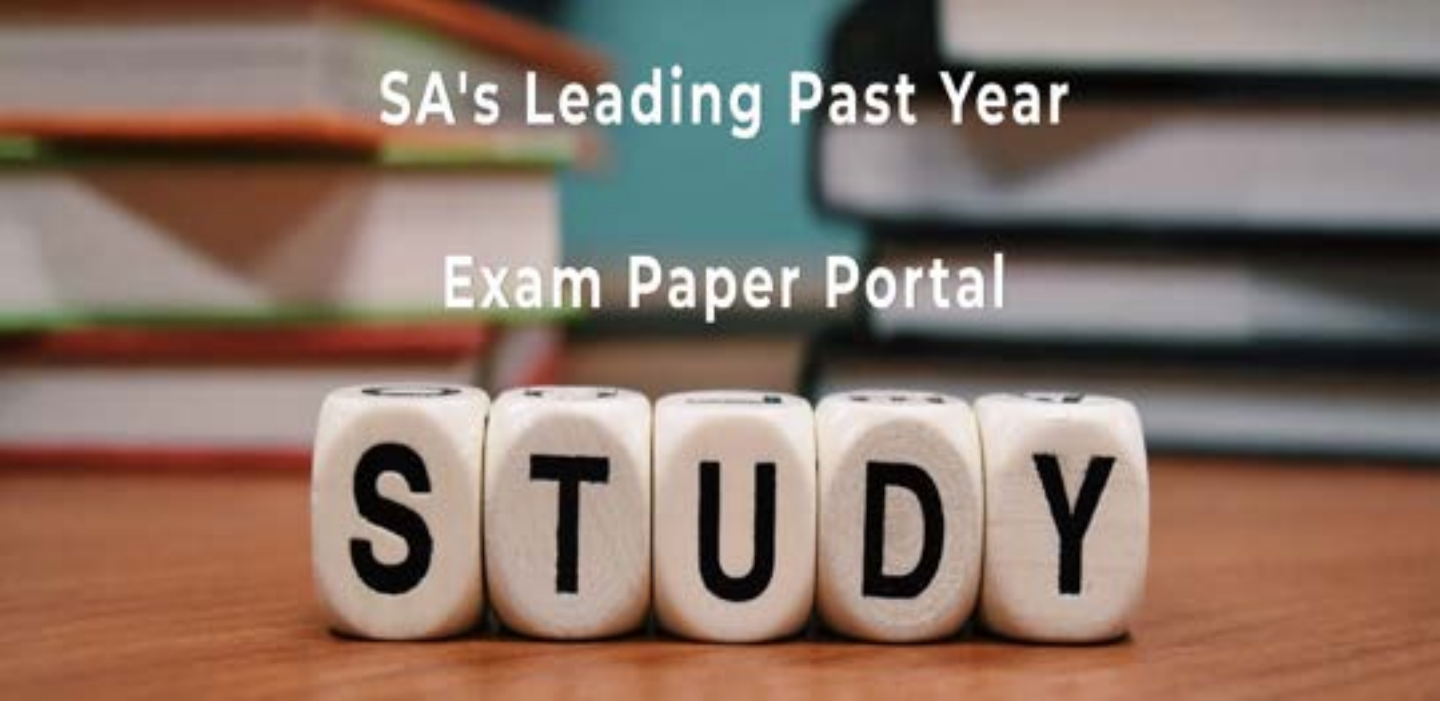

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GRADE 12

MATHEMATICS P3

FEBRUARY/MARCH 2012

MARKS: 100

TIME: 2 hours

This question paper consists of 11 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 11 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 4.2, QUESTION 8, QUESTION 9, QUESTION 10, QUESTION 11.1 and QUESTION 11.2 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 the sheets 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 neatly and legibly.

QUESTION 1

The first FOUR terms of the sequence of numbers are 2; 5; 10 and 17.

1.1 Write down the next TWO terms in the sequence. (2)

1.2 Write down a recursive formula for the sequence. (3)
[5]

QUESTION 2

A large company employs several people. The table below shows the number of people employed in each position and the monthly salary paid to each person in that position.

