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Alternative No:

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Supervising Examiner's/
Invigilator's initial:

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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 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 (2 x 10 =20 marks)

Answer all questions

Question 1

- (i) Multiplication of matrices is possible only if:
- A Number of rows in the 1st matrix is equal to the number of rows in the 2nd Matrix.
 - B Number of rows in the 2nd matrix is equal to the number of columns in the 1st matrix.
 - C Number of columns in the 1st matrix is equal to the number of rows in the 2nd matrix.
 - D Number of columns in the 2nd matrix is equal to the number of rows in the 1st matrix.

Answer.....

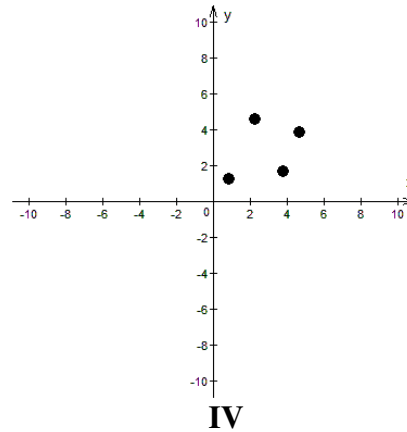
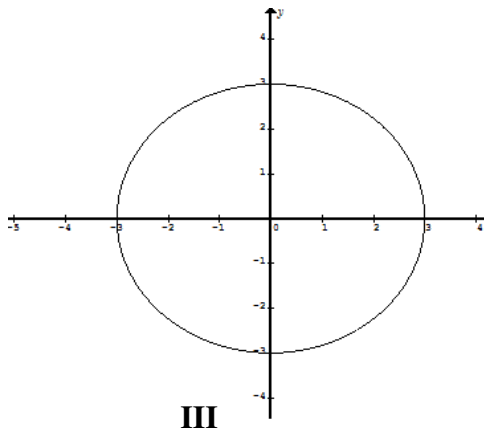
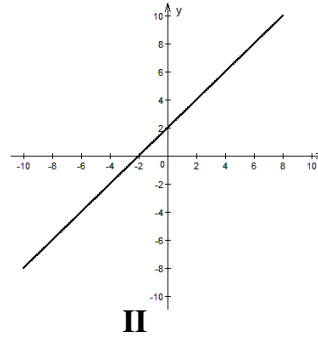
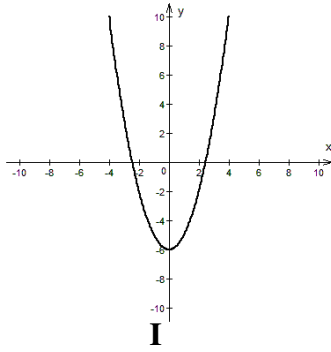
- (ii) What is the value of m in the equation $\sqrt{30} + \sqrt{m} = 5\sqrt{6}$
- A $\sqrt{5}$
 - B -5
 - C $-\sqrt{5}$
 - D 5

Answer.....

- (iii) Ugyen stood 12m away from a flagpole and looked up to the top of the pole at an angle of 50° . Ugyen's eyes are 1.7 m above the ground. How tall is the pole?
- A 13.7
 - B 10.3
 - C 12
 - D 16.9

Answer.....

(iv) Which of the following graphs is not a function?



- A** I
- B** II
- C** III
- D** IV

Answer.....

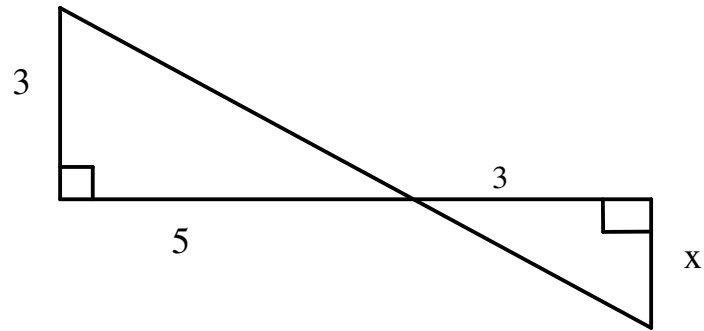
(v) When two dice are rolled, what is the probability of getting a sum of 10

- A** $\frac{1}{2}$
- B** $\frac{1}{6}$
- C** $\frac{1}{12}$
- D** $\frac{1}{36}$

Answer.....

