Index No: | 0 | 1 | 0 | 1 | 2 | | | | | |

Alternative No:

Supervising Examiner's/ Invigilator's initial:

Mathematics

Writing Time: 3 hours
Total Marks : 100

READ THE FOLLOWING DIRECTIONS CAREFULLY:

1. **Do not** write for the first **fifteen minutes.** This time is to be spent on reading the questions. After having read over the questions, you will be given **Three hours** to answer all questions.

2. Write your **index number** in the space provided on the **top right hand corner of this cover page only.**

3. In this paper, there are **three sections:** Section A, Section B and Section C. You are expected to answer **ALL** the questions in Section A and Section B. Under Section C, there are 8 questions (question numbers 14 -21). Each question has two parts, I and II. Attempt either I or II from each question. The intended marks for a question or its parts are stated in the brackets.

4. Read the directions to each question carefully and write **all** your answers in the space provided in the **question booklet** itself.

5. Remember to write **quickly** but **neatly.**

6. You are not allowed to remove any page from this booklet.

7. **Do not** leave the examination hall before you have made sure that you have answered all the required number of questions.

8. The use of calculator (fx-82/fx-100) is allowed without memory.

For Chief Marker's and Markers' Use Only

Section	**A**	**B**												**C**							
Question	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Award																					
Marker's initial																					

SECTION A

Answer all questions.

Question 1 **[2 x 10 = 2**

(i) Which of the following pairs of matrices can be multiplied?

A 3×3 and 3×2
B 2×1 and 2×1
C 3×1 and 2×3
D 2×4 and 2×3

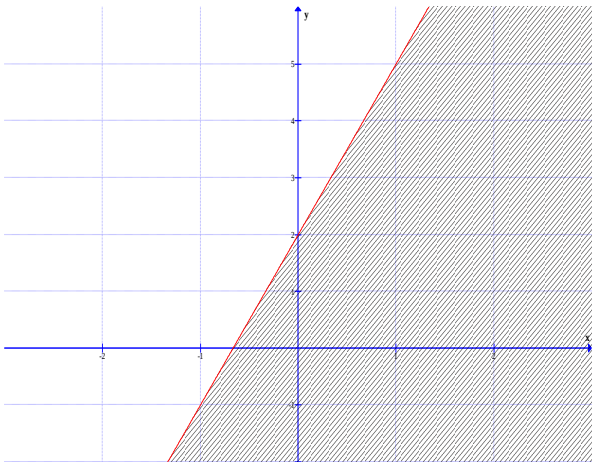
Answer…….

(ii) The amount received in an investment of Nu. 6000 for two years at an interest rate of 5% p.a. compounded semi-annually is:

A Nu. 6500
B Nu. 6262
C Nu. 6288
D Nu. 6623

Answer…….

(iii) What is the slope of the given graph?



A $\frac{1}{3}$

B 4

C 3

D $\frac{1}{4}$

Answer…….

(iv) Dorji wants to paint a rectangular prism box having a volume of 8000 cm^3. What is the surface area of the box that could minimize the cost?

A 537 cm^2
B 1600 cm^2
C 2400 cm^2
D 3200 cm^2

Answer…….

(v) Which of the following is **NOT** a quadratic function?

A $f(x) = 2x^2 - x$
B $f(x) = (x-2)^2 - x^2$
C $f(x) = 3(x+5)(x-2)$
D $f(x) = (x+3)^2 - 3$

Answer…….

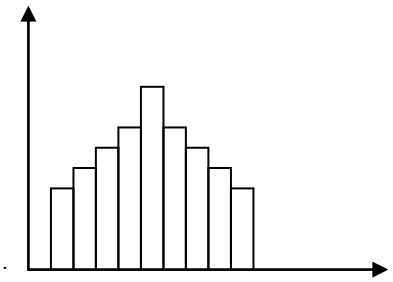
(vi) What are the coordinates of the vertex for the graph of the function $f(x) = 3(x-2)^2 - 30$?

A (2, 30)
B (-2, -30)
C (-2, 30)
D (2, -30)

Answer…….

