**Alternative No:**

**Index No:** | 0 | 1 | 0 | 1 | 0 | | |

*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 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 13 -20). 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) without memory is allowed.

*For Chief Marker's and Markers' Use Only*

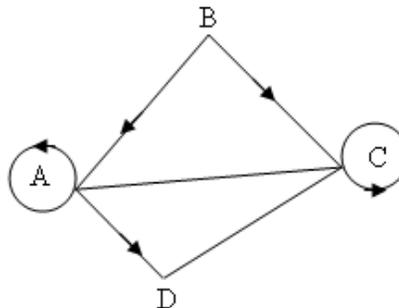| Section | A | B | | | | | | | | | | | | C | | | | | | | |
|---------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|
| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| Award | | | | | | | |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

**Section A (2 x 10 =20 marks)**

*Answer all questions*

## Question 1

(i)      The number of one – stop over trips from A to C in the given diagraph is

    **A**    one

    **B**    two

    **C**    three

    **D**    four

    Answer**:**……………………………………….

(ii)      The value of p in the equation $\sqrt{5} \times \sqrt{p} = \sqrt{75}$ is

    **A**    $\sqrt{15}$

    **B**    15

    **C**    375

    **D**    $\sqrt{375}$

    Answer:…………………………………………..

(iii)      The slope and y-intercept form of the given inequality
$10\,x > -3y + 5$ is

    **A**    $y < \dfrac{10x}{3} + \dfrac{5}{3}$

    **B**    $y < \dfrac{-10x}{3} + \dfrac{5}{3}$

    **C**    $y > \dfrac{-10x}{3} + \dfrac{5}{3}$

    **D**    $y < \dfrac{10x}{3} + \dfrac{5}{3}$

    Answer………………………………………….

---

(iv)     Converting 13929 into a number with 3 significant figures, the result is

     **A**     139

     **B**     13900

     **C**     $1.398 \times 10^4$

     **D**     $1.4 \times 10^{-4}$

Answer…………………………………………..
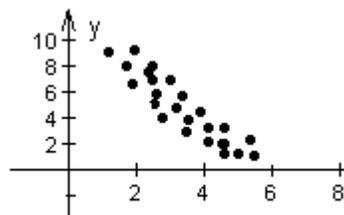
(v)      The horizontal translation for the function $f(x) = -2(x+4)^2 + 3$ is

     **A**     3 steps right

     **B**     3 steps left

     **C**     4 steps right

     **D**     4 steps left

Answer………………………………………….

(vi)     The best correlation that describes the graph given on the right is

     (i)     strong
     (ii)     weak
     (iii)     positive
     (iv)     negative

Choose the best combination

     **A**     (i) and (iii)

     **B**     (ii) and (iii)

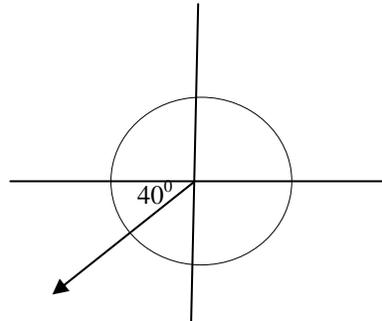     **C**     (i) and (iv)

     **D**     (ii) and (iv)

Answer…………………………………….......

(vii)    The value of $\sin 37^0$ is equivalent to

    **A**    $\cos(90 - 53)$

    **B**    $\cos 53^0$

    **C**    $\sin(90 - 37)$

    **D**    $\sin 53^0$

Answer……………………………………………..

(viii)   The bearing of the given vector is

    **A**    $40^0$

    **B**    $50^0$

    **C**    $130^0$

    **D**    $230^0$

Answer……………………………………….

