higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

MATHEMATICS
(Second Paper)
NQF LEVEL 2

NOVEMBER 2011

(10501042)

9 November (X-Paper)
09:00 – 12:00

REQUIREMENTS: **Scientific calculator**
Protractor

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

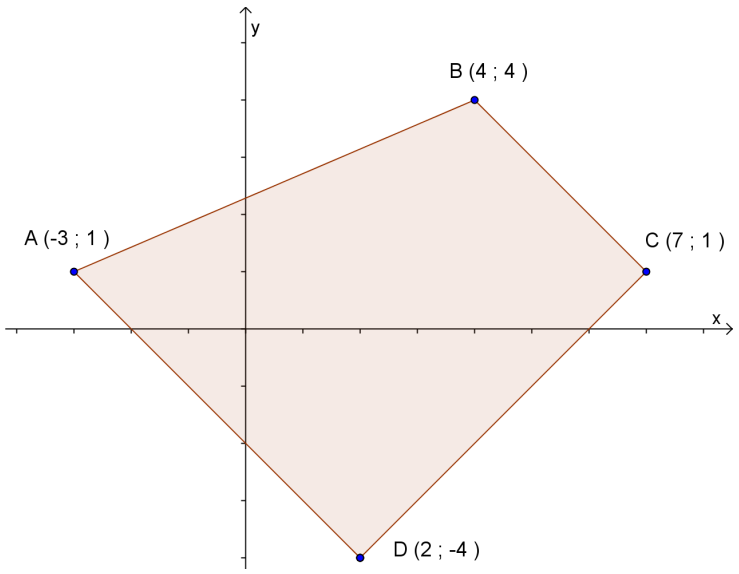
TIME: 3 HOURS
MARKS: 100

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. Clearly show ALL calculations, diagrams, graphs, etc, 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 drawn to scale.
7. Write neatly and legibly.

QUESTION 1

1.1 Given:



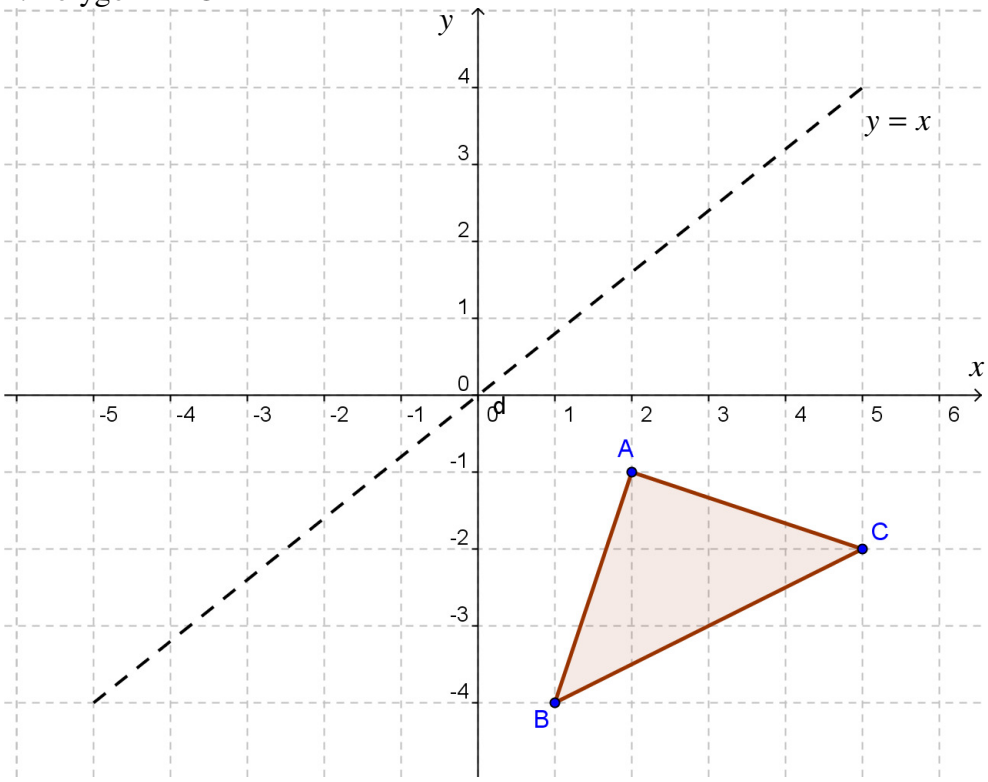
1.1.1 Calculate the distance of line segment AB. (Leave your answer in surd form). (3)

