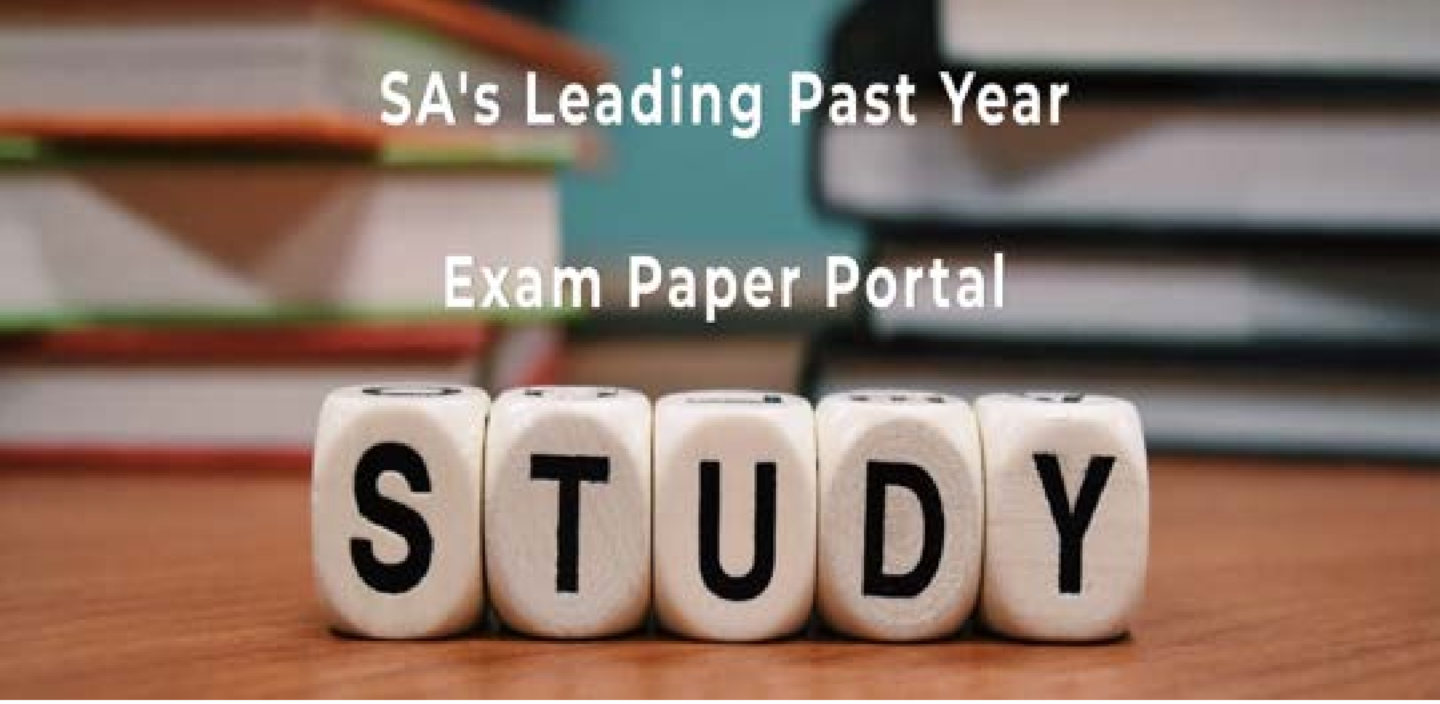
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# GRADE 12

# MATHEMATICS TERM 1 TEST 2022

**TIME:**

This question paper consists of 6 pages, including information sheet.

**INSTRUCTIONS AND INFORMATION**

1. This question paper consists of SIX questions
2. Answer ALL the questions
3. Answers only will NOT necessarily be awarded full marks.
4. If necessary, round off answers to TWO decimal places, unless stated otherwise.
5. Diagrams are NOT necessarily to drawn to scale.
6. An information sheet with formulae is attached at the end of the question paper.
7. Write neatly and legibly.

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## QUESTION 1

Consider the quadratic number pattern: $-\frac{1}{2}\ ;\ 2\ ;\ \frac{11}{2}\ ;\ 10\ ;\ ...$

1.1 **Write down the value of** $T_5$. (1)

1.2 Show that the General term of this number pattern is $T_n = \frac{1}{2}n^2 + n - 2$. (4)

1.3 Determin the value of $T_{75} - T_{74}$. (2)

**[7]**

## QUESTION 2

Given the linear pattern: 3 ; 7 ; 11 ; .

