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higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

MATHEMATICS
(Second Paper)
NQF LEVEL 2

NOVEMBER EXAMINATION

(10501042)

4 November 2013 (X-Paper)
09:00–12:00

REQUIREMENTS:
1. **A non-programmable scientific calculator.**
2. **Protractor.**

This question paper consists of 11 pages, a 2-page formula sheet and a 1-page answer sheet.

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. Answer questions 1.2.3 and 1.2.4 on the attached ANSWER SHEET and submit this ANSWER SHEET with your ANSWER BOOK.
5. Clearly show ALL calculations, diagrams, graphs, etcetera, which you have used in determining the answers.
6. If necessary, answers should be rounded off to THREE decimal places, unless stated otherwise.
7. Diagrams are NOT drawn to scale.

QUESTION 1

1.1 Define the following terminology, as used in statistics:

1.1.1 Inter-quartile Range (2)

1.1.2 Outlier (2)

1.2 The following data shows the favourite brands of running shoes for 30 Comrades marathon runners:

Brand Of Running Shoe		
Soviet	Adidas	Adidas
Reebok	Loxion Kulca	Loxion Kulca
Adidas	Puma	Reebok
Loxion Kulca	Loxion Kulca	Reebok
Puma	Reebok	Soviet
Puma	Puma	Loxion Kulca
Loxion Kulca	Adidas	Adidas
Adidas	Loxion Kulca	Soviet
Puma	Reebok	Puma
Soviet	Puma	Loxion Kulca

Use the table above to answer the following questions:

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

Frequency Distribution table : Brand of Running Shoe		
Brand	Tally	Frequency
Puma		
Loxion Kulca	𝍸 |||	
Adidas		
Soviet		
Reebok		
	Total:	

(5)

1.2.2 Which brand of shoe is most preferred by the runners? (1)

1.2.3 Using the information from QUESTION 1.2.1 construct a bar graph on the attached ANSWER SHEET that represents the information. (4)

1.2.4 Using the information from QUESTION 1.2.1 construct a pie chart on the attached ANSWER SHEET that represents the information. (5)

1.3 The Quality Assurance body at Majuba FET College embarked on a local project to improve the appearance of the college. Sid, the local landscaper laid out instant lawn across the campuses. The area of lawn laid per day, for 25 days, is given below:

58	45	53	41	30
34	36	47	51	44
42	58	50	44	58
56	39	42	56	46
33	43	56	53	34

1.3.1 Draw a stem and leaf plot that represents the information above. (4)

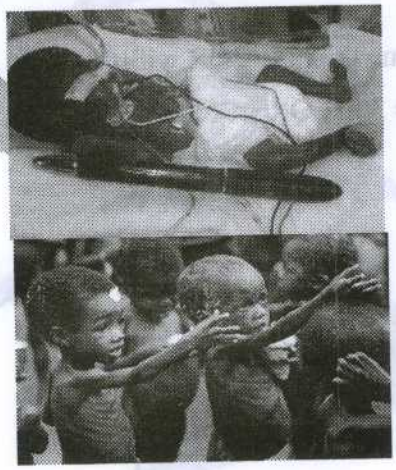
1.3.2 Determine the modal value/s (mode) for the data set. (2)

1.3.3 Determine the median value for the data set. (1)

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

1.4 Infant mortality is the number of deaths of infants under one year old in a given year per 1 000 live births. This rate is often used as an indicator of the level of health in a country. The table below lists the countries with the ten highest infant mortality rates.

Country	Infant mortality
Angola	191
Afghanistan	144
Sierra Leone	144
Mozambique	144
Liberia	130
Guinea	127
Nigeria	122
Somalia	122
Malawi	119
Mali	119



Use the table above to answer the following questions.