1.1.2 Calculate the co-ordinates of the midpoint (M) of line segment BC. (2)

1.1.3 Prove that $AD \perp DC$. (5)

1.1.4 Determine the angle of inclination of line DC. (2)

1.2 Given: Polygon ABC



1.2.1 What is the mathematical name of polygon ABC? (1)

1.2.2 What would be the co-ordinates of point A if it is translated 2 units up and 3 units to the left? (2)

1.2.3 Use ANNEXURE A and draw the reflected image of polygon ABC if it is reflected about the line $y = x$. (3)

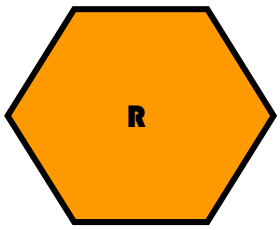
1.3 The manufacturers of Ricoffy have put onto the shelves a new and bigger container. During the packaging process these containers have a water resistant rectangular piece of paper stuck onto the container. A plastic lid is then fitted onto the top of the container. The container can hold a volume of 2654 cm^3 when filled right to the top.

1.3.1 What is the mathematical name for this container? (1)

1.3.2 If the length of this rectangular piece of paper is 40 cm, determine the height of the container. (6)

1.3.3 If the diameter of the lid is 2mm greater than the diameter of the container, determine the diameter of the lid. (2)

1.3.4 The following logo is printed on the rectangular piece of paper.

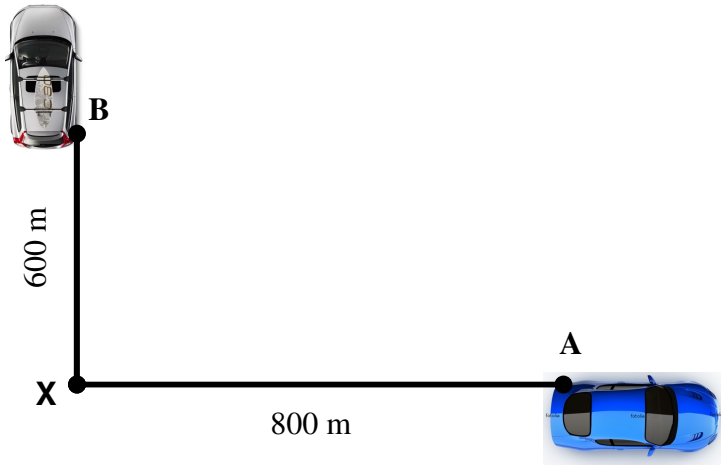


Determine the surface area of the hexagon that is used as the logo of the company if it has a side length of 3 cm. (3)

[30]

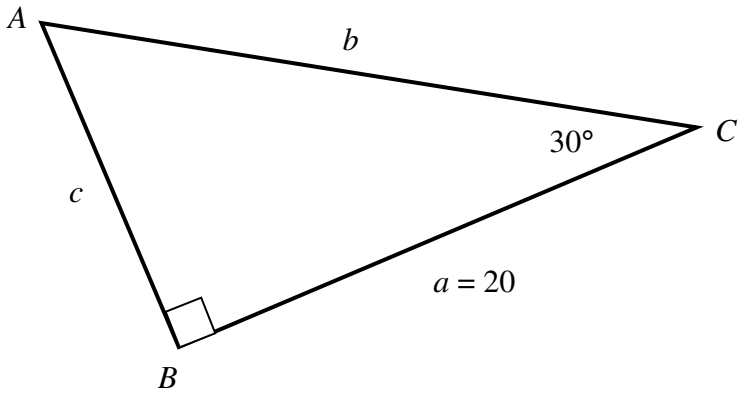
QUESTION 2

2.1 Two cars start at point **X**. Car A travels 800 m due East while Car B travels 600 m due North. Calculate the shortest straight-line distance between the two cars.