(vi) What is the value of x in the figure given below

- A 1.8
- B 5
- C 2.25
- D 3



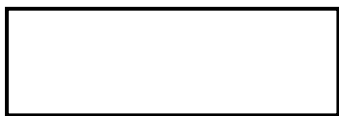
Answer

(vii) How many lines of symmetry does square have?

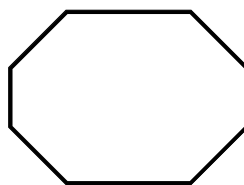
- A 2
- B 4
- C 3
- D 8

Answer.....

(viii) Which of the following figures is the most efficient figure, provided all the figures have the same perimeter



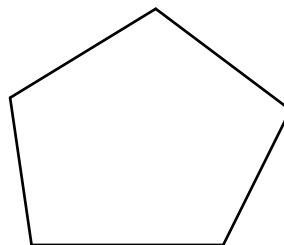
I



II



III



IV

- A I
- B II
- C III
- D IV

Answer.....

(ix) What are the zeros of the function $f(x) = 10x^2 - 13x - 3$

- A $\frac{1}{5}$ and $\frac{3}{2}$
- B $-\frac{1}{5}$ and $-\frac{3}{2}$
- C $-\frac{1}{5}$ and $\frac{3}{2}$
- D $\frac{1}{5}$ and $-\frac{3}{2}$

Answer.....

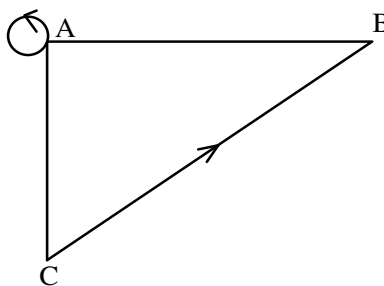
- (x) Calculate the median of the following data
 7, 3, 0, 5, 8, 1, 4, 3, 7, 6
- A 8
 B 1
 C 4
 D 4.5

Answer.....

Section B (32 Marks)
Answer all questions

Question 2

- (a) Create an adjacency matrix for the digraph given below [1]



- (b) Create a digraph for the adjacency matrix given below [2]

$$\begin{bmatrix} 0 & 1 & 1 \\ 1 & 1 & 0 \\ 0 & 2 & 1 \end{bmatrix}$$

Question 3

- (a) Which of the following option is better for a buyer? Explain [3]

Option 1

20% mark up on an item with a cost price of Nu. 480

Option 2

15% discount on the same item that has a marked price of Nu.700

- (b) Simplify $\sqrt{108} + \sqrt{12}$ [1]

Question 4

- (a) Transform the linear equation $3x-4y=12$ to slope and Y-intercept form [1]

(b) Sketch the graph of the resulting linear function

Question 5

Sonam wrote a 20 item multiple choice test and answered every question. He got 5 points for each correct item and lost 3 points for each incorrect item. His total score was 68 points. How many items did he answer correctly? [3]

Question 6

Determine the total surface area of a cylinder with a diameter of 36cm and height 48cm. (Give your answer correct to 2 decimal places) [3]

Question 7

The difference between the squares of two consecutive integers is 35. What are the numbers? [3]

Question 8

Factor and solve $2x^2 + 5x - 3 = 0$

Question 9

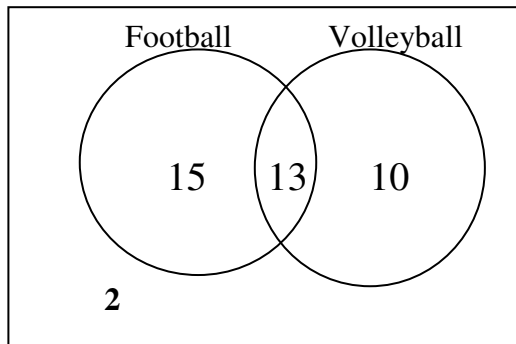
Construct a box and whisker plot for the following set of data

35, 20, 11, 10, 50, 12, 16, 25, 60, 45, 40, 32, 26, 48, 15, 13, 18, 22, 38

[3]

Question 10

The venn diagram given below shows the number of students in a class of 50 students who play only football, only volleyball and plays both football and volleyball.

