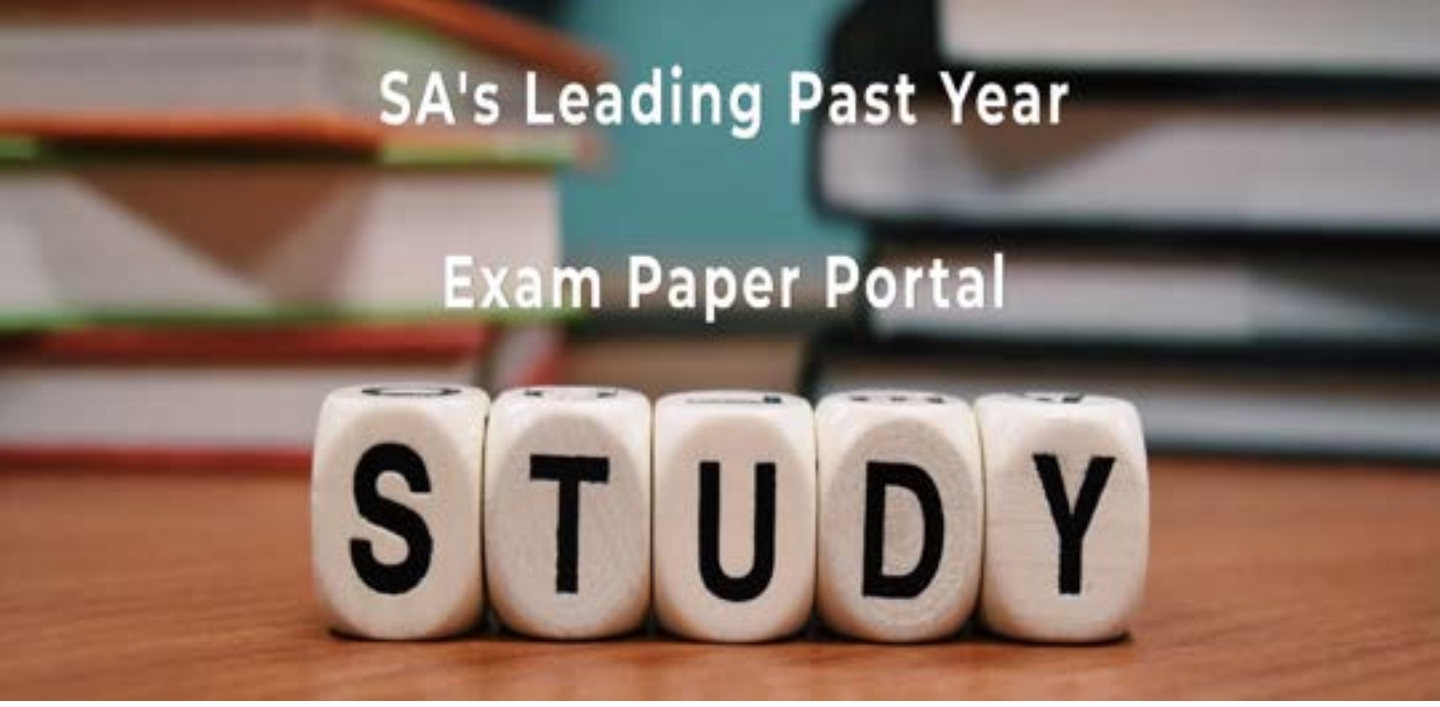

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GRADE 12

MATHEMATICS P3

NOVEMBER 2012

MARKS: 100

TIME: 2 hours

This question paper consists of 9 pages, 5 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. Answer ALL the questions.

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

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

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

5. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.

6. Diagrams are NOT necessarily drawn to scale.

7. FIVE diagram sheets for answering QUESTION 1.2, QUESTION 3.1, QUESTION 7.1, QUESTION 7.2, 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.

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

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

10. Write neatly and legibly.

QUESTION 1

A recording company investigates the relationship between the number of times a CD is played by a national radio station and the national sales of the same CD in the following week. The data below was collected for a random sample of 10 CDs. The sales figures are rounded to the nearest 50.

Number of times CD is played	47	34	40	34	33	50	28	53	25	46
Weekly sales of the CD	3 950	2 500	3 700	2 800	2 900	3 750	2 300	4 400	2 200	3 400

1.1 Identify the independent variable. (1)

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

1.3 Determine the equation of the least squares regression line. (4)

1.4 Calculate the correlation coefficient. (2)

1.5 Predict, correct to the nearest 50, the weekly sales for a CD that was played 45 times by the radio station in the previous week. (2)

1.6 Comment on the strength of the relationship between the variables. (1)
[13]

QUESTION 2

Each of the 200 employees of a company wrote a competency test. The results are indicated in the table below:

	PASS	**FAIL**	**TOTAL**
Males	46	32	78
Females	72	50	122
Total	118	82	200

2.1 Are the events PASS and FAIL mutually exclusive? Explain your answer. (2)

2.2 Is passing the competency test independent of gender? Substantiate your answer with the necessary calculations. (4)
[6]

QUESTION 3

A company producing television sets decided to check the lifespan (in years) of their most popular model. They selected 50 sets of the most popular model at random for this test. The lifespan of each set was recorded. The information is represented in the table below.