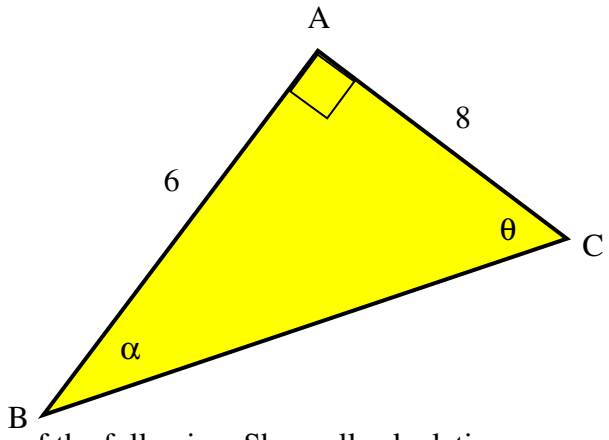
(4)

2.2 Given: ΔABC with $\hat{B} = 90°$ and $a = 20$



Determine the values of b and c. (4)

2.3 Given: ΔABC with $\hat{A}=90°$; $A\hat{B}C=\alpha$ and $A\hat{C}B=\theta$



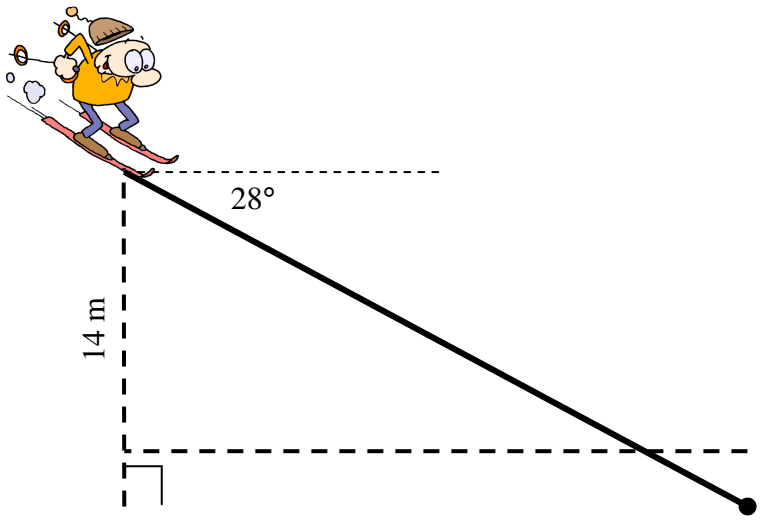
Determine the value of the following. Show all calculations

2.3.1 $\sin\theta$ (2)

2.3.2 $\sin^2\theta+\cos^2\theta$ (3)

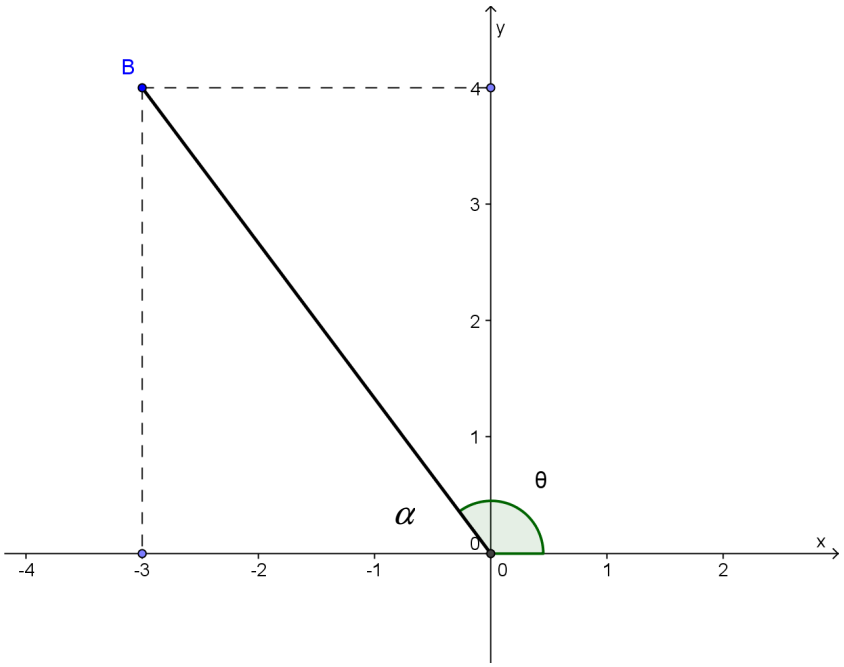
2.3.3 $\dfrac{\sin\alpha}{\cos\alpha}$ (3)

2.4 The angle of depression from the top of a skiing slope to a point at the bottom is 28°. The vertical height of the slope is 14 m. Determine the length of the slope.