1.4.1 Calculate the mean mortality rate of the 10 countries listed. (3)

1.4.2 Determine the median of the mortality rate of the 10 countries. (2)

1.4.3 What is the modal value for the data shown above? (1)

1.4.4 Determine the value of the lower quartile for the given data. (2)

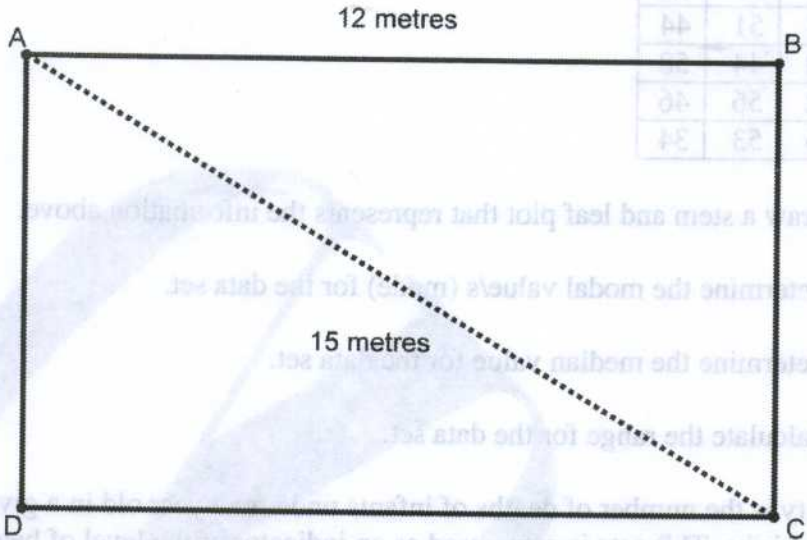
1.4.5 Determine the value of the upper quartile for the given data. (2)

1.4.6 Determine the inter-quartile range for the above data. (1)

1.4.7 Calculate the range for the mortality rate between Angola and Mali. (1)
[40]

QUESTION 2

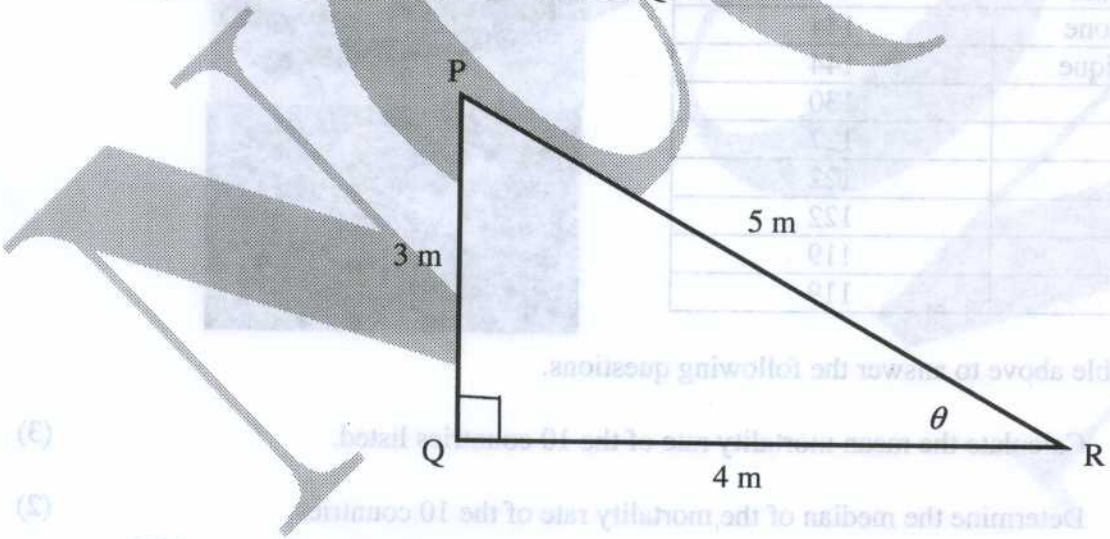
2.1 An insect is observed walking around a rectangular garden. The distance from A to B is 12 metres and the distance from A to C is 15 metres.



