INST:
i. Answer Question 1 and any other 3 (Three) Questions ii. Show all the working
iii. Start every question on a new page

## Question 1. (25 marks)

(a)Use the properties of exponential to Simplify the following expressions
(i) $x^{2} \cdot x^{-6}$
(ii) $\frac{4^{6}}{4^{2}} \times 4^{3}$
(iii) $\left(2^{2} \cdot x^{0}\right)$
(iv) $\left[\left(x^{2} y^{-3}\right)\left(x y^{3}\right)\right]^{0}$
(v) $\left(\frac{6^{4}}{4^{-2}}\right) \cdot\left(\frac{4^{6}}{6^{-3}}\right)$
(b) Solve forxin the following expressions
i. $3^{2 x}=3^{4}$
ii. $\quad 2^{x+1}=2^{-4}$
iii. $\quad 4^{x+1}=64$
(c) solve for $x$ in the following equations;
(i) $5 x-2+x=9+3 x+10$
(ii) $\sqrt{\left(\frac{4 x^{2}-1}{2 x+1}\right)}=4$
(iii) $3 x^{2}-9 x-30=0$
(iv) $x^{2}=11 x-24$
(v) $|3 x+5|=10$
(d) Given $\log _{10} 2=0.3010$ and $\log _{10} 3=0.4771$. Evaluate the following loga rithms in base 10;
i) $\log _{10} 6 \div \log _{10} 3$
ii) $\log _{10} 18$
iii) $\log _{10} 3^{5}$
iv) $\log _{3} 2$
(e) Solve the following loganthmic equations

$$
\begin{aligned}
& \text { i. } \quad \log _{2}(x+2)+\log _{2} 5=3 \\
& \text { ii. } \quad \log _{3}(x+3)-\log _{3}(x-1)=1
\end{aligned}
$$

(f) Use the properties of logarithms to simplify the following;
(i) $\log _{3} 27+\log _{3} 9-\log _{3} 81$
(ii) $\log _{2} 8-\log _{2} 16$
(iii) $\log _{4}(64)^{\frac{1}{3}}$

## Question 2. (15)

(a) The sum of two numbers is 20 . If 4 is added to the larger number, the result is 3 times the sma ller number. Find the numbers.
(b) The perimeter of the rectangle shown below is 24 cm . what is the value of $x$ ?

(c) Use a calculator to evaluate the following;
i) ${ }^{8} C_{6}$
ii) ${ }^{6} P_{6}$
iii) $\frac{{ }^{5} P_{3}}{{ }^{8} C_{5}}$
(d) How many possible distinguishable permutations are there in the letters of the words;
i) INTERM EDIATE
ii) CHAPTER
iii) STATEMENTS
(e) Using Binomial Theorem, write the $5^{\text {th }}$ and the $10^{\text {th }}$ terms in the following expansion;

$$
(x-2)^{12}
$$

## Question 3. (15 marks)

(a) find the equation of a line that passesthrough the following pair of points ( 4,1 ) and ( $2,-3$ )
(b) find the equation of a line that has the following properties;
i) passesthro' $(2,7)$ and is pemendicular to the line $y=x+1$
ii) passes thro' $(2,7)$ and is parallel to the line $y=4 x+7$
(c) Given $f(x)=x^{2}-1$ and $g(x)=x-1$.

Find (i) $(\mathrm{f}+\mathrm{g})(\mathrm{x})$ (ii) $(\mathrm{f}-\mathrm{g})(2) \quad$ (iii) $(\mathrm{f} . \mathrm{g})(\mathrm{x}) \quad$ (iv) $(\mathrm{f} / \mathrm{g})(\mathrm{x})$

$$
\text { (v) } f \circ g(x)
$$

(d) Given $f(x)=3 x+5$, find the inverse, $\mathrm{f}^{-1}(\mathrm{x})$.
(e) If the equation of a line is given as; $y=2 x-3$. What is the slope and the $y$-intercept of this line? Sketch this line.
(f) Write the equation of a line that passes through the following points; ( 2,0 ) and (-5,2)
(g) Write the equation of a line that has the following properties; Passes thro' $(2,6)$ and is perpendicular to the line described by the equation $\mathrm{y}=3-2 \mathrm{x}$

## Question 4. (15 marks)

(a) Using the binomial expansion formula a pproximate the following;
i. $(2.02)^{9}$ use only the first four tems
ii. $(x+2)^{12}$ write the $8^{\text {th }}$ and $13^{\text {th }}$ terms in the expansion
(b) solve the following absolute/ inequality functions;
i. $|3 x+4|>10$
ii. $4-3 x>10$
(c) The sum of three consecutive odd numbers is 45 . Find the numbers.
(d) One leg of a right triangle is 6 cm longer than the other leg. The length of the hypotenuse of the triangle is 24 cm . Find the lengths of the two legs.
(e) How many distinguishable permutationscan be formed using the letters in the word COMMISSION ?

## Question 5. (15 marks)

(a) Perform the indicated operations if possible.
i. $\left[\begin{array}{cc}-1 & 4 \\ 2 & -6\end{array}\right]-\left[\begin{array}{cc}1 & -2 \\ 0 & 5\end{array}\right]$
ii. $\left[\begin{array}{ccc}4 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 0 & 4\end{array}\right]+\left[\begin{array}{ccc}-2 & 1 & 3 \\ 5 & 6 & -8 \\ 3 & 0 & 7\end{array}\right]$
iii. $\left[\begin{array}{cc}-1 & 4 \\ 2 & -6\end{array}\right] \times\left[\begin{array}{cc}1 & -2 \\ 0 & 5\end{array}\right]$
iv. $\left[\begin{array}{cc}-3 & 5 \\ 2 & 0 \\ 1 & 4\end{array}\right] \times\left[\begin{array}{ccc}-2 & 1 & 3 \\ 5 & 6 & -8\end{array}\right]$
(b) Find the deteminants of the following matric es if they exist;

$$
\text { i. }\left[\begin{array}{cc}
11 & 4 \\
-3 & 0
\end{array}\right] \quad \text { ii. }\left[\begin{array}{ccc}
0 & 2 & 1 \\
3 & -1 & 2 \\
4 & 0 & 1
\end{array}\right]
$$

(c) using the matrix method (Cramer's Rule), solve the following system of linear equations;

$$
\begin{aligned}
& 2 x-3 y=-10 \\
& 3 x+2 y=11
\end{aligned}
$$

(d) Using the matrix method, find the following:
i. The equation of a line that passes thro' the points; $(-1,3)$ and $(3,6)$.
ii. Area of a triangle whose vertic es have the following co-ordinates $(-1,0)(3,8)$ and ( $6,-1$ ).
iii. Check whether these points a re collinear; $(0,2),(3,4)$ and (6,1).

