



Province of the  
**EASTERN CAPE**  
EDUCATION



**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

**NOVEMBER 2022**

**MATHEMATICS P2  
(DEAF)**

**MARKS: 150**

**TIME: 3 hours**

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This question paper has 14 pages, an information sheet and an answer book of 20 pages.

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**INSTRUCTIONS**

Read the following instructions carefully.

1. This question paper has 10 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK.
3. Show ALL calculations, diagrams, graphs, etc. that you have used for your answers
4. Answers only will NOT get full marks.
5. Use an approved scientific calculator (non-programmable and non-graphical). We will say if it is different.
6. Round off answers to TWO decimal places. We will say if it is different.
7. Diagrams are NOT drawn to scale.
8. An information sheet with formulae is at the end of the question paper.
9. Write neatly.

**QUESTION 1**

The following table shows a sleeping pattern record, in hours, of ten Grade 11 learners:

<b>Learner</b>	1	2	3	4	5	6	7	8	9	10
<b>Number of hours slept</b>	7	8	8	5	6	3	4	8	7	10

- 1.1 Calculate the **mean number** of **hours slept** by the learners. Give the **answer** correct to **TWO decimal places**. (1)
- 1.2 Write the **five-number summary** for this **data**. (2)
- 1.3 Draw a box-and-whisker diagram for this data set. (2)
- 1.4 Refer to your **diagram** and **comment** on the **skewness** of the **data**, and **give a reason** for your answer. (2)
- 1.5 Calculate the **standard deviation** for this data. Give your **answer** correct to **TWO decimal places**. (2)
- 1.6 A learner is considered to have slept well, if his sleeping time is above one standard deviation from the mean. **How many learners slept well?** (2)
- [11]

**QUESTION 2**

The different ages of teachers at a certain school in the Eastern Cape are given in the table below.

2.1 Complete the following table in your ANSWER BOOK.

AGE	FREQUENCY	CUMULATIVE FREQUENCY
$25 < A \leq 30$	2	
$30 < A \leq 35$	8	
$35 < A \leq 40$	4	
$40 < A \leq 45$	5	
$45 < A \leq 50$	11	
$50 < A \leq 55$	19	
$55 < A \leq 60$	20	
$60 < A \leq 65$	6	

(2)

2.2 Draw an **ogive** on the **set of axes** in your ANSWER BOOK to **represent the data** in the table.

(4)

2.3 Use your **graph** to **find an estimate** of the **median age**.

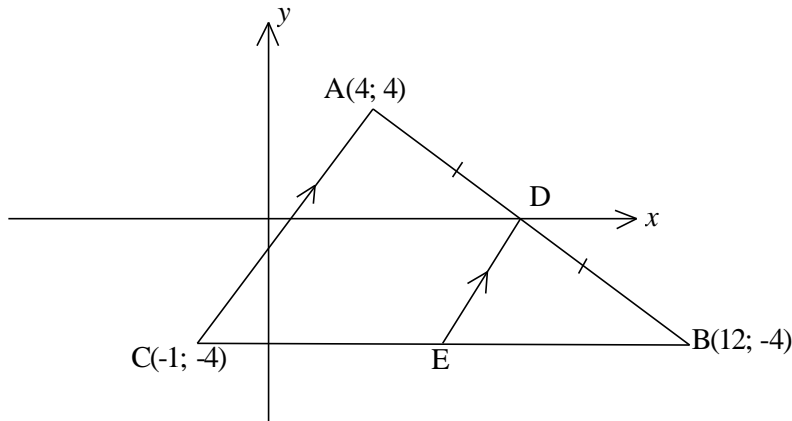
(2)

2.4 The school would like to give all teachers older than 57 a special present. Use your graph to find an estimate for the percentage of teachers older than 57 years of age.

(2)  
**[10]**

**QUESTION 3**

In the diagram below, the coordinates of  $A(4; 4)$ ,  $B(12; -4)$  and  $C(-1; -4)$  are given.  $AC \parallel DE$  and  $CEB$  is a straight line.  $D$  is the midpoint of  $AB$ .