Calculate the total distance that the insect walked. (3)

2.2 Given: Triangle PQR with $\hat{Q} = 90°$.

PQ = 3 m , QR= 4 m and PR = 5 m. $P\hat{R}Q = \theta$



2.2.1 What is the mathematical name given to the longest side of a right angled triangle? (1)

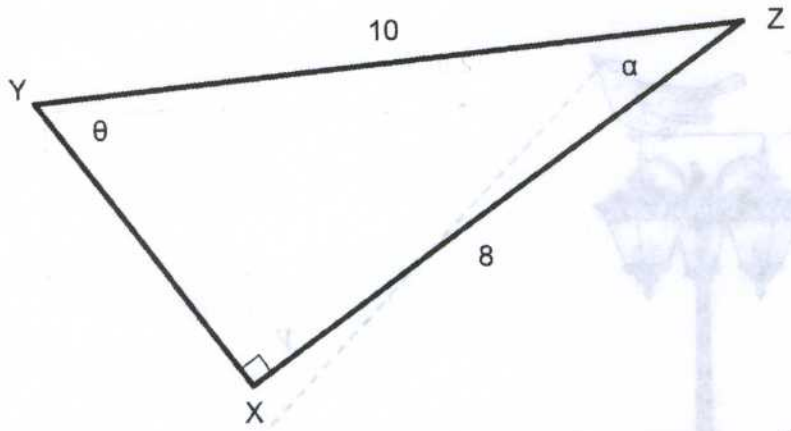
2.2.2 Write as a ratio:

(a) The value of sin θ (1)

(b) The value of cos θ (1)

(c) The value of tan θ (1)

2.3 Given triangle XYZ with angle $\hat{X} = 90°$, $X\hat{Y}Z = \theta$, $X\hat{Z}Y = \alpha$.



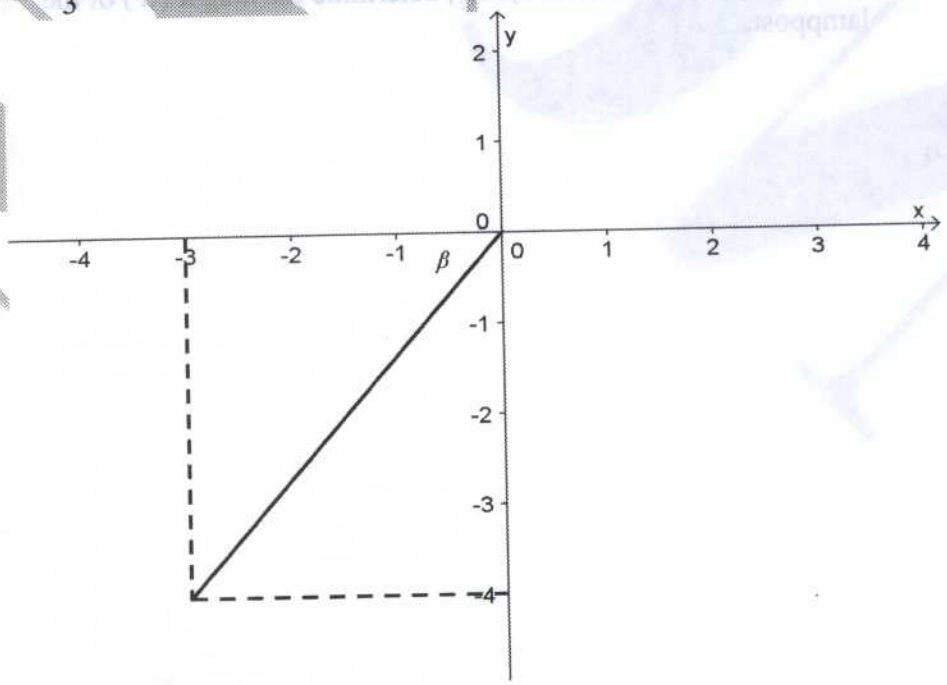
Determine the value of the following. Show all calculations. Leave answers in decimal form.