(vii) The type of distribution described by the histogram displayed below is a

A positively skewed distribution.
B uniform skewed distribution.
C U-shaped distribution.
D normal distribution.



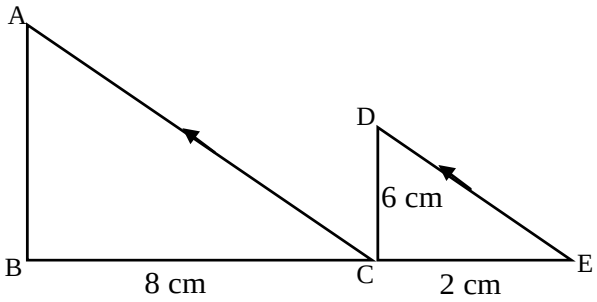
Answer…….

(viii) If the right triangle $\cos ec\, x = \sqrt{2}$, what is the value of x?

A 30^0
B 45^0
C 60^0
D 90^0

Answer…….

(ix) The length of side AB in the given diagram is



A 1.5 cm
B 24 cm
C 2.7 cm
D 12 cm

Answer…….

(x) The number of planes of symmetry in a regular hexagon based prism is:

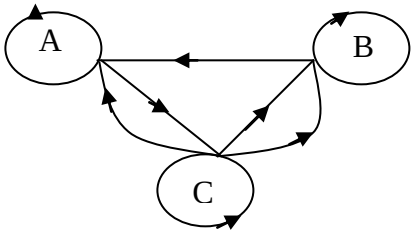
A 0
B 5
C 6
D 7

Answer…….

SECTION B (32 marks)
Answer all questions.

Question 2.

a) Draw a simplified digraph for the digraph given below.
[3]



b) Create an adjacency matrix for the above digraph.

c) What is the dimension of the adjacency matrix?

Question 3.

Karma wants to pay off a loan of Nu 20,000. Which is the better option for him to pay off the loan?

Option A: Pay off the loan at the end of one year at an interest rate of 14% p.a compounded monthly.
Option B: Pay off Nu 23,000 at the end of one year. **[2]**

Question 4.

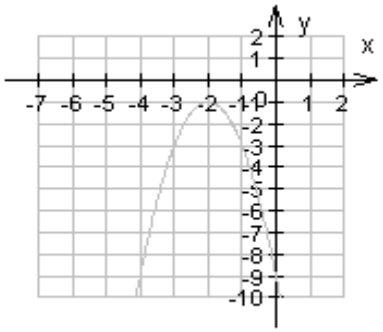
Simplify: $\left(\sqrt{2a}+\sqrt{3b}\right)\left(\sqrt{2a}-\sqrt{3b}\right)$ **[2]**

Question 5.

Factorize $3x^2+2x-5$ **[2]**

Question 6.

Determine the equation of the parabola given below. **[2]**



Question 7.

Sketch a scatter plot with each of the following correlation coefficient. **[3]**

a) Close to - 1
b) Close to 0.5
c) Close to 0

Question 8.

A bag contains four white balls and five black balls. You pick one ball and then pick another one. What is the probability of picking **[3]**

a) a second white ball if the first picked is white and you replace it before picking the second one?

b) a second white ball if the first ball picked is white and you don't replace it?

c) a white ball on the second pick if the first ball picked is black and you replace it?

Question 9.

Rinzin walked 4 km at a bearing of 90^0. She turned and walked 5 km again at a bearing of 180^0. **[3]**

a) Draw a single vector to describe the trip.

b) What is its bearing and distance?

Question 10.

Draw Δ PQR with PQ = 6 cm, QR = 4 cm and PR = 5 cm. Determine its area. **[3]**

Question 11.