POSITION	NUMBER EMPLOYED IN POSITION	MONTHLY SALARY PER PERSON (IN RAND)
Managing director	1	150 000
Director	2	100 000
Manager	2	75 000
Foreman	5	15 000
Skilled workers	30	10 000
Semi-skilled workers	40	7 500
Unskilled workers	65	6 000
Administration	5	5 000

2.1 Calculate the total number of people employed at this company. (1)

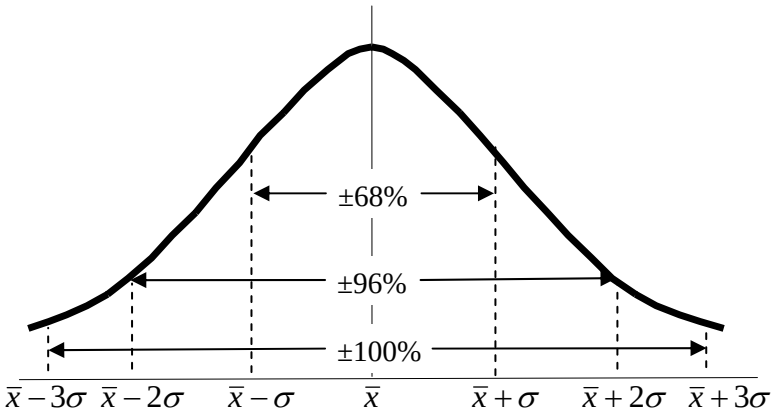
2.2 Calculate the total amount needed to pay salaries for ONE month. (2)

2.3 Determine the mean monthly salary for an employee in this company. (2)

2.4 Is the mean monthly salary calculated in QUESTION 2.3 a good indicator of an employee's monthly salary? Motivate your answer. (2)
[7]

QUESTION 3

The number of SMS messages sent by a group of teenagers was recorded over a period of a week. The data was found to be normally distributed with a mean of 140 messages and a standard deviation of 12 messages.



Answer the following questions with reference to the information provided in the graph:

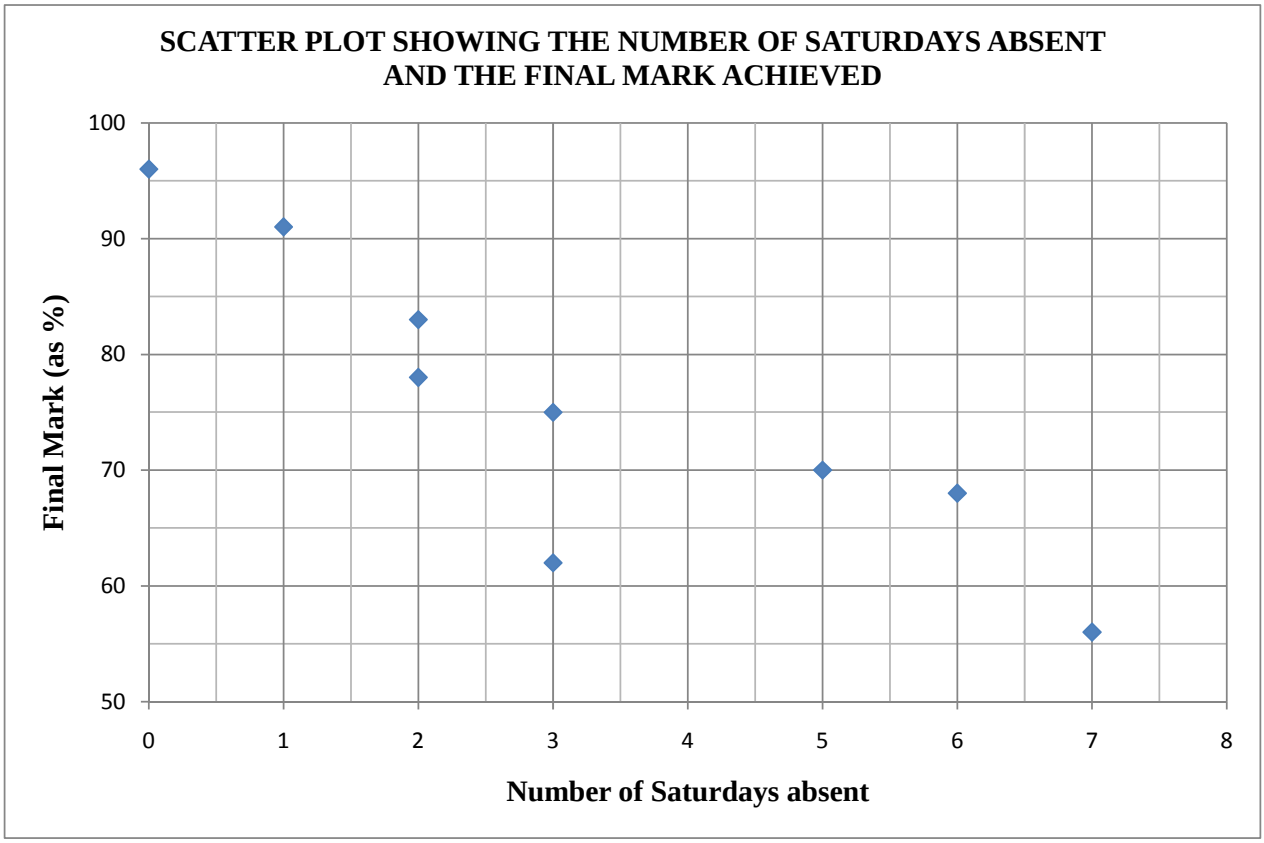
3.1 What percentage of teenagers sent less than 128 messages? (3)

