

# higher education & training

Department:  
Higher Education and Training  
REPUBLIC OF SOUTH AFRICA

## NATIONAL CERTIFICATE (VOCATIONAL)

### MATHEMATICS (Second Paper) NQF LEVEL 2

NOVEMBER 2012

(10501042)

5 November (X-Paper)  
09:00 – 12:00

A scientific calculator may be used.

This question paper consists of 9 pages, a 2-page formula sheet and a 2-page answer sheet.





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|   |
|---|
| <p><b>TIME: 3 HOURS</b><br/><b>MARKS: 100</b></p> |
|---|

**INSTRUCTIONS AND INFORMATION**

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etcetera, which you have used in determining the answers.
5. If necessary, answers should be rounded off to THREE decimal places, unless stated otherwise.
6. Diagrams are NOT necessarily drawn to scale.
7. Write neatly and legibly.

| CHOICE OF DJ | TALLY | FREQUENCY |
|--------------|-------|-----------|
| DJ Fresh     |       |           |
| DJ Spu       |       |           |
| DJ Chins Man |       |           |
| DJ Cloo      |       |           |
| DJ Mbuso     |       |           |
| Total        |       |           |



**QUESTION 1**

1.1 Define the following terms:

- 1.1.1 Ungrouped data (2)
- 1.1.2 Range (2)
- 1.1.3 Modal value (2)

1.2 GQ Magazine held a poll to determine the favourite DJ's of NCV learners. The results of the first 30 responses are tabulated below.

| CHOICE OF DJ   |                |            |
|----------------|----------------|------------|
| DJ Mbuso ✓     | DJ S'bu ✓      | DJ Mbuso ▷ |
| DJ China Man ✗ | DJ Cleo ✓      | DJ S'bu ✓  |
| DJ S'bu ✓      | DJ Fresh ✓     | DJ Cleo ✓  |
| DJ Mbuso ▷     | DJ Cleo ✓      | DJ Mbuso ▷ |
| DJ Fresh ✓     | DJ Mbuso ▷     | DJ Fresh ✓ |
| DJ Cleo ✓      | DJ China Man ✗ | DJ Cleo ✓  |
| DJ Fresh ✓     | DJ Cleo ✓      | DJ Fresh ✓ |
| DJ S'bu ✓      | DJ S'bu ✓      | DJ Mbuso ▷ |
| DJ Cleo ✓      | DJ Cleo ✓      | DJ S'bu ✓  |
| DJ China Man ✗ | DJ Mbuso ▷     | DJ Cleo ✓  |



Use the information given above to answer the following questions:

1.2.1 Copy and complete the following frequency distribution TABLE (tally chart) in the ANSWER BOOK.

| FREQUENCY DISTRIBUTION TABLE: CHOICE OF DJ |        |           |
|--|--------|-----------|
| DJ   | TALLY  | FREQUENCY |
| DJ Fresh                                   |        |           |
| DJ S'bu                                    | ### /  | 6         |
| DJ China Man                               |        |           |
| DJ Cleo                                    |        |           |
| DJ Mbuso                                   |        |           |
|  | Total: |           |

- 1.2.2 Which DJ is most liked by these learners? (1)
- 1.2.3 Use the completed table from QUESTION 1.2.1 to construct a bar graph on ANNEXURE A that represents the information. (4)
- 1.2.4 Use the completed table from QUESTION 1.2.1 to construct a frequency polygon on ANNEXURE A that represents the information. (3)



1.3 Farmer Brown has a dairy with 40 cows. He has recorded the quantity of milk (in litres) that each cow produces per week in the TABLE below.