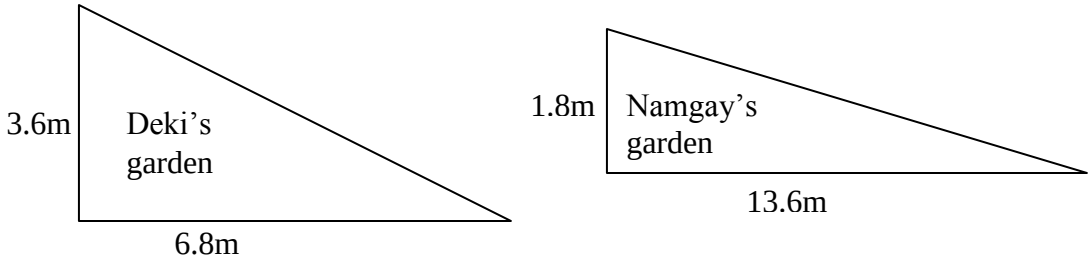
The length of a table is 3 cm longer than its width. Area of the table is 54 cm^2.
Calculate the dimensions of the table? **[2]**

Question 12.

Find the point of intersection for the pairs of straight lines given below
$\frac{1}{2}x + \frac{1}{5}y = 1$ and $\frac{3}{2}x - \frac{1}{2}y = \frac{1}{4}$ **[3]**

Question 13.

Deki and Namgay have made a flower garden each as shown below **[3]**



a) Whose garden will use the minimum fencing material? Why?

b) Check and show your work.

SECTION C [48 marks]

Under this section, there are 8 questions question numbers 14 – 21). Each question has two parts, I and II. Attempt either I or II from each question.

Question 14. (I)

a) Sonam factored every multiple of 4 from 4 to 28 into prime factors. He used a squared matrix to show how many times each prime factor 2, 3, 5 and 7 appeared in each number. **[4]**

i) Create Sonam's matrix

ii) Which is the element at (3, 4)?

iii) What type of matrix is this?

b) Find the unknown values.

$$\begin{bmatrix} x & -3 \\ 4 & 1 \end{bmatrix} \times \begin{bmatrix} 2 & 5 \\ 0 & y \end{bmatrix} = \begin{bmatrix} 4 & -8 \\ 8 & 26 \end{bmatrix}$$

OR

Question 14. (II)

a) Create a simplified digraph for the adjacency matrix given below. **[2]**

	A	B	C	D
A	0	1	1	0
B	0	0	1	1
C	1	1	0	1
D	0	1	1	0

b) Square the adjacency matrix to find the number of one stopover.

c) How many two stopovers are there from vertex A to D? What are they? **[2]**

Question 15. (I)

a) Your father is purchasing a compound bow for Nu 60,000 and he is offered two payment options.

Option A: Pay Nu 4000 at the end of each month for 18 months. No down payment is required.

Option B: Pay 40% as down payment and then pay Nu 15,000 every six months until the full amount is paid. The interest charged on any outstanding balance after each payment is 20% p.a compounded semi annually.

Which option would you recommend to your father? Why? Show your work. **[4]**

b) What will be the annual interest rate compounded annually for investing Nu 2500 that can generate Nu 2903.91 in four years.

OR

Question 15. (II)

a) Mr. Sonam bought 200 PCAL shares with face value of Nu 100 from his friend at a premium of 30%. The Company declared a dividend of 25% at the end of a year. **[4]**

i) Find the cost of each share for Sonam.

ii) How much has Sonam invested?

