higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

MATHEMATICS

(Second paper)

NQF LEVEL 2

(10501042)

6 November 2024 (Y-paper)
13:00–16:00

Non-programmable scientific calculators and protractors may be used.

This question paper consists of 7 pages, 1 formula sheet and 3 addenda.

023Q2N2406

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
MATHEMATICS
NQF LEVEL 2
(Second paper)
TIME: 3 HOURS
MARKS: 100

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. Start each section on a new page.
5. Use only a black or blue pen.
6. Round off answers to THREE decimal places, unless stated differently.
7. Write neatly and legibly.

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QUESTION 1

1.1 Define the following terms:

1.1.1 Mean

1.1.2 Median

(2 × 2) (4)

1.2 A survey was conducted with 30 boys to determine their favourite sports. The raw data collected from a survey is presented below.

Soccer	Volleyball	Soccer
Tennis	Soccer	Rugby
Soccer	Rugby	Basketball
Volleyball	Soccer	Rugby
Rugby	Tennis	Soccer
Soccer	Basketball	Basketball
Basketball	Soccer	Tennis
Tennis	Rugby	Basketball
Volleyball	Soccer	Soccer
Soccer	Rugby	Soccer

1.2.1 The frequency distribution table below also appears on ADDENDUM A (attached). Use the data to complete the tally and frequency column of the frequency distribution table on ADDENDUM A. (Adhere to the instruction on ADDENDUM A.)

Frequency distribution table: Choice of sport		
Sport	**Tally**	**Frequency**
Basketball		
Rugby		
Soccer		
Tennis	IIII	4
Volleyball		
	TOTAL:	

(5)

1.2.2 Which sport has the most supporters? (1)

1.2.3 Using the information from Question 1.2.1, construct a pie chart that represents the information on ADDENDUM A (attached). All calculated values must be shown in table 1.2.3. (5)

1.2.4 Using the information from Question 1.2.1, construct a bar graph that represents the information on ADDENDUM B (attached). (5)

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1.3 Students struggling with mathematics were assigned to twenty lecturers. The number of students that each lecturer is responsible for is listed below.

63	82	74	99
109	95	66	100
95	68	67	79
70	95	95	84
95	91	90	103

1.3.1 Draw a stem and leaf plot that represents the information above in the ANSWER BOOK. (5)

1.3.2 Determine the mode value (mode) for the data set (2)

1.3.3 Determine the median value for the data set (2)

1.3.4 Calculate the range for the data set (1)

1.4 Use the data below to answer the questions that follow:

27	33	32	17	27	48	67	24	35

1.4.1 Determine the lower quartile (2)

1.4.2 Determine the upper quartile (2)

1.4.3 Determine the interquartile range (2)

1.4.4 Determine the semi-interquartile range (1)

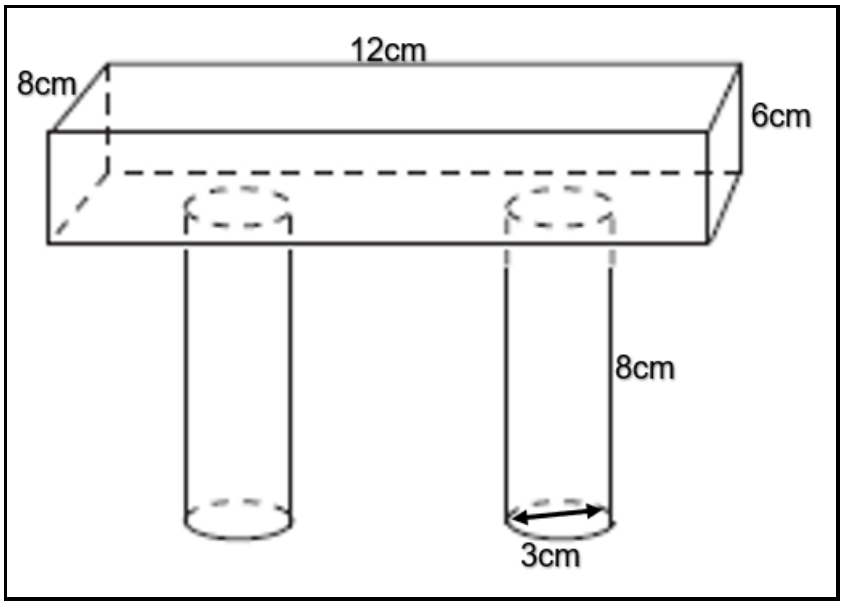
1.4.5 Determine the 75^{th} percentile of the data (3)