(ix)   The number of axis of rotation in a cube is

    **A**    13

    **B**    7

    **C**    8

    **D**    3

Answer……………………………………

(x) The correct inequality for the following graph is

A $\quad y \leq 3x - 1$

B $\quad y \geq 3x - 1$

C $\quad y < 3x - 1$

D $\quad y > 3x - 1$
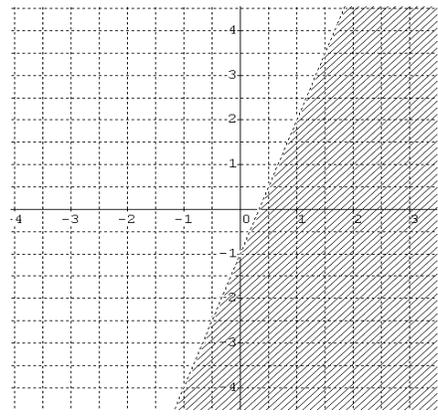
Answer…………………………

**Section B (32 Marks)**
*Answer all questions*

**Question 2**

$$A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}, \qquad B = \begin{bmatrix} 1 & 3 & 1 \\ 2 & 0 & 2 \end{bmatrix}, \qquad C = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 0 \end{bmatrix}$$ **[3]**

(i) Write down the dimension of the matrices A, B and C.

(ii)     Find A × B

(iii)    Calculate (A × B) + C

**Question 3**

Pema earned a dividend amount of Nu.1050 from 50 shares of a stock with a face value of Nu.100. **[4]**

(i)     What was the dividend rate?

(ii)    How much more he would have earned if the rate had been 7% higher?

(iii)   How much money will he receive from the sale if he sells his shares at a premium of 15%?

## Question 4

Solve the systems of linear equation

$3x + 4y = -7$ and $\dfrac{1}{3}x + \dfrac{1}{2}y = -\dfrac{3}{4}$ [3]

## Question 5

A 100m long wire was bent to form the following shapes (figures not drawn to the scale) [3]
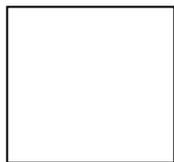


Fig 1                    Fig 2
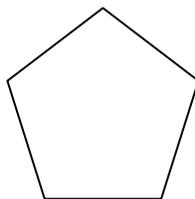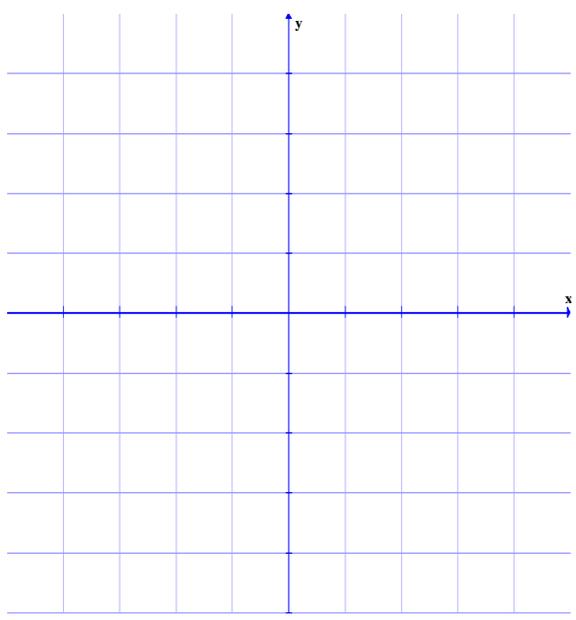
(i) Predict which of the above figures will enclose a greater area? Give reasons.

(ii)    Draw a figure that will enclose the maximum area. Find its area.

**Question 6**

(i)    Graph the following quadratic function in the grid paper given below:    **[3]**

$$f(x) = -\frac{1}{3}(x+4)(x-2)$$

(ii)   Find the zeros and y-intercept.

## Question 7

Solve the following equations                                              **[3]**
(i)   $|2x - 4| + 5 = 7$

(ii)   $(2x - 3)(7x + 4) = 0$

**Question 8**

Following are the marks obtained by 30 students in a class

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 4 | 20 | 30 | 40 | 45 | 58 |
| 12 | 20 | 34 | 42 | 52 | 59 |
| 15 | 21 | 36 | 43 | 55 | 63 |
| 15 | 25 | 37 | 43 | 58 | 63 |
| 20 | 30 | 38 | 43 | 58 | 71 |

(i)     Draw a box and whisker plot

(ii)     Mention 5 – number summary

**Question 9**

Dorji randomly chooses a number card from cards numbered 1 to 100.