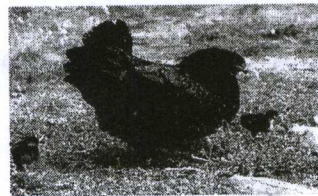
|    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|
| 41 | 84 | 89 | 66 | 88 | 80 | 86 | 83 |
| 50 | 43 | 42 | 88 | 89 | 40 | 42 | 69 |
| 63 | 69 | 75 | 40 | 69 | 68 | 69 | 54 |
| 73 | 51 | 65 | 77 | 52 | 85 | 42 | 43 |
| 71 | 83 | 69 | 88 | 79 | 69 | 80 | 82 |



- 1.3.1 Draw a stem-and-leaf plot for the information given above. (4)
- 1.3.2 Determine the modal value (mode) for the data set. (1)
- 1.3.3 Determine the median value for the data set. (2)
- 1.3.4 Calculate the range for the data set. (2)

1.4 The following data set shows the number of eggs laid by Mama Mchunu's hens:

|    |    |    |    |
|----|----|----|----|
| 4  | 17 | 9  | 9  |
| 12 | 15 | 14 | 11 |
| 15 | 6  | 24 | 4  |



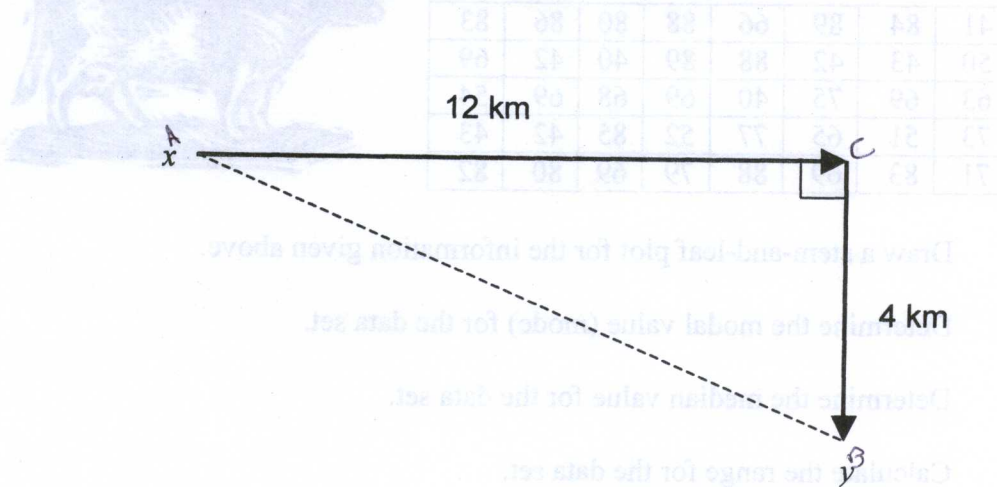
- 1.4.1 Determine the mean value for the data set. (3)
- 1.4.2 Calculate the values for the first quartile ( $Q_1$ ) and the third quartile ( $Q_3$ ). (4)
- 1.4.3 Determine the inter-quartile range ( $IQR$ ) for the data set. (2)
- 1.4.4 Determine the value of the 65<sup>th</sup> percentile. ( $P_{65}$ ) (3)

[40]



**QUESTION 2**

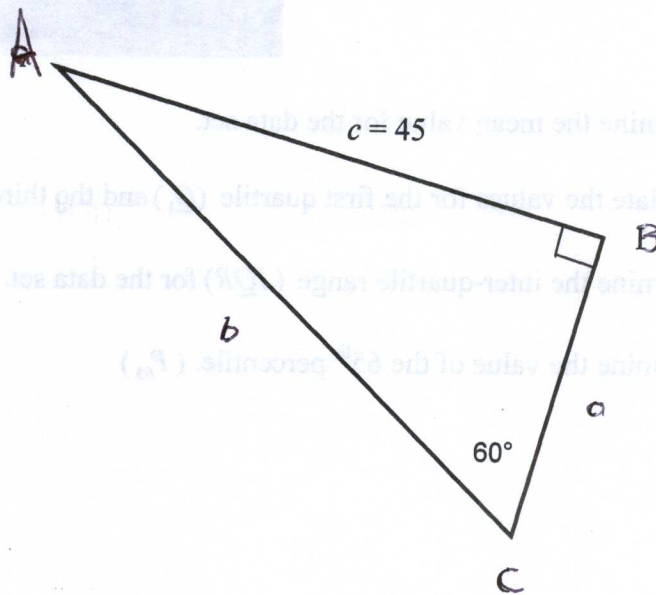
- 2.1 An ambulance leaves the hospital parking ( $x$ ) to travel to an emergency ( $y$ ). The path and distance of the journey is shown by the sketch below.