[40]

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QUESTION 2

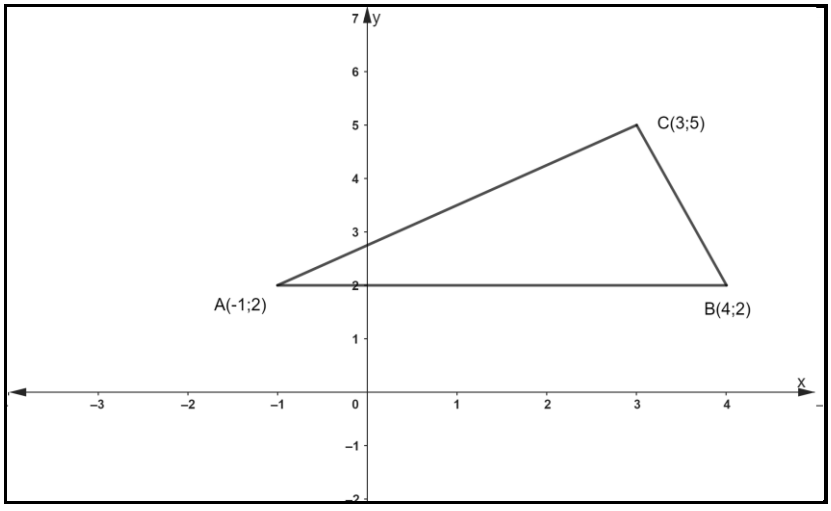
2.1 The sketch below shows a concrete beam in the shape of a rectangular prism with a length of 12 cm, a width of 8 cm and a height of 6 cm. The beam is to rest on two closed cylinders, each having a diameter of 3 cm and a height of 8 cm.