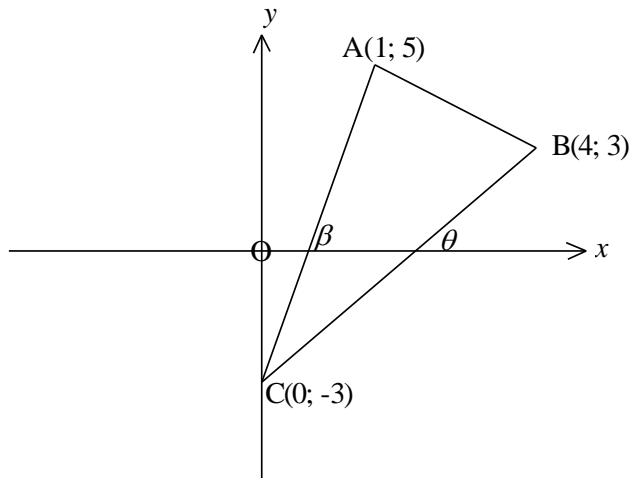


Determine (find out):

- 3.1 The length of  $AB$ . Give your answer correct to TWO decimal places (2)
  - 3.2 The coordinates of  $D$ , the midpoint of  $AB$  (2)
  - 3.3 The equation of line  $DE$  (4)
  - 3.4 The coordinates of  $E$  (3)
- [11]**

## QUESTION 4

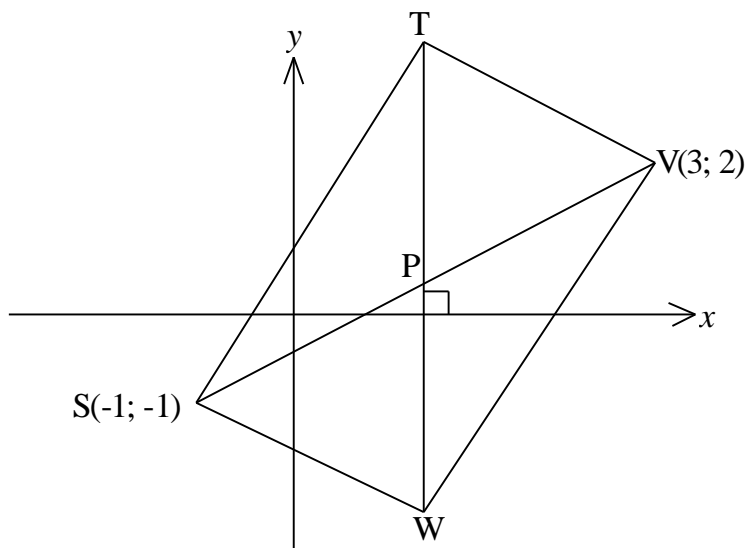
A(1; 5), B(4; 3) and C(0; -3) are vertices of the triangle given below.



- 4.1 **Determine**<sub>(calculate)</sub>, using any method, the coordinates of D if ABCD is a parallelogram. (2)
- 4.2 If the distance between C and F(8; p) is 12 units, **determine**<sub>(calculate)</sub> the value(s) of p (to the nearest integer). (5)
- 4.3 **Determine**<sub>(calculate)</sub> the size of  $\widehat{ACB}$ . (5)
- [12]**

## QUESTION 5

In the diagram below, the diagonals of STVW are equal in length and bisect each other at P. Calculate the coordinates of T and W.



