.**



53. Find the median value.

A. 50.0
B. 34.5
(C.) 30.5
D. 25.0
E. 10.0

The media value is the value on the horizontal axis (the upper class boundaries) that corresponds to half the total frequency. It is 30.5. Note that the total frequency is 50 and not 60. And half of it is 25.

54. Calculate the 6th decile.

A. 50.0
B. 40.0
C. 45.5
D. 36.0
E. 20.0

6th decile $= \left(\frac{6}{10}\right)\Sigma f$

$\left(\frac{6}{10}\right)50$; $0.6 \times 50 = 30$

Thus from the ogive, 30 corresponds to 36 on the horizontal axis

55. Determine the 80th percentile.

A. 60.5
B. 55.5
C. 45.5
D. 40.5
E. 35.5

80th Percentile $(0.8)50 = 40$

$\left(\frac{80}{100}\right)\Sigma f$

$\left(\frac{80}{100}\right)50$

from the ogive 40 is 45.5 on the horizontal axis.

Use the information below to answer questions **56** and **57.**

The table below shows the age distribution of students in a school choir.

Age	12	13	14	15	16	17
Frequency	2	1	3	6	5	3

56. How many students are in the school choir?

A. 10
B. 15
C. 20
D. 25
E. 30

$2+1+3+6+5+3 = 20$

57. What is the modal age?

A. 6
B. 8
C. 10
D. 15
E. 17

15

58. Differentiate $3x^2 - 7x - 4$ with respect to x.

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

$3x^2 - 7x - 4$

Let $y = 3x^2 - 7x - 4$

$\frac{dy}{dx} = (3\times2)x^{(2-1)} - 7x^{(1-1)} - 0$

$= 6x - 7x^0$

$= 6x - 7$

59. If $y = x(x^3 - x + 1)$, evaluate $\int_{-1}^{1} y\,dx$.

A. $-\frac{4}{15}$
B. 0
C. $\frac{11}{15}$
D. 1
E. 3

$y = x(x^3 - x + 1)$

$y\,dx = x^{(1-1)}(3x^{(3-1)} - x^{(1-1)} + 0)$

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

$= 3x^2 - 1$

$\Rightarrow \int_{-1}^{1} y\,dx = \frac{3x^{(2+1)}}{3} - 1x^{(0+1)}$

$= x^3 - x$

$\Rightarrow \int_{-1}^{1}(x^3 - x) = (1^3 - 1) - 0; (-1^3 + 1) = 0$

60. What is the value of $\int_0^1 (1-2x)^2\,dx$?

A. $-\frac{1}{8}$
B. $-\frac{1}{4}$
C. 0
D. $\frac{1}{3}$
E. 4

$\int_0^1 (1-2x)^2 dx$

Let $u = 1 - 2x$

$m = u^2$

$\Rightarrow \int m = \frac{u^{2+1}}{3} = \frac{u^3}{3}$

$\Rightarrow \int_0^1 \frac{[1-2(0)]^3}{3} = \frac{(1)^3}{3} = \frac{1}{3}$

$\int_0^1 \frac{[1-2(1)]^3}{3} = \frac{(-1)^3}{3} = -\frac{1}{3}$