LIFESPAN (IN YEARS)	FREQUENCY
$4{,}95 \leq x < 5{,}65$	2
$5{,}65 \leq x < 6{,}35$	6
$6{,}35 \leq x < 7{,}05$	18
$7{,}05 \leq x < 7{,}75$	17
$7{,}75 \leq x < 8{,}45$	5
$8{,}45 \leq x < 9{,}15$	2

3.1 Construct a histogram to represent the data. Use the grid provided on DIAGRAM SHEET 2. (3)

3.2 Calculate the estimated mean lifespan of the most popular model of television set. (3)

3.3 The data representing the lifespan of this batch of television sets is normally distributed. This implies that approximately 68% of the data lies within one standard deviation of the mean, approximately 98% of the data lies within two standard deviations of the mean and approximately 100% of the data lies within three standard deviations of the mean. The standard deviation of this data set is 0,76 years.

Calculate the lifespan of the most popular model of television set such that 98% of the lifespan of all the sets will exceed this value. (3)

3.4 The company wants to issue a 5-year guarantee with this model of television set. What would you recommend? Justify your recommendation. (2)

[11]

QUESTION 4

During summer in a certain city in South Africa the probability of a sunny day is $\frac{4}{7}$ and the probability of a rainy day is $\frac{3}{7}$.

- If it is a sunny day, then the probability that Vusi cycles to work is $\frac{7}{10}$, the probability that Vusi drives to work is $\frac{1}{5}$ and the probability that Vusi takes the train to work is $\frac{1}{10}$.
- If it is a rainy day, then the probability that Vusi cycles to work is $\frac{1}{9}$, the probability that Vusi drives to work is $\frac{5}{9}$ and the probability that Vusi takes the train to work is $\frac{1}{3}$.

4.1 Draw a tree diagram to represent the above information. Indicate on your diagram the probabilities associated with each branch as well as all the outcomes. (5)

4.2 For a day selected at random, what is the probability that:

4.2.1 It is rainy and Vusi will cycle to work (2)

4.2.2 Vusi takes the train to work (3)

4.3 If Vusi works 245 days in a year, on approximately how many occasions does he drive to work? (4)

[14]

QUESTION 5

Every client of CASHSAVE Bank has a personal identity number (PIN) which is made up of 5 digits chosen from the digits 0 to 9.

5.1 How many personal identity numbers (PINs) can be made if:

5.1.1 Digits can be repeated (2)

5.1.2 Digits cannot be repeated (2)

5.2 Suppose that a PIN can be made up by selecting digits at random and that the digits can be repeated. What is the probability that such a PIN will contain at least one 9? (4)

[8]

QUESTION 6

6.1 Write down a recursive formula for the sequence: 1 ; 5 ; 13 ; 29 ; 61; ... (4)

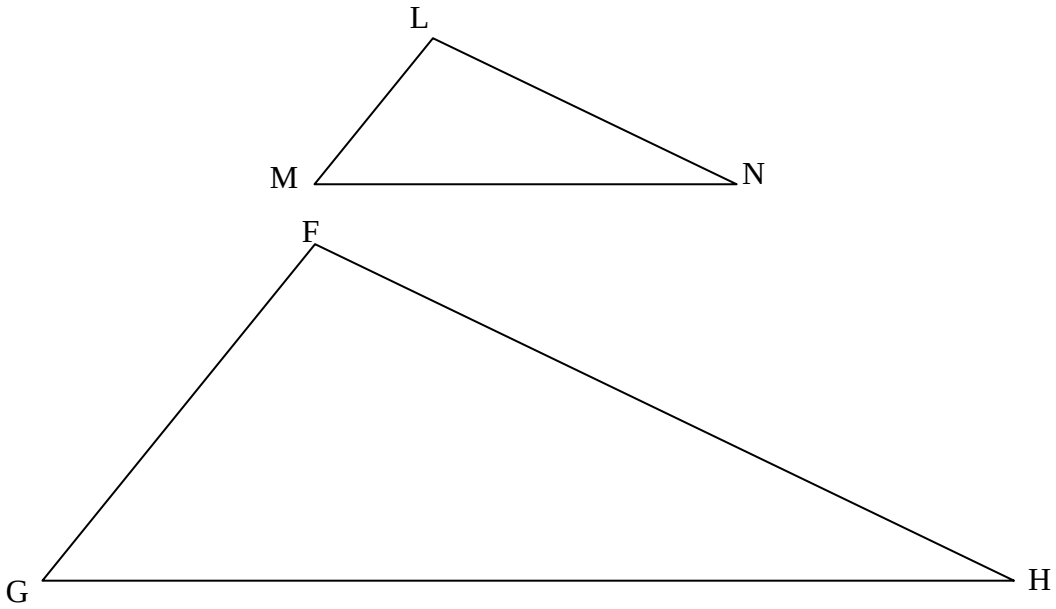
6.2 Write down the next term of the given recursive sequence:
4 ; 7 ; 13 ; 24 ; 44; ... (2)