Calculate the straight line distance between points  $x$  and  $y$

(4)

- 2.2 Given triangle ABC with angle  $\hat{B} = 90^\circ$ ,  $c = 45$  units and angle  $\hat{C} = 60^\circ$

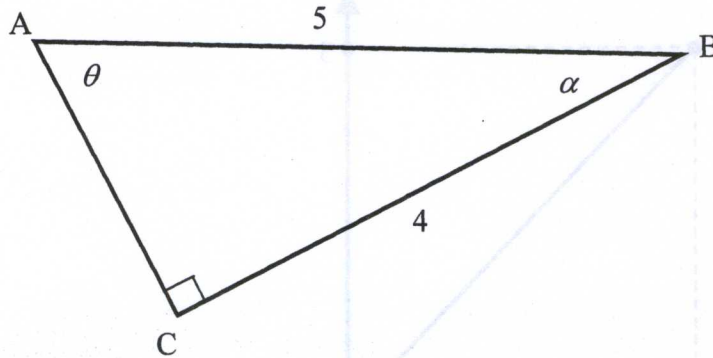


Calculate the lengths of the sides

- 2.2.1  $a$  (2)

- 2.2.2  $b$  (2)

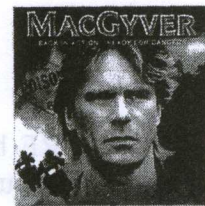
2.3 Given triangle ABC with angle  $\hat{C} = 90^\circ$ ,  $\hat{CAB} = \theta$ ,  $\hat{ABC} = \alpha$



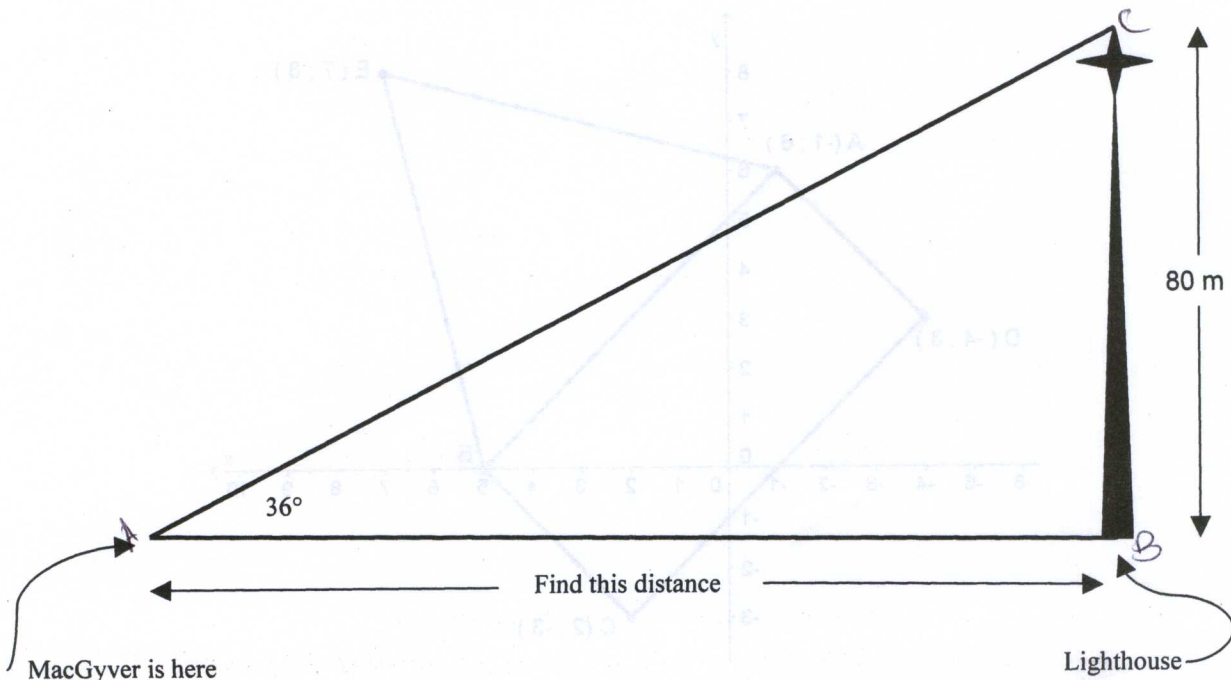
Determine the value of the following. Show ALL the calculations:

- 2.3.1  $\cos \theta$  (3)
- 2.3.2  $1 + \tan^2 \theta$  (3)
- 2.3.3  $\frac{\cos \alpha}{\sin \alpha}$  (3)

2.4 MacGyver is stranded at sea. He notices a lighthouse on the distant shoreline. MacGyver estimates that the top of the lighthouse is at an angle of  $36^\circ$  from his current position. If the lighthouse is 80 m high, how far must MacGyver swim till he reaches the lighthouse?



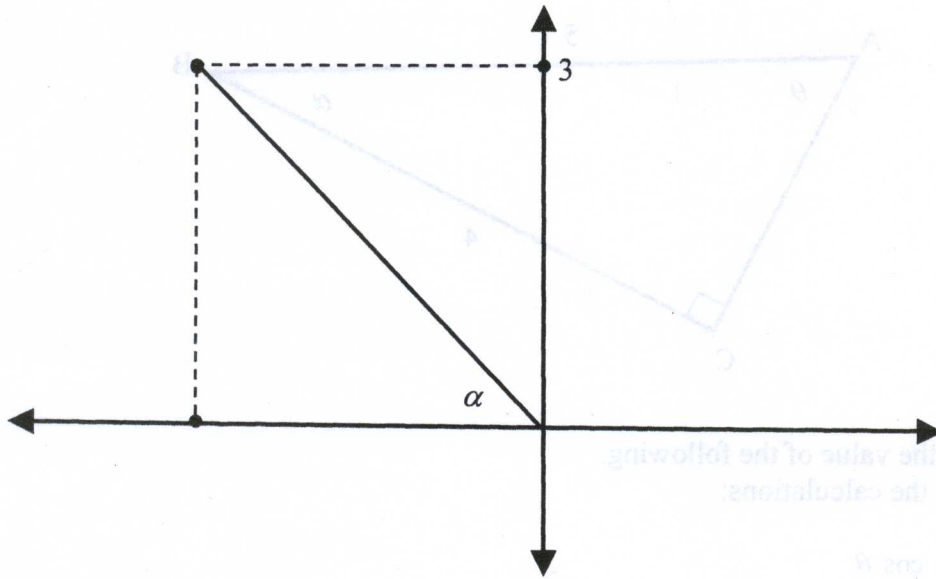
Use the following diagram to calculate your answer



(3)



2.5 Determine the following if  $\sin \alpha = \frac{3}{5}$  and  $90^\circ \leq \alpha \leq 180^\circ$



2.5.1  $\cos \alpha$

(3)

2.5.2  $\sin^2 \alpha + \cos^2 \alpha$

(2)