3.2 What percentage of teenagers sent between 116 and 152 messages? (3)
[6]

QUESTION 4

A group of students attended a course in Statistics on Saturdays over a period of 10 months. The number of Saturdays on which a student was absent was recorded against the final mark the student obtained. The information is shown in the table below and the scatter plot is drawn for the data.

Number of Saturdays absent	0	1	2	2	3	3	5	6	7
Final mark (as %)	96	91	78	83	75	62	70	68	56



4.1 Calculate the equation of the least squares regression line. (4)

4.2 Draw the least squares regression line on the grid provided on DIAGRAM SHEET 1. (2)

4.3 Calculate the correlation coefficient. (2)

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

4.5 Predict the final mark of a student who was absent for four Saturdays. (2)
[12]

QUESTION 5

The sports director at a school analysed data to determine how many learners play sport and what the gender of each learner is. The data is presented in the table below.

	DO NOT PLAY SPORT	PLAY SPORT	TOTAL
Male	51	69	120
Female	49	67	116
Total	100	136	236

5.1 Determine the probability that a learner, selected at random, is:

5.1.1 Male (2)

5.1.2 Female and plays sport (2)

5.2 Are the events 'male' and 'do not play sport' mutually exclusive? Use the values in the table to justify your answer. (2)

5.3 Are the events 'male' and 'do not play sport' independent? Show ALL calculations to support your answer. (4)
[10]

QUESTION 6

In a factory, three machines, A, B and C, are used to manufacture plastic bottles. They produce 20%, 30% and 50% respectively of the total production. 1%, 2% and 6% respectively of the plastic bottles produced by machines A, B and C are defective.

6.1 Represent the information by means of a tree diagram. Clearly indicate the probability associated with each branch of the tree diagram and write down all the outcomes. (4)

6.2 A plastic bottle is selected at random from the total production.

6.2.1 What is the probability that it was produced by machine B and it is not defective? (3)

6.2.2 What is the probability that the bottle is defective? (3)
[10]

QUESTION 7

Three items from four different departments of a major chain store will be featured in a one-page newspaper advertisement. The page layout for the advertisement is shown in the diagram below where one item will be placed in each block.