[6]

NOTE: Give reasons for all statements made in QUESTION 7, QUESTION 8, QUESTION 9 and QUESTION 10.

QUESTION 7

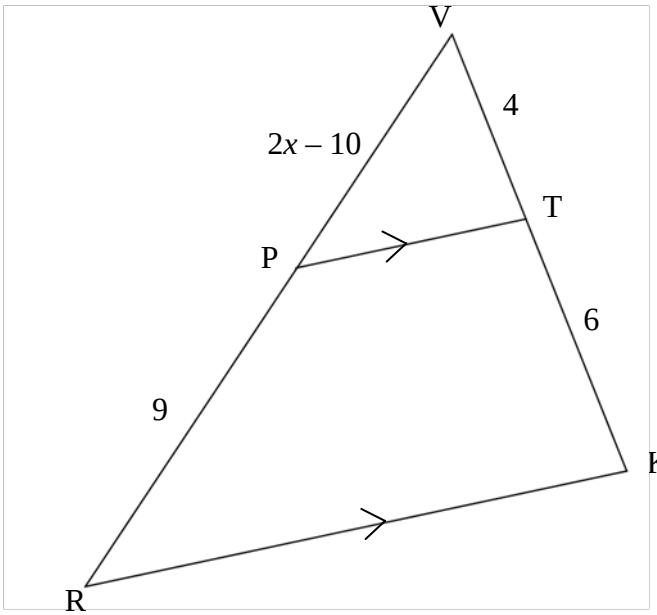
7.1 If in Δ LMN and Δ FGH it is given that $\hat{L} = \hat{F}$ and $\hat{M} = \hat{G}$, prove the theorem that states $\frac{LM}{FG} = \frac{LN}{FH}$.



(7)

7.2 In the diagram below, ΔVRK has P on VR and T on VK such that PT || RK. VT = 4 units, PR = 9 units, TK = 6 units and VP = $2x - 10$ units.

Calculate the value of x.



(4)
[11]

QUESTION 8

8.1 Complete the following statement:

The angle between the tangent and the chord is equal ... (1)

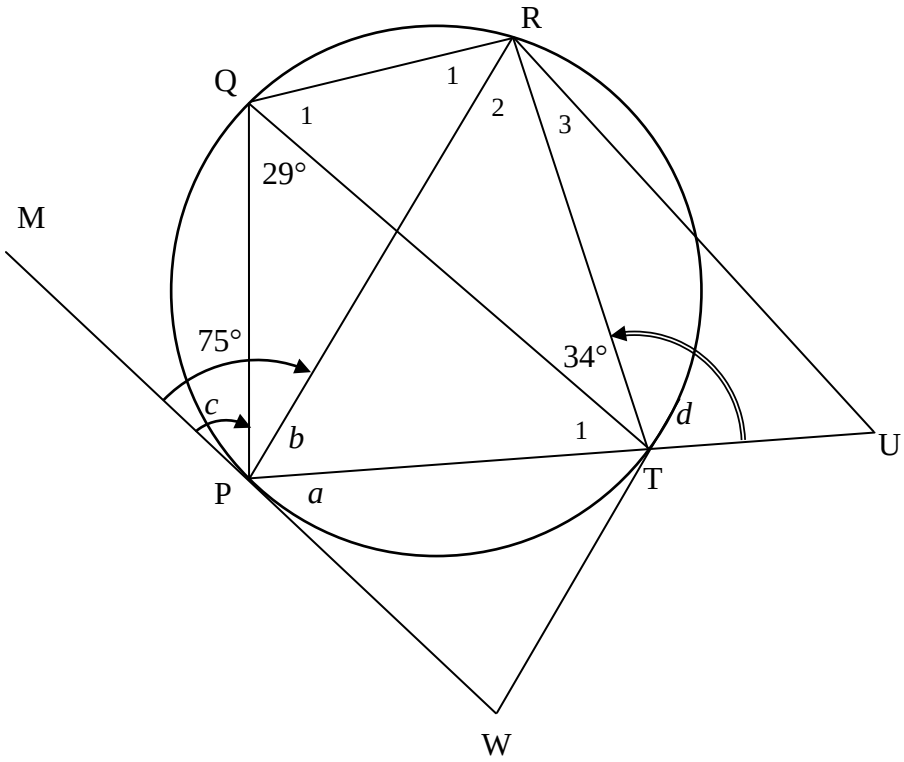
8.2 In the diagram points P, Q, R and T lie on the circumference of a circle. MW and TW are tangents to the circle at P and T respectively. PT is produced to meet RU at U.