(6)  
[6]

## QUESTION 6

6.1 If  $-3 \sin \beta - 2 = 0$  and  $\beta \in [0^\circ; 270^\circ]$ , use a sketch in the correct quadrant to **determine**(calculate) the value of:  $1 + \tan^2 \beta$  without a calculator. (5)

6.2 If,  $\cos 75^\circ = m$  express each of the following in terms of  $m$ , showing all your working:

6.2.1  $\cos^2 105^\circ$  (2)

6.2.2  $\sin 15^\circ$  (2)

6.2.3  $\tan 15^\circ$  (2)

6.3 Given the expression:

$$\frac{\cos(180^\circ - k) \cdot \sin(k - 90^\circ) - 1}{\tan^2(540^\circ + k) \cdot \sin(90^\circ + k) \cdot \cos(-k)}$$

6.3.1 Simplify the expression. (7)

6.3.2 **Determine**(calculate) the values of  $k \in [0^\circ; 360^\circ]$  for which the expression is undefined. (6)

6.4 Prove that:

$$\frac{1 + \sin \theta}{1 - \sin \theta} - \frac{1 - \sin \theta}{1 + \sin \theta} = \frac{4 \tan \theta}{\cos \theta} \quad (5)$$

6.5 **Determine**(find out) the general solution of:

$$6 \sin^2 \theta + \cos \theta = 4 \quad (7)$$

6.6 If  $p = \tan A + \sin A$  and  $q = \tan A - \sin A$ , prove that:

$$pq = \tan^2 A \cdot \sin^2 A \quad (5)$$

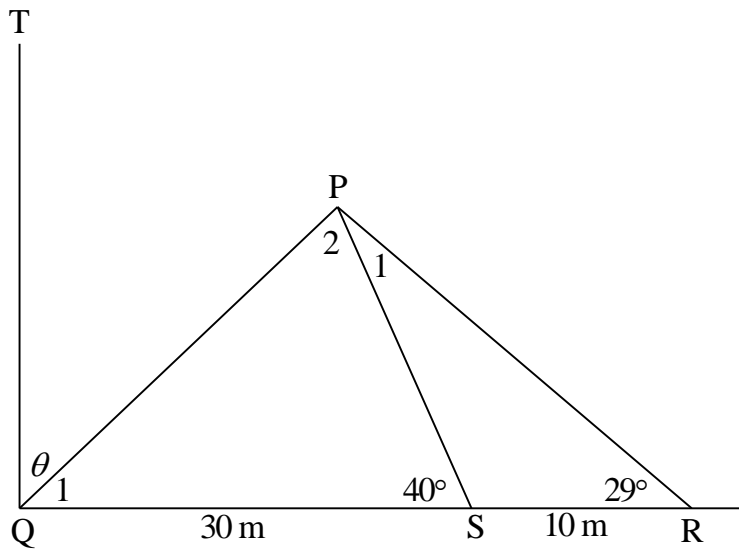
[41]

## QUESTION 7

Study the diagram below and answer the questions.

$\widehat{TQR} = 90^\circ$ ,  $\widehat{QSP} = 40^\circ$ ,  $\widehat{SRP} = 29^\circ$ ,  $QS = 30$  m and  $SR = 10$  m.

It is also given that  $\widehat{TPQ} = \theta$ .