2.3.1 $\sin\theta$ (2)

2.3.2 $1+\cos^2\alpha$ (2)

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

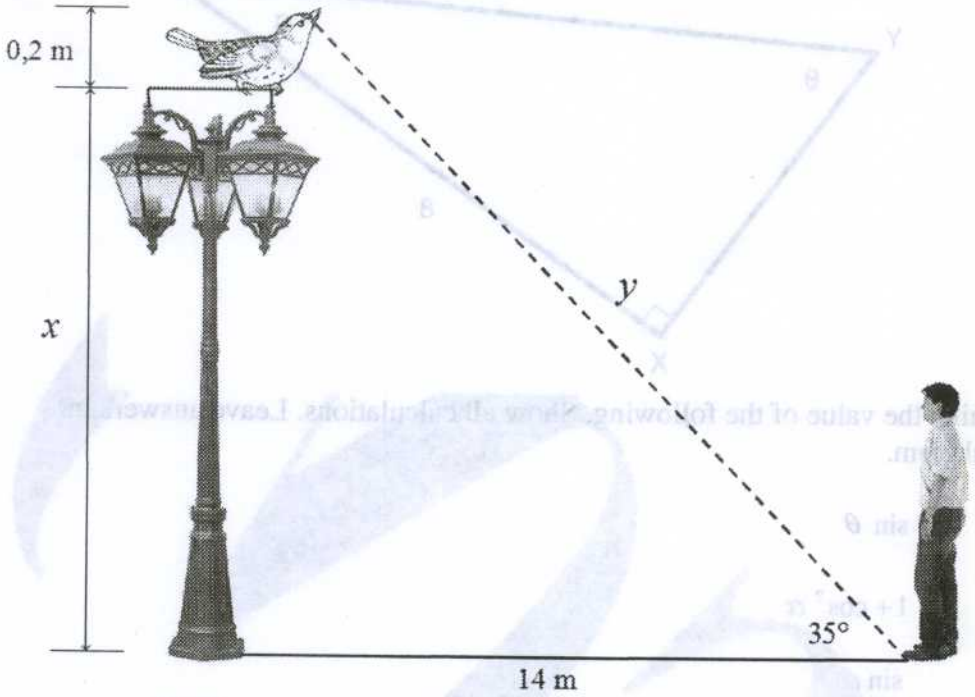
2.4 If $\tan\beta = \dfrac{4}{3}$ and $180° \le \beta \le 270°$, determine the following:



2.4.1 $\cos\beta$ (2)

2.4.2 $\tan^2\beta + \sin^2\beta$ (2)

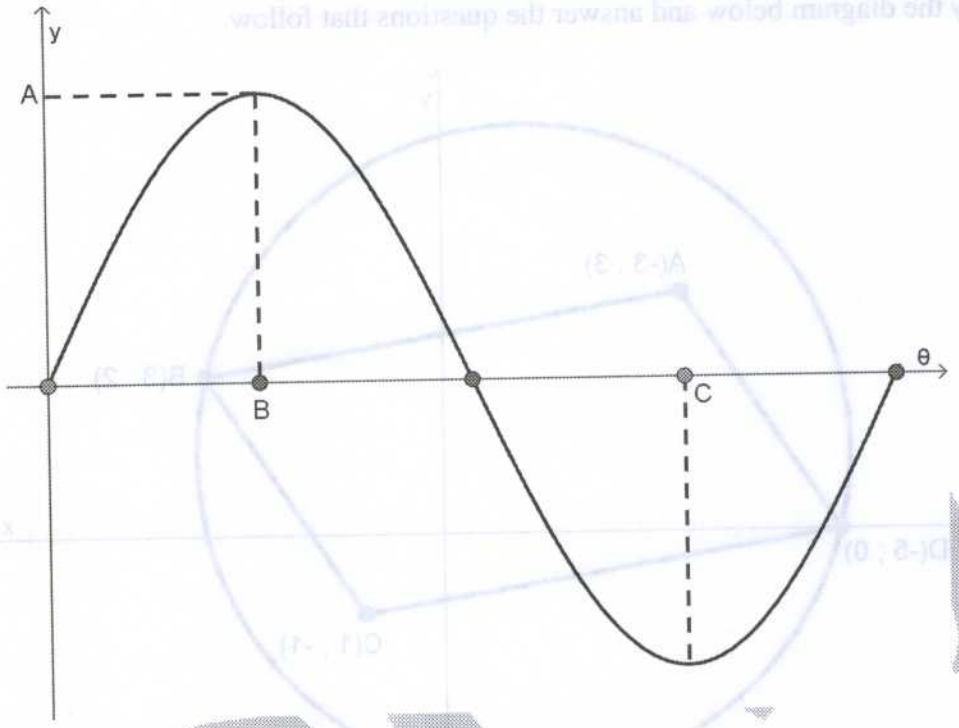
2.5 A bird sits on top of a lamppost. The angle of depression from the top of the bird to the foot of a man is 35°. The distance between the man and the base of the lamppost is 14 m.



