higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

MATHEMATICS
(Second paper)
NQF LEVEL 2

(10501042)

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

Non-programmable scientific calculators may be used.

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

027Q2S2025

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 otherwise.
7. Write neatly and legibly.

QUESTION 1

1.1 Define the following terminology used in data handling:

1.1.1 Range (2)

1.1.2 Raw data (2)

1.2 The ages of people attending a gymnasium to stay fit are represented as follows:

34; 35; 18; 29; 32; 42; 25; 23; 25; 32; 19; 55; 33; 54; 34; 40; 25; 37; 36; 20

1.2.1 Construct a stem-and-leaf diagram. (5)

1.2.2 Determine the median. (2)

1.2.3 Calculate the mean. (2)

1.2.4 Write down the mode. (1)

1.3 The points scored by a basketball player are represented as follows:

33; 11; 26; 3; 42; 49; 35; 11; 49; 42; 10; 3; 2; 47; 32; 29; 6; 18

1.3.1 Find the range. (2)

1.3.2 Arrange the points in ascending order. (2)

1.3.3 Determine the lower quartile. (2)

1.3.4 Determine the upper quartile. (2)

1.3.5 Find the interquartile range. (2)

1.3.6 Determine the semi-interquartile range. (2)

1.3.7 Determine the 40th percentile. (3)

1.4 A college tuckshop wants to stock fruit and conducts a survey to determine which fruits are most popular among students. A total of 30 students are included with the following results:

Choice of fruit		
Banana	Apple	Banana
Banana	Apple	Apple
Apple	Orange	Orange
Orange	Banana	Apple
Apple	Orange	Apple
Apple	Apple	Apple
Orange	Apple	Orange
Apple	Banana	Apple
Orange	Apple	Banana
Apple	Orange	Orange

1.4.1 Use this data to complete the **Tally** and **Frequency** columns of the frequency distribution table in **ADDENDUM A** (attached).

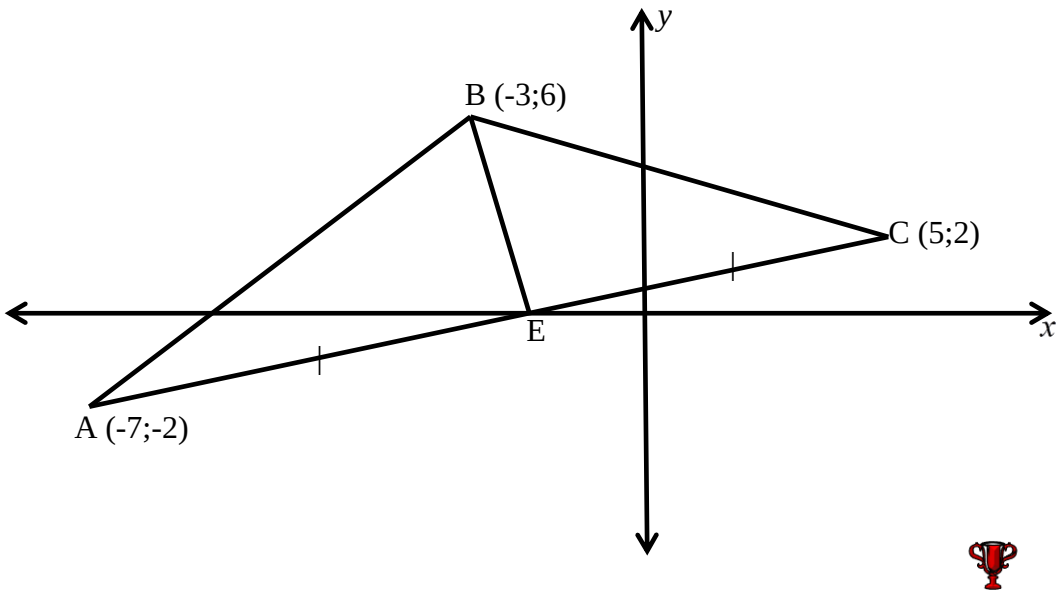
Calculate the percentage of the total for the frequency of each fruit. Show this in the column with the heading "**Percentage Frequency**" in the frequency distribution table in **ADDENDUM A** (attached). (7)

1.4.2 Use the frequency table to construct a pie chart in the pie provided in **ADDENDUM A** (attached). Give a heading in the space provided. (4)

[40]

QUESTION 2

2.1 The vertices of ΔABC are A (-7;-2); B (-3;6) and C (5;2). E is the midpoint of AC.



2.1.1 Calculate the coordinates of E. (2)

2.1.2 Calculate the length of line BC. (3)

2.1.3 Determine the gradient of line BC. (3)

2.2 P (a;-1) and Q (5;3) are two points on a Cartesian plane.

If PQ is 5 units in length, determine the value of a. (4)