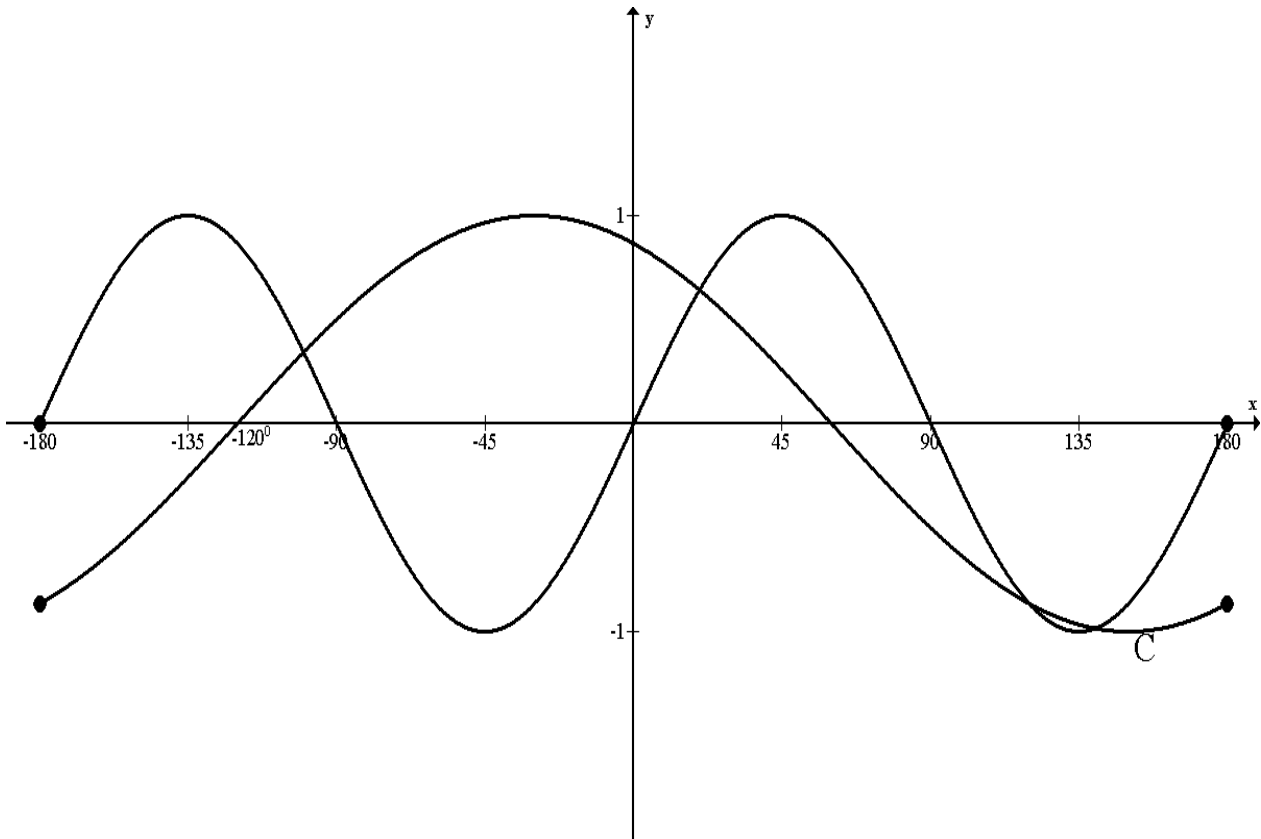
- 7.1 Give a reason why  $\widehat{P}_1 = 11^\circ$ . (1)
- 7.2 Calculate the length of PS. (3)
- 7.3 Determine (calculate) the value of  $\theta$ , correct to the nearest degree. (5)

[9]



## QUESTION 8

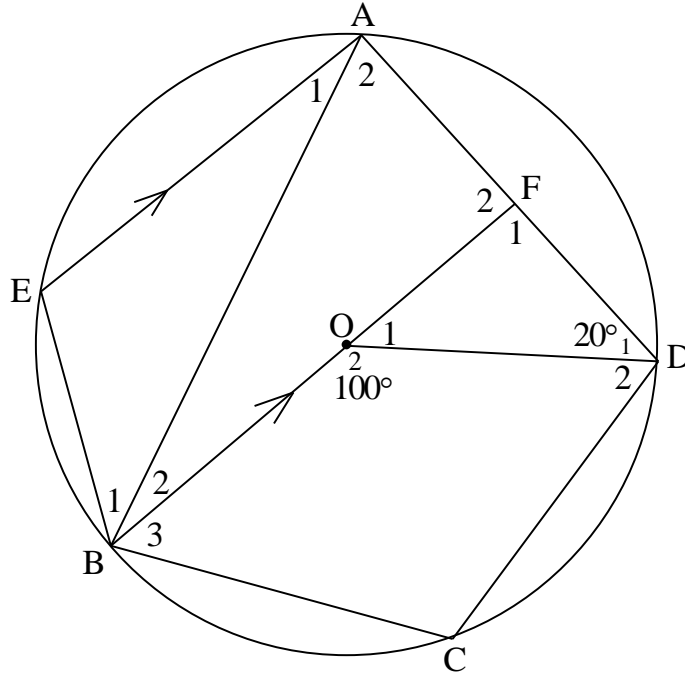
The sketch graphs of  $f(x) = \sin ax$  and  $g(x) = \cos(x - b)$  is given below.