$M\hat{P}R = 75°$

$P\hat{Q}T = 29°$

$Q\hat{T}R = 34°$

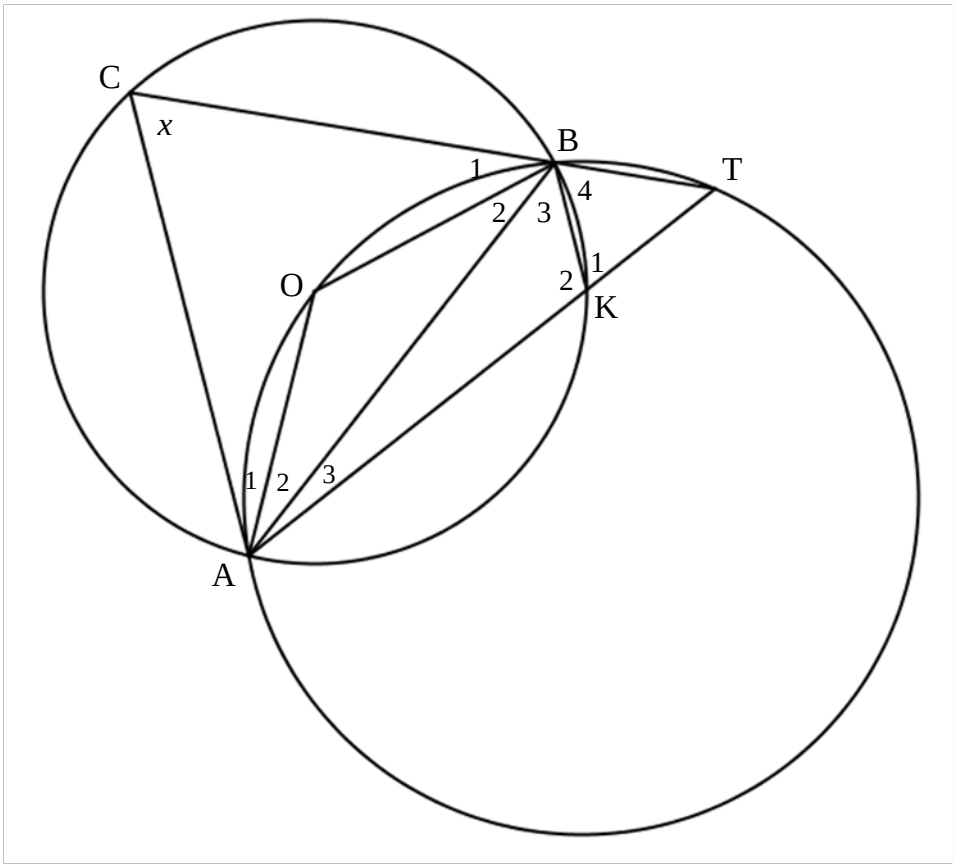
Let $T\hat{P}W = a$, $R\hat{P}T = b$, $M\hat{P}Q = c$ and $R\hat{T}U = d$, calculate the values of *a*, *b*, *c* and *d*.



(9)
[10]

QUESTION 9

O is the centre of the circle CAKB.
AK produced intersects circle AOBT at T.
$A\hat{C}B = x$



9.1 Prove that $\hat{T} = 180° - 2x$. (3)

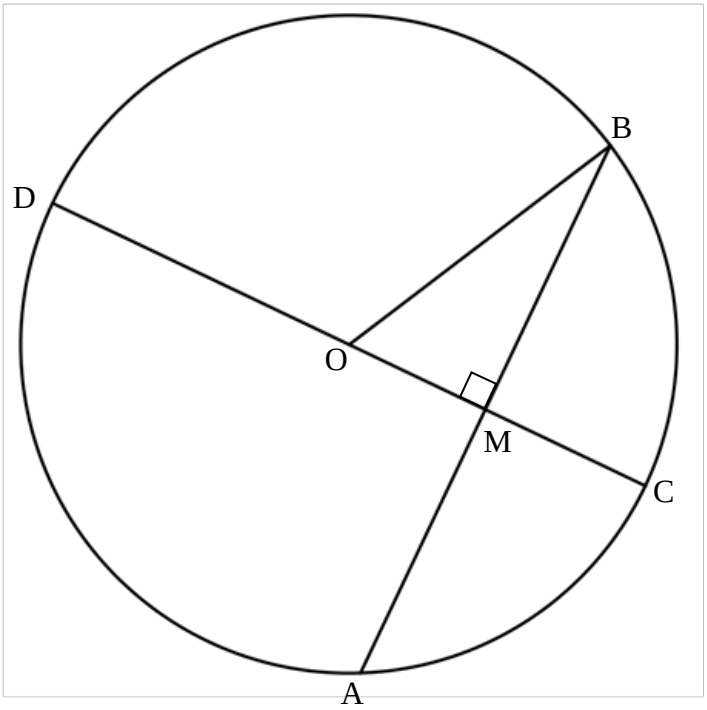
9.2 Prove AC || KB. (5)