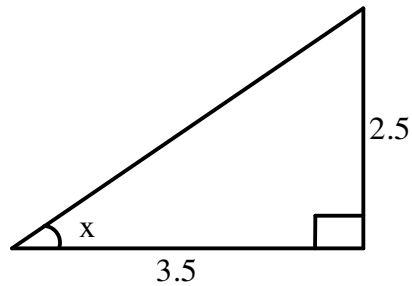


A student is randomly selected. What is the probability that the student [3]

- i) Play football
- ii) Play Volleyball
- iii) Play both the games

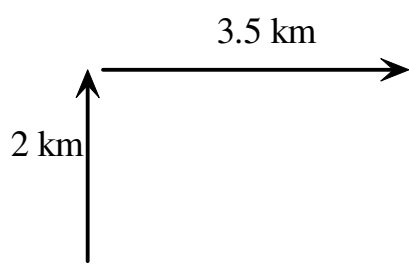
Question 11

Calculate the $\cos x$ for the right triangle given below [2]



Question 12

Represent the trip given below as a single vector and find it's bearing



Question 13

Construct the circle for an acute $\triangle ABC$: $AB=6.5\text{cm}$, $BC= 4.3\text{cm}$ and $\angle ABC = 65^\circ$ [2]

Section C (6 x 8 = 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) Tenzin withdrew the following notes from a bank

Types of notes	No. of Notes
Nu.10	100
Nu.50	20
Nu.100	10

Calculate the total value of the notes by multiplying two matrices [3]

- (b) Use the matrix given below to find the number of one- stopover trips between each pair of vertices [3]

$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

OR

Question 14 (II)

- (a) Find the missing numbers in the matrices given below

[3]

$$\begin{pmatrix} 2 & 1 & 4 \\ 0 & ? & 2 \end{pmatrix} \begin{pmatrix} 1 & ? \\ 2 & 1 \\ 3 & 4 \end{pmatrix} = \begin{pmatrix} ? & 21 \\ 8 & 9 \end{pmatrix}$$

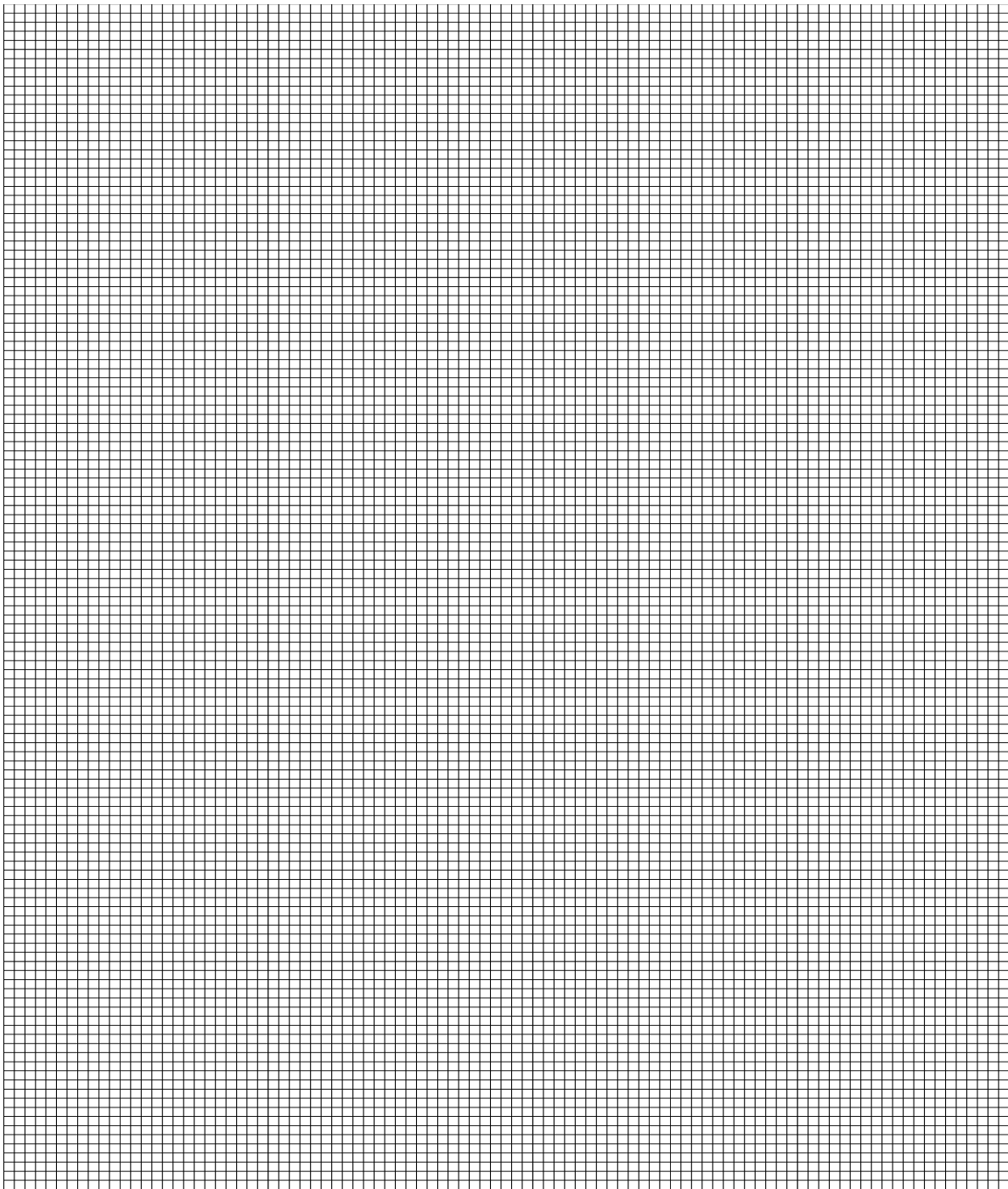
- (b) The co-ordinates of the vertices of a triangle are given below in a matrix