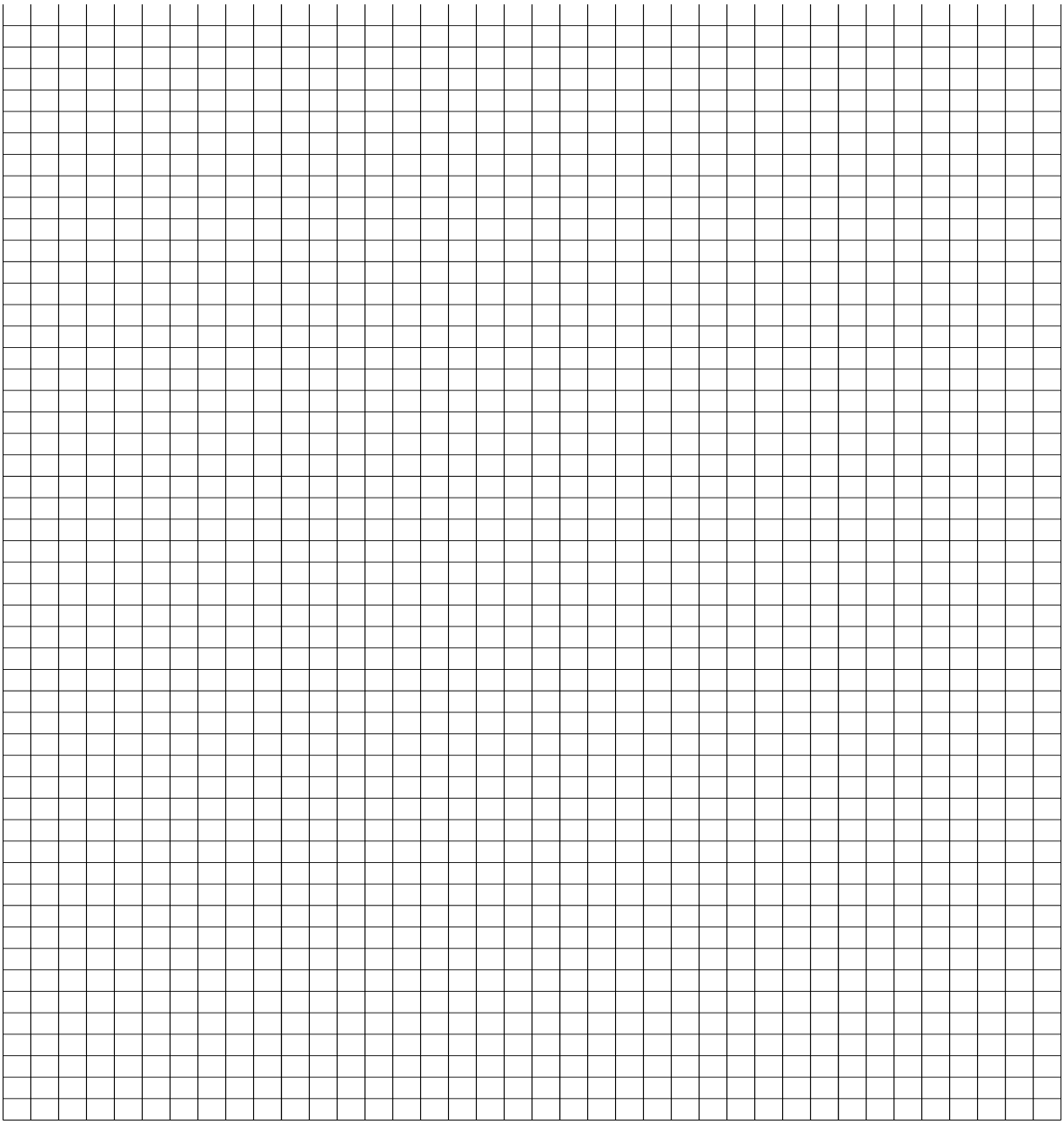
iii) How much dividend will he receive?

iv) Find his income percent.

b) Draw a picture to show $\sqrt{8} = 2\sqrt{2}$. **[2]**

Question 16. (I)

a) Sketch the graph of the inequality $y \geq 4x - 5$. **[3]**



b) A group of students participated in a quiz competition and answered 50 questio

- They got 10 points for the correct answer.
- They lost 5 points for the incorrect answer.
- Their total score at the end of the competition was 275 points. **[3]**

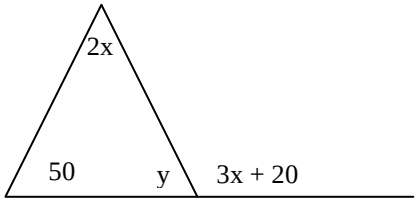
i) Write the system of equations to model the above situation.

ii) How many questions did they answer correctly?

iii) How many questions did they answer incorrectly?

Question 16. (II)

a) Determine the unknown values from the given diagram. **[3]**



b) Jigme drives at an average speed of 30 km/hr for 'p' hours and at an average speed of 20 km/hr for the remaining 'q' hours. He travels a total of 51 km. **[3]**

i) Write an equation to model this situation.

ii) Write a function that tells how many hours he travels at 30 km/hr if you know how many hours he travels at 20 km/hr.

iii) How long does he travel at 30 km/hr if he travels 1.2 hrs at 20 km/hr.

