Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2023

MATHEMATICS P2 (DEAF LEARNERS)

MARKS: **150**

TIME: **3 hours**

This question paper has 14 pages, with a 1-page information sheet, and an answer book of 20 pages.

INSTRUCTIONS AND INFORMATION

Read the **instructions**. **Answer** the **questions**.

1. This **question paper** has **10 questions**.

2. **Answer ALL** the questions.
   Write in the **SPECIAL ANSWER BOOK**.

3. **Show ALL calculations**, **diagrams**, **graphs**, etc. which you have **used in your answers**.

4. **Answers only** will **NOT always** get **full marks**.

5. You **may use** a prescribed **calculator.**
   Some questions will **tell** you **NOT** to use a **calculator**.

6. **Round off** answers correct to **TWO decimal places**.
   Some questions will **tell** you **how to round off**.

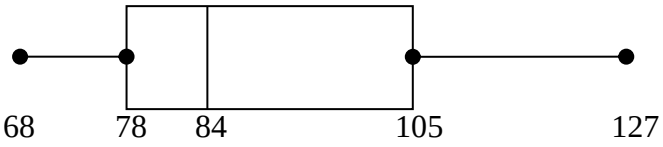
7. **Diagrams are NOT always drawn to scale.**

8. An **information sheet** with formulae is **included** at the **end** of the question paper.

9 Write **neatly**.
   Your work must be **easy** to **read**.

QUESTION 1

The **box-and-whisker diagram shows** the **distribution** of the **September examination marks** of a **group** of 24 boys in **Grade 11**.
The **median** is 84 and the **mean** is **87**.



1.1 How **many boys scored** more than **105**? (1)

1.2 In **which direction** are the **marks skewed**? (1)

1.3 **Calculate** the r**ange** of the **data**. (2)

1.4 On **checking** the **answer book** of the **candidate** who **scored 127**, an **adding error** is **discovered**. His **mark** is **changed** to **147**.
Determine the **resulting value** of the **following measures**:

1.4.1 **The median** (1)

1.4.2 **The mean** (2)
[7]

QUESTION 2

55 learners were **sampled** at the **school tuckshop** to **measure** their **waiting time** in **minutes** before being **served**. The **results** were **published** in the **table** below:

Time waiting (minutes)	Number of learners	Cumulative frequency
$0 < x \leq 4$	6	
$4 < x \leq 8$	10	
$8 < x \leq 12$	19	
$12 < x \leq 16$	15	
$16 < x \leq 20$	5	

2.1 **Complete** the **cumulative frequency table** in the ANSWER BOOK. (2)

2.2 **Draw** the **cumulative frequency graph** on the **grid** in the ANSWER BOOK. (4)

2.3 **Use** your **graph** to **estimate** the **number** of **learners** who **waited** for **more** than **14 minutes**. (3)