2.3 Given ΔDEF with vertices D (2;-7); E (5;-2); F (4;-4).

2.3.1 Find the image of ΔDEF by reflecting about $y = x$. (6)

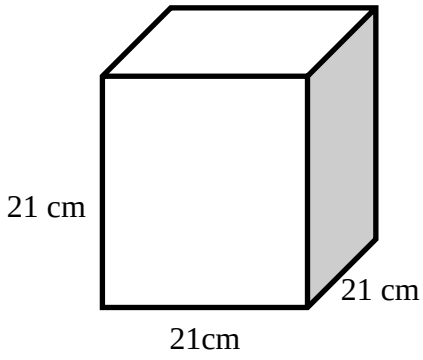
2.3.2 What would the coordinates of E be if it is translated 2 units up and 3 units to the left? (2)

2.4 Write down the rule used for each of the following reflections:

2.4.1 A (5;2) to A′ (2;5) (1)

2.4.2 B (-2;-4) to B′ (2;-4) (1)

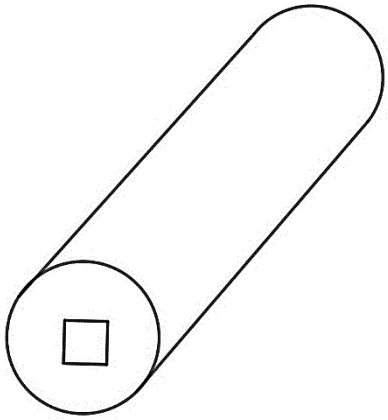
2.5 Given a closed cube with 21 cm sides:



2.5.1 Calculate the volume. (2)

2.5.2 Calculate the total surface area. (2)

2.6 A steel cylinder has a square hole with 4 cm sides bored through it as shown in the diagram below. The diameter of the cylinder is 6 cm and the length of the cylinder is 10 cm.

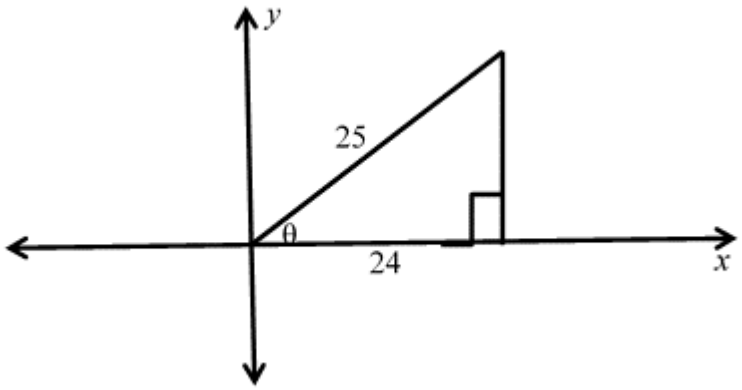


Calculate the volume of the steel required to manufacture the cylinder with a square hole through the cylinder. (4)

[30]

QUESTION 3

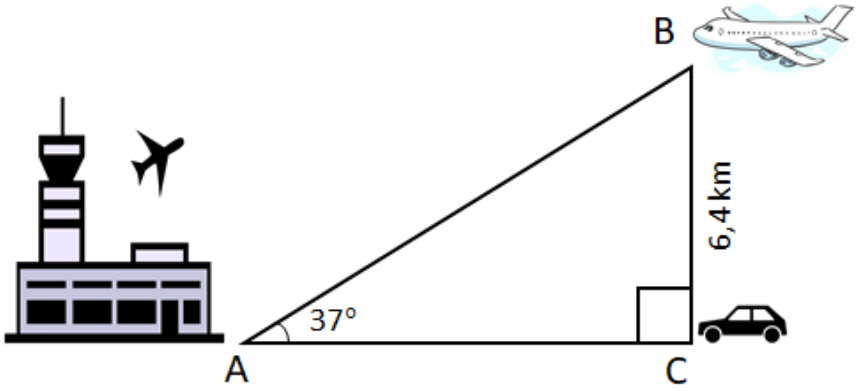
3.1 If $\cos\theta = \frac{24}{25}; 0° \leq \theta \leq 90°$ determine the following:



3.1.1 $\sin\theta$ (3)

3.1.2 $5\cos\theta - 12\tan\theta$ (3)

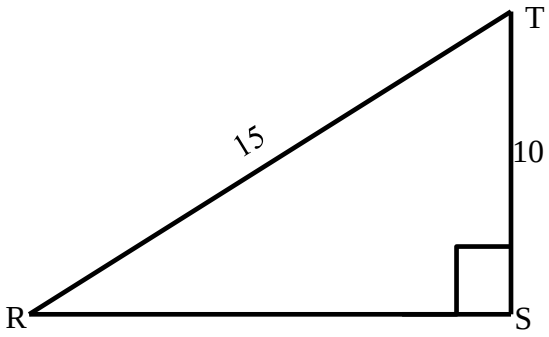
3.2 At a moment in time, a plane in flight is 6,4 km above the ground at point B. The angle of elevation from the airport at point A to the plane at point B is 37°. A car at point C is directly below the plane.