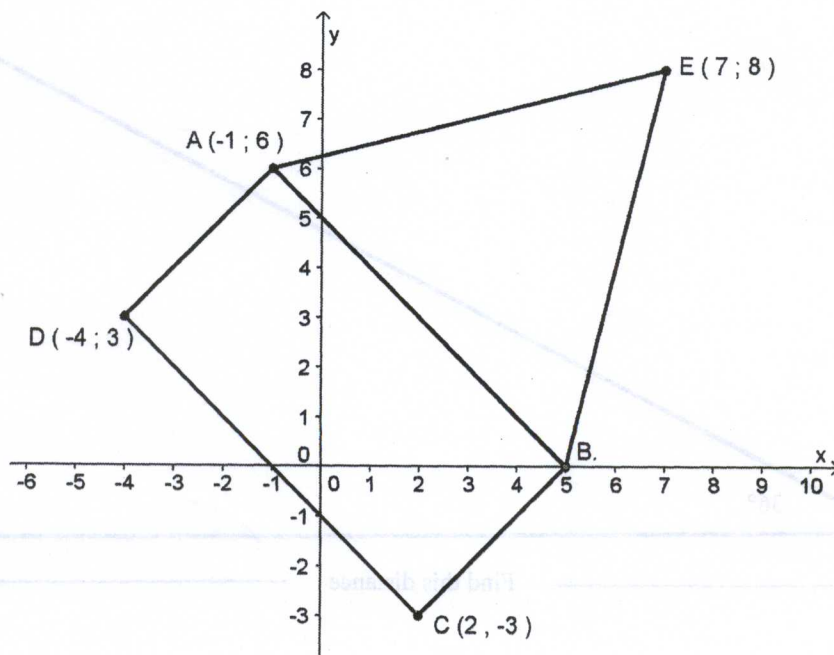
2.6 Use ANNEXURE B to sketch the graph of  $f(x) = \sin \theta + 1$  for  $\theta \in [0^\circ; 360^\circ]$

(5)

[30]

**QUESTION 3**

3.1 The FIGURE below shows the floor plan of a building, with one rectangular room and one triangular room.



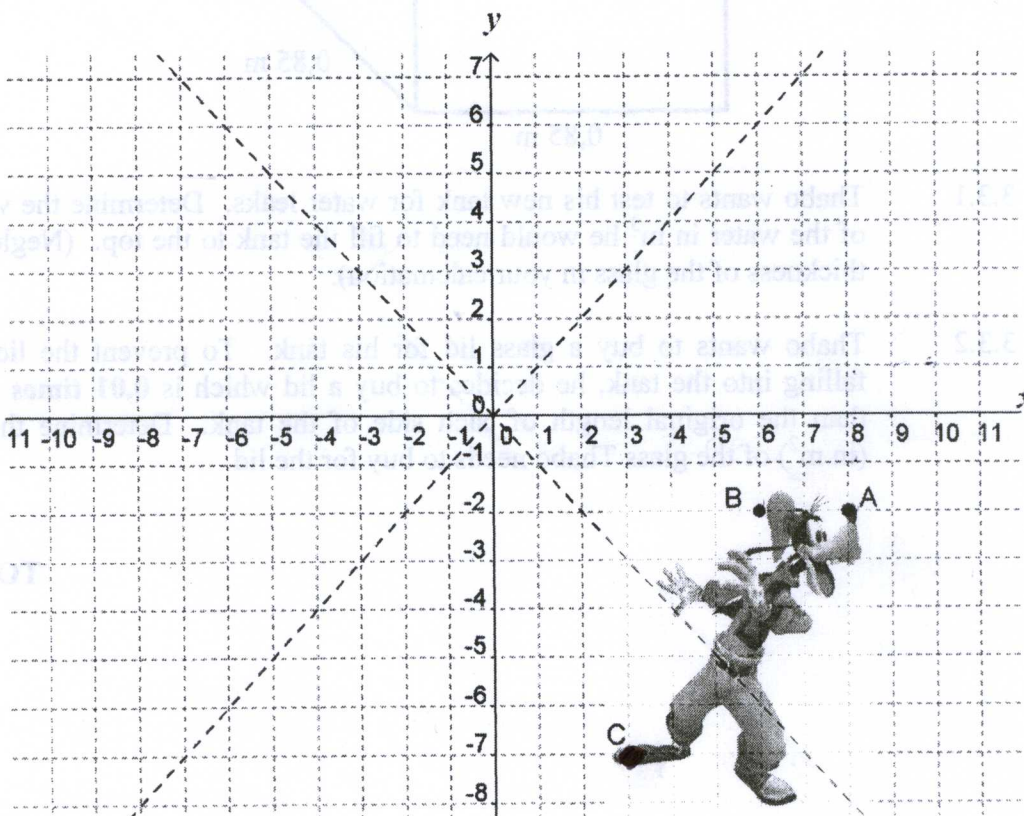
3.1.1 Prove that the walls AD and DC are at right angles to each other.