2.1.1 Determine the surface area of one closed cylinder. (3)

2.1.2 Calculate the total volume of concrete needed to make the beam and the pillars. (7)

2.2 The figure below shows ΔABC with vertices $A(-1;\ 2)$, $B(4\ ;\ 2)$ and $C(3;5)$.



2.2.1 Calculate the length of line segment AC (3)

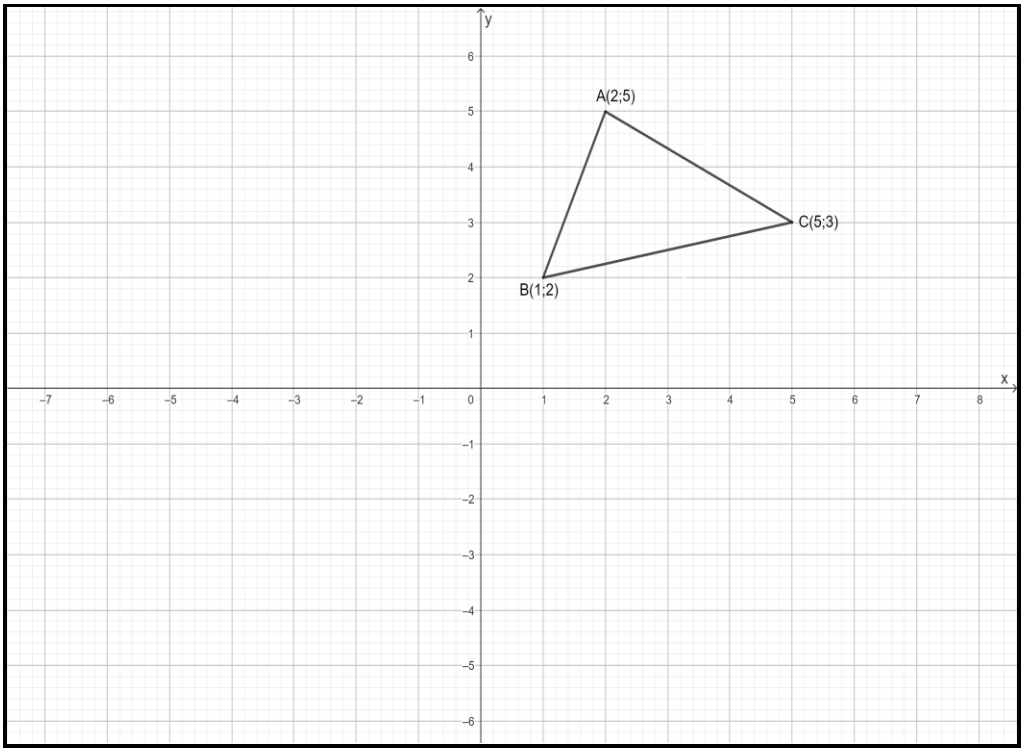
2.2.2 Determine the length of line segment BC (3)

2.2.3 Calculate the co-ordinates of the midpoint of AC (3)

2.2.4 Determine the angle of inclination of line segment AC (5)

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2.3 A triangle with vertices A (2; 5), B (1; 2) and C (5; 3) is shown below.



2.3.1 Determine the co-ordinates of Ḃ if ΔABC is translated 2 *units* down and 1 *unit* to the left (2)

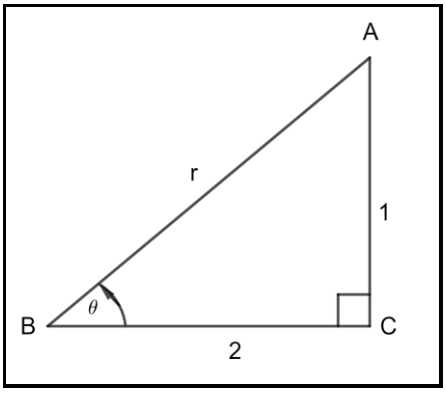
2.3.2 Determine the co-ordinates of Á if ΔABC is reflected about the *y*-axis (2)

2.3.3 Determine the co-ordinates of Ć if ΔABC is reflected about the *x*-axis (2)

[30]

QUESTION 3

3.1 Consider the following diagram. In ΔABC, $AB = r$, $AC = 1$ and $BC = 2$. Determine the values of the following:



3.1.1 $\sin\theta - \cot\theta$ (3)

3.1.2 $3cos^2\theta + cosec\,\theta$ (3)

3.2 Use a calculator to simplify the following:

3.2.1 $cos^2\ 30^o + \sqrt{\tan 45^o} + \sin(60^o + 30^o)$ (3)

3.2.2 $\sin 45^o \div \cos 45^o$ (2)

3.3 Solve for θ, where $\theta \leq 90^o$

3.3.1 $\tan\theta = sin\ 90^o$ (3)

3.3.2 $\dfrac{2}{cosec\ \theta} - 1 = 0$ (3)

