

**higher education  
& training**

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL CERTIFICATE (VOCATIONAL)**

**MATHEMATICS  
(PAPER 2)  
NQF LEVEL 3**

**NOVEMBER 2011**

**(10501053)**

**10 November (X-Paper)  
09:00 – 12:00**

**Requirements: Scientific calculator**

**This question paper consists of 7 pages, 2 Annexure and a 1 page formula sheet.**



**TIME: 3 HOURS**  
**MARKS: 100**

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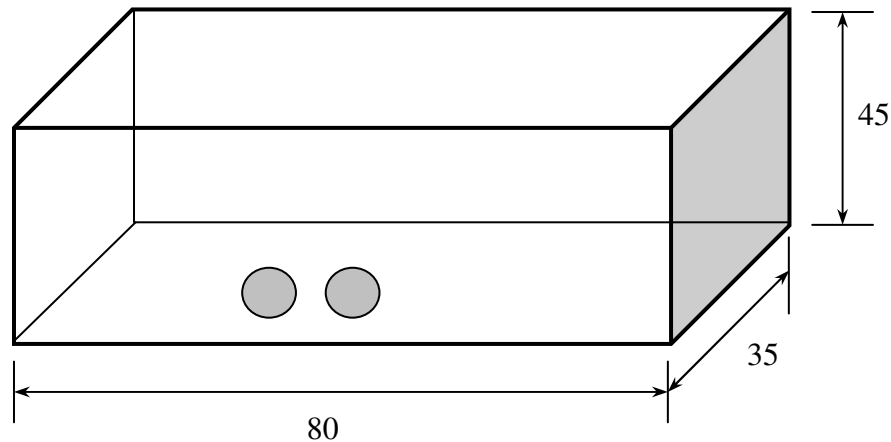
**INSTRUCTIONS AND INFORMATION**

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. Write neatly and legibly.
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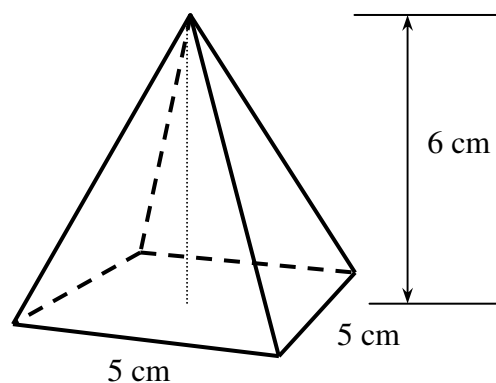


**QUESTION 1**

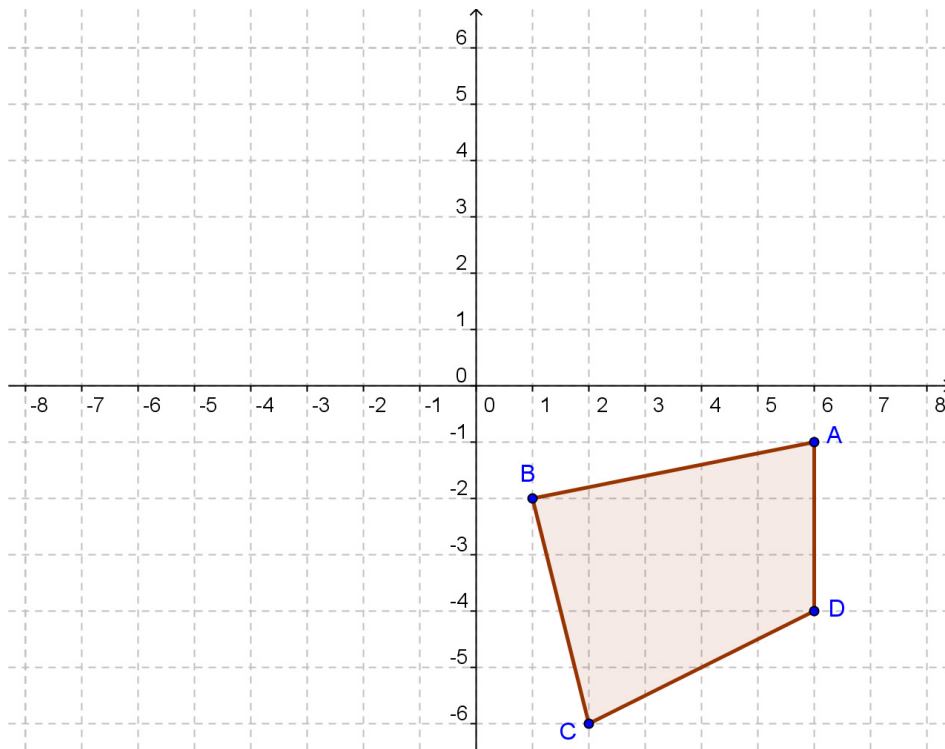
- 1.1 An open rectangular fish tank, 80 cm long, 35 cm wide and 45 cm high is initially full of water. John puts 30 marbles, each with a diameter of 1 cm, into the tank resulting in some of the water spilling over the fish tank.