9.3 Prove $\Delta BKT \;|||\; \Delta CAT$ (3)

9.4 If AK : KT = 5 : 2, determine the value of $\frac{AC}{KB}$ (3)
[14]

QUESTION 10

In the diagram below, O is the centre of the circle. Chord AB is perpendicular to diameter DC.
CM : MD = 4 : 9 and AB = 24 units.



10.1 Determine an expression for DC in terms of x if CM = $4x$ units. (1)

10.2 Determine an expression for OM in terms of x. (2)

10.3 Hence, or otherwise, calculate the length of the radius. (4)
[7]

TOTAL: 100

CENTRE NUMBER: | | | | | | | | |

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DIAGRAM SHEET 1

QUESTION 1.2

Scatter plot showing the number of times a CD was played vs the CD sales in the following week

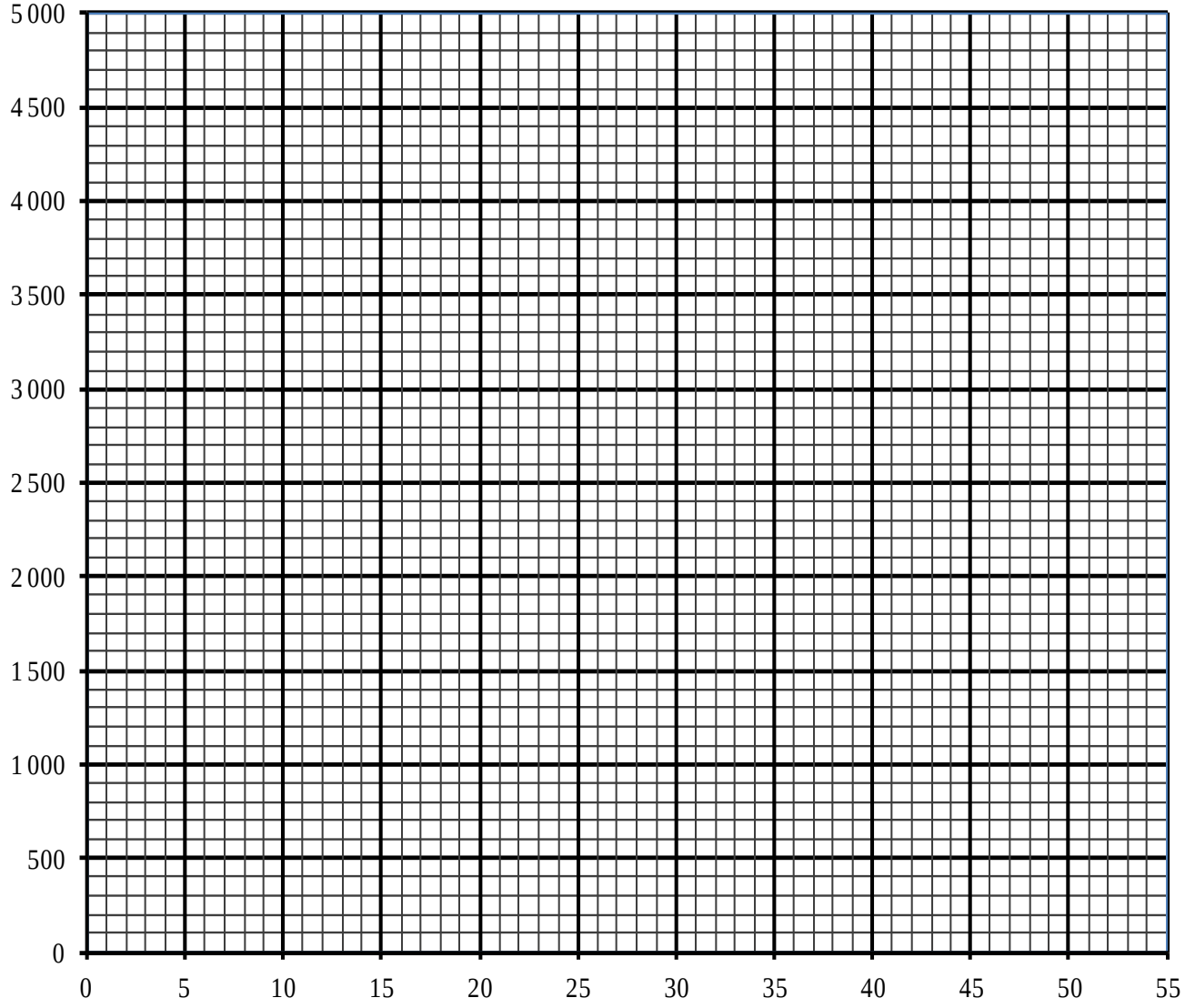

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DIAGRAM SHEET 2

