higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# NATIONAL CERTIFICATE (VOCATIONAL)

## MATHEMATICS
(Second paper)
**NQF LEVEL 2**

(10501042)

**25 November 2020 (Y-paper)**
**13:00–16:00**

**A nonprogrammable calculator may be used.**

**This question paper consists of 8 pages, a formula sheet of 2 pages and 3 addenda.**

107Q2N2025

Copyright reserved

**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. Round off the answers to THREE decimal places unless otherwise stated.
5. Write neatly and legibly.

---

Copyright reserved 

## QUESTION 1

1.1 The shirts of the boys in grade 9B of a certain school are the following sizes:

28; 27; 32; 31; 33; 29; 28; 31; 28; 28; 29; 28; 28; 31; 32; 28; 29; 28; 30; 31; 28; 30; 29; 28; 32; 28

1.1.1 How many boys are in grade 9B? (1)

1.1.2 Calculate the mean of the sizes. (2)

1.1.3 Arrange the sizes in ascending order. (2)

1.1.4 Determine the median of the sizes. (2)

1.1.5 Write down the mode of the sizes. (1)

1.2 A researcher analyses data about the people suffering from type A flu virus. The ages are as follows:

60; 80; 75; 87; 88; 49; 94; 84; 59; 43; 56; 86; 82; 62; 51; 79; 89; 78

1.2.1 Construct a stem and leaf diagram. (7)

1.2.2 Write down the minimum age and the maximum age. (2)

1.2.3 Determine the lower quartile ($Q_1$). (2)

1.2.4 Calculate the upper quartile ($Q_3$). (2)

1.2.5 Determine the interquartile range (IQR). (2)

1.2.6 Determine the value for the $70^{th}$ percentile. (2)

1.2.7 Determine the range. (2)

Copyright reserved 

1.3 In a competition at a dog parlour 40 judges voted for their choice of dog breed. The table represents the raw data collected by the adjudicators.

| CHOICE OF DOG BREED | |
|---|---|
| Labrador | Husky |
| Pug | Jack Russel |
| Husky | Labrador |
| Labrador | Jack Russel |
| Husky | Pug |
| Husky | Husky |
| Pug | Fox terrier |
| Labrador | Pug |
| Jack Russel | Fox terrier |
| Pug | Pug |
| Labrador | Husky |
| Husky | Labrador |
| Husky | Labrador |
| Fox terrier | Husky |
| Husky | Jack Russel |
| Jack Russel | Fox terrier |
| Husky | Pug |
| Pug | Husky |
| Labrador | Jack Russel |
| Fox terrier | Husky |







1.3.1 Use the information above and complete the frequency distribution table (tally chart) on the attached ADDENDUM A.
Hand in the ADDENDUM A with the ANSWER BOOK. (5)