**Event A**: The number is even

**Event B**: The number is a multiple of 5

What is the probability of each of the following?                                    **[3]**

(i)   Event A happening

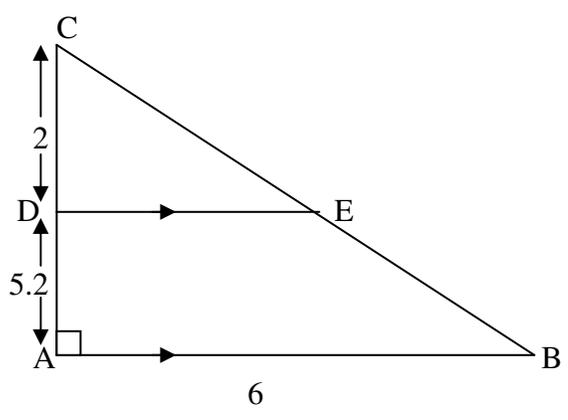(ii)   Event B happening

(iii)  Event A and B both happening

**Question 10**

What is the length of side DE?                                                    **[2]**

**Question 11**

A ladder 10m long leaning against a wall reaches 5m up the wall. Find the angle the ladder makes with the ground? **[2]**

**Question 12**

Describe the turn symmetry for a regular hexagon based prism. **[2]**

**Section C (6 x 8 = 48 Marks)**
*Attempt either I or II from each question.*

**Question 13(I)**

a)     The matrix A shows the number of girls and matrix B shows the number
       of boys of different schools with respect to their classes:                    **[3]**

$$A = \begin{array}{c} \\ \\ \\ \end{array} \begin{array}{cccc} \text{vii} & \text{viii} & \text{ix} & \text{x} \\ \begin{bmatrix} 25 & 12 & 16 & 10 \\ 15 & 17 & 15 & 14 \\ 18 & 16 & 10 & 10 \end{bmatrix} & & & \begin{array}{c} \text{LMSS} \\ \text{MMSS} \\ \text{KMSS} \end{array} \end{array}$$

$$B = \begin{array}{cccc} \text{vii} & \text{viii} & \text{ix} & \text{x} \\ \begin{bmatrix} 23 & 18 & 14 & 12 \\ 13 & 18 & 15 & 16 \\ 22 & 20 & 12 & 16 \end{bmatrix} & & & \begin{array}{c} \text{LMSS} \\ \text{MMSS} \\ \text{KMSS} \end{array} \end{array}$$

(i)     Calculate A + B. What do the elements in the resulting matrix represent?

(ii)    Calculate A – B. Interpret  from the resulting matrix, the number of students in
        class viii of LMSS.