A	B	C
D	E	F
G	H	I
J	K	L

7.1 In how many different ways can all these items be arranged in the advertisement? (2)

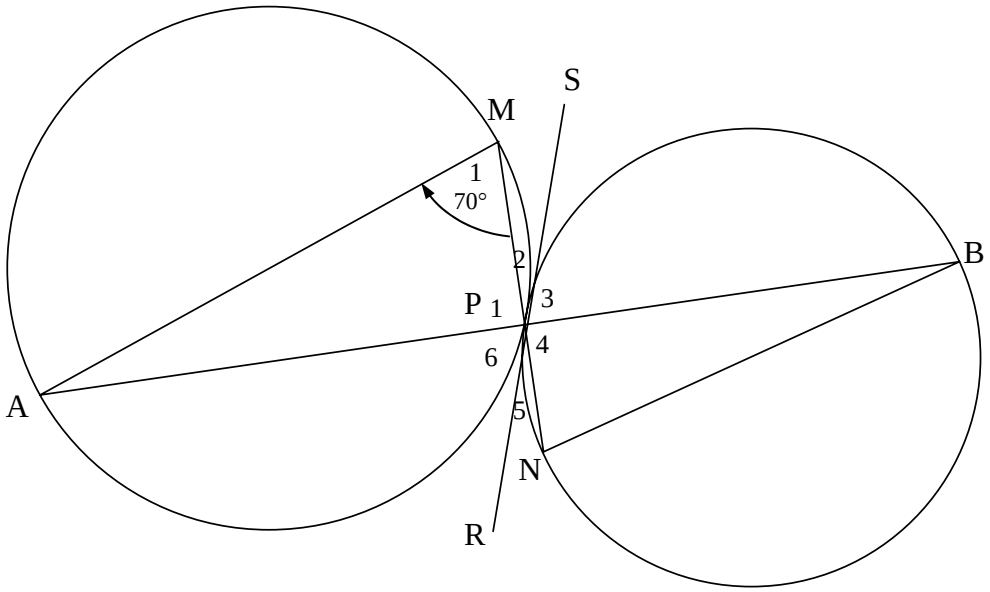
7.2 In how many different ways can these items be arranged if specific items are to be placed in blocks A, F and J? (2)

7.3 In how many different ways can these items be arranged in the advertisement if items from the same department are grouped together in the same row? (3)
[7]

In the next FOUR questions, ensure you give reasons for EACH statement you make.

QUESTION 8

In the diagram below, AM is the diameter of the bigger circle AMP. RPS is a common tangent to both circles at P. APB and MPN are straight lines.



8.1 State the size of $\hat{P}_1$. (1)

8.2 Hence, show that BN is the diameter of the smaller circle. (2)

8.3 If $\hat{M}_1 = 70°$, calculate the size of each of the following angles:

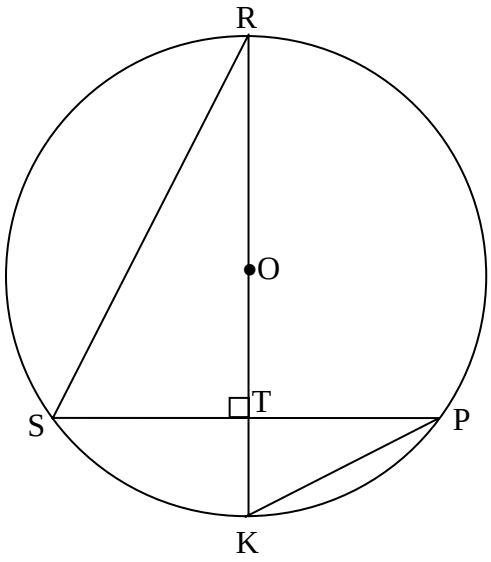
8.3.1 $\hat{A}$ (1)

8.3.2 $\hat{P}_6$ (1)

8.3.3 $\hat{B}$ (2)
[7]

QUESTION 9

In the diagram below, O is the centre of the circle with diameter RK.
PS ⊥ RK.
RK intersects PS at T.



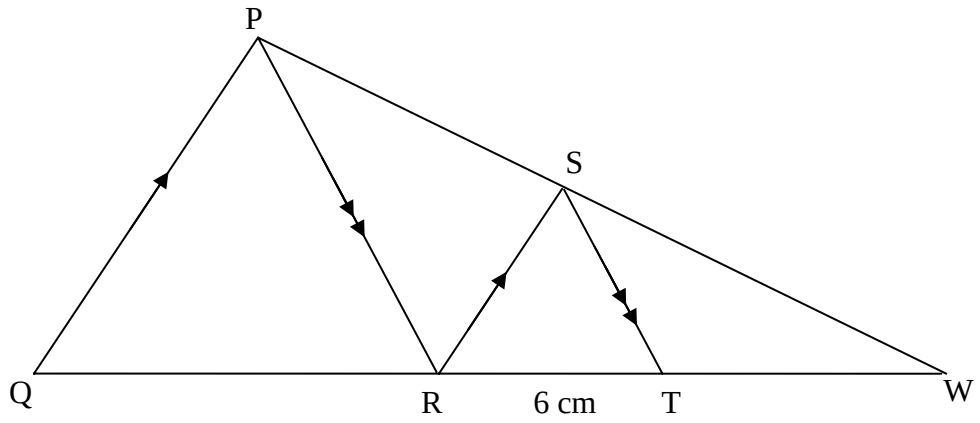
9.1 If PS = 4*x*, write down the length of ST in terms of *x*. (1)