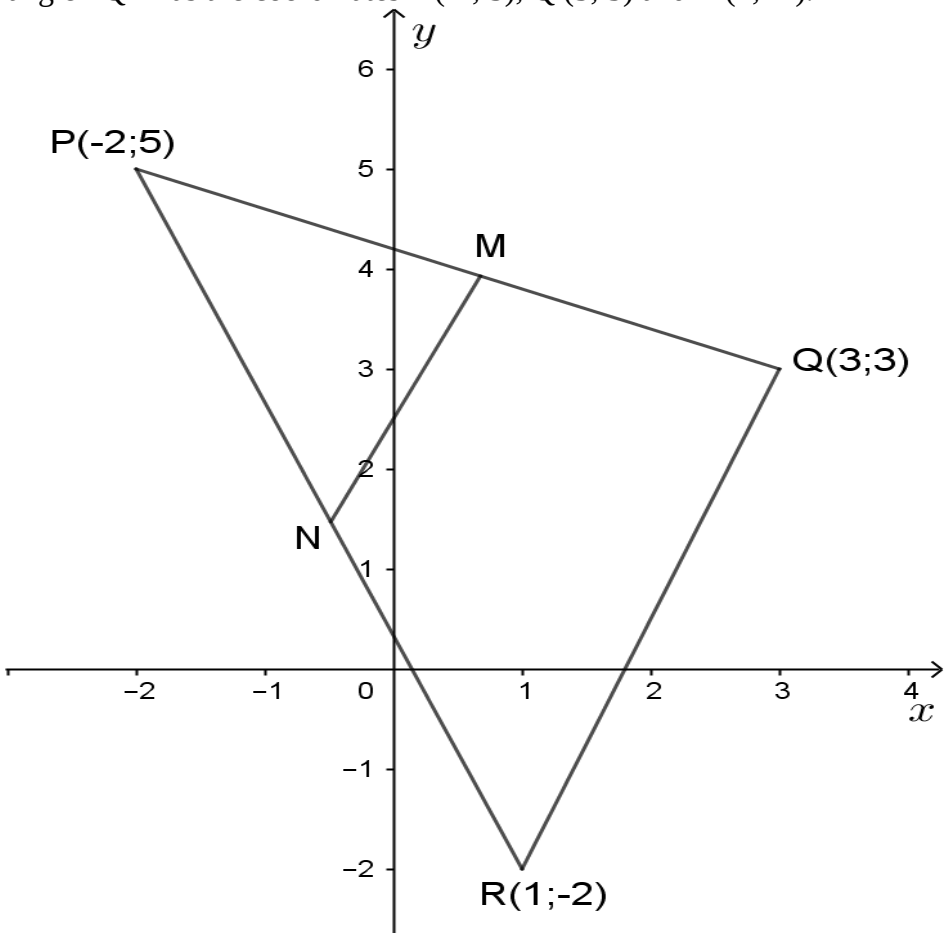
1.3.2 Which dog has been voted as the judge's choice of dog breed? (1)

1.3.3 Construct a pie chart graph on ADDENDUM B that represents the information on the table in QUESTION 1.3.1. Show the calculations for the percentage of each pie area and indicate the dog breed in the relevant area. (7)

**[40]**

**QUESTION 2**

2.1 The triangle PQR has the coordinates P (-2; 5); Q (3; 3) and R (1; -2).




2.1.1 Calculate the lengths of PQ, QR and PR. Answers may be left in surd form. (6)

2.1.2 Calculate M and N which form the midpoints of PQ and PR respectively. (4)

2.1.3 Show that the gradients of MN and QR are equal. (4)

2.1.4 Calculate the area of the triangle if PQR is a right-angled triangle. (2)

2.2 Describe the following transformations:

2.2.1 $A(7 ; -5) \rightarrow A'(9 ; 0)$ (2)

2.2.2 $B(-4 ; 6) \rightarrow B'(4 ; 6)$ (1)

2.2.3 $C(-3 ; -2) \rightarrow C'(-2 ; -3)$ (1)

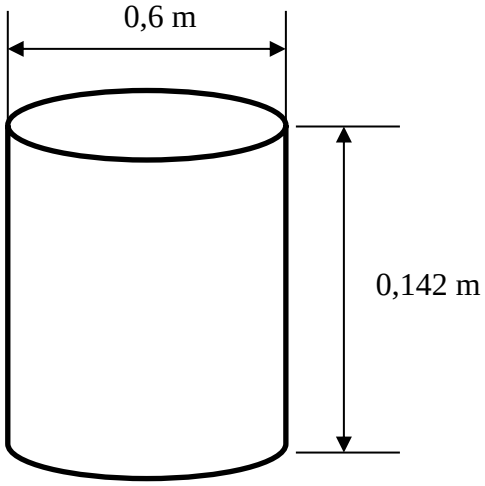
2.2.4 $D(8 ; 1) \rightarrow D'(8; -1)$ (1)

Copyright reserved 

2.3 The perimeter of a rectangle is 42 cm and its breadth is 10 cm.

Calculate the length of the rectangle. (3)

2.4 Zodwa wants to use the metal cylinder below as a pot in which to plant flowers.




Calculate each of the following regarding the cylinder:

2.4.1 Radius (1)

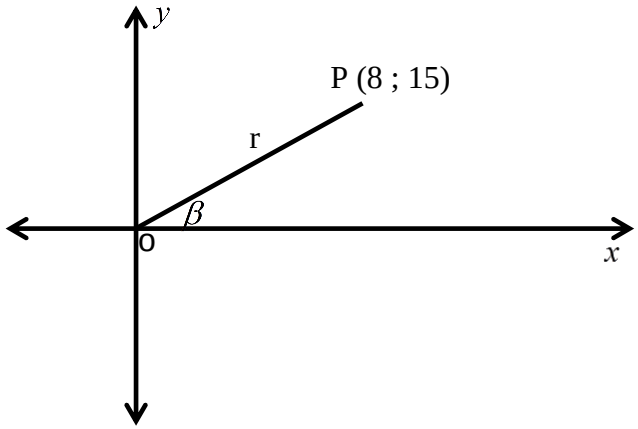
2.4.2 Circumference (2)

2.4.3 Volume (3)

**[30]**

**QUESTION 3**

3.1 Below is a diagram of a Cartesian plane with coordinates P (8 ; 15).




3.1.1 Calculate the distance (r) OP.

Determine each of the following values:

3.1.2 $\cos\beta + \sin\beta$

3.1.3 $\tan\beta \times \cos\beta$

(3 × 2) (6)

3.2 If $\sqrt{3}\tan\alpha - 1 = 0$ and $0° \leq \alpha \leq 90°$, calculate the value of each of the following:

3.2.1 $\cos\alpha$ (3)

3.2.2 $1 + 3\tan^2\alpha$ (2)

3.3 If A = 75° and B = 15°, calculate each of the following using a calculator:

3.3.1 cos (A – B)

3.3.2 sin (A + B) + $\cos^2 0°$ - tan 45°

(2 × 2) (4)

3.4 Solve for $\alpha$ in each of the following using a calculator. Give the answer to one decimal.

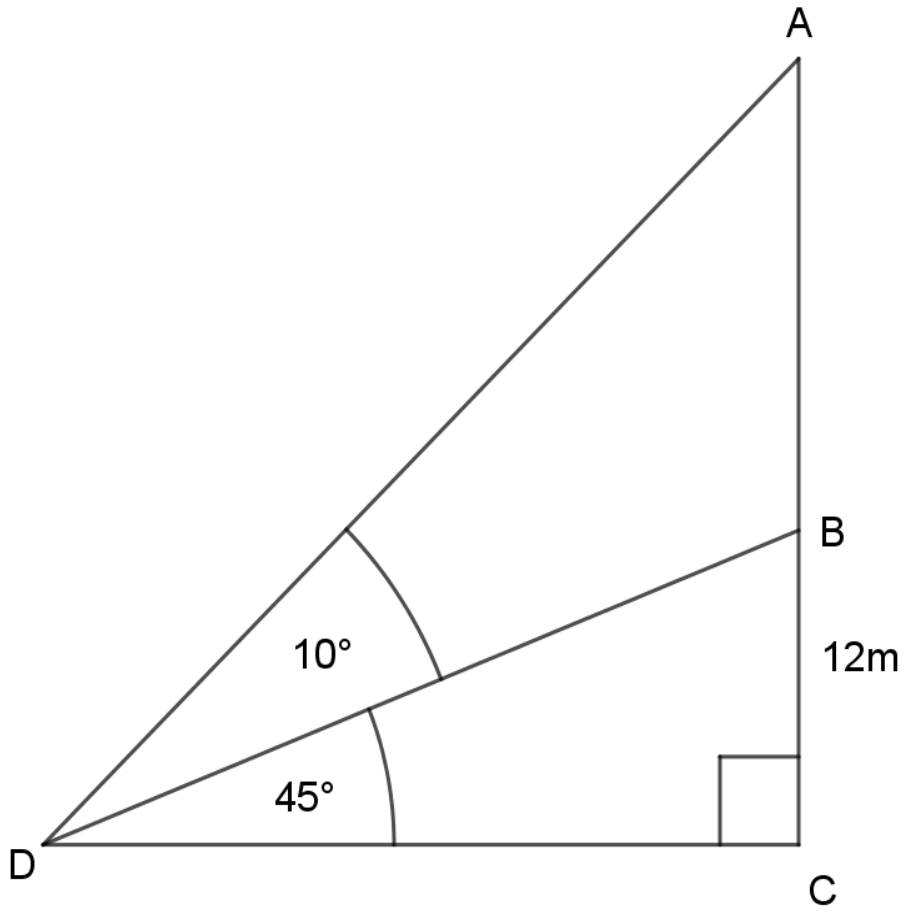
3.4.1 $\cos(\alpha - 20°) = \frac{\sqrt{3}}{2}$