b)
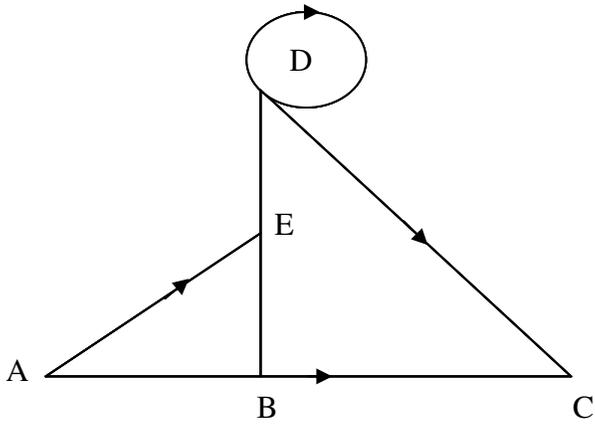


(i) Create the adjacency matrix for the given diagraph
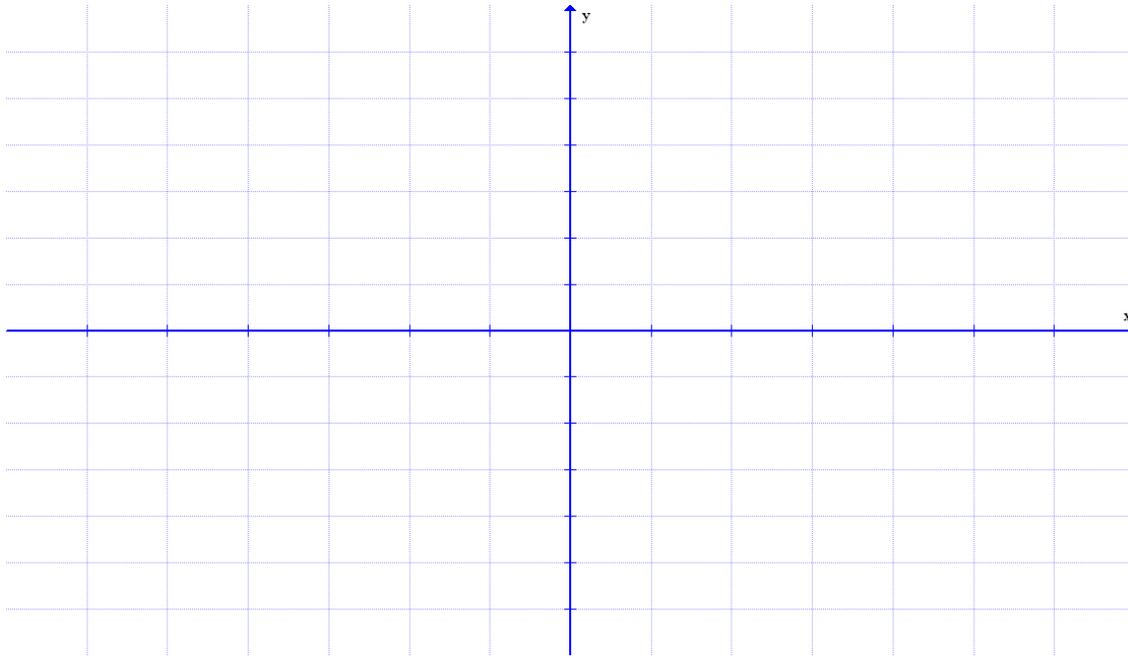
(ii) Find the number of two stop-over trips from A to E. Use the diagraph to solve the problem.

**OR**

**Question 13 (II)**

   a)    (i)    Draw the shape on the grid paper for matrix B describing the shape of a quadrilateral.

$$B = \begin{bmatrix} 1 & 4 & 1 & 4 \\ 2 & 2 & 5 & 5 \end{bmatrix}$$



       (ii)    if $A = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ , Plot the coordinates of A x B on the same grid

           hence explain the change in the shape. **[3]**

b) (i) Create a diagraph for the following adjacency matrix.

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

(ii) Use the adjacency matrix in part a (i) to find the number of one stop-over trips between each pair of vertices. **[3]**

**Question 14 (I)**

a)   Dawa borrowed Nu. 20,000. He repaid the loan at the end of four years with a single payment of Nu. 35,680. What interest rate was charged if the compounding was semi annual?   **[3]**

b)   (i)   Simplify $\dfrac{\sqrt[3]{64} - (\sqrt{18}X\sqrt{50})X\sqrt[3]{27x^3}}{\sqrt[5]{32}}$

(ii)     Solve the equation:     $\dfrac{7\sqrt{27} - 4\sqrt{12}}{\sqrt{m}} = 3$

**OR**

**Question 14 (II)**

a)     Sonam wants to invest Nu.10,000. in a bank. She has the following
options:     **[3]**
Option A**:** 8% p.a simple interest
Option B: 7% p.a compound interest compounded monthly

    (i)     Calculate her amount after 10 years under each option?