- 1.1.1 Determine the initial volume (in  $cm^3$ ) of the water in the tank (2)
- 1.1.2 Calculate the volume (in  $cm^3$ ) of 1 marble (2)
- 1.1.3 Calculate the volume (in  $cm^3$ ) of the water that spilled over the edges of the tank after all the marbles have been added in. (2)
- 1.1.4 John also places in the tank a water feature in the shape of a square pyramid with a side length of 5 cm and vertical height of 6 cm. Determine the volume occupied by this water feature. (3)



- 1.2 Given below is a polygon with vertices A (6; -1); B (1; -2), C (2; -6) and D (6; -4).



Use ANNEXURE A to draw the polygon after it is rotated through  $180^\circ$  about the origin. (4)

- 1.3 Simplify:  

$$\frac{\cos(90^\circ - x) \cos(360^\circ - x) \tan x}{\sin(90^\circ - x) \cos(180^\circ + x) \tan(180^\circ + x)}$$
 (4)

- 1.4 Prove, without the use of a calculator, that:

$$\sin(-60^\circ) \cdot \tan 120^\circ + \cos 135^\circ \cdot \sin 225^\circ = 2 \quad (5)$$

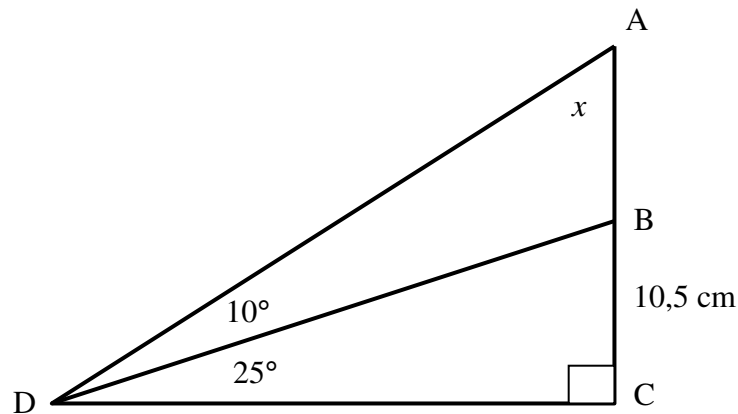
- 1.5 Make use of trigonometric identities to prove the following:

$$\frac{\sin x}{1 + \cos x} - \frac{1 - \cos x}{\sin x} = 0 \quad (5)$$

- 1.6 Determine the value/s of  $\theta$  in the following equation, if  $0^\circ \leq \theta \leq 360^\circ$ :

$$\sin \theta + \sqrt{2} = -\sin \theta \quad (5)$$

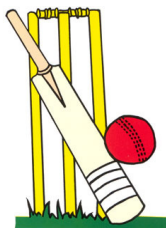
- 1.7 In the figure below,  $\hat{ACD} = 90^\circ$ ,  $\hat{ADB} = 10^\circ$ ,  $\hat{BDC} = 25^\circ$  and  $BC = 10,5$  cm.  
Let  $\hat{DAB} = x$



- 1.7.1 Calculate the value of  $x$ . (1)
- 1.7.2 Determine the length of DB (3)
- 1.7.3 Determine the length of AB. (4)
- [40]**

## QUESTION 2

- 2.1 Given below are the scores of batting legend Sachin Tendulkar for the last 9 matches he played.