3.4.2 sin $\alpha$ = 0,468

(2 × 2) (4)

Copyright reserved 

3.5 In $\Delta$ ADC below, $\hat{C} = 90^{\circ}$, $A\hat{D}B = 10^{\circ}$, $B\hat{D}C = 45^{\circ}$ and BC = 12 m.




3.5.1 Determine $A\hat{D}C$ (1)

Calculate the length of each of the following sides:

3.5.2 DC (3)

3.5.3 AC (2)

3.5.4 AB (2)

3.6 Use the table and grid in ADDENDUM C (attached) and draw the graph
f(x) = -2cosx + 1; (3)
**[30]**

**TOTAL: 100**

Copyright reserved

**MATHEMATICS L2 P2**

**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 × 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 × perpendicular height

11) Total surface area of a triangular prism = (height of prism × perimeter of base) + 2 (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) $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$ or Mean = $\frac{total\ or\ sum\ of\ all\ items}{number\ of\ items}$

17) $R = X_n - X_1$ or Range = highest value – lowest value

Copyright reserved

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

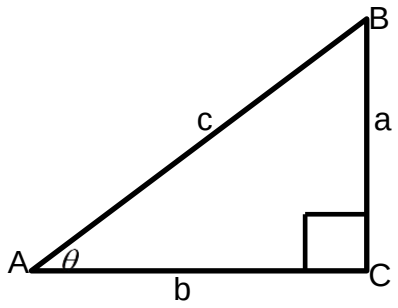
19) $Q_{j\ position} = \dfrac{j}{4}(n+1)$

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

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

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

23) Right-angled triangle




Theorem of Pythagoras:

$$c^2 = a^2 + b^2$$

24) Ratios of angle $\theta$

$\sin\theta = \dfrac{a}{c}$ $\cos\theta = \dfrac{b}{c}$ $\tan\theta = \dfrac{a}{b}$

Copyright reserved

**MATHEMATICS L2 P2**

**ADDENDUM A** **EXAMINATION NUMBER:** | | | | | | | | | | | | | |

**QUESTION 1.3.1**

| DOG BREED | Tally | Frequency |
|---|---|---|
| Labrador | ~~////~~ /// | 8 |
| Husky | | |
| Jack Russel | | |
| Pug | | |
| Fox terrier | | |
| | TOTAL: | |

(5)

**NOTE**: Hand in the completed ADDENDUM A with the ANSWER BOOK.

Copyright reserved 

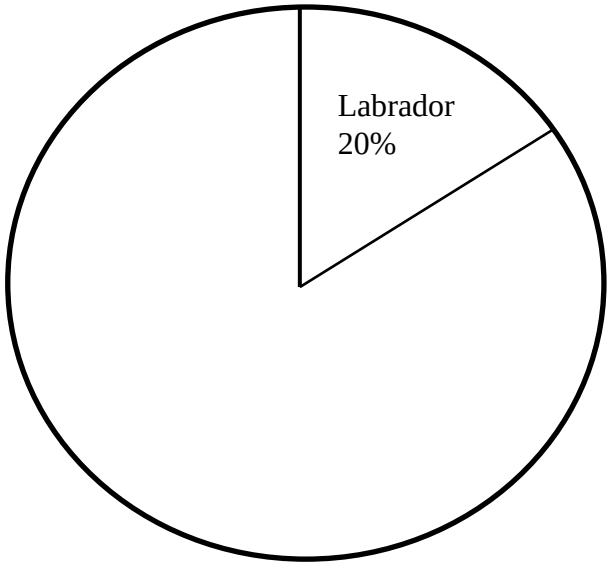
**MATHEMATICS L2 P2**

**ADDENDUM B** **EXAMINATION NUMBER:** | | | | | | | | | | | | | |

**QUESTION 1.3.3**

$$Labrador: \frac{8}{40} \times 360° = 72°$$

$$Percentage = \frac{8}{40} \times 100 = 20\%$$




(7)

