basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P3

NOVEMBER 2010

MARKS: 100

TIME: 2 hours

This question paper consists of 7 pages, 3 diagram sheets and 1 information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.

2. Answer ALL the questions.

3. Clearly show ALL calculations, diagrams, graphs, et cetera, that you have used in determining your answers.

4. Answers only will not necessarily be awarded full marks.

5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

6. If necessary, round your answers off to TWO decimal places, unless stated otherwise.

7. Diagrams are NOT necessarily drawn to scale.

8. THREE diagram sheets for answering QUESTION 4.1, QUESTION 7, QUESTION 8.1, QUESTION 8.2, QUESTION 9 and QUESTION 10 are attached at the end of this question paper. Write your centre number and examination number on these sheets in the spaces provided and insert them inside the back cover of your ANSWER BOOK.

9. An information sheet, with formulae, is included at the end of the question paper.

10. Number the answers correctly according to the numbering system used in this question paper.

11. Write legibly and present your work neatly.

QUESTION 1

A school organised a camp for their 103 Grade 12 learners. The learners were asked to indicate their food preferences for the camp. They had to choose from chicken, vegetables and fish.

The following information was collected:

- 2 learners do not eat chicken, fish or vegetables
- 5 learners eat only vegetables
- 2 learners only eat chicken
- 21 learners do not eat fish
- 3 learners eat only fish
- 66 learners eat chicken and fish
- 75 learners eat vegetables and fish

Let the number of learners who eat chicken, vegetables and fish be x.

1.1 Draw an appropriate Venn diagram to represent the information. (7)

1.2 Calculate x. (2)

1.3 Calculate the probability that a learner, chosen at random:

1.3.1 Eats only chicken and fish, and no vegetables. (2)

1.3.2 Eats any TWO of the given food choices: chicken, vegetables and fish. (2)

[13]

QUESTION 2

A supermarket conducted a survey on its service to customers. This was done on a Wednesday morning. The survey indicated that 78% of the customers were satisfied with the service offered by the supermarket and 90% of the customers agreed that the supermarket was a stress-free place to do their shopping. The total number of customers interviewed was 130.

2.1 Would you agree that the supermarket could regard the findings of the survey as reliable? Motivate your answer. (2)

2.2 How many customers thought that the supermarket's service was not satisfactory? (2)

2.3 Give TWO recommendations to the supermarket on using surveys to gather information regarding its customer service. (2)

[6]

QUESTION 3

A toothpaste manufacturer fills toothpaste tubes with an average of 182 grams of toothpaste. The standard deviation of a control sample is 0,454 grams.

3.1 If 20 000 tubes of toothpaste are manufactured daily, how many tubes will fall within ONE standard deviation of the mean? (2)

3.2 Calculate the range of the weight of toothpaste tubes in the control sample. (4)
[6]

QUESTION 4

The data below shows the pulse rate of a sample of 12 people when they rest and then again after 2 minutes of jogging.

Resting heart rate (beats per minute)	47	55	95	65	75	78	80	72	82	76	68	62
Heart rate after jogging (beats per minute)	65	68	100	78	81	90	85	84	105	88	75	80

4.1 Draw a scatter plot of the data given on the grid provided on DIAGRAM SHEET 1. (3)

4.2 Calculate the equation of the least squares line for this data. (4)

4.3 Calculate the correlation coefficient. (2)

4.4 Comment on the correlation of the data. (2)

4.5 If Joan's heart rate after jogging is 86 beats per minute, what is her resting heart rate, in beats per minute? (2)
[13]

QUESTION 5

In Gauteng number plates are designed with 3 alphabetical letters, excluding the 5 vowels, next to one another and then any 3 digits, from 0 to 9, next to one another. The GP is constant in all Gauteng number plates, for example TTT 012 GP. Letters and digits may be repeated in a number plate.