27	103	105
107	110	112
122	138	194

- 2.1.1 Determine the median score. (2)
- 2.1.2 Determine the first quartile ( $Q_1$ ) and the third quartile ( $Q_3$ ). Hence write down the value of the inter-quartile range (IQR). (3)
- 2.1.3 Determine the upper and the lower fence values. (4)
- 2.1.4 Construct a box and whisker diagram for the above information showing any outliers. (6)

2.2 Consider the following table:

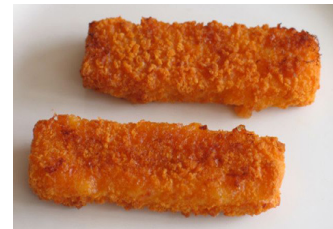
CLASS INTERVALS	FREQUENCY	<CUMULATIVE FREQUENCY
< 20	0	0
20 – 29	10	10
30 – 39	17	27
40 – 49	6	33
50 – 59	12	45
60 - 69	15	60

2.2.1 Use the table given above to sketch the ogive curve. Use ANNEXURE A to sketch the ogive curve. (6)

2.2.2 Use the Ogive curve obtained in QUESTION 2.2.1 to determine the interquartile range. (5)

2.3 Fish-fingers from Sea Harvest are made in Saldana. Special care is taken to ensure that each fish-finger is of the correct mass. The recommended mass of a fish-finger is 48g. A sample of 8 fish-fingers was weighed and the masses (in grams) were recorded as shown in the table given below.

53	48	51	49
57	60	47	51



Determine the standard deviation of the above data.

(7)  
[33]

### QUESTION 3

3.1 Ashley invests R 12000 into a saving scheme which offers interest at a rate of 7,25 % per annum. Determine the interest that is earned on that investment if he invests for a period of 3 years compounded annually. (4)

3.2 Andrea is planning her daughter's 21<sup>st</sup> birthday party. She needs R 21000 for the party. She has two options available to her.

OPTION A: She could borrow the money from the bank which charges her interest at a rate of 9 % compound interest, compounded quarterly for a period of 3 years.

OPTION B: She could borrow the money from her mother-in-law who charges her interest at a rate of 10% per annum, compounded semi-annually for a period of 3 years.

Which of the two options would be financially more feasible for Andrea?

(7)

- 3.3 Tebogo deposited R 5000 into a savings account. The bank offered him an interest rate of 8% p.a. for the first two years, and 10% p.a. for the next three years compounded annually. At the end of the first year he deposited an additional amount of R 2000 and at the end of the fourth year he deposited another R 1000. Show the time line for the above investment and determine the value of the investment after 5 years. (9)
- 3.4 Nombuso is the financial secretary for the local Church ladies club. Use the information presented to complete the income and expenditure statement for the club.

**INCOME:**

Balance brought forward: R 3 200  
 Contribution from Church Board: R 2400  
 Fund raising: R 1100  
 Sponsors from local business: R 800

**EXPENSES:**

Gifts to Orphanage: R 1400  
 Trip to Tongaat: R 2000  
 Catering for the trip: R 1000  
 Purchasing Bibles: R 1400

Use Annexure A to complete the income and expenditure statement given below:

<b>INCOME AND EXPENDITURE: LADIES CLUB</b>	
<b>INCOME</b>	<b>AMOUNT</b>
Balance brought forward	R 3200
*	*
Fund raising	R 1100
*	*
<b>TOTAL INCOME</b>	
<b>EXPENDITURE</b>	<b>AMOUNT</b>
Gifts to Orphanage	R 1400
Trip to Tongaat	R 2000
*	*
*	*
<b>TOTAL EXPENDITURE</b>	*
<b>SURPLUS/DEFICIT</b>	*