[3]

$$T = \begin{pmatrix} 0 & 10 & 6 \\ 4 & 8 & -2 \end{pmatrix}$$

- (i) Plot the points on a grid paper
- (ii) Multiply the matrix by 2
- (iii) Plot the new co-ordinates on the same grid paper

To be used for question 14II(b) (i) and (ii)



Question 15 (I)

(a). Pema Borrowed Nu.50, 000 at 15% p.a. compounded annually. He agreed to the following payment plan.

Nu. 15000 at the end of the first year

Nu.20,000 at the end of the second year

The final payment of the remaining amount at the end of the third year

Determine the amount of final payment.

[3]

- (b). Samdrup bought 100 shares with a face value of Nu.50, but were selling at a discount of 18%. A dividend of 20% was paid at the end of one year. He then sold all the shares at 15% premium. Calculate his net profit in this transaction. [3]

OR

Question 15 (II)

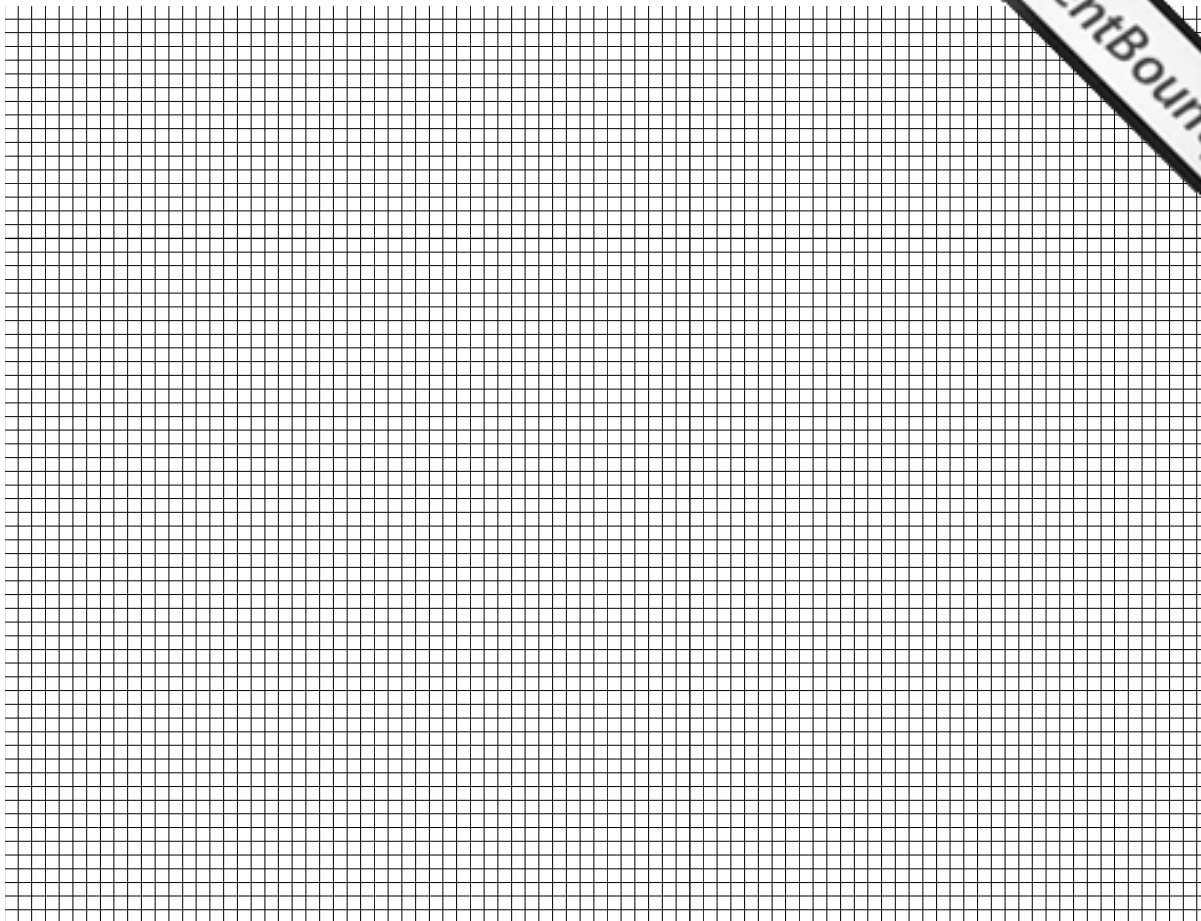
- (a) Lhamo borrowed Nu. 25,000 from a bank at a rate of interest compounded quarterly. The balance was Nu. 20,500 after making the first quarterly payment of Nu. 5000. What was the interest rate? [3]