5.1 How many unique number plates are available? (3)

5.2 What is the probability that a car's number plate will start with a Y? (3)

5.3 What is the probability that a car's number plate will contain only one 7? (3)

5.4 How many unique number plates will be available if the letters and numbers are not repeated? (3)
[12]

QUESTION 6

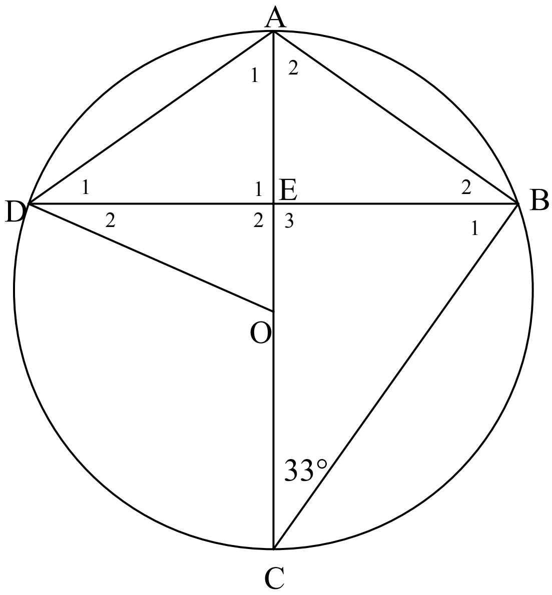
Given: $T_{k+1} = T_k + (5 - 4k)$ where $T_1 = 3$ and $k \geq 1$

6.1 Determine the FIRST FOUR terms of the sequence. (3)

6.2 What type of sequence will this formula generate? Give a reason for your answer. (2)
[5]

QUESTION 7

In the diagram below AC is a diameter of the circle with centre O. AC and chord BD intersect at E. AB, BC and AD are also chords of the circle. OD is joined. AE ⊥ BD.



If $\hat{C} = 33°$, calculate, with reasons, the size of:

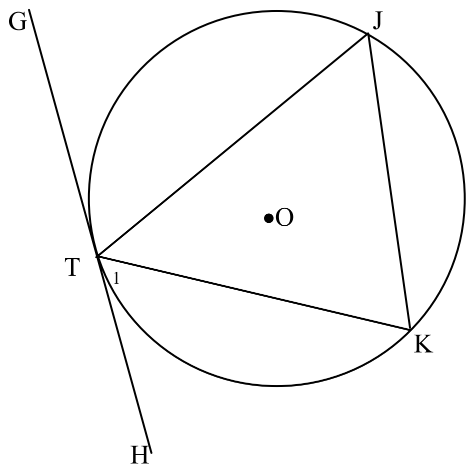
7.1 $\hat{A}_1$ (3)

7.2 $\hat{D}_2$ (2)

7.3 Show that AE bisects $D\hat{A}B$ (3)
[8]

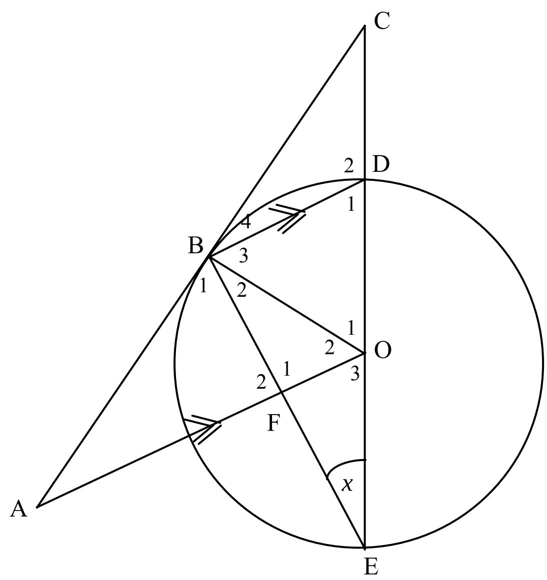
QUESTION 8

8.1 In the diagram below O is the centre of the circle. GH is a tangent to the circle at T. J and K are points on the circumference of the circle. TJ, TK and JK are joined.



Prove the theorem that states $\hat{T}_1 = T\hat{J}K$. (5)

8.2 ED is a diameter of the circle, with centre O. ED is extended to C. CA is a tangent to the circle at B. AO intersects BE at F. BD || AO. $\hat{E} = x$.



8.2.1 Write down, with reasons, THREE other angles equal to x. (4)

8.2.2 Determine, with reasons, $C\hat{B}E$ in terms of x. (3)

8.2.3 Prove that F is the midpoint of BE. (4)

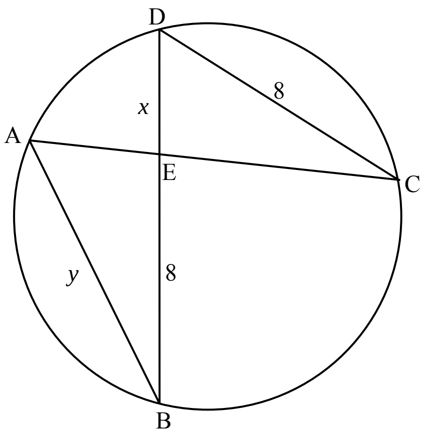
8.2.4 Prove that ΔCBD ||| ΔCEB. (2)