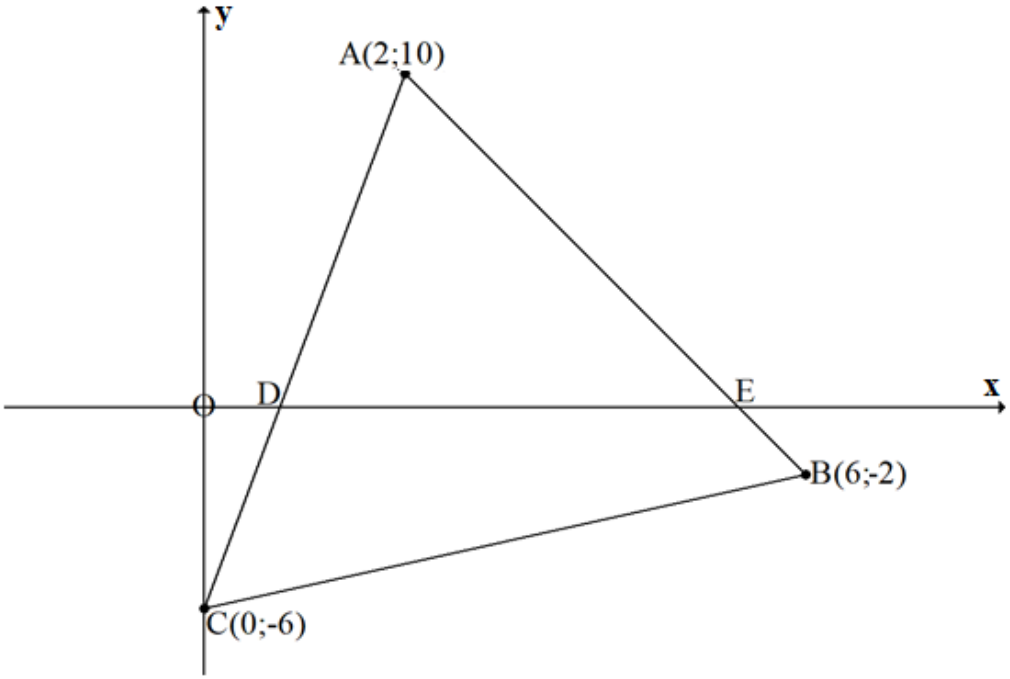
2.4 **Write** down the **modal class** of the **data**. (1)

2.5 **Use** your **graph**. **Estimate** the **interquartile range** of the **data**. (3)
[13]

QUESTION 3

3.1 **Collinear points** are **points** that **lie** on the **same straight line**.
If $A(-8;0)$, $B(x-5;-8)$ and $C(x;-14)$ are **collinear**, then **calculate** the **value** of *x*. (5)

3.2 $A(2;10)$; $B(6;-2)$ and $C(0;-6)$ are **vertices** of a **triangle.**
Points D and E are *x*-intercepts of **straight-line** AC and AB **respectively**.
Study the **diagram**. **Answer** the **questions**.



3.2.1 **Calculate** the **coordinates** of M, the **midpoint** of BC. (2)

3.2.2 **Calculate** the **length** of AC.
Leave your **answer** in **simplified surd form**. (2)

3.2.3 **Write** the **coordinates** of F, if ABCF is a **parallelogram**. (2)

3.2.4 **Show** that ABCF is **not** a **rectangle**. (3)

3.2.5 **Determine** the **equation** of **straight lines** AB and AC. (5)

3.2.6 **Calculate** the **size** of $\hat{A}$. (6)

3.2.7 **Calculate** the **area** of ΔADE. (5)
[30]

QUESTION 4

4.1 **Do not use a calculator.**
If $7\tan\theta = 3$ and $\cos\theta < 0$, **use** a **sketch** in the **correct quadrant** to **determine** the **value** of: $\frac{\sin\theta + \cos\theta}{2\sin\theta}$. (6)

4.2 If $\sin 32° = p$, **express each** of the following **in terms** of p:

4.2.1 $\tan(-32°)$ (3)

4.2.2 $\sin 418°$ (2)

4.3 **Do not use a calculator.**
Simplify the following **fully**.

$$\frac{\sin 120°.\tan 300°}{\cos(-60°).\tan 225°}$$ (7)

4.4 **Prove** the following **identity**:

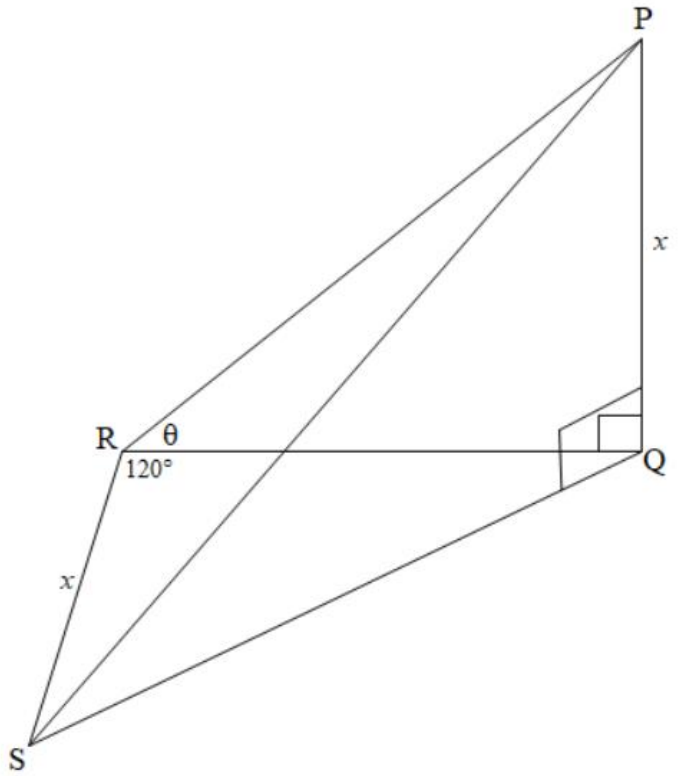
$$\frac{\cos^2 x - \cos x - \sin^2 x}{2\sin x\cos x + \sin x} = \frac{1}{\tan x} - \frac{1}{\sin x}$$ (5)

4.5 **Determine** the **general solution** of: $\sin(5\theta) = \cos(\theta - 40°)$ (6)
[29]

QUESTION 5

Diagram:

PQ is a **vertical tower**.
Q, **R** and **S** are **points** on the **same horizontal plane.**
The **angle** of **elevation** from R to P is θ. $Q\widehat{R}S = 120°$ and PQ = RS = x.



5.1 **Determin**e QR **in terms** of θ and x. (2)

5.2 **Show** that **QS** = $x\sqrt{\frac{1}{tan^2\theta}+\frac{1}{\tan\theta}+1}$ (4)

5.3 If $x = 15$ cm and $\theta = 22°$, **calculate:**

5.3.1 QS (2)

5.3.2 $Q\widehat{P}S$ (2)
[10]

QUESTION 6

Given: $f(x) = \sin 2x$ and $g(x) = \tan x - 1$

6.1 **Use** the **grid** in the SPECIAL ANSWER BOOK.
Draw the **sketch graphs** of f and g on the **same set** of **axes** given in the ANSWER BOOK for $x \in [-45°;180°]$.

Show ALL:
- Endpoints,
- Intercepts with the axes,
- Turning points as well as
- Asymptotes. (6)

6.2 **Use** your **graphs** to **determine value**(s) of x for which:

6.2.1 $\sin 2x > 0$ (1)

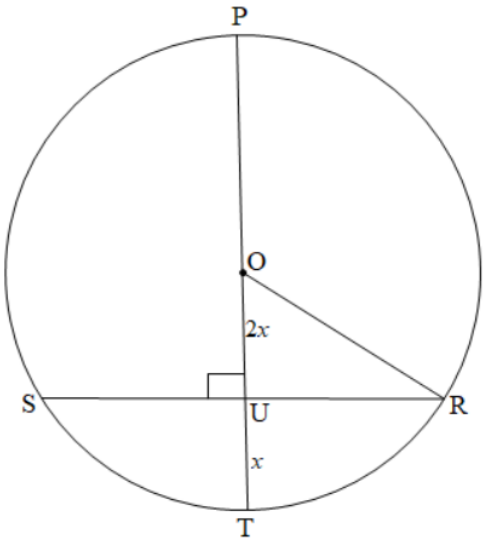
6.2.2 $f(x).g(x) \geq 0$ (3)

6.3 If $h(x) = f(x) + 2$, **write** down the **range** of h. (2)
[12]

QUESTION 7

7.1 **Diagram:**

O is the **centre** of the **circle.**
SR = 40 cm and OT ⊥ SR.
It is **also given** that UT $= x$ and OU $= 2x$.