**NOTE**: Hand in the completed ADDENDUM B with the ANSWER BOOK.

Copyright reserved 

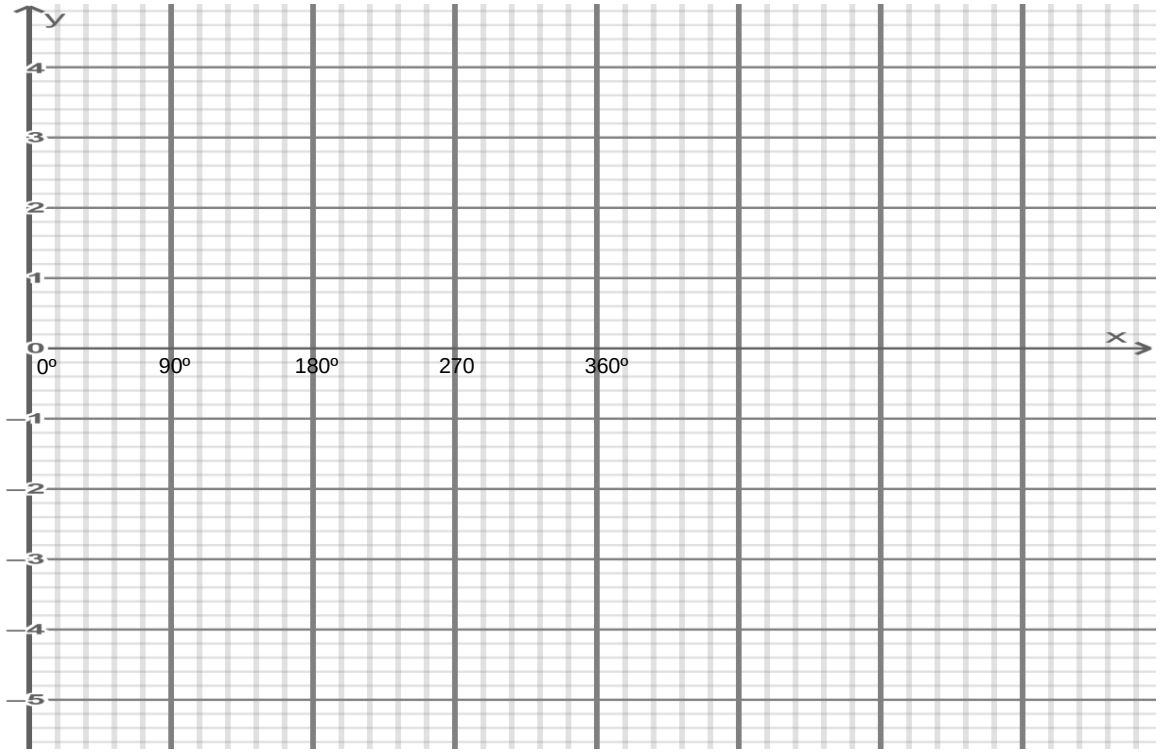
**MATHEMATICS L2 P2**

**ADDENDUM C** **EXAMINATION NUMBER:** | | | | | | | | | | | | | |

**QUESTION 3.6**

| $x$ | 0º | 90º | 180º | 270º | 360º |
|---|---|---|---|---|---|
| $f(x) = -2cosx + 1$ | | | | | |

3.6




(3)

**NOTE**: Hand in the completed ADDENDUM C with the ANSWER BOOK.

Copyright reserved