8.2.5 Prove that 2EF.CB = CE.BD. (3)

[21]

QUESTION 9

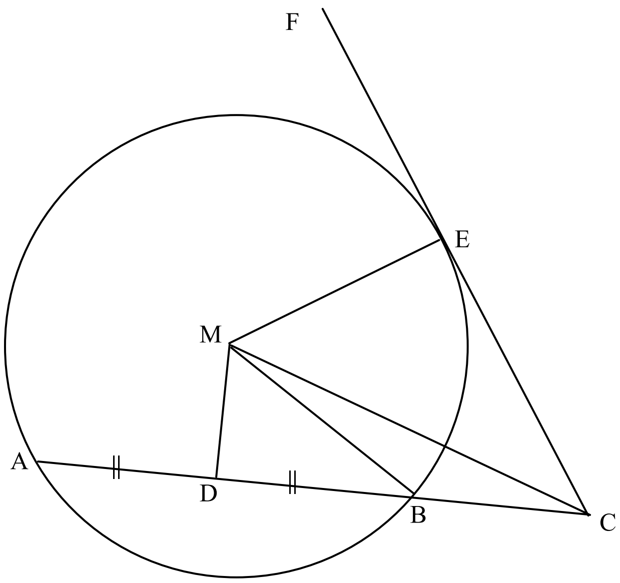
In the diagram below A, B, C and D are points on the circumference of the circle.
BD and AC intersect at E. Also,
EB = 8 cm,
DC = 8 cm and
AE : EC = 4 : 7.



If DE = x units and AB = y units, calculate x and y. **[6]**

QUESTION 10

In the diagram below M is the centre of the circle. FEC is a tangent to the circle at E. D is the midpoint of AB.



10.1 Prove MDCE is a cyclic quadrilateral. (3)

10.2 Prove that $MC^2 = MB^2 + DC^2 - DB^2$. (3)

10.3 Calculate CE if AB = 60 mm, ME = 40 mm and BC = 20 mm. (4)
[10]

TOTAL: 100

CENTRE NUMBER:

EXAMINATION NUMBER:

DIAGRAM SHEET 1

QUESTION 4.1

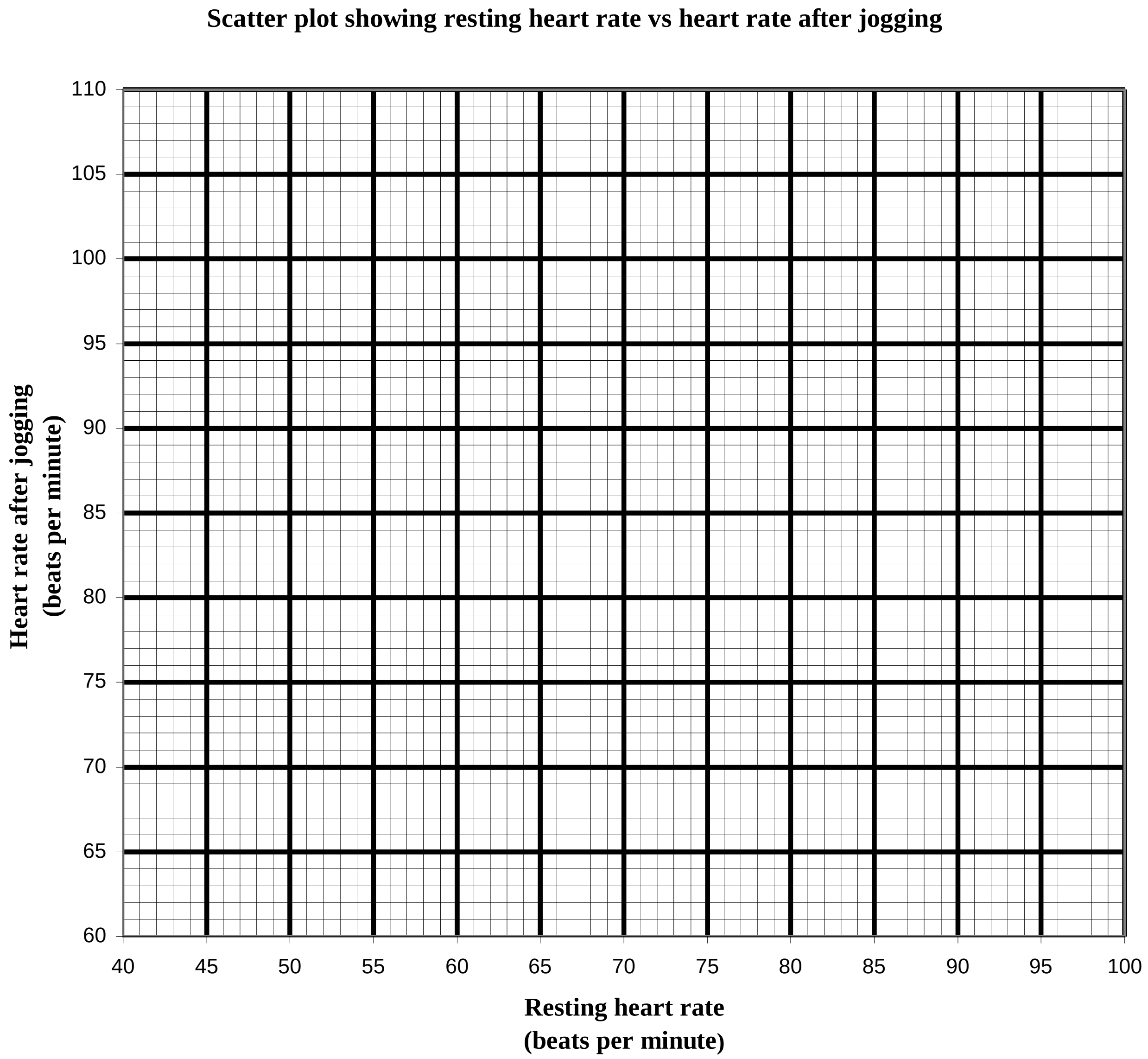


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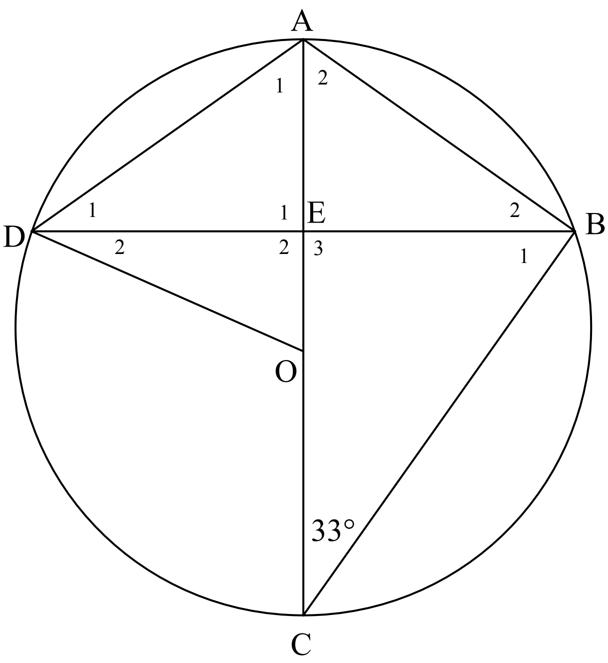
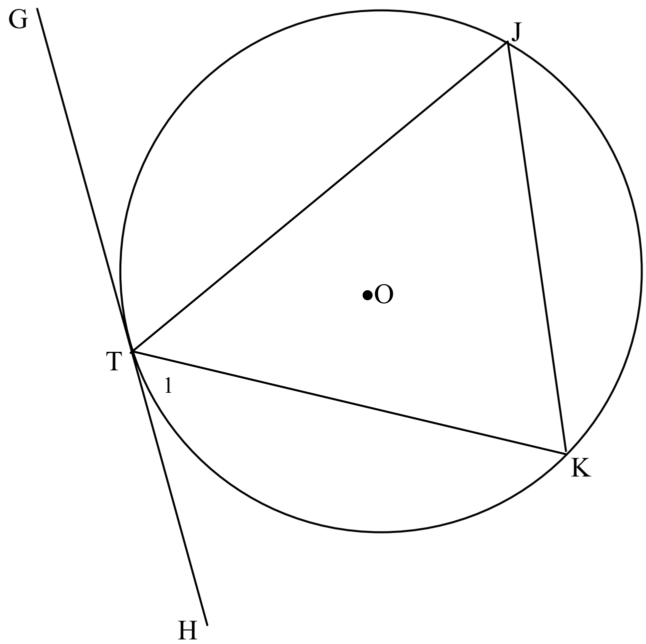
DIAGRAM SHEET 2