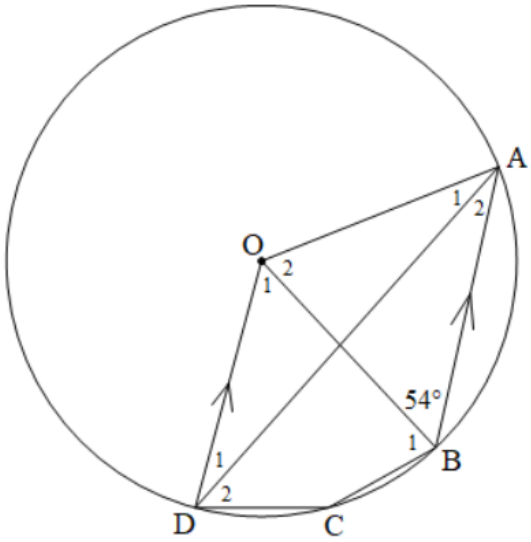
Determine:

7.1.1 The **length** of OR in terms of x (1)

7.1.2 The **value** of x
Leave your **answer** in **simplest surd form**. (5)

7.2 **Diagram:**

O is the **centre** of the **circle**.
ABCD are **points** on the **circumference** of the **circle**.
OD ∥ AB and $O\widehat{B}A = 54°$.



Determine:

7.2.1 The **size** of $\widehat{A}_2$ (4)

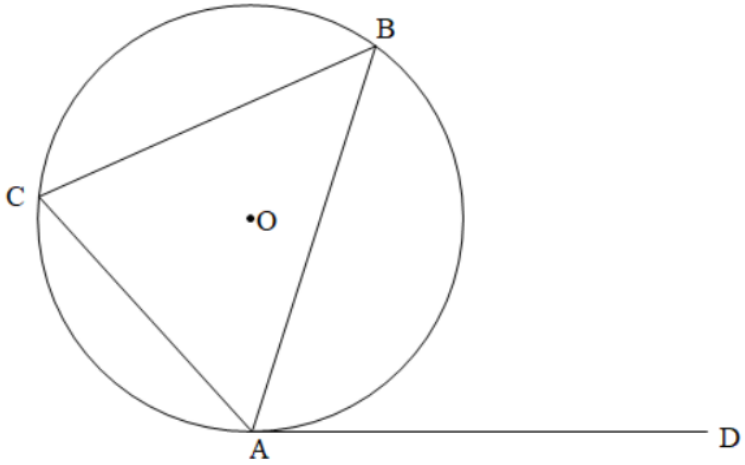
7.2.2 The **size** of $\widehat{C}$ (2)

7.2.3 **Prove** that DA **bisects** $O\widehat{A}B$ (3)
[15]

QUESTION 8

8.1 **Diagram:**

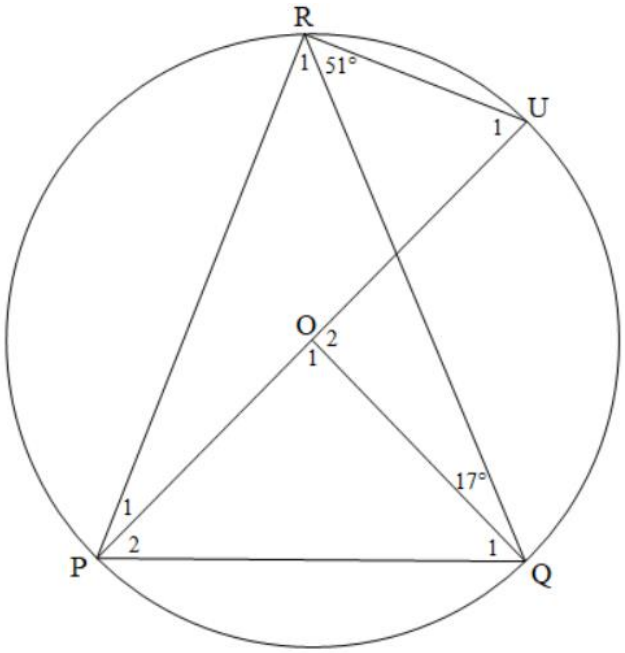
DA is a **tangent** to the **circle** with **centre O**.