- (b) Order the following expression in ascending order by expressing them as entire radicals $2\sqrt{7}, 3\sqrt{5}, 4\sqrt{2}, 10\sqrt{6}, 20, 8\sqrt{3}$ [3]

Question 16 (I)

- (a) Tempa drives an average of 40 km/hr for the first x hours and an average of 30 km/hr for the remaining y hours. He travels a total of 65 km . Write a function that tells the number of hours he travels at 40 km/hr , if you know the numbers of hours he travels at 30 km/hr . [3]

- (b) Sketch the graph of $6x + 2y \geq 6$ (*the graph is provided in the following page*) [3]



OR

Question 16(II)

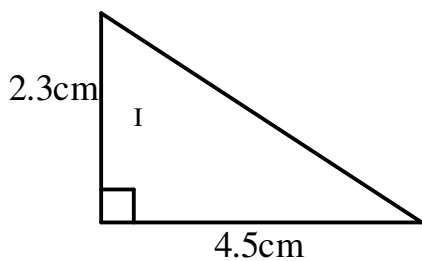
- (a) Without actually graphing, find the point of intersection of the graph for the system of equations given below [3]
- $$4x - 2y = 3 \text{ and } -3x + y = -2$$

- (b) A student bought 15 notebooks for a total of Nu.134. The ruled note book cost Nu. 10 and the plain note book cost Nu. 8. Use a system of equation to determine how many books of each type he bought?

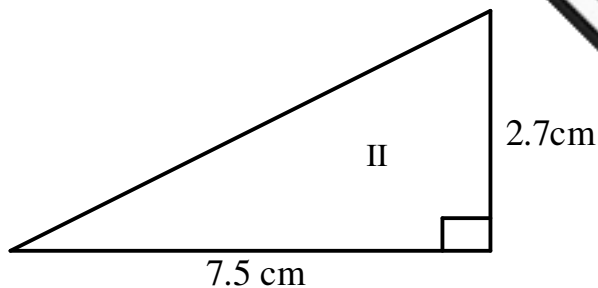
Question 17 (I)

- (a) How many significant figures are there in each number [3]
- (i) 342.56
- (ii) 0.002450
- (iii) 2.34000

(b) Which of the following triangle has a shorter perimeter? Show your work.