9.2 Prove that ΔRST ||| ΔPKT. (3)

9.3 If it is further given that TK = *x* and RT = 320 mm, calculate the value of *x*. (3)
[7]

QUESTION 10

In ΔPQW, S is a point on PW and R is a point on QW such that SR || PQ.
T is a point on QW such that ST || PR.
RT = 6 cm
WS : SP = 3 : 2



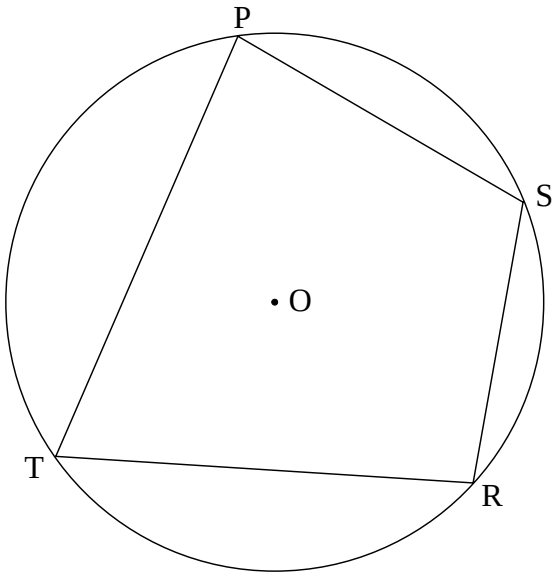
Calculate:

10.1 WT (3)

10.2 WQ (4)
[7]

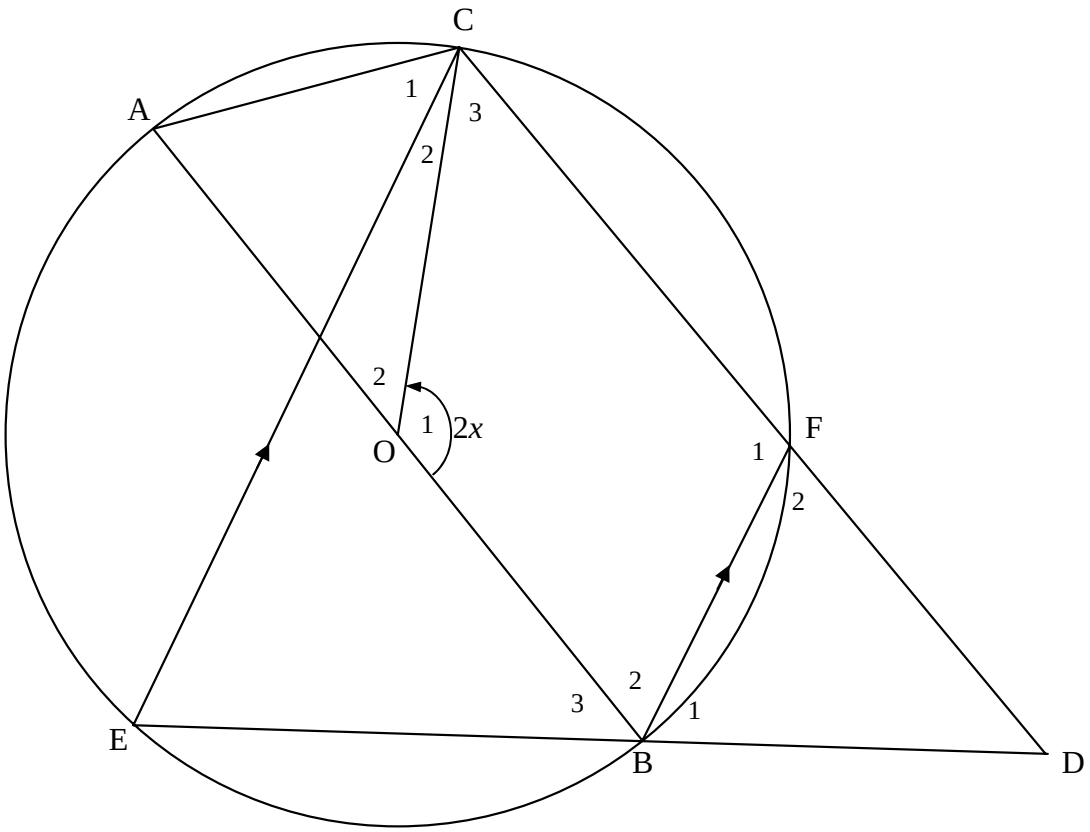
QUESTION 11

11.1 In the diagram below, O is the centre of the circle. PSRT is a cyclic quadrilateral. Prove the theorem that states $P\hat{T}R + P\hat{S}R = 180°$.