2.1 Determine $T_{20}$. (3)

2.2 Calculate the sum of the first 20 terms. (2)

**[5]**

## QUESTION 3

The $n^{\text{th}}$ term of a geometric series is $T_n = x(x+1)^{n-1}$

3.1 Determine the common ratio, in terms of $x$, in its simplest form. (2)

3.2 Determine the values of $x$ so that the series $\sum_{n=1}^{\infty} x(x+1)^{n-1}$ converges. (3)

3.3 Calculate $S_\infty$. (3)

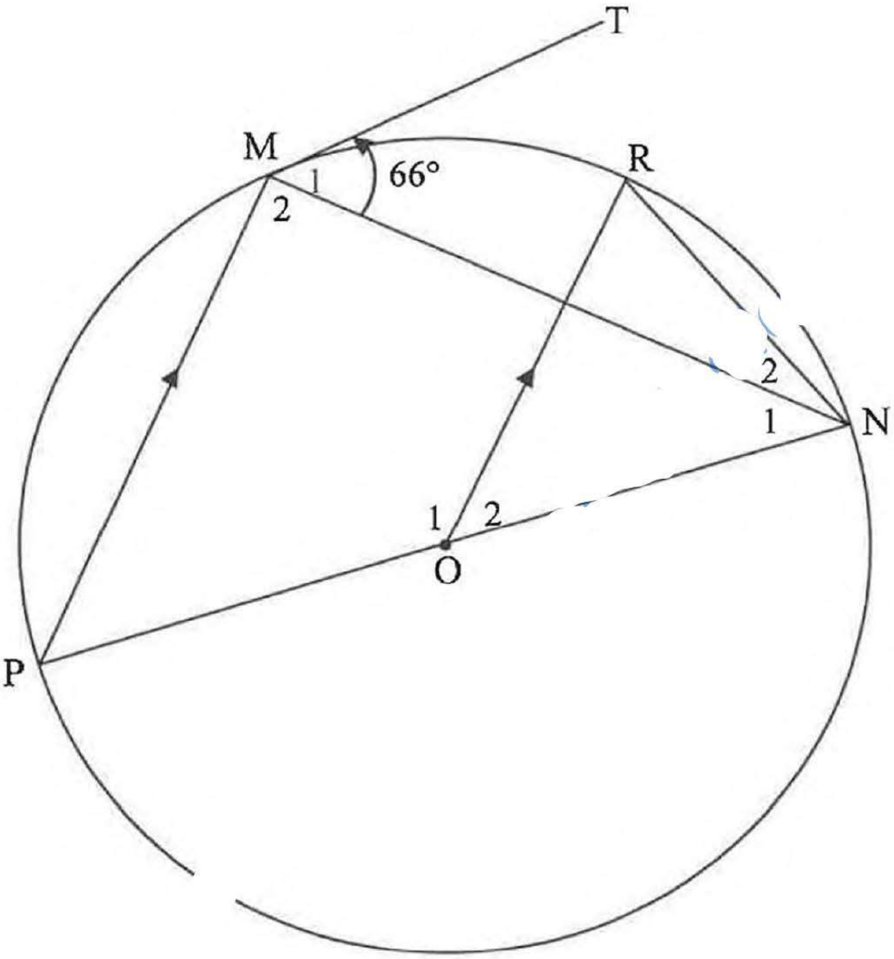
3.4 If $x = 1$, write down the first three terms of the geometric series. (2)

3.5 Determine the sum of the first 25 terms of the series calculated in Question 3.4 . (3)

**[13]**

## QUESTION 4

PON is a diameter of the circle centred at O. TM is a tangent to the circle at M, a point on the circle. R is another point on the circle such that OR || PM. NR and MN are drawn and $\hat{M}_1 = 66°$.




Calculate with reasons, the size of EACH of the following angles.

4.1 $\hat{P}$ (2)