Use the **diagram.**
Prove the **theorem** that **states** that:
$D\hat{A}B = B\hat{C}A$. (5)

8.2 **Diagram:**

O is the **centre** of **circle** QPRU.
$O\widehat{Q}R = 17°$ and $Q\widehat{R}U = 51°$.



Calculate the **size** of:
Give reasons.

8.2.1 $\widehat{R}_1$ (2)

8.2.2 $\widehat{O}_1$ (2)

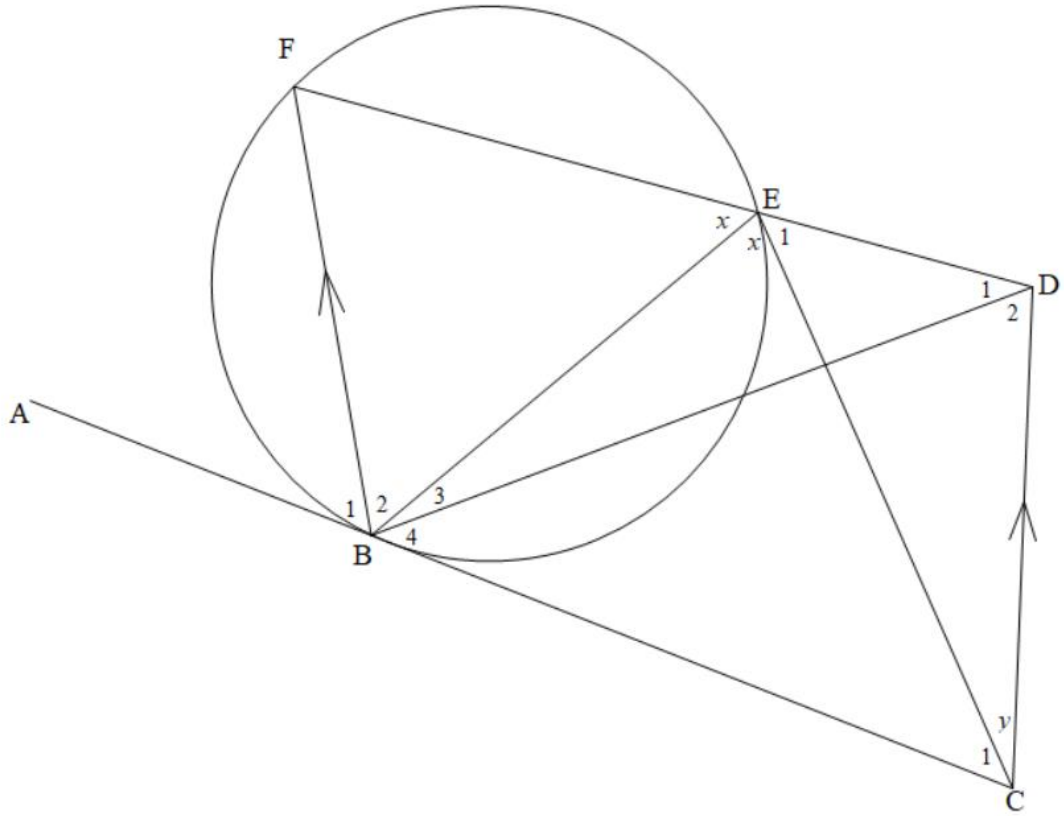
8.2.3 $\widehat{Q}_1$ (2)

8.2.4 $\widehat{U}_1$ (2)
[13]

QUESTION 9

Diagram:

ABC is a **tangent** to **circle** BFE at B.
From C, a **straight-line** is **drawn parallel** to BF to **meet** FE **produced** at D.
EC and BD are **drawn**.
$F\hat{E}B = B\hat{E}C = x$ and $E\hat{C}D = y$.