(6)

11.2 In the diagram below, O is the centre of the circle. AB is a diameter of the circle. Chord CF produced meets chord EB produced at D. Chord EC is parallel to chord BF.
CO and AC are joined.
Let $\hat{O}_1 = 2x$



11.2.1 Determine, in terms of x, the size of $\hat{F}_1$. (4)

11.2.2 Prove that DF = BD. (4)

11.2.3 Show that $\hat{C}_1 = \hat{C}_3$. (4)

11.2.4 If DF = 5 cm and OA = 6 cm, calculate area ΔBFD : area ΔAOC. (4)
[22]

TOTAL: 100

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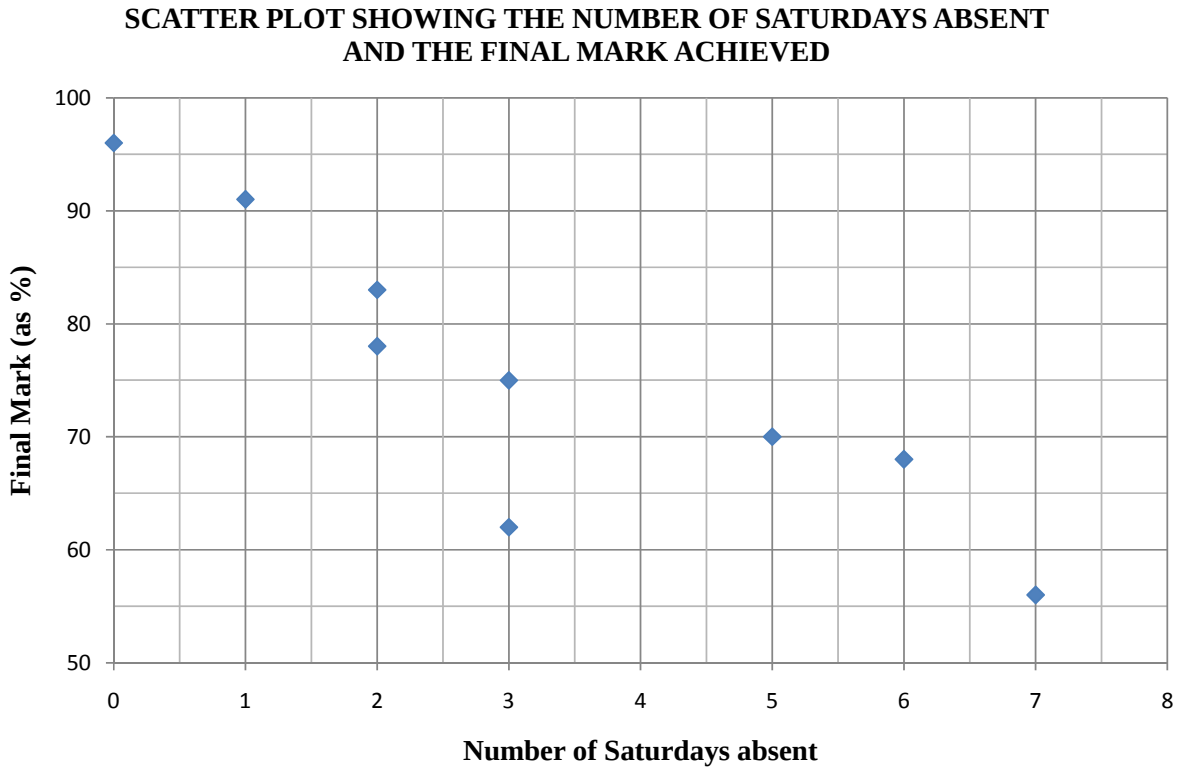
DIAGRAM SHEET 1