2.5.1 Determine the distance (y) between the bird and the man. (3)

2.5.2 If the height of the bird is 0,2 m , determine the height (x) of the lamppost. (5)

2.6 The following diagram is a sketch for the graph of $f(x) = 2\sin\theta$ for $\theta \in [0° ; 360°]$



2.6.1 Determine the value of A in the graph. (1)

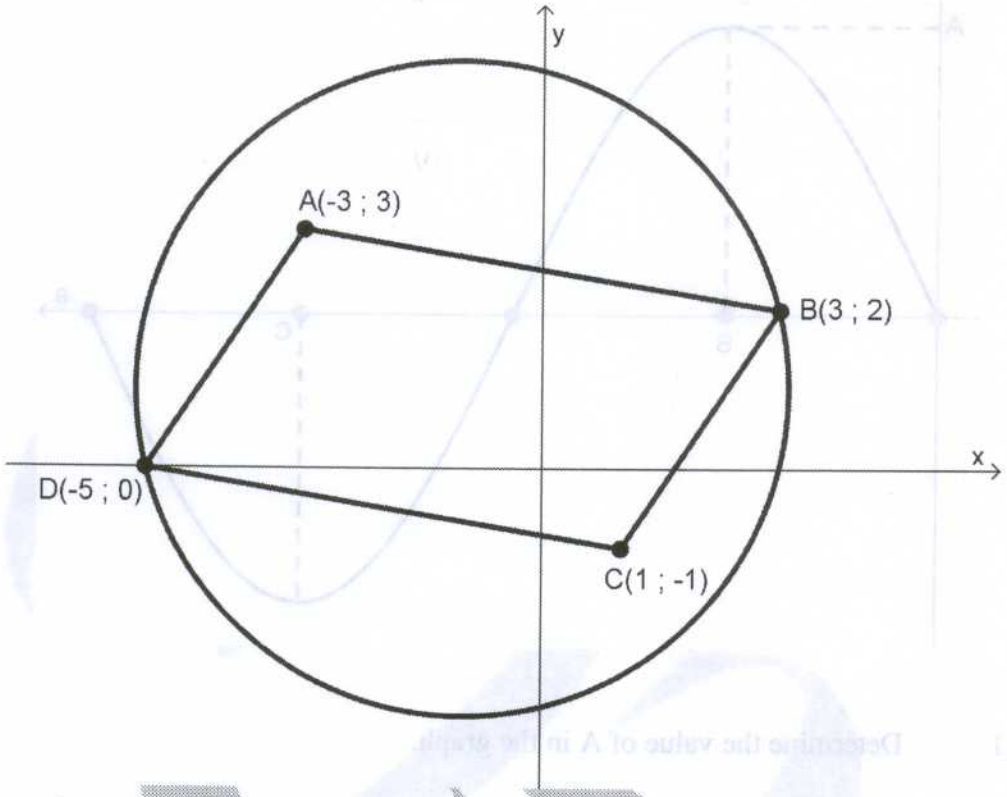
2.6.2 Write down the range for the graph of $f(x) = 2\sin\theta$ (1)

2.6.3 Points B and C are angles in degrees on the horizontal axis. Determine the value of angles B and C. (2)

[30]