(7)  
[27]

**TOTAL: 100**



**FORMULAE SHEET**

1. Slant surface area of a pyramid =  $\frac{1}{2} a l n$
2. Area of curved surface of a cone =  $\pi r l$
3. Circumference of circle =  $2\pi r$
4. Slant height of a cone =  $l = \sqrt{h^2 + r^2}$
5. Volume of a sphere =  $V = \frac{4}{3} \pi r^3$
6. Area of a sphere =  $A = 4\pi r^2$
7. Volume of a pyramid =  $\frac{1}{3} (\text{area of base}) \times \perp \text{ height}$
8. Volume of cone =  $V_{\text{cone}} = \frac{1}{3} \pi r^2 h$
9.  $m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$
10.  $(x_m ; y_m) = \left( \frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2} \right)$
11. Distance =  $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
12.  $\frac{\sin \theta}{\cos \theta} = \tan \theta$
13.  $\frac{\cos \theta}{\sin \theta} = \cot \theta$
14.  $\sin^2 \theta + \cos^2 \theta = 1$
15.  $1 + \tan^2 \theta = \sec^2 \theta$
16.  $1 + \cot^2 \theta = \operatorname{cosec}^2 \theta$
17.  $\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$
18. fence =  $Q_3 + 1,5(IQR)$
19. fence =  $Q_1 - 1,5(IQR)$
20. variance =  $s^2 = \frac{\sum (x_i - \bar{x})^2}{n}$
21. standard deviation (population) =  $s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$  and for sample,  $s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}}$
22.  $I = A_0 \times \frac{r}{100} \times t$  or  $I = \frac{P r t}{100}$  or  $A_t = P(1 + in)$
23.  $A_t = A_0 \left( 1 + \frac{r}{100 \times m} \right)^{t \times m}$  or  $A_t = P(1 + i)^n$
24.  $A_t = A_0 \left( 1 - \frac{r}{100} \right)^t$  or  $A_t = P(1 - i)^n$
25.  $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$
26.  $a^2 = b^2 + c^2 - 2bc \cos A$
27.  $A = \frac{1}{2} ab \sin C$



