BINDURA UNIVERSITY OF SCIENCE EDUCATION MT015

MATHEMATICS BRIDGING COURSE

Time: 2 **Hours** 15 **minutes**

Candidates should attempt **FOUR** questions. Marks will be allocated as indicated.

Each question should start on a fresh page.

QUESTION 1 [20 MARKS]

(a) Solve the following equations

(i) $\frac{1}{(3a-1)} = \frac{2}{a-1} - \frac{3}{8}$ [5]

(ii) $4y^2 + 5y - 21 = 0$ [5]

(iii) $x^2 - 8x = -3$ [5]

(b) Solve the simultaneous equation

$8a - 3b = 46$

$2a - 6b = 22$ [5]

QUESTION 2 [20 MARKS]

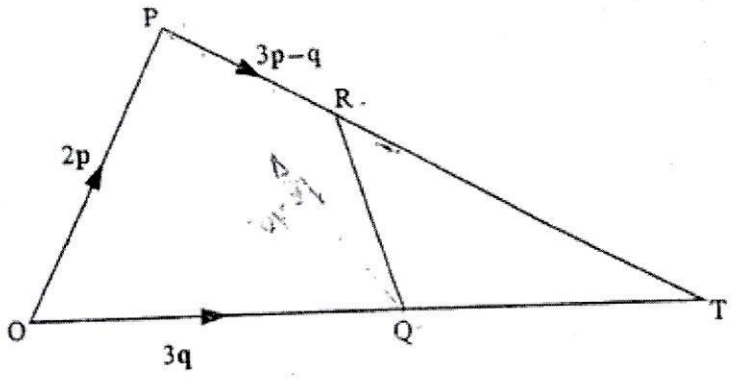
(a) Given that $\boldsymbol{M} = \begin{pmatrix} 4 & -9 \\ -2 & 5 \end{pmatrix}$, $\boldsymbol{N} = \begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}$ and $\boldsymbol{L} = \begin{pmatrix} 2d & 4 \\ 1 & 3 \end{pmatrix}$. Find;

(i) $\boldsymbol{M} + 2\boldsymbol{N}$

(ii) $\boldsymbol{MN}$

(iii) The value of $\boldsymbol{d}$ **which makes matrix** $\boldsymbol{L}$ singular. [6]

(b)



In the diagram, PRT and OQT are straight lines. $\overrightarrow{OP} = 2\boldsymbol{p}$, $\overrightarrow{OQ} = 3\boldsymbol{q}$, and $\overrightarrow{PR} = 3\boldsymbol{p} - \boldsymbol{q}$.

(i) Express $\overrightarrow{RQ}$ as simply as possible in terms of **p** and/or **q**. [2]

(ii) Given that $PT = mPR$, Express $\overrightarrow{PT}$ in terms of $\boldsymbol{p}, \boldsymbol{q}$ and m. [2]

(iii) Given also that $OT = nOQ$ form an equation connecting $\boldsymbol{p}, \boldsymbol{q}, m$ and n. Hence find the value of m and the value of n. [4]

(c) $\begin{pmatrix} 4x & x-5 \\ 1-3x & x \end{pmatrix}$ is the inverse matrix of $\begin{pmatrix} x & 5-x \\ 3x-1 & 4x \end{pmatrix}$. Find two values of x for which this is true. [6]

QUESTION 3 [20 MARKS]

(a). Write as a single fraction in its lowest terms: $\frac{2x+3}{x+4} - \frac{5}{3x-2}$. [4]

(b) Factorize $5ay - 2bx - 7by + 5ax$. [3]

(c). Write the ratio $75g : 3kg$ in its simplest form. [3]

(d) The length of a rectangle is increased by 10% and the width of the same rectangle is decreased by 10%. Find the area of the new rectangle as a percentage of the original rectangle. [5]

(e)

x	4	9	d
y	3	c	0.6

y is inversely proportional to the square root of x. Find the value of c and the value of d. [5]

QUESTION 4 [20 MARKS]

(a) If $\cos X = -\frac{12}{13}$ find $\sin X$ [3]

(b) In the triangle ABC, find C given that AB= 5cm, BC= 3cm and A= 35^0. [4]

(c) Given that CD = 5 and BC =12 in the triangle BCD below in Fig 1.