(ii)     Which option would she choose? Give one reason.

b)        Dorji is a car sales person. He is paid Nu 2000 per week and an additional
          3.5% commission on his sales.
          Determine:                                                                              **[3]**
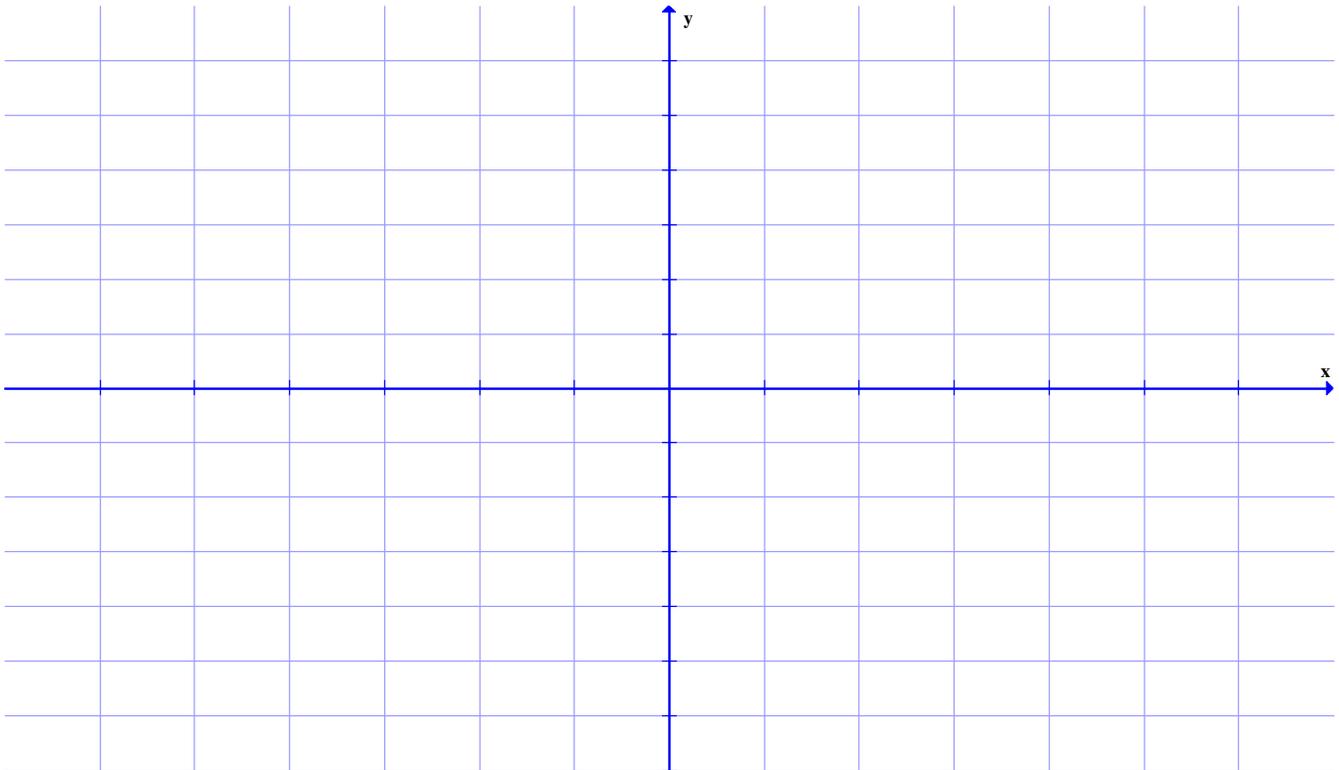          (i)      Dorji's total income for the week in which sales was Nu 60,000.

          (ii)     What should be the total sale, if he needs to earn a total income
                   of Nu 9000 in a week?
                   .

**Question 15 (I)**

    a)        Sketch the graph of the following inequality

            $2x + 3y \geq 6$          **[3]**

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b)          If $7p - 5q = 15$