Triangle I



Triangle II

OR

Question 17 (II)

(a) Round off each of the following number as indicated

[3]

(i) 12.0456 to 4 significant figures

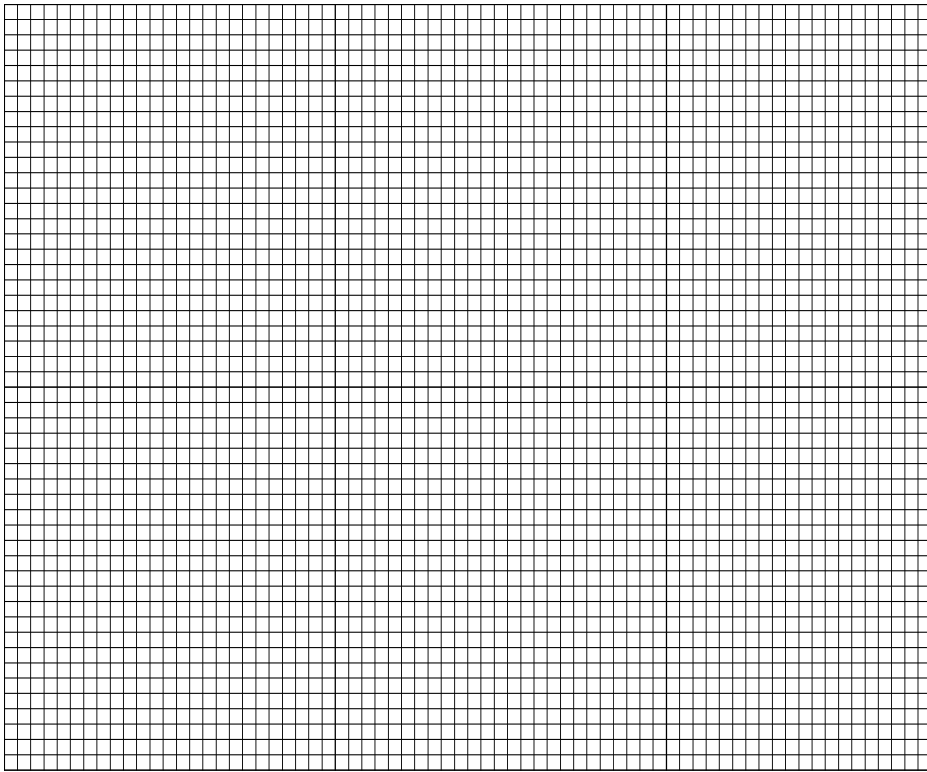
(ii) 0.02157 to 3 significant figures

(iii) 455.20 to 3 significant figures

- (b) Find the height of a squared based prism with a total surface area of 96cm^2 and a base of $3\text{cm} \times 3\text{cm}$

Question 18(I)

- (a) Draw the graph of the function $f(x) = \frac{1}{2}(x-4)(x+2)$ [4]
(the graph is provided in the following page)

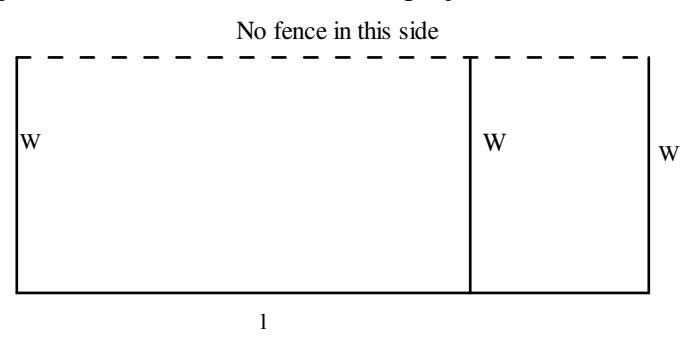


(b) Write down the equation of the symmetry of the graph in Question 18 I (a) [2]

OR

Question 18(II)

- (a) Wangmo wants to fence a playground in her school and to build a dividing fence to make separate play areas for junior and senior students. The project allows for 315m of fencing.



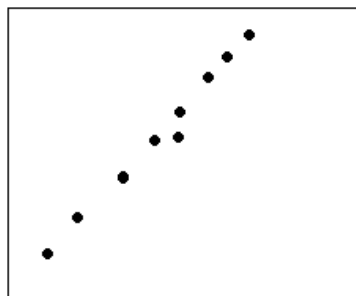
Write a function that represents the total area of the playground as a function of its width. Hence determine the width that will result in the maximum total area that can be enclosed using 315 m of fencing. [4]

(b) Solve $6x^2 + 5x - 6 = 0$

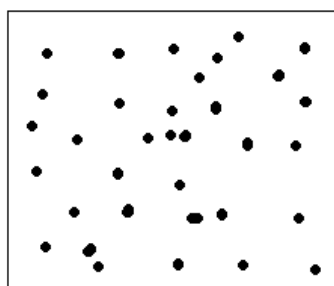
Question 19(I)