Question 17. (I)

a) Ap Naku is building a rectangular dinning table with an area of 21,000 cm^2. He plans to put wood trim around the four edges. **[4]**

i) What is the shortest length of the trim he could use?

ii) How much less trim would he use if the table is round and the trim is flexible?

iii) What shape would you suggest to Ap Naku to minimize the cost of the wood trim? Why?

b) The length of the table is 127 cm when measured by a centimeter ruler. **[2]**

i) What might be the length if a ruler that measures to the nearest 10 cm is used?

ii) What might the length be if a millimeter ruler is used?

OR

Question 17. (II) **[4]**

a)

i) Determine the surface area of a cube with edge length of 3.2 cm.

ii) Determine the radius of the sphere with same surface area of the cube.

iii) A regular nonagon based prism has the same surface area as the cube. Which one will have more capacity? Why?

b) How many significant figures are there in each?

i) 0.00050 ii) 42.005

c) Write the smallest and greatest five digit number with 4 significant figures. **[1]**

Question 18. (I)

Wangmo sells chillies. If she sells 1 kg for Nu 20, she expects to sell about 50 kg per day. For every increase in price of Nu 1, she expects her daily sales to decrease by about 1kg. **[6]**

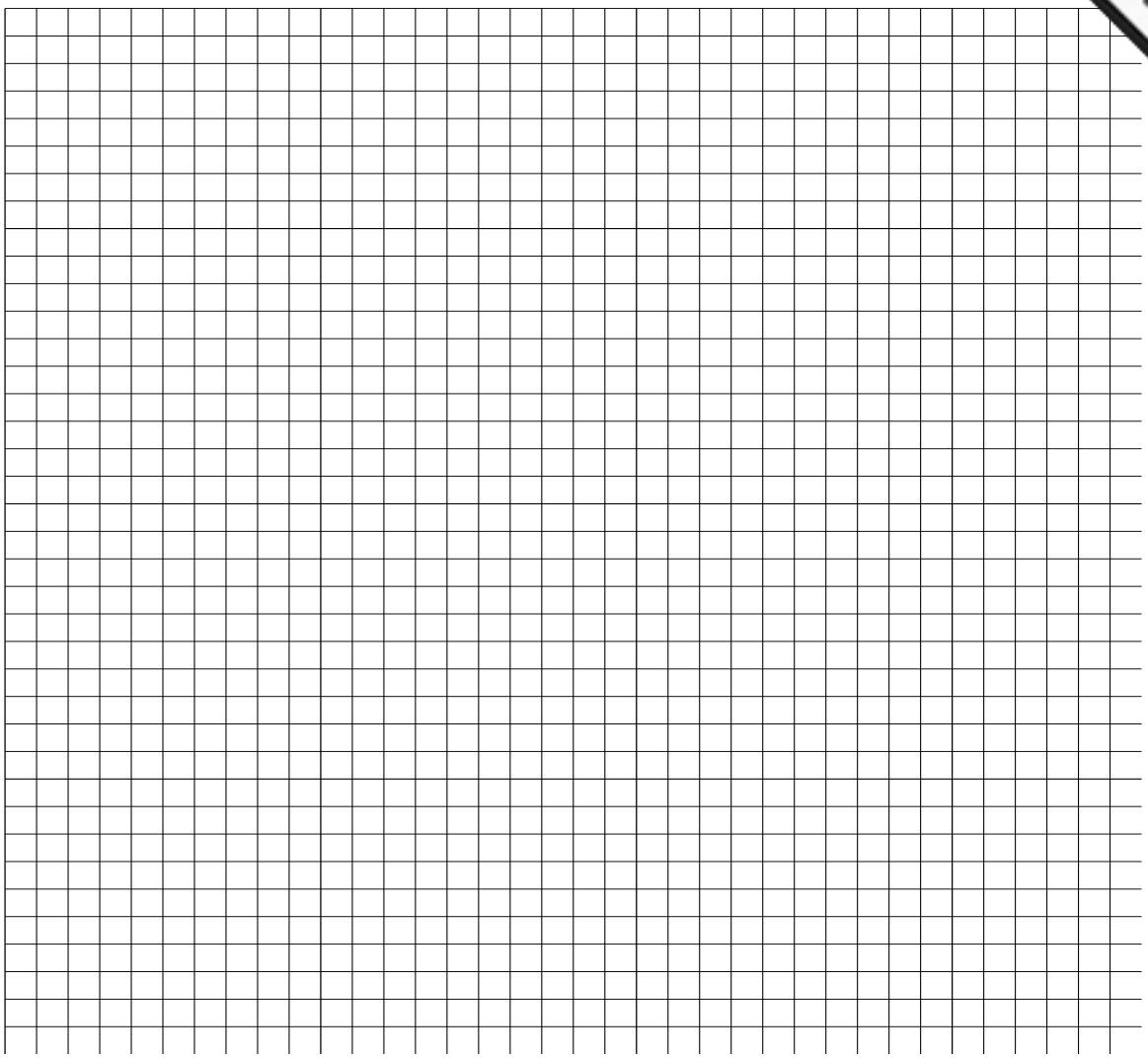
a) Write an algebraic expression to represent:

i) The price of each kilograms of chillies, if wangmo increases the price by Nu x

ii) The number of kilograms of chillies Wangmo expects to sell for each price increase of Nu x.

b) Use your answers from part (a) to write a function representing Wangmo's total sales for each price increase of Nu x

c) Sketch the graph of the function from part (b)



d) Use the graph to estimate the price that will result in greatest daily sales and the total sales at this price.

OR

Question 18. (II)

a) The orange orchard of Pema is of rectangular shape with the length 40 m more than twice the breadth. Find the length and the breadth of the orchard if the area is $4800m^2$. **[3]**

b)

i) What geometric transformations should be applied to $f(x) = x^2$ to result in the function $f(x) = -2(x+3)^2 - 4$?

ii) What are the coordinates of the vertex of the given function?

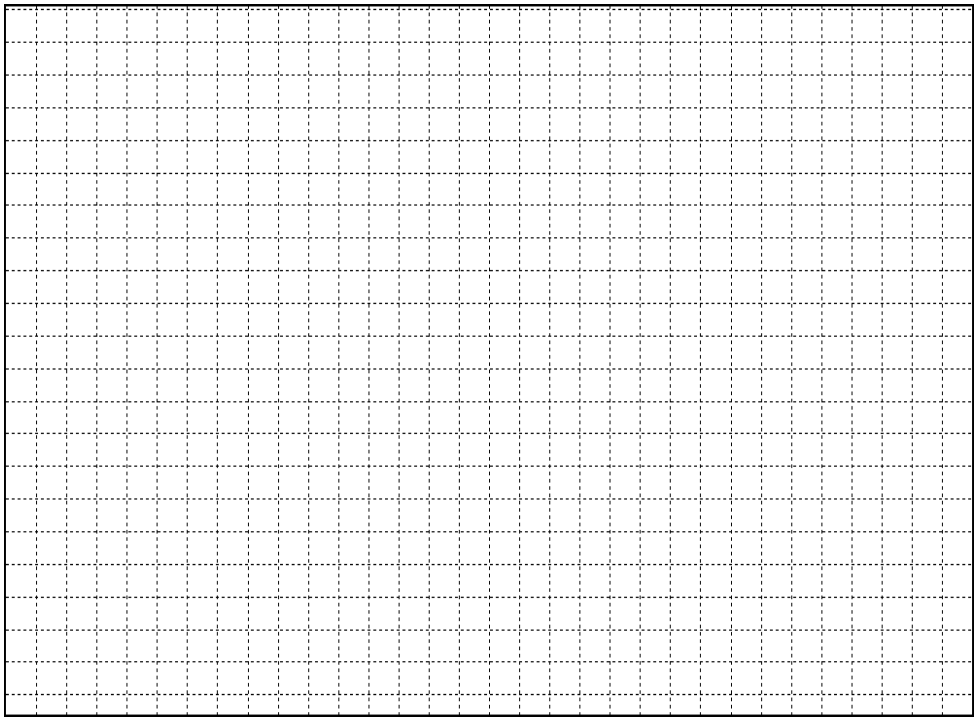
iii) Describe the transformation using mapping notation. **[3]**