(3)

2.5 Given:



If $\tan\theta = -\frac{4}{3}$ and $0° \le \theta \le 180°$

Determine the following:

2.5.1 $\sin\theta \times \cos\theta$ (3)

2.5.2 $(\sin\theta + \cos\theta)^2$ (2)

2.6 Use ANNEXURE A to sketch the following graphs on the same set of axes for $\theta \in [0°;360°]$. For each graph write down any points of intersection

$f(x) = -\sin\theta$ and $g(x) = \cos\theta$ (6)

[30]

QUESTION 3

3.1 Define the following terminology and give one example of each type of data.

3.1.1 Continuous data (2)

3.1.2 Discrete data (2)

3.2 MOTOR QA hosted a competition for the Car of the year 2011. Their 40 judges voted for their choice for the car of the year. Given below is the raw data that was collected by the adjudicator.

CHOICE OF CAR	
BMW	Hyundai
VW Golf	Toyota
Hyundai	BMW
BMW	Toyota
Hyundai	VW Golf
Hyundai	Hyundai
VW Golf	Audi
BMW	VW Golf
Toyota	Audi
VW Golf	VW Golf
BMW	Hyundai
Hyundai	BMW
Hyundai	BMW
Audi	Hyundai
Hyundai	Toyota
Toyota	Audi
Hyundai	VW Golf
VW Golf	Hyundai
BMW	Toyota
Audi	Hyundai

3.2.1 Copy and complete the following frequency distribution table (Tally chart).

Frequency Distribution table: Choice of Car		
Car	Tally	Frequency
BMW	𝍸 |||	8
Hyundai		
Toyota		
VW Golf		
Audi		
	Total:	

(5)

3.2.2 Which car was voted in as the car of the year 2011? (1)

3.2.3 Using the information from QUESTION 3.2.1 construct a pie chart on ANNEXURE B that represents the information. All calculations must be shown. (5)

3.2.4 Using the information from QUESTION 3.2.1 construct a bar graph on ANNEXURE B that represents the information. (4)

3.3 The following data refers to the number of motorists that were given speeding fines for first thirty weeks of the year.

45	68	123	101	55
56	58	115	78	78
60	112	69	75	90
94	68	104	93	99
78	49	60	79	100
80	72	66	82	88

3.3.1 Draw a stem and leaf plot for the information given above. (4)

3.3.2 Determine the modal value (mode) for the data set. (1)

3.3.3 Determine the median value for the data set. (2)

3.3.4 Calculate the range for the data set. (2)

3.4 Given: 6; 14; 17; 19; 17; 8; 11; 16; 26; 11; 13; 6

3.4.1 Determine the mean value for the data set. (3)

3.4.2 Calculate the values for the first quartile (Q_1) and the third quartile (Q_3). (4)

3.4.3 Determine the inter-quartile range (IQR) for the data set. (2)

3.4.4 Determine the value of the 70^{th} percentile (P_{70}). (3)

[40]