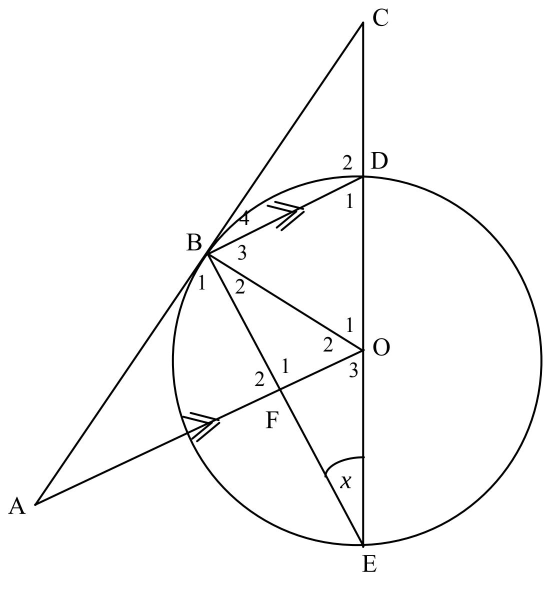
QUESTION 7



QUESTION 8.1



QUESTION 8.2



QUESTION 9

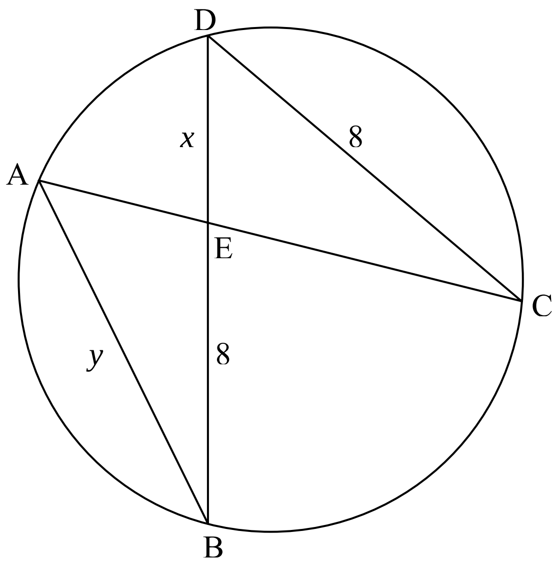


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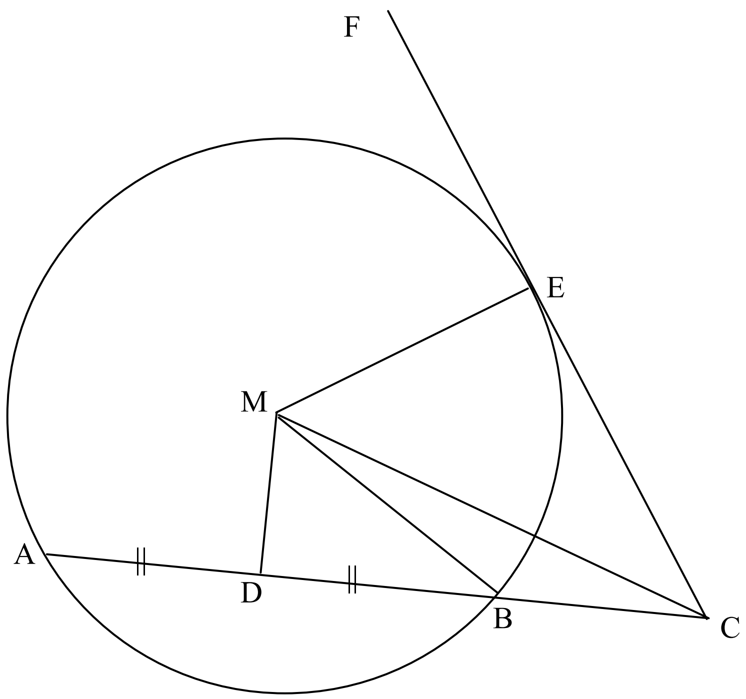
DIAGRAM SHEET 3

QUESTION 10



INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $\quad a^2 = b^2 + c^2 - 2bc.\cos A$

$$area\ \Delta ABC = \frac{1}{2} ab.\sin C$$

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

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

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

$(x\,;\,y) \to (x\cos\theta + y\sin\theta\,;\,y\cos\theta - x\sin\theta)$ $\quad (x\,;\,y) \to (x\cos\theta - y\sin\theta\,;\,y\cos\theta + x\sin\theta)$

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

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

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