(a) Identify the type of correlation in each of the following

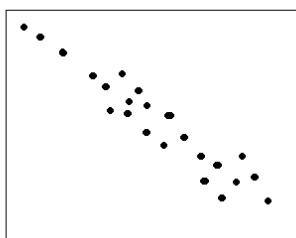
[4]



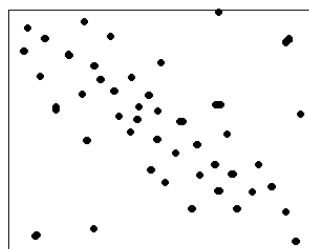
(i)



(ii)



(iii)



(iv)

- (b) The 11 letters in the word MATHEMATICS are written on 11 cards and placed in a bag. Two cards are drawn from the bag one after the other.
- (i) You draw a card with the letter A and then replace it. What is the probability that you will draw a card with the letter A on the Second time?
- (ii) You draw a card with letter A and do not replace it. What is the probability that you will draw a card with the letter A on the second draw?

OR

Question 19 (II)

- (a) The data given below are the ages of 30 people in a group

5	25	22	32	10	25
21	27	29	39	37	18
10	36	11	33	48	16
24	36	45	38	7	26
15	37	17	22	25	13

Create a Stem and leaf plot for the above data

[4]

- (b) A group of students were surveyed about the amount of television they watch.

Hours	No. of students
0-10	2
10-20	12
20-30	15
30-40	40
40-50	8

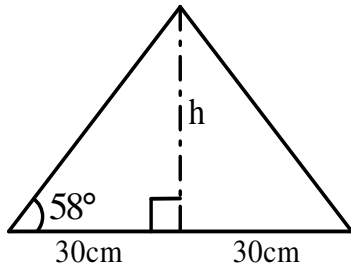
Calculate the mean for the above frequency distribution.

[2]

Question 20 (I)

- (a) From the top of the cliff, the angle of depression of a car moving towards the tower is found to be 40° . If the cliff is 75m high, how far is the car from the base of the cliff? [4]

- (b) Calculate the area of the triangle given below

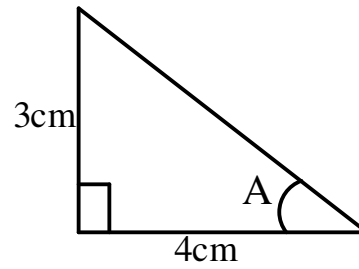


OR

Question 20 (II)

- (a) Dema is standing at the window of a tall building. Her eyes are 15.8m above the ground and she is looking down at an object which is 48m away from the base of the building. What is the angle of depression? [4]

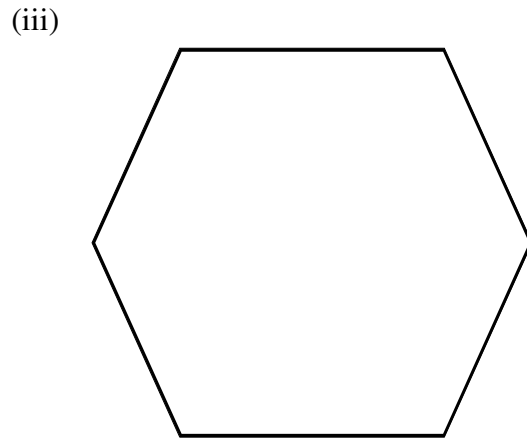
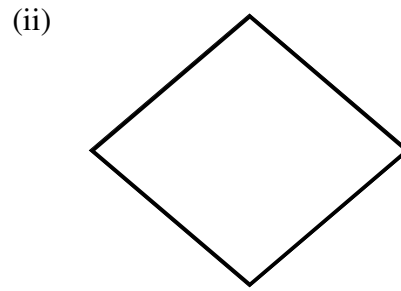
- (b) Determine the sine, cosine and tangent for $\angle A$, using the given measurement [2]



Question 21 (I)

- (a) Draw a triangle PQR with $PQ = 6cm$, $QR = 4cm$, and $PR = 5cm$. Determine the area. [3]

(b) Draw the lines of symmetry for the following shapes



OR

Question 21 (II)

- (a) Draw a triangle ABC in which $BC = 6.9\text{cm}$, $AB = 8.3\text{cm}$ and $\angle B = 62^\circ$.
Construct the in circle and locate its centre with the letter I [3]

(b) Create any three shapes with rotational symmetry of order 2.

[3]