TOTAL: 100

Formulae 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

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) = $\dfrac{Q_3 - Q_1}{2}$

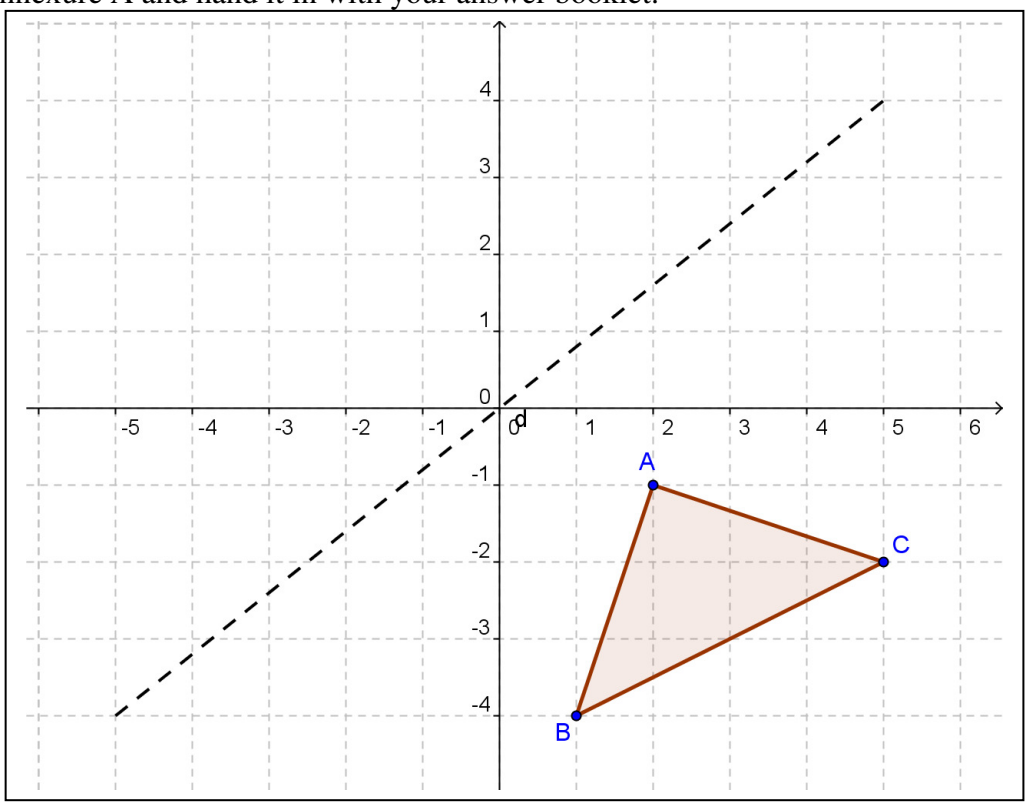
22) $P_{j\ position} = \dfrac{j}{100}(n+1)$

ANNEXURE A

ANSWER SHEET **EXAMINATION NUMBER:**

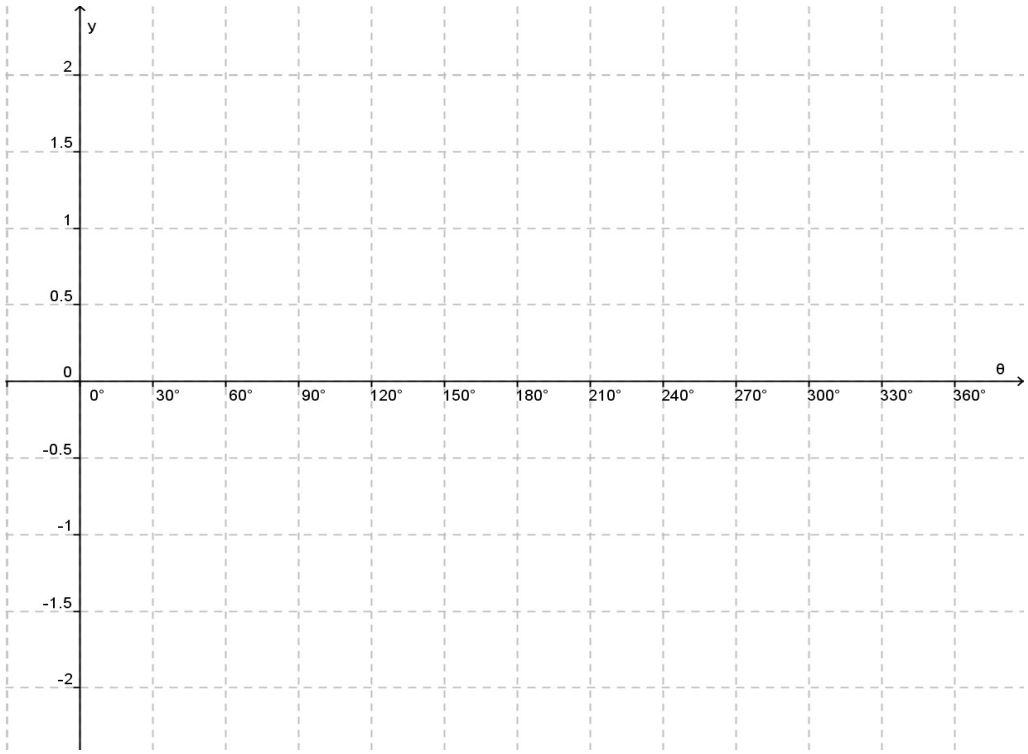
Detach Annexure A and hand it in with your answer booklet.