         (i)      Write down p as a function of q. Hence find $f(4)$

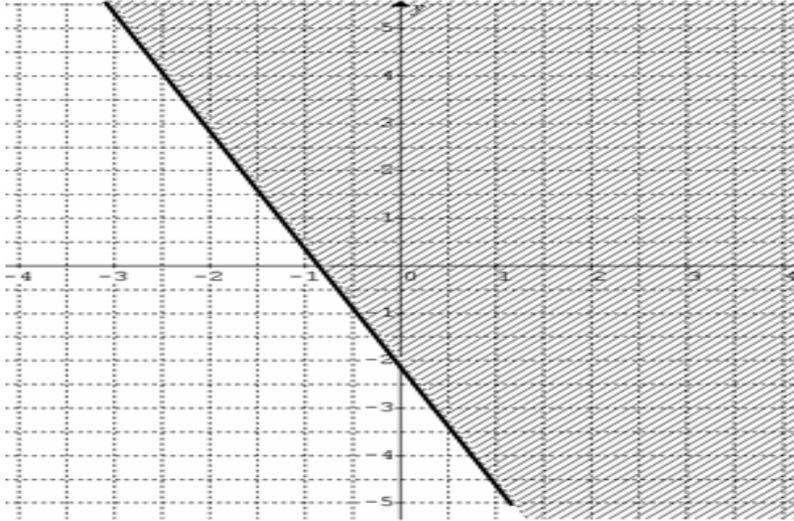         (ii)      Write down q as a function of p. Hence find $f(5)$

**OR**

**Question 15 (II)**

a)           Determine the inequality for the following graph                            **[3]**

b) Dorji and Dema together earn a total income of Nu 950. If one third of Dorji's income and twice of Dema's income sums upto Nu 1000. Find their income? [3]

**Question 16 (I)**

a)  Write down the number of significant figures in each of the following:   [3]

      i.  430.00

      ii.  $7.500 \times 10^2$

      iii.  0.00108

      iv.  8900

      v.  Write down the least 5 digit number with 5 significant figures.

      vi.  Write down the greatest 5 digit number with 2 significant figures.

b)     A solid square based prism with edge length of 10 cm and height 15 cm is
       melted and recast into spherical balls of 5mm radius. Find the total number
       of balls that can be made?                                                    **[3]**

<div align="center">

**OR**

</div>

**Question 16 (II)**

a)     Two regular solid shapes made of same metal are given below:                  **[3]**

       Shape A: Cylinder with radius 3 mm and height 4 mm
       Shape B: Cuboid with dimension: 7 mm x 4 mm x 5 mm

       (i)     Calculate the volume of the two shapes.

(ii)     Which of the above shapes will be heavier?

(iii)    If 1 mm$^3$ weighs 5 grams, find the weight of shape B.
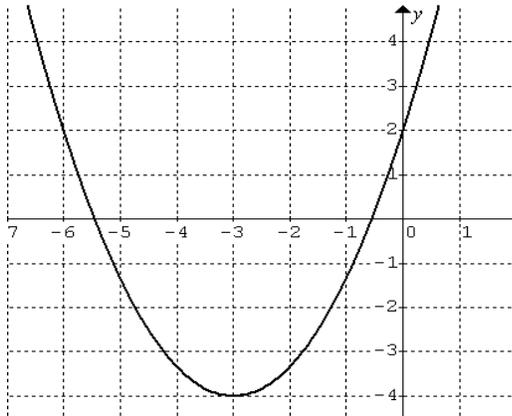
b)    Dawa needs to buy materials to fence his garden. He buys 3 strands of barbed wire
      and a post for every 4 m of fence. Each post costs Nu 450 and barbed wire costs Nu.15
      per meter. What is the shape of the largest area Dawa can enclose if he spends Nu 4410
      on fencing materials? Show your calculations.                                    **[3]**

**Question 17 (I)**

a)      Determine the equation of the given parabola                          **[3]**

b)      Factorize $6x^2 + x - 1$ and use the factors to solve $6x^2 + x - 1 = 0$? **[3]**

**OR**

**Question 17 (II)**

a)      The sum of the squares of the two consecutive odd numbers is 130. Find the
        numbers?                                                                    **[3]**

b)      Which of the following function is equivalent?
$f(x) = 2(x-3)(x+5)$
$g(x) = 2x^2 + 4x - 30$
$h(x) = 2(x-1)^2 + 32$

**Question 18 (I)**

The measurements of the growth of seedlings after one month are given
below:

10   21   23   32   41

11   25   36   14   44

31   36   27   28   49

42   11   46   14   36

**[6]**

a)      Create a stem and leaf plot

b) Use the stem and leaf plot to create a histogram with the same size of interval.

c) Identify the type of distribution.