(3)



- 3.1.2 Calculate the area of the rectangular room. (5)
- 3.1.3 The owner of the house decides that the rectangular room is too large and he can make two smaller rectangular rooms from this one. He decides to put up a partition in such a way that the two rooms are exactly the same size. Determine the co-ordinates of the end points of the partition. (4)

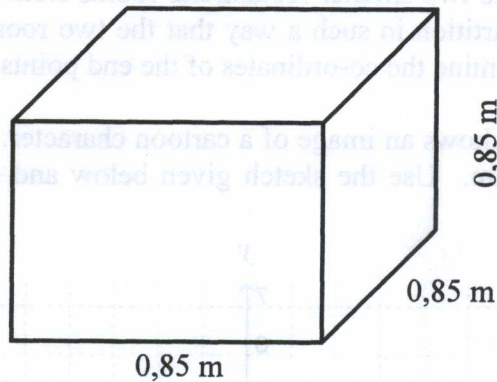
3.2 The following diagram shows an image of a cartoon character. Three points A, B and C are found on the diagram. Use the sketch given below and answer the questions that follow.



- 3.2.1 What would be the co-ordinates of point A if it were translated 3 units up and 2 units to the right? (2)
- 3.2.2 What would be the co-ordinates of point B if it were reflected about the line  $y = -x$ ? (2)
- 3.2.3 What would be the co-ordinates of point A if it is reflected about the  $y$ -axis? (2)
- 3.2.4 What would be the co-ordinates of point C if it is reflected about the line  $y = x$ ? (2)



3.3 Thabo has glued together five square pieces of glass to build a fish tank which is open at the top. The length, breadth and height of the tank are all 0,85 m. The completed fish tank is shown below.



3.3.1 Thabo wants to test his new tank for water leaks. Determine the volume of the water in  $m^3$  he would need to fill the tank to the top. (Neglect the thickness of the glass in your calculation). (5)

3.3.2 Thabo wants to buy a glass lid for his tank. To prevent the lid from falling into the tank, he decides to buy a lid which is **0,01 times** longer than the original length of each side of the tank. Determine the area (in  $m^2$ ) of the glass Thabo needs to buy for the lid. (5)

[30]

**TOTAL: 100**



## FORMULAE SHEET

$$1) A_{\text{square}} = l \times l = l^2$$

$$2) A_{\text{rectangle}} = l \times w$$

$$3) A_{\text{triangle}} = \frac{1}{2} b \times h$$

$$4) A_{\text{circle}} = \pi r^2$$

$$5) C = 2\pi r$$

$$6) \text{Area of parallelogram} = \text{base} \times \text{perpendicular height}$$

$$7) A_{\text{hexagon}} = \frac{3\sqrt{3}}{2} L^2$$

$$8) A_{\text{hexagon}} = \frac{\sqrt{3}}{2} W^2$$

$$9) A_{\text{cylinder}} = 2\pi r(h + r)$$

$$10) \text{Volume} = \text{Area of base} \times \text{perpendicular height}$$

$$11) \text{Total surface area of a triangular prism} =$$

$$(\text{height of prism} \times \text{perimeter of base}) + 2(\text{area of base})$$

$$12) m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$13) D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$14) M = \left( \frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2} \right)$$

$$15) \theta = \tan^{-1} m$$

$$16) \bar{x} = \frac{\sum_{i=1}^n x_i}{n} \quad \text{or} \quad \text{Mean} = \frac{\text{total or sum of all items}}{\text{number of items}}$$

$$17) R = X_n - X_1 \quad \text{or} \quad \text{Range} = \text{highest value} - \text{lowest value}$$



18)  $\bar{x} = \frac{\sum f_i x_i}{n}$

19)  $Q_{j \text{ position}} = \frac{j}{4}(n+1)$

20) Inter-quartile range = upper-quartile – lower-quartile =  $(Q_3 - Q_1)$

21) Semi inter-quartile range =  $\frac{1}{2}$  (upper-quartile – lower-quartile) =  $\frac{Q_3 - Q_1}{2}$

22)  $P_{j \text{ position}} = \frac{j}{100}(n+1)$