QUESTION 3

3.1 Study the diagram below and answer the questions that follow.



3.1.1 Calculate the length of line segment AD. (Leave your answer in surd form.) (3)

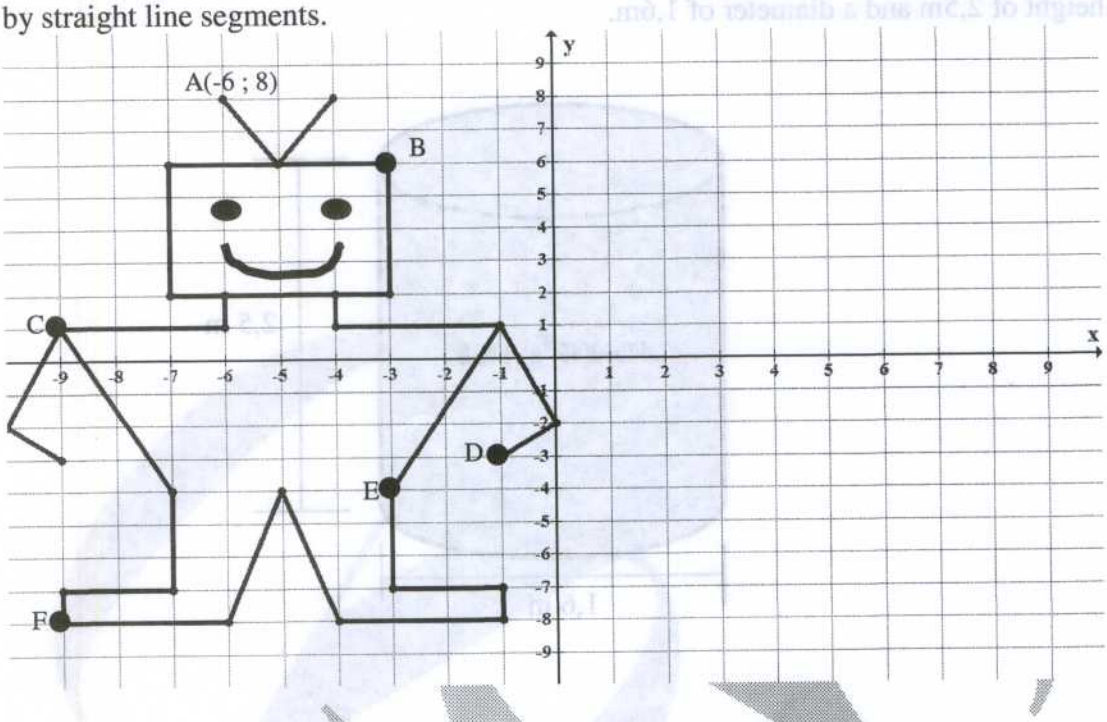
3.1.2 Calculate the co-ordinates of the midpoint (M) of line segment AB. (2)

3.1.3 Calculate the gradient of line segment BC. (2)

3.1.4 Determine the angle of inclination of line segment BC. (2)

3.1.5 Determine the gradient of another line segment which is perpendicular to AD. (3)

3.2 The following diagram shows six points on a Cartesian plane which have been joined by straight line segments.



3.2.1 Write down the co-ordinates of point B. (2)

3.2.2 What would be the co-ordinates of point C if it is translated 2 units upwards and 3 units to the right? (2)

3.2.3 What would be the co-ordinates of point D if it is reflected about the y-axis? (2)

3.2.4 What would be the co-ordinates of point E if it is reflected about the x-axis? (2)

3.2.5 What would be the co-ordinates of point F if it is reflected about the line $y = -x$? (2)

3.3 The diagram below shows a cylindrical Jo Jo tank. The tank has a perpendicular height of 2,5m and a diameter of 1,6m.

3.3.1 Calculate the volume of the Jo Jo tank. (4)

3.3.2 The tank is to be housed on a circular platform which has an area of $1{,}8m^2$. Will the base of the Jo Jo tank fit on the platform? Motivate your answer with a suitable calculation. (4)

[30]

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