3.4 Given $f(x) = 2\cos x$ and $g(x) = \sin x + 1$ where $0^o \leq x \leq 360^o$.

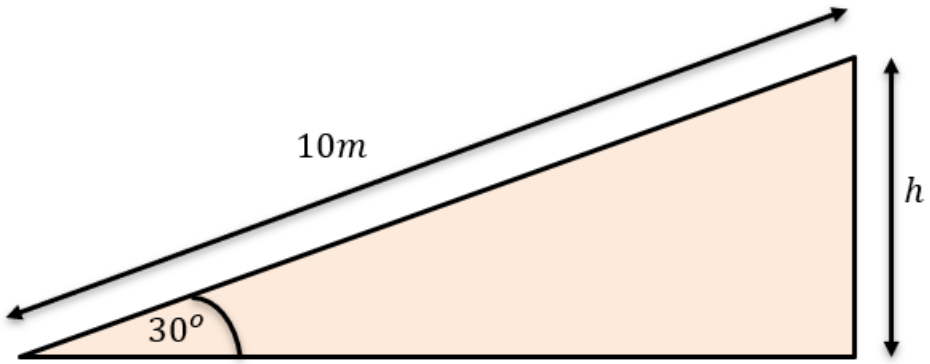
3.4.1 On ADDENDUM C (attached), sketch $f(x)$ and $g(x)$ on the same set of axes. Start by completing the table of values for $f(x)$ and $g(x)$ to help you draw the graphs. (6)

3.4.2 What is the amplitude of $f(x)$? (1)

3.4.3 What is the period of $g(x)$? (1)

3.4.4 What is the range and domain of $g(x)$? (2)

3.5 If an inclined plane has a length of 10 meters and an angle of 30 degrees as shown below,



Calculate the unknown height (h) in the figure given. (3)

[30]

TOTAL: 100

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(10501042)

FORMULA SHEET

1. $A_{square} = l \times l = l^2$
2. $A_{rectangle} = l \times w$
3. $A_{triangle} = \frac{1}{2} b \times h$
4. $A_{circle} = \pi r^2$
5. $C = 2\pi r$
6. $Area\ of\ parallelogram = base\ \times perpendicular\ height$
7. $A_{hexagon} = \frac{3\sqrt{3}}{2} L^2$
8. $A_{hexagon} = \frac{\sqrt{3}}{2} W^2$
9. $A_{cylinder} = 2\pi r(h + r)$
10. $Volume = Area\ of\ base\ \times perpendicular\ height$
11. $V_{cylinder} = \pi r^2 h$
12. $Total\ surface\ area\ of\ a\ triangular\ prism = (height\ of\ prism \times perimeter\ of\ base) + \ \ 2(area\ of\ base)$
13. $m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$
14. $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
15. $M = \left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$
16. $\theta = \tan^{-1} m$
17. $\bar{x} = \sum \frac{f_i x_i}{n}$ ***OR*** $Mean = (tatal\ or\ sum\ of\ all\ items) \div (number\ of\ items)$
18. $R = X_n - X_1$ ***OR*** $Range = highest\ value - lowest\ value$
19. $Q_{jposition} = \frac{j}{4}(n + 1)$
20. $Interquartile\ range = upper\ quartile - lower\ quartile = (Q_3 - Q_1)$
21. $Semi - interquartile\ range = \frac{1}{2}(upper\ quartile - lower\ quartile) = \frac{Q_3 - Q_1}{2}$
22. $P_{jposition} = \frac{j}{100}(n + 1)$

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EXAMINATION NUMBER: | | | | | | | | | | | | | | |

Enter your EXAMINATION NUMBER in the spaces provided above.
Detach the ADDENDUM and hand it in with the ANSWER BOOK.