- 8.1 **Determine**<sub>(calculate)</sub> the values of  $a$  and  $b$ . (2)
- 8.2 **Determine**<sub>(find out)</sub> the coordinates of C, a turning point on  $g(x)$ . (2)
- 8.3 For which values of  $x$ , where  $x < 0$ , is  $f(x) \cdot g(x) \geq 0$ ? (3)
- 8.4 **Determine**<sub>(calculate)</sub> the equation of  $f(x)$  if the  $y$ -axis is moved  $30^\circ$  to the left. (1)
- [8]**

**QUESTION 9**

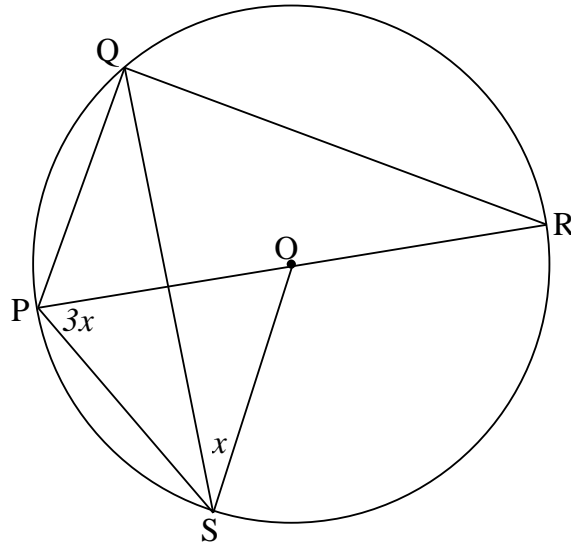
9.1 In the diagram below, O is the centre of circle AEB CD, with line BOF  $\parallel$  EA. F lies on AD,  $\widehat{BOD} = 100^\circ$  and  $\widehat{D}_1 = 20^\circ$ . The sizes of some of the angles are given in the table below. In each case, supply a valid reason.



	STATEMENT	REASONS
9.1.1	$\widehat{A}_2 = 50^\circ$	
9.1.2	$\widehat{O}_1 = 80^\circ$	
9.1.3	$\widehat{F}_1 = 80^\circ$	
9.1.4	$\widehat{A}_1 = 30^\circ$	
9.1.5	$\widehat{B}_2 = 30^\circ$	

(5)

9.2 P, Q and R are points on the circumference of the circle with centre O. PR is the diameter of the circle.  $\widehat{QSO} = x$  and  $\widehat{OPS} = 3x$ .



Express each of the following in terms of  $x$ , giving a reason for your answer:

9.2.1  $\widehat{SQR}$  (2)

9.2.2  $\widehat{PQS}$  (3)

9.2.3  $\widehat{PSQ}$  (3)

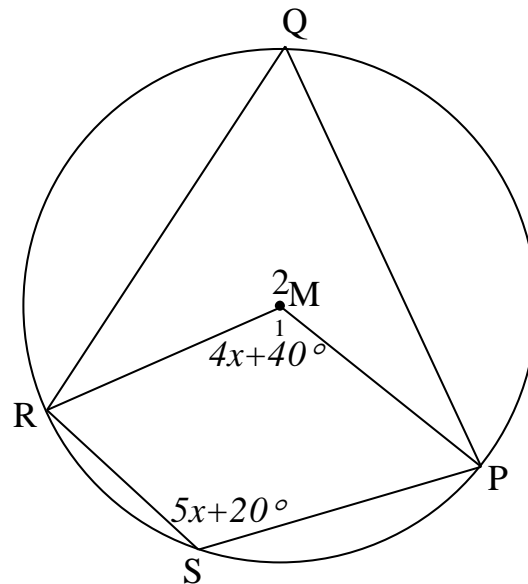
9.2.4  $\widehat{PRQ}$  (2)