QUESTION 4.2



QUESTION 8

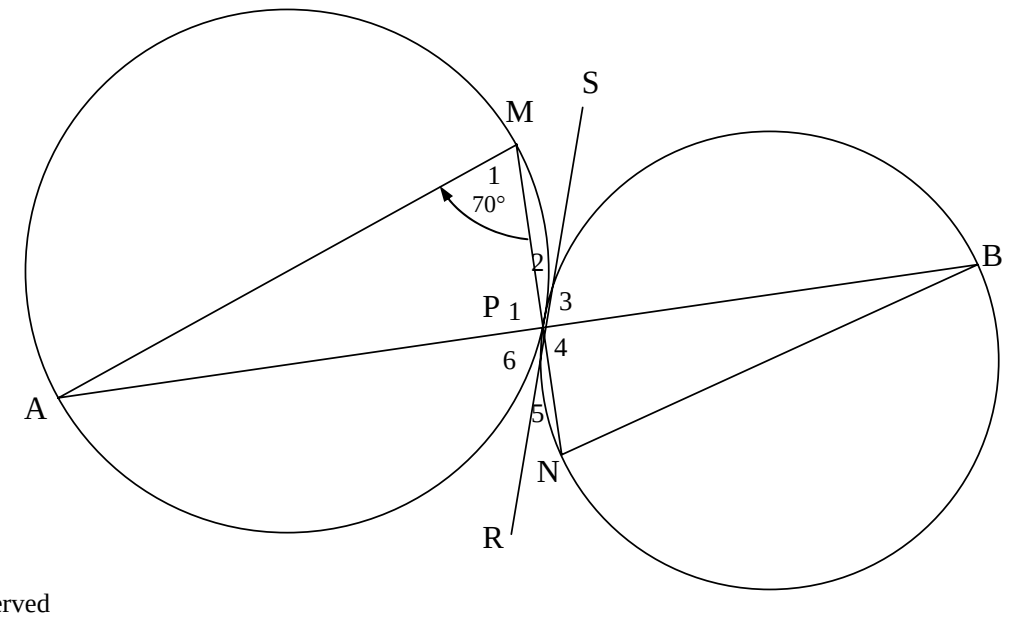


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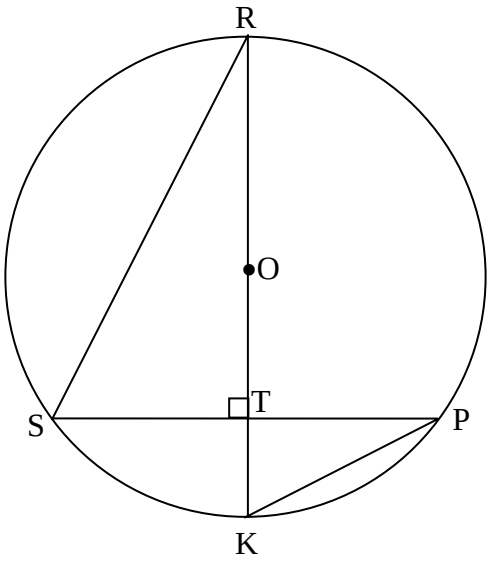
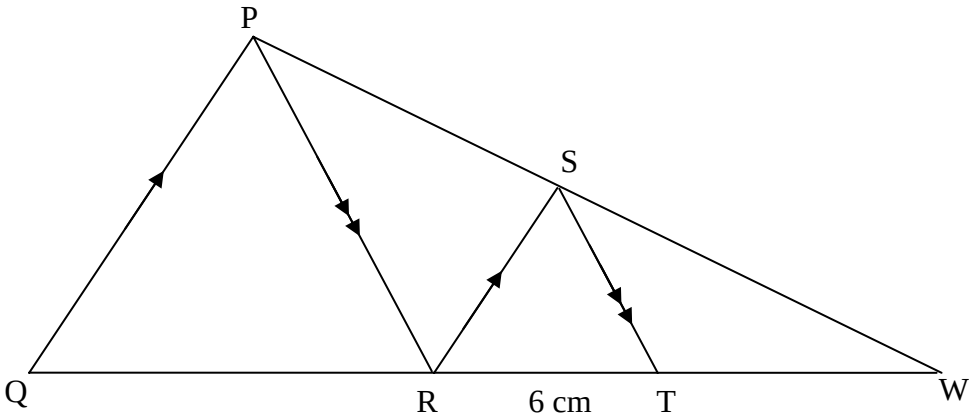
DIAGRAM SHEET 2

QUESTION 9



QUESTION 10



CENTRE NUMBER:

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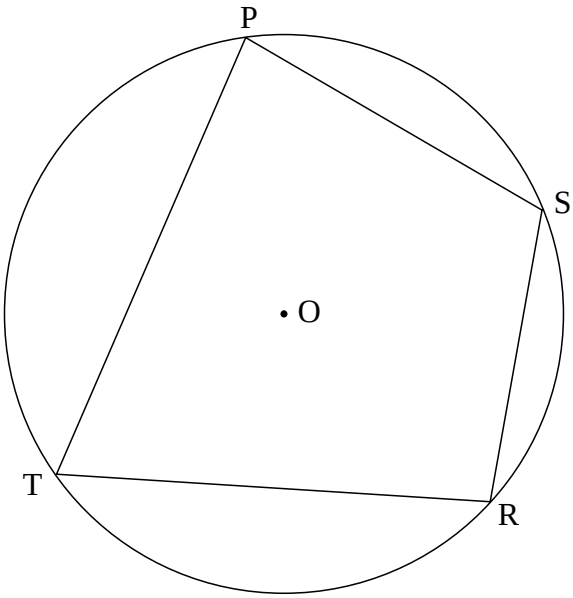
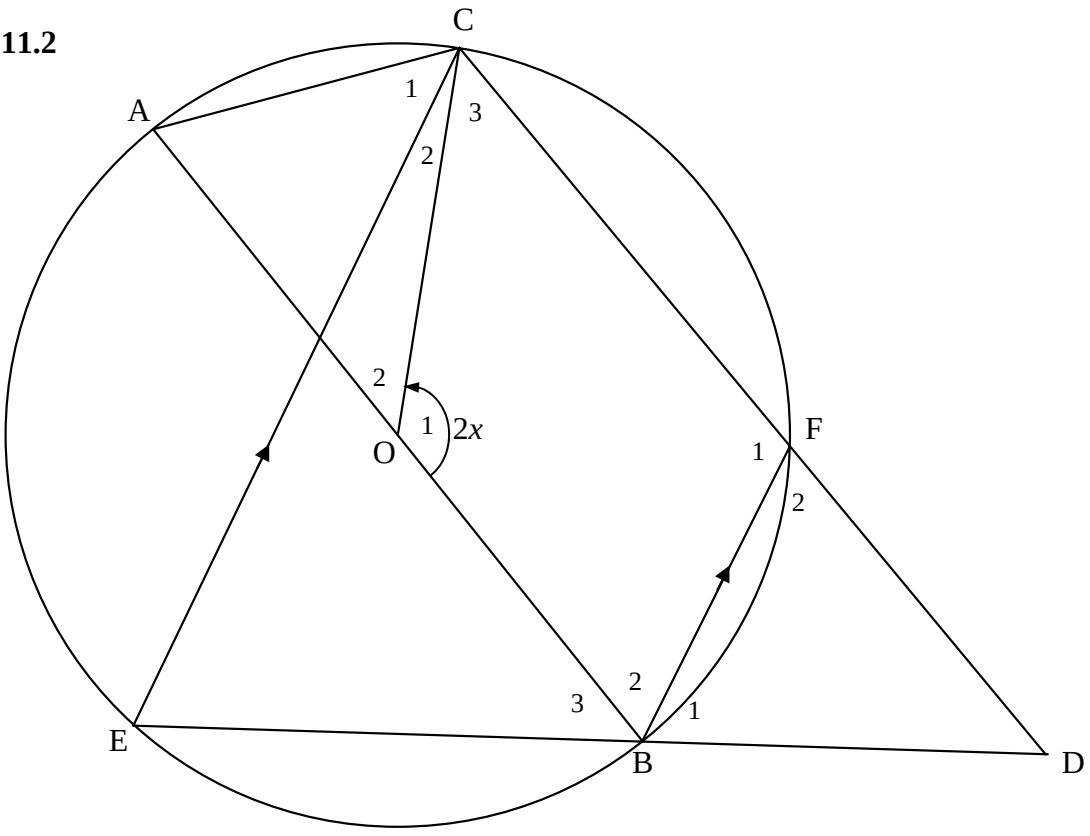
DIAGRAM SHEET 3

QUESTION 11.1



QUESTION 11.2



INFORMATION SHEET: MATHEMATICS
INLIGTINGSBLAD: WISKUNDE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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