QUESTION 3.1

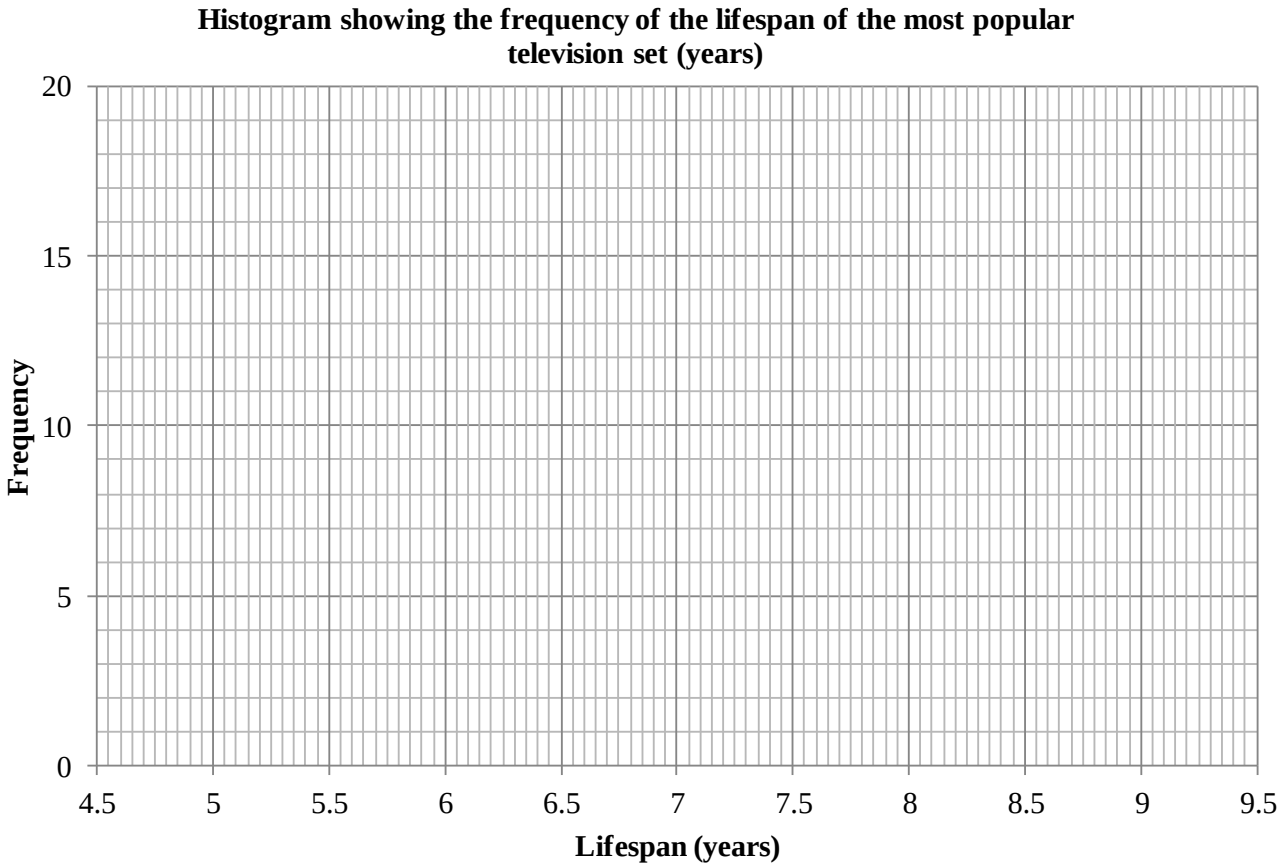

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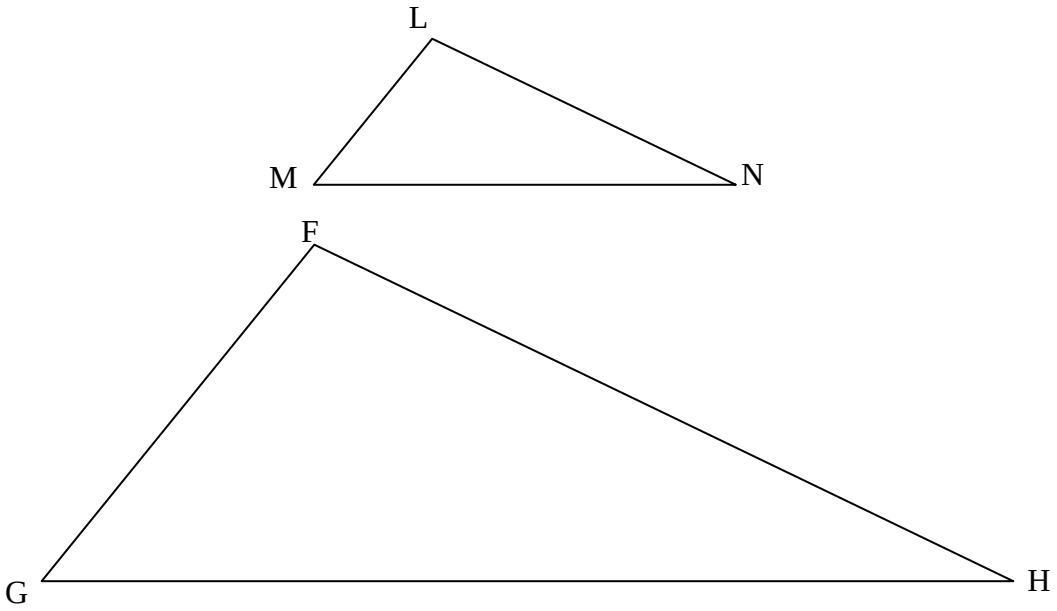
DIAGRAM SHEET 3

QUESTION 7.1



QUESTION 7.2

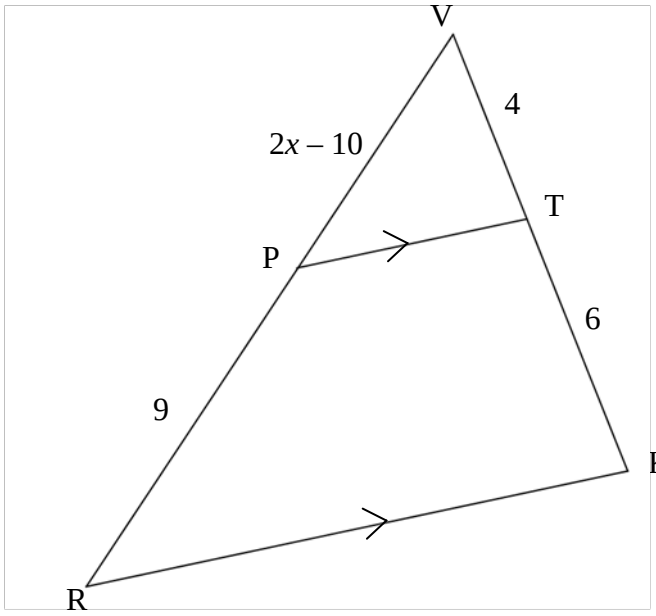


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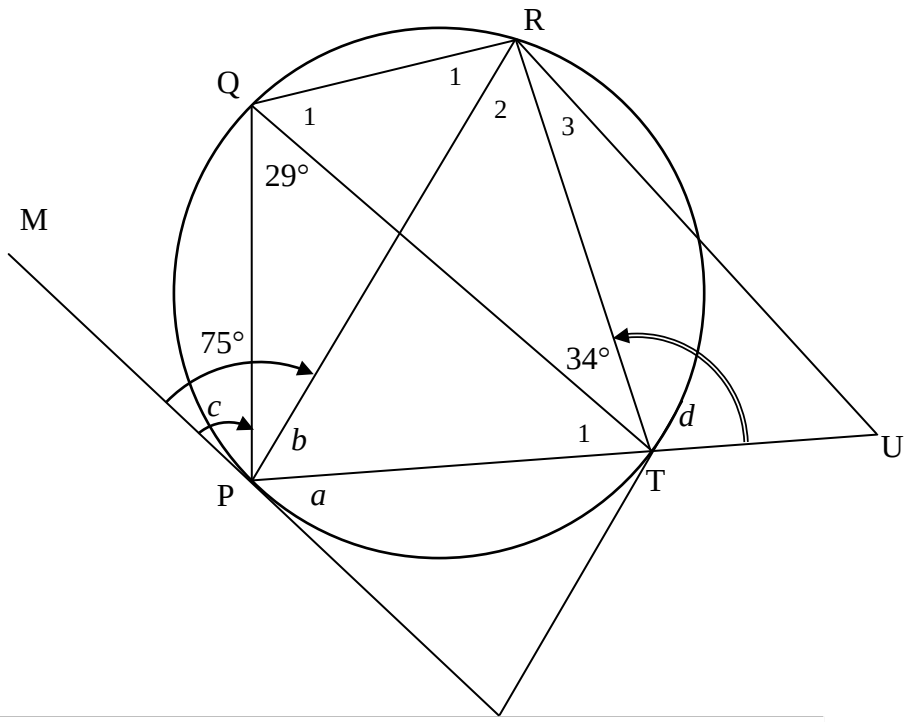
DIAGRAM SHEET 4