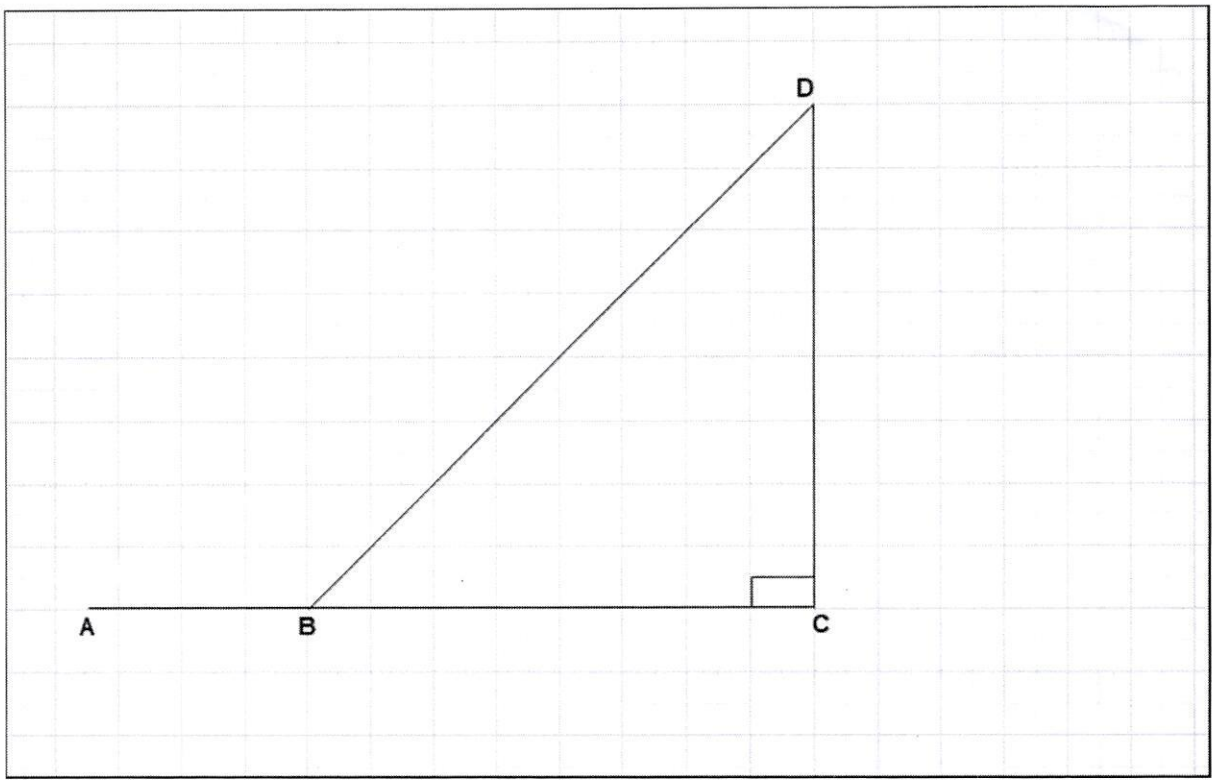


Fig 1 .

Find sin ABD, cos ABD and tan ABD. [5]

(d) In $\Delta XYZ, XY = 14cm,\ \angle Y = 121^0$ and $YZ = 26.9\ cm$. Find XZ. [4]

(e) In $\Delta ABC, a = 9cm,\ b = 16cm$ and $c = 11\ cm$. Find, to the nearest degree, the largest angle in the triangle. [4]

QUESTION 5 [20 MARKS]

QUESTION 6 [20 MARKS]

(a) In a group of five boys, three play soccer and two play hockey.

(i) One boy is chosen at random, calculate the probability that he is a soccer player. [3]

(ii) Two boys are chosen at random, calculate the probability that one plays soccer and the other plays hockey. [5]

(b) Answer the whole of this question on a sheet of graph paper.

A farmer had 100 pigs. He weighed them and their masses were recorded and summarised as shown in the table below 1

Mass (kg)	$40< m \leq 60$	$60< m \leq 70$	$70< m \leq 80$	$80< m \leq 90$	$90< m \leq 100$	$40< m \leq 140$
Number of pigs	12	14	18	22	14	20

(i) Calculate the values of p and q in the table below [2]

Mass (kg)	$m\leq 40$	$m\leq 60$	$m\leq 70$	$m\leq 80$	$m\leq 90$	$m\leq 100$	$m\leq 140$
Number of pigs	0	12	26	p	66	q	100

(ii) Using a horizontal scale of 2cm to represent 20 kg and a vertical scale of 2cm to represent 20 pigs, draw a smooth cumulative frequency curve to illustrate this information. [5]

(iii)Showing your method clearly on the graph, use the graph to estimate

(a) Median mass

(b) The number of pigs whose masses were more than 65 kgs but less than 120 kg. [3]

(iv) The data in table 1 may also be expressed in the form given below

Mass (kg)	$40< m \leq 60$	$60< m \leq 80$	$80< m \leq 100$	$100 < m \leq 140$
Number of pigs	12	32	36	20

When a histogram is drawn to illustrate this information, the height of the column represent pigs with mass m in the interval $40 < m \leq 60$ is 2,4. Without drawing the histogram, calculate the height of the column that represent values of m in the ranges

(a) $60 < m \leq 80$

(b) $100 < m \leq 140$ [2]

END OF EXAMINATION