**OR**

**Question 18 (II)**

a) Is each pair of the correlation described below positively correlated, negatively correlated or not correlated? **[3]**

   (i) Number of pages you write and the amount of ink left in your pen.

   (ii) Distance you walked and the distance left for you to walk.

   (iii) Amount of money in your pocket and the marks obtained in mathematics.

b) The table below shows the volume of water left in the tank after each hour

| Hours | Water in tank(litres) |
|---|---|
| 0 | 2800 |
| 1 | 2400 |
| 2 | 2000 |
| 3 | 1800 |
| 4 | 1600 |
| 5 | 1500 |
| 6 | 1200 |
| 7 | 900 |
| 8 | 890 |
| 9 | 700 |
| 10 | 600 |
| 11 | 400 |
| 12 | 150 |

(i) Create a scattered plot and sketch the curve of best fit.

(ii)  How much water is left in the tank after 10 hrs?

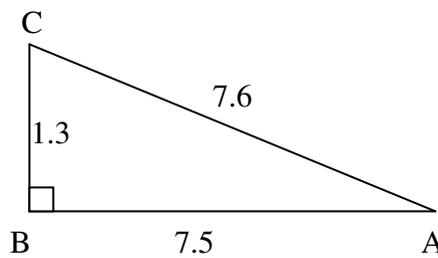(iii)  After how many hours will the tank be empty?

**Question 19 (I)**

a)    In each of the triangles given below, order the following ratios from the greatest
to the least:  Sin A, Cos A and Tan A.                                                                    **[3]**
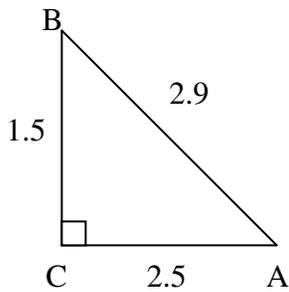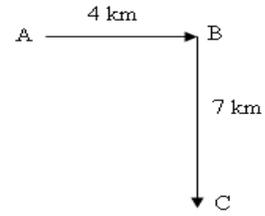


Triangle 1                                          Triangle 2

b)    Draw a single vector to represent this two-part trip. Describe its bearing and vector:



**OR**

## Question 19 (II)

a)    A ladder rests at 10.6 m high wall. The foot of the ladder is 20.8 m away from the wall. Find the angle that ladder makes with the ground.  **[3]**

b)    Complete each with an acute angle:

       (i)    $\sin 20^0 = \cos$………………

      (ii)    $\tan 62^0 = \cot$……………...

    (iii)    $\cos$………….$=1$

    (iv)    $\sin$………….$= 0.71$

     (v)    $\tan$…………$= 1.19$

    (vi)    $\cos 68^0 = \sin$………………

## Question 20 (I)

a)    (i)    Draw the lines of symmetry for the following shapes:    **[3]**
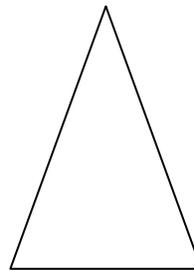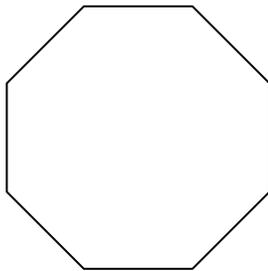


    (ii)    How many planes of symmetry does the cone have? Explain

b)      Construct an equilateral triangle of side 5 cm and show
      (i)      Circum-centre, and
      (ii)     Construct the in-circle in the same triangle.

**OR**

**Question 20 (II)**

a)     Identify each statement as inductive or deductive reasoning:        $[1\frac{1}{2}]$

   i.   "The sun will rise between those two hills as always it does".

   ii.  "Given the two angles of triangle sum up to $90^0$ it is always a right triangle".

   iii. "Empty plastic bottles will always float in water."

b)   Use the inductive reasoning to prove that the sum of angles of a triangle is two

     right angles .

c)   Draw a triangle ABC, AB = 6 cm, BC is two third of AB and AC is one
     and a half time AB. Construct an altitude CD on AB, and measure CD.                **[3]**

# Rough Work

**Rough Work**