Question 19 (I)

a) Acquired Immune Deficiency Syndrome (AIDS) is a disease that affects millions of people world wide. This table shows the global estimates of cumulative AIDS cases from 1982 to 1996. **[4]**

Year	AIDS cases (million)
1982	0
1983	0.1
1984	0.2
1985	0.4
1986	0.7
1987	1.1
1988	1.6
1989	2.3
1990	3.2
1991	4.2
1992	5.5
1993	6.9
1994	8.5
1995	10.4
1996	12.5

i) Create a scatter plot. Draw a curve of best fit.



ii) What kind of relationship is it?

iii) Why does this curve make sense for this set of data?

b)

i) Which pair given below describes two independent events? Which are dependent events? **[2]**

Pair A:	**Pair B:**
* Picking a blue button and not replacing it and then * Picking a white button on the second pick.	* Drawing a 5 from a deck of number Cards (0-9) . * rolling a 5 on a die.

ii) For pair B, what is the probability of rolling a 5 on the die?

OR

Question 19(II)

a) This stem and leaf plot shows the number of days each member of a running club ran with the club in May. **[6]**

Stem	Leaves
0	4 6 6 7 8 8 8
1	0 1 3 5 5 8 9
2	0 1
3	0 5 6
4	0

i) Construct a histogram.

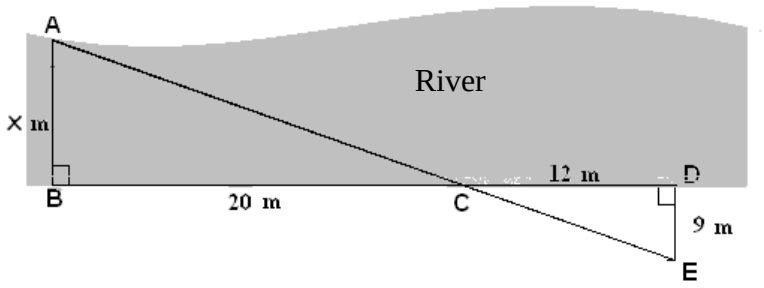
ii) Construct a box and whisker plot for the above histogram.

iii) What are the 5 – number summary?

iv) Compare how the two graphs show the distribution of the data.

Question 20(I)

a) How wide is the river at AB? **[2]**



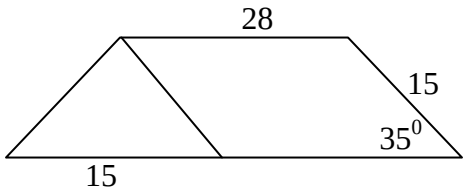
b) Gaki is looking up at the top of a chorten from 150 m away. The angle of elevation is 7^0. Gaki's eyes are about 1.4 m above the ground. How high is the tip of the chorten? **[3]**

c) If $\sin 43^0 = \cos x$, find the value of x. **[1]**

OR

Question 20(II)

a) The Trapezoid shown below is made up of a triangle and a parallelogram. Find the area of the trapezoid. **[3]**



b) An angle has a sin of 0.4. Calculate the values of each of the other 5 trigonometric ratios? **[3]**

Question 21 (I)

a) Identify each as the inductive or the deductive reasoning **[2]**

i) Gravity pulls all objects to the earth, so if I release the pen from my hand I know it will fall to the earth.

ii) Whenever I construct a triangle and measure the angles I get a total of 180^0.

b) An isosceles triangle that is not equilateral has exactly one line of symmetry. Use the deductive reasoning to prove it. **[4]**

OR

Question 21(II)

a) How many lines of symmetry does each of the following shapes have? **[1]**

i) Regular hexagon.

ii) Circle.

b) i) Construct a ΔABC where AB = 8cm, $\angle A = 60^0$ and $\angle C = 50^0$ (Use compasses wherever possible). **[4]**

ii) Locate the centroid and make it 'E'.

iii) Drop an altitude from the vertex 'C' to AB and measure it.

Rough Work

Rough Work