9.1 **Calculate**, in **terms** of x and y the **sizes** of the **following angles**.
Give **reasons** for your **answers**.

9.1.1 $A\hat{B}F$ (2)

9.1.2 $B\hat{C}D$ (2)

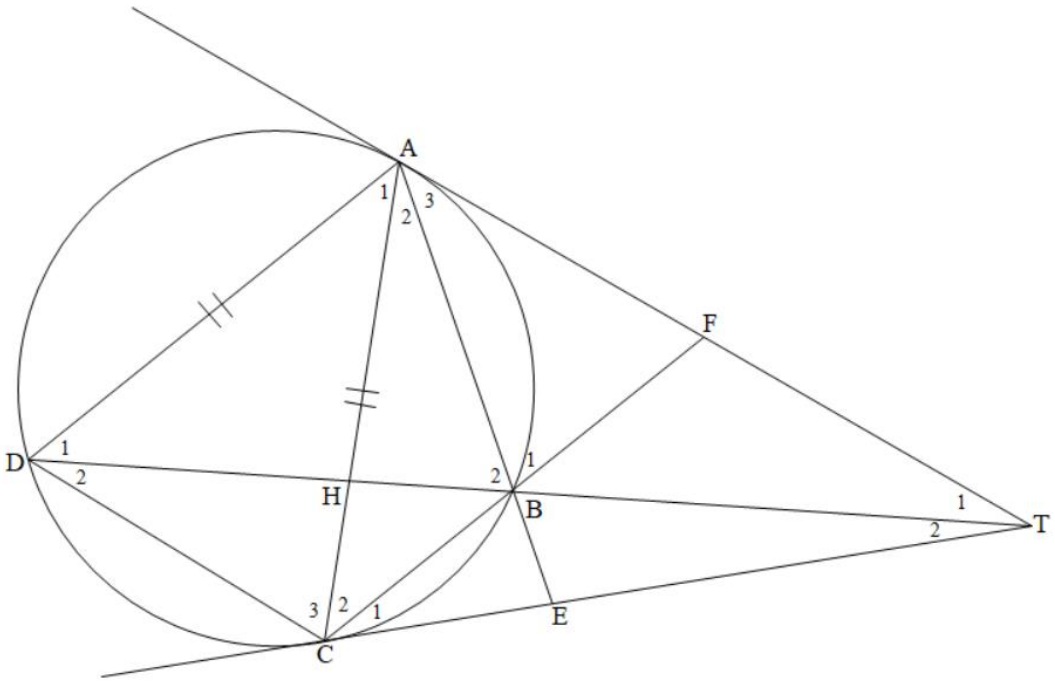
9.2 **Why** is BEDC a **cyclic quadrilateral**? (1)

9.3 **Which** other **two angles** are **equal** to x?
Give reasons. (4)
[9]

QUESTION 10

Diagram:

ABCD is a **cyclic quadrilateral** with AC = AD.
Tangents AC and CT **touch** the **circle** at A and C **respectively**.



Prove:

10.1 $\widehat{B}_1 = \widehat{B}_2$ (4)

10.2 BECH is a **cyclic quadrilateral**. (3)

10.3 CA is a **tangent** to the **circle passing through points** A, B and T. (5)
[12]

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n \qquad A = P(1+i)^n$$

$$\sum_{i=1}^{n} 1 = n \qquad \sum_{i=1}^{n} i = \frac{n(n+1)}{2} \qquad T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\left(2a + (n-1)d\right)$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a\left(r^n - 1\right)}{r-1} \;; \quad r \neq 1 \qquad S_\infty = \frac{a}{1-r} \;; \; -1 < r < 1$$

$$F = \frac{x\left[(1+i)^n - 1\right]}{i} \qquad P = \frac{x[1-(1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad \mathrm{M}\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

$$\text{In } \Delta ABC: \quad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad a^2 = b^2 + c^2 - 2bc.\cos A \qquad \text{area } \Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum fx}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$