ADDENDUM A

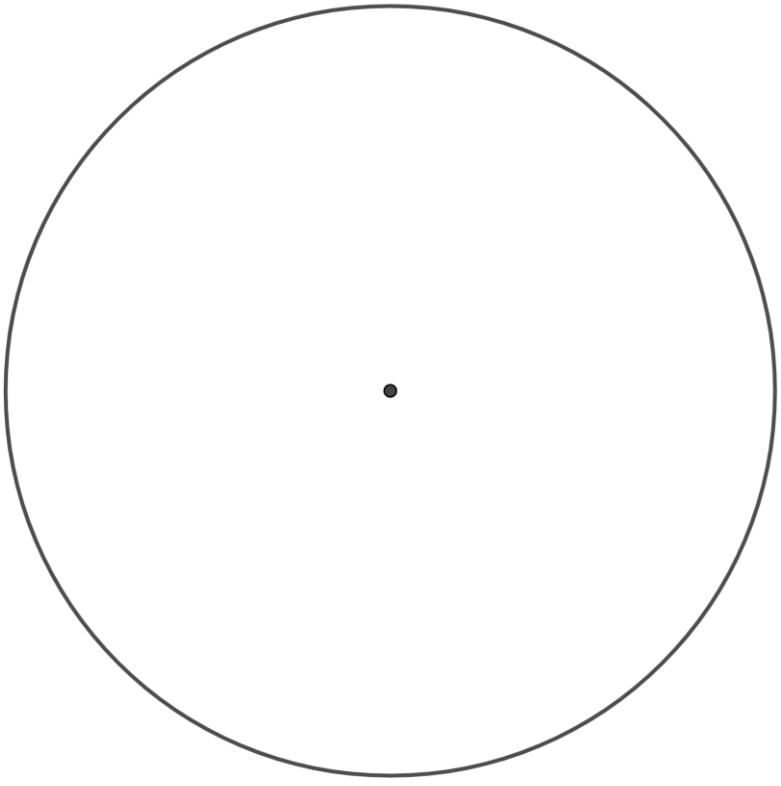
1.2.1

Frequency distribution table: Choice of sport		
Sport	**Tally**	**Frequency**
Basketball		
Rugby		
Soccer		
Tennis	IIII	4
Volleyball		
	TOTAL:	

(5)

1.2.3

Sport	**Frequency**	**%**	**Degrees**
Basketball			
Rugby			
Soccer			
Tennis			
Volleyball			



(5)

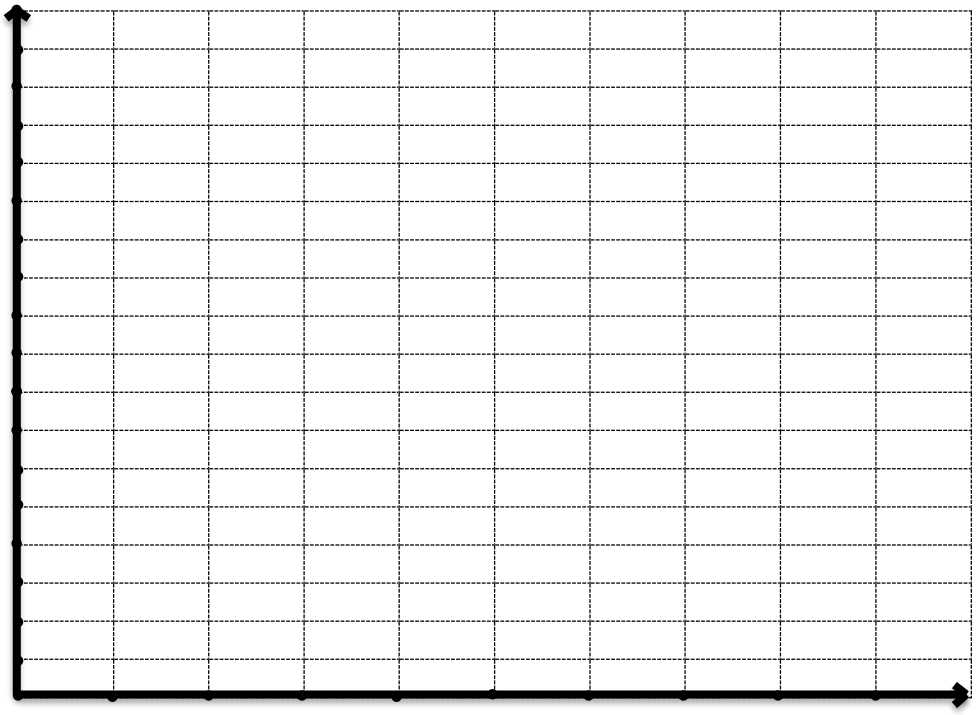
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ADDENDUM B

