m<uq jk jdr mÍCIKh - 2023
First Term Examination - 2023

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GRADE 12

ixhqla; .Ks;h
COMBINED MATHEMATICS

02 meh
Two Hour

- **Answer four questions only.**

01. a). Express as a rational number $\mathbf{0.1\dot{7} + 0.\dot{1}\dot{2}}$

b). Solve the equation,

$$x - \sqrt{x+1} = 5$$

c). Solve the simultaneous equations.

$$x + y = 7$$
$$xy = 6$$

d). Solve the equation,

$$5^x - 24 = \frac{25}{5^x}$$

02. a). Find the domain and range of the following functions.

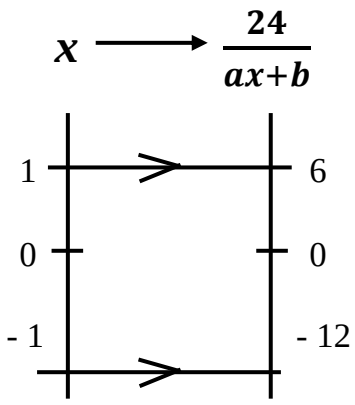
i. $f(x) = -2x^2$

ii. $f(x) = \frac{2}{x-2}$

iii. $f(x) = \sqrt{4-x}$

b). The arrow diagram shows,

part of the mapping $\mathbf{f : x \rightarrow \frac{24}{ax+b}}$, $\mathbf{x \neq -\frac{b}{a}}$



Find, i. The values of a and b
ii. The element that has an image of **8** under **f**.
iii. The two values of x for which $f(x) = x$

c). The functions $\mathbf{f : x \rightarrow x - 5}$ and $\mathbf{g : x \rightarrow \frac{1}{x-1}}$, $\mathbf{x \neq 1}$

i. $\boldsymbol{fg\ (x)}$ ii. $\boldsymbol{g^{-1}\ o\ f^{-1}\ (x)}$ iii. $\mathbf{gg\ (x)}$

03. a). State the remainder theorem and prove it.

If $\boldsymbol{f\ (x)}$ is a polynominals of degree two when $\boldsymbol{f\ (x)}$ is divided by $\mathbf{(x - 1)}$, $\boldsymbol{x}$ and $\mathbf{(x + 1)}$ the remainders are **O**, **1** and **5** respectively. Find $\boldsymbol{f\ (x)}$.

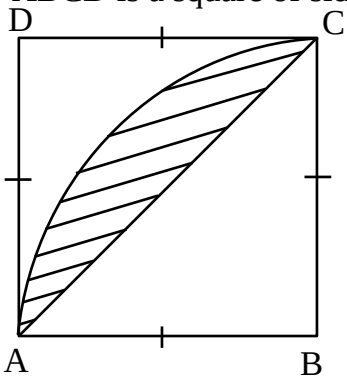
b). Solve the equation,

$$\mathbf{\log_x 2 - \log_4 x + \frac{7}{6} = 0}$$

c). Express in partial fractions.

$$\frac{x^2}{(x^2+1)\,(x-1)}$$

04. a). ABCD is a square of side 14 cm. Find



i. The length of the shaded region.
ii. The are of the shaded region.

b). Prove that $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} = \frac{2\sec\theta}{\tan\theta}$

c). If $\sin\theta = -\frac{8}{17}$ and $3\frac{\pi}{2} < \theta < 2\pi$ then find value of $\sin 2\theta$

d). Show that $\sin 50^o - \sin 70^o + \cos 80^o = 0$

05. a). The position vectors of three points **A, B** and **C** relative to the origin **O** are $\underline{p}$, $3\underline{q} - \underline{p}$ and $9\underline{q} - 5\underline{p}$ respectively. Show that **A, B** and **C** lie on the same straight line and state the ratio of **AB : BC**

b). The position vectors of the points **A, B** and **C** relative to origin **O** are $\underline{a} = 4\underline{i} - 3\underline{j}$, $\underline{b} = 2\underline{i} + 4\underline{j}$ and $\underline{C} = 22\underline{i} - 11\underline{j}$ respectively.

Find,

i. $\overrightarrow{AB}$ and $\overrightarrow{BC}$
ii. The angle $\mathbf{A\hat{B}C}$
iii. The value of the constant λ and μ for which $\lambda\underline{a} + \mu\underline{b} = \underline{C}$