9.2.5  $\widehat{QPR}$  (2)

[17]

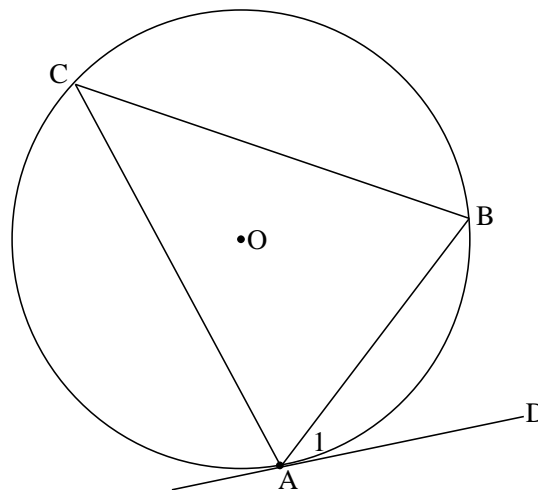
## QUESTION 10

- 10.1 In the figure, P, Q, R and S are points on the circumference of a circle with centre M. It is given that  $\widehat{M}_1 = 4x + 40^\circ$  and  $\widehat{S} = 5x + 20^\circ$ .



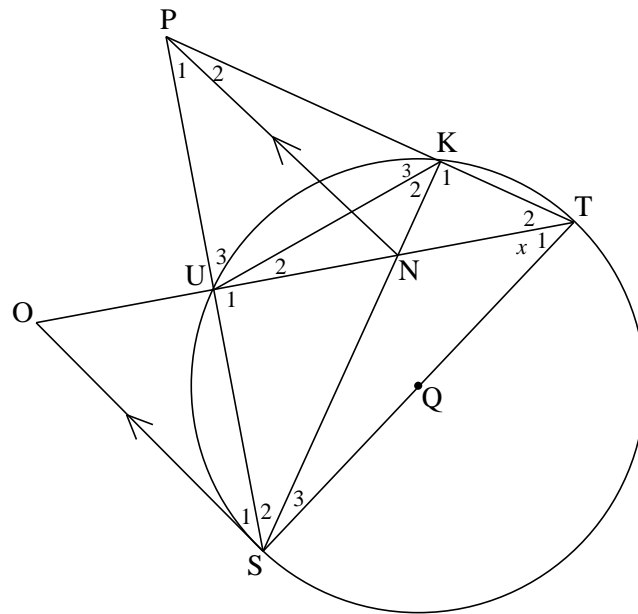
**Calculate** the size of  $\widehat{Q}$  with reasons. (5)

- 10.2 In the diagram below, the circle with centre O passes through the points A, B and C. AD is a tangent to the circle at A.



Use the diagram to prove the theorem that states that  $\widehat{A}_1 = \widehat{C}$ . (6)

10.3 Refer to the diagram below.  $ST$  is a diameter of the circle.  $OS \parallel PN$ ,  $TO$  bisects  $\widehat{STP}$ . Let  $\widehat{T}_1 = x$ .



10.3.1 Prove that PUNK is a cyclic quadrilateral. (5)

10.3.2  $SO$  is a tangent to circle KUST. (6)

10.3.3 Prove that POST is a cyclic quadrilateral. (3)  
[25]

**TOTAL: 150**

## INFORMATION SHEET: MATHEMATICS

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

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2}(2a + (n - 1)d)$$

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1} ; \quad r \neq 1$$

$$S_\infty = \frac{a}{1 - r} ; \quad -1 < r < 1$$

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

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

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

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

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

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

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

In  $\triangle ABC$ :

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

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

$$\sin 2\alpha = 2\sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum x}{n}$$

$$\hat{\sigma}^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$