QUESTION 8.2



QUESTION 9

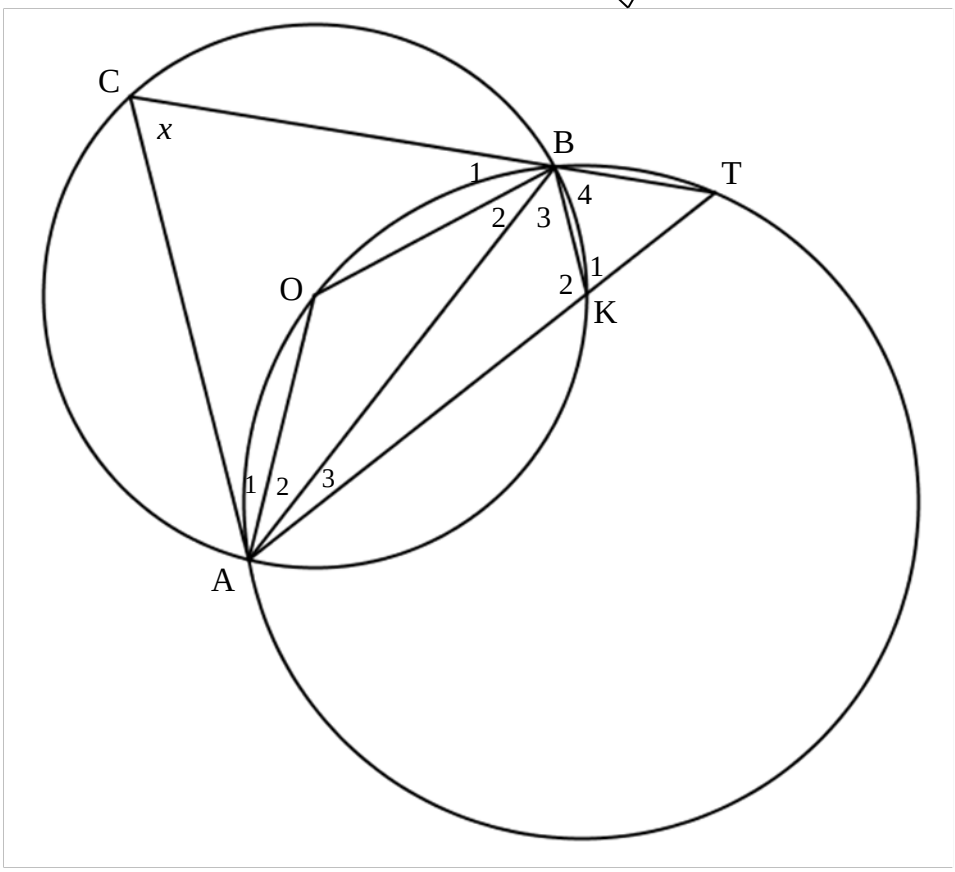


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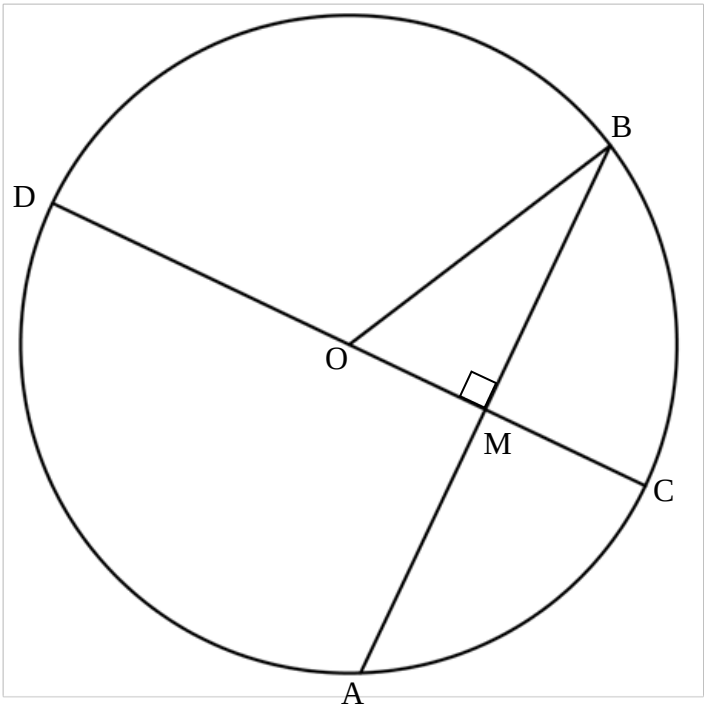
DIAGRAM SHEET 5

QUESTION 10



INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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