1.2.3



(3)

2.6



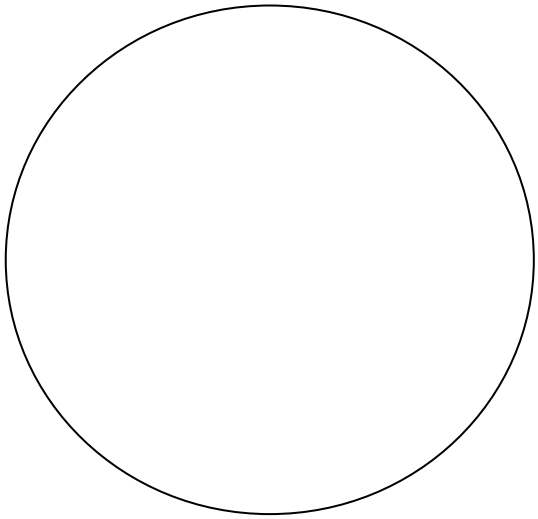
(6)

ANNEXURE B

ANSWER SHEET **EXAMINATION NUMBER:**

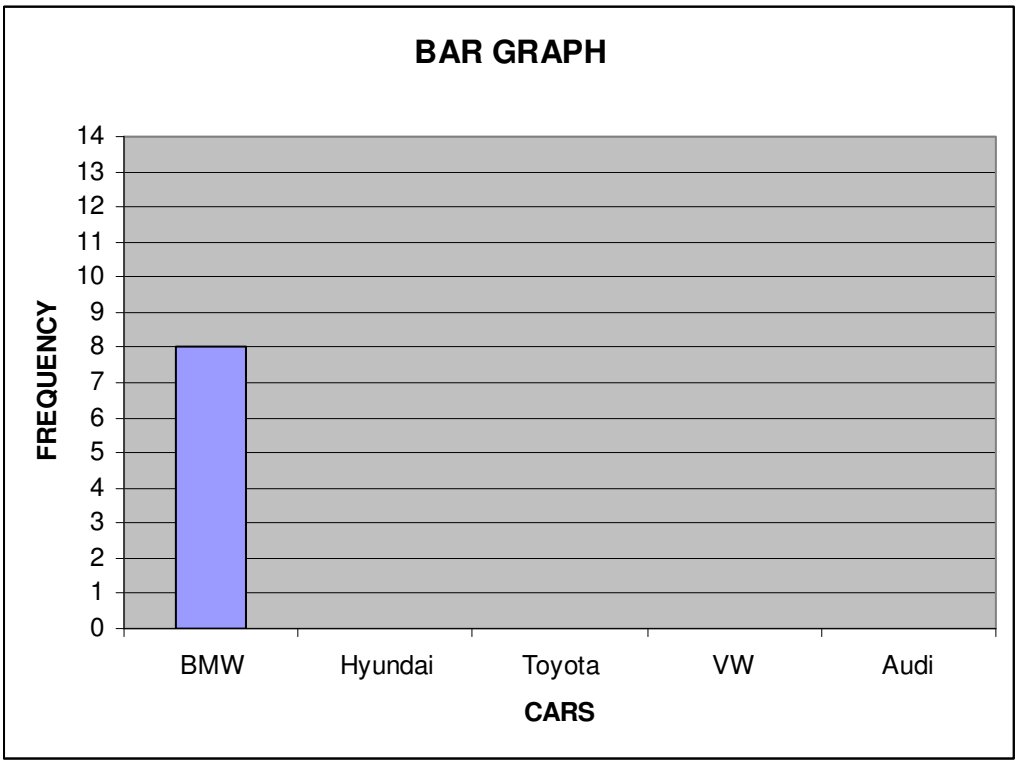
Detach Annexure A and hand it in with your answer booklet.

3.2.3



(5)

3.2.4



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