1.2 1.2.4



(5)

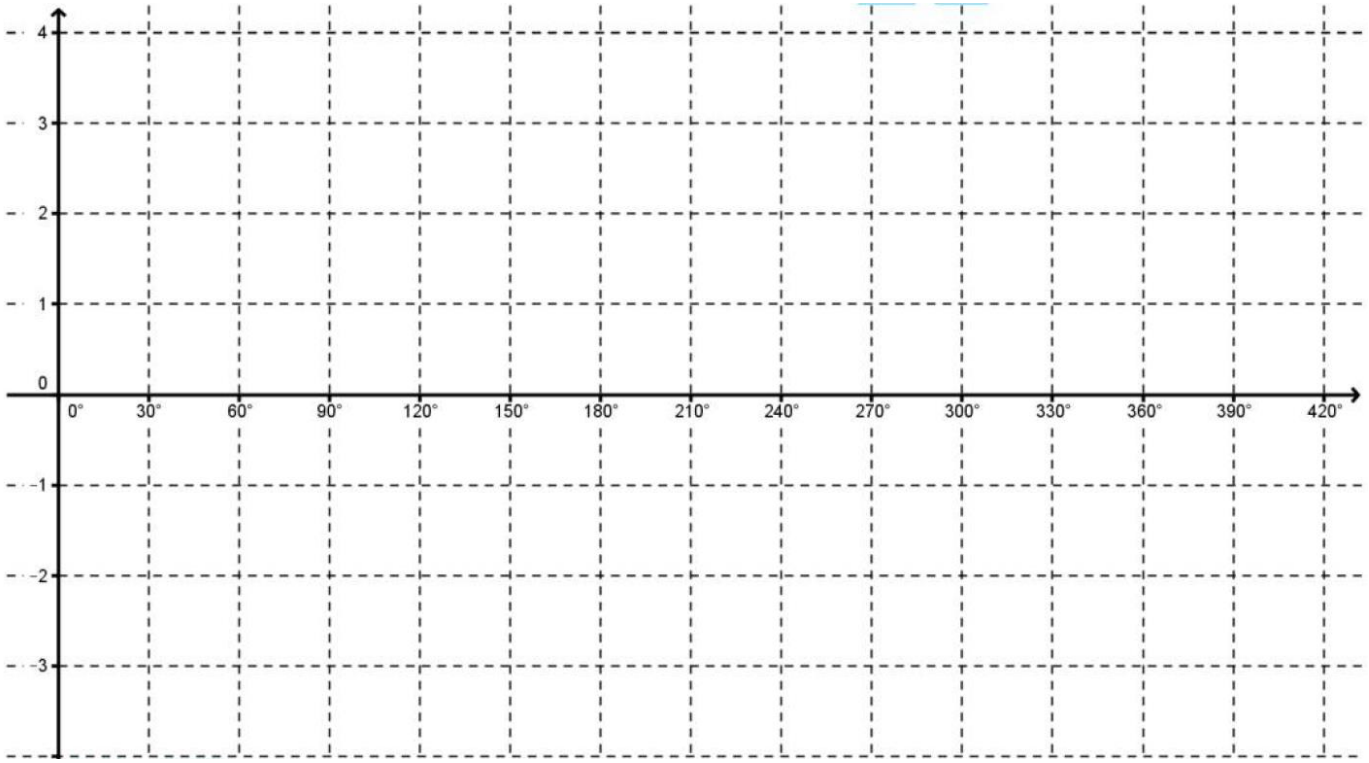
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ADDENDUM C

3.4 3.4.1

x	0^o	30^o	60^o	90^o	120^o	150^o	180^o	210^o	240^o	270^o	300^o	330^o	360^o
$f(x)$													
$g(x)$													



(8)

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