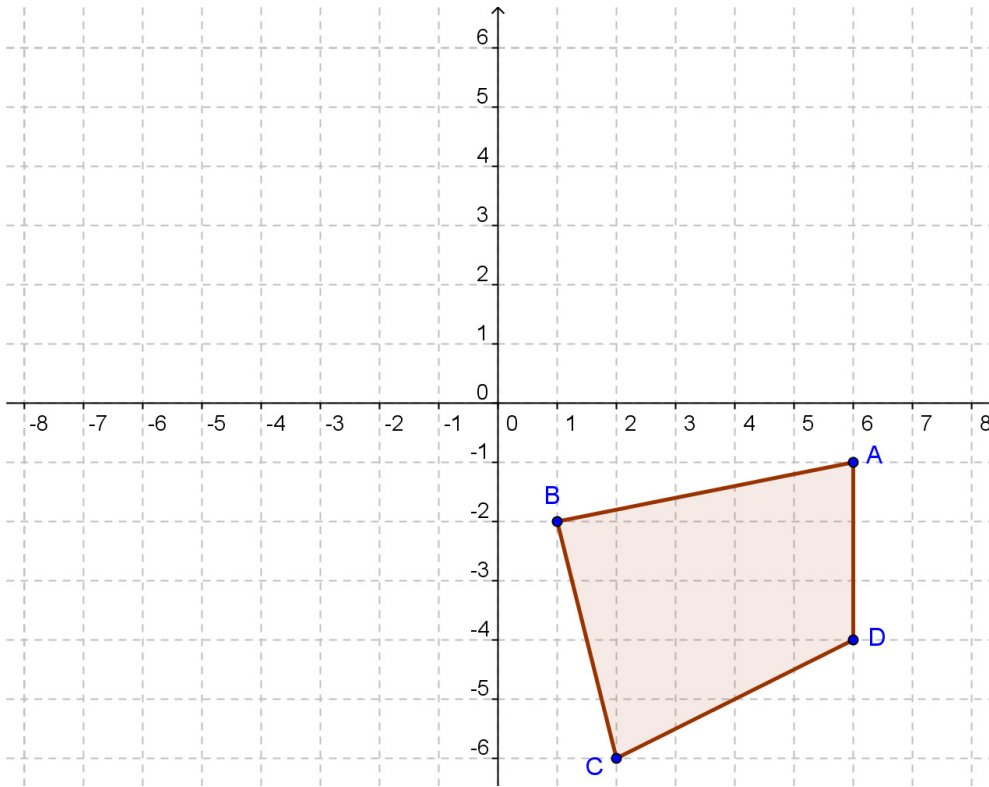
**ANSWER SHEET**

**EXAMINATION NUMBER:**

**ANNEXURE A**

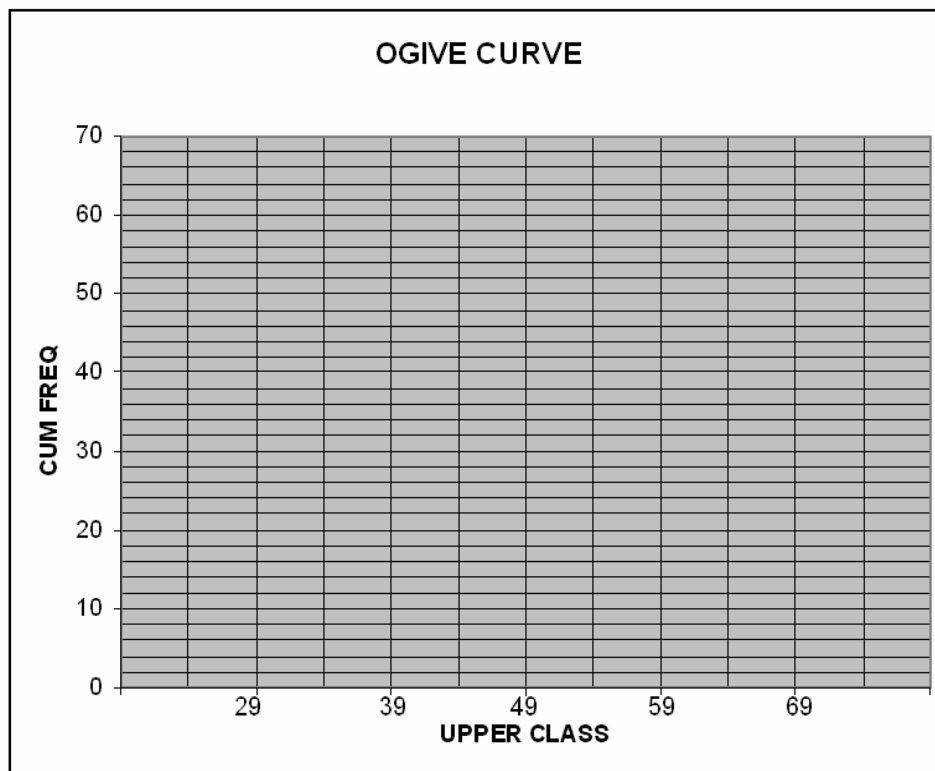
Detach ANNEXURE A and hand it in with your answer booklet.

1.2



(4)

2.2.1



(6)



ANSWER SHEET

EXAMINATION NUMBER:

**ANNEXURE B**

Detach ANNEXURE B and hand it in with your answer booklet.

3.4

<b>INCOME AND EXPENDITURE: LADIES CLUB</b>	
<b>INCOME</b>	<b>AMOUNT</b>
Balance brought forward	R 3200
*	*
Fund raising	R 1100
*	*
<b>TOTAL INCOME</b>	
<b>EXPENDITURE</b>	<b>AMOUNT</b>
Gifts to Orphanage	R 1400
Trip to Tongaat	R 8000
*	*
*	*
<b>TOTAL EXPENDITURE</b>	
<b>SURPLUS/DEFICIT</b>	
	*

(7)