3.2.1 Calculate the distance AB that the plane is from the airport. (3)

3.2.2 Calculate the distance AC that the car is from the airport. (3)

3.3 In triangle RST, RT = 15 units; ST = 10 units; $\hat{S} = 90°$.



3.3.1 What is the name given to the longest side of the right-angled triangle (RT)? (1)

3.3.2 Write down $\cos \hat{T}$ as a ratio in its lowest form. (2)

3.3.3 Calculate $\hat{T}$. (2)

3.3.4 Calculate the length of RS. (3)

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

3.4.1 Write down the range of $f(x)$. (2)

3.4.2 Sketch $f(x)$ and $g(x)$ on the same system of axes on the graph provided in **ADDENDUM B** (attached), using the table provided to first tabulate the values. (8)

[30]

TOTAL: 100

FORMULA 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) Area of parallelogram = base $\times$ 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) Volume = Area of base $\times$ perpendicular height

11) $V_{cube} = l \times l \times l = l^3$

12) $V_{\text{cylinder}} = \pi r^2 h$

13) Total surface area cube = $6 \times l^2$

14) Total surface area triangular prism = (height of prism$\times$perimeter of base) + 2(area of base)

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

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

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

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

19) $\bar{x} = \frac{\sum x_i}{n}$ or Mean $= \frac{\text{total or sum of all items}}{\text{number of items}}$

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

21) $Q_{\text{jposition}} = \frac{j}{4}(n+1)$

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

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

24) $P_{\text{jposition}} = \frac{j}{100}(n+1)$

ADDENDUM A

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

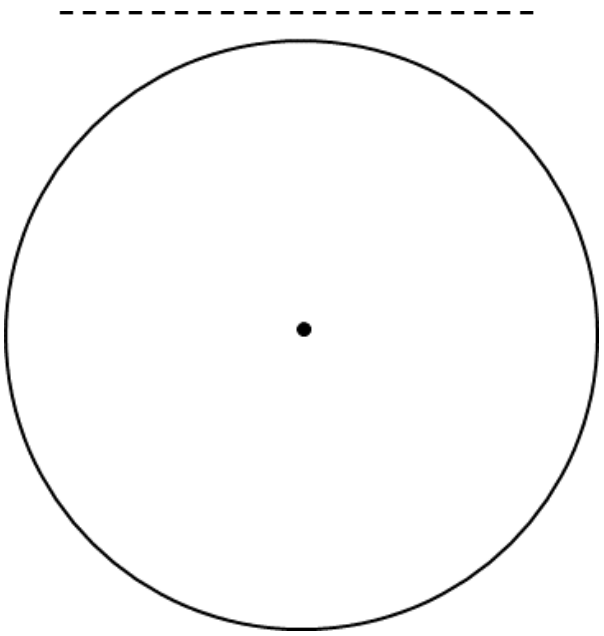
CENTRE NUMBER: | | | | | | | | | |

1.4.1

Fruit	Tally	Frequency	Frequency Percentage
Apples			
Bananas			
Oranges			
Total			100%

(7)

1.4.2



(4)

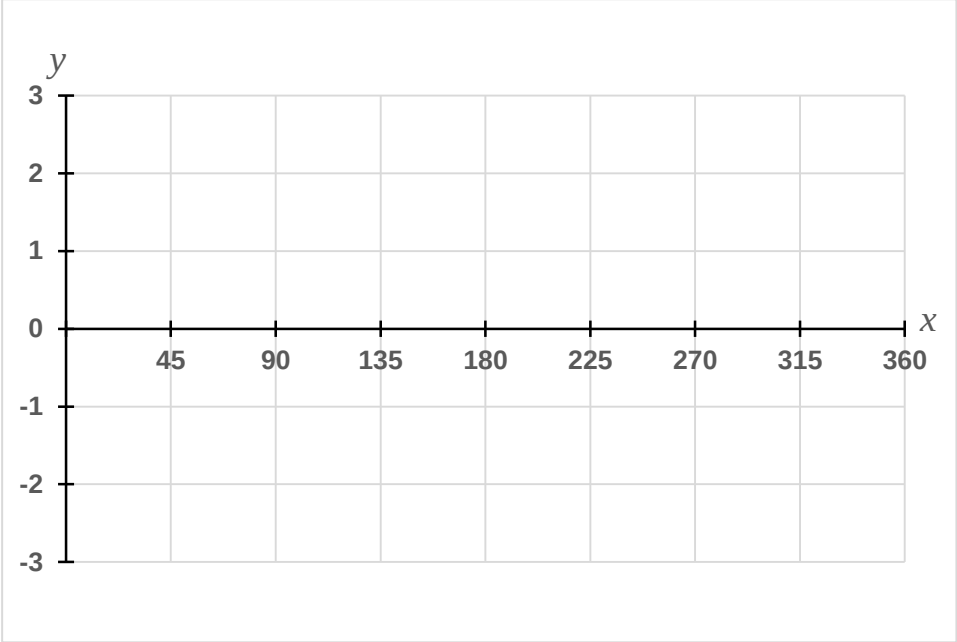
ADDENDUM B

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

CENTRE NUMBER: | | | | | | | | | |

3.5.2

x	0°	45°	90°	135°	180°	225°	270°	315°	360°
$f(x) = 2\sin x$						**-1,4**			
$g(x) = \cos x + 1$						**0,3**			



(8)