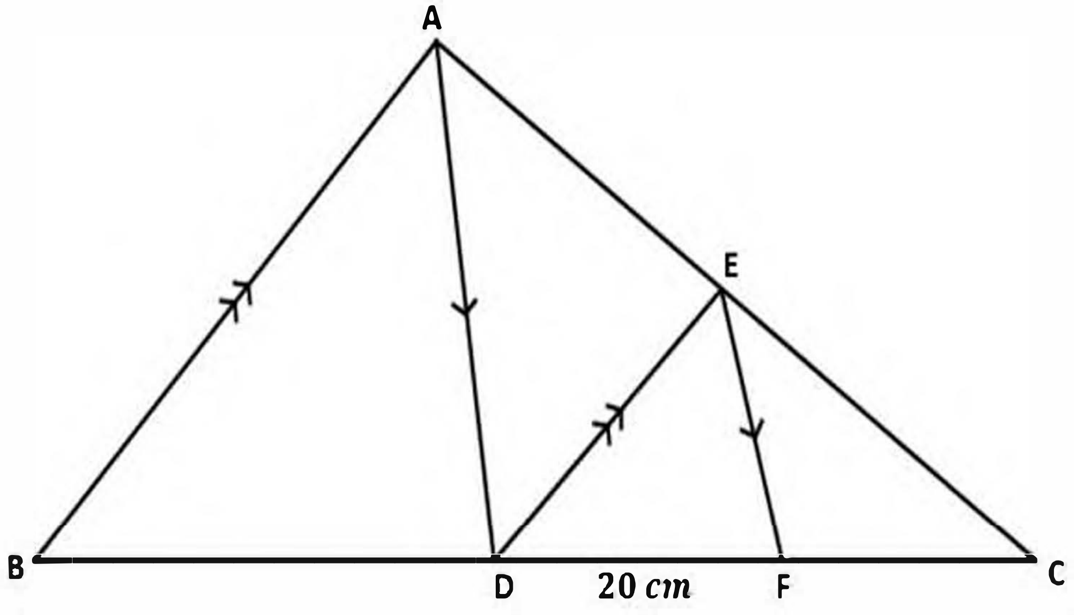
4.2 $\hat{M}_2$ (2)

4.3 $\hat{N}_1$ (1)

**[5]**

## QUESTION 5

In the diagram, $\Delta\, ABC$ with points D and F on BC and E a point on AC such that EF || AD and DE || BA. Further it is given that $\frac{AE}{EC} = \frac{5}{4}$ and DF = 20 cm.




5.1 Calculate giving reasons, the length of:

5.1.1 FC (3)

5.1.2 BD (3)

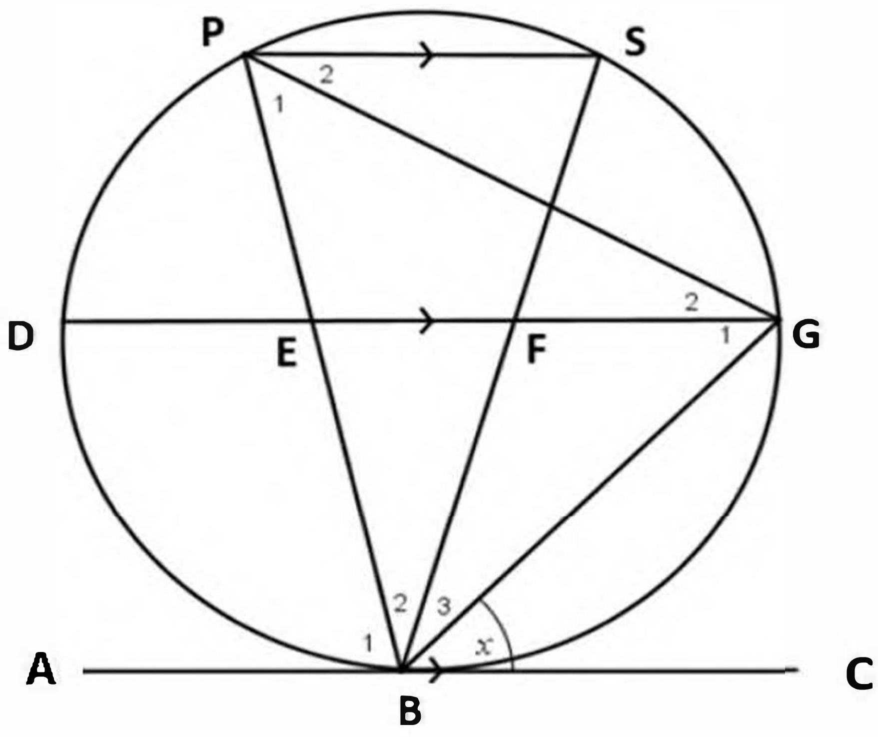
5.2 Evaluate $\frac{Area\,\Delta\,\text{ECF}}{Area\,\Delta\,\text{ABC}}$ (4)

**[10]**

## QUESTION 6

In the diagram P, S, G, B and D are points on the circle such that PS || DG || AC.

ABC is a tangent to the circle at B. $G\hat{B}C = x$




6.1 Give a reason why $\hat{G}_1 = x$. (1)

6.2 Prove that:

6.2.1 $BE = \frac{BP \times BF}{BS}$ (2)

6.2.2 $\Delta BGP \,|||\, \Delta BEG$ (4)

6.2.3 $\frac{BG^2}{BP^2} = \frac{BF}{BS}$ (3)

**[10]**

**TOTAL: 50 Marks**

**INFORMATION SHEET: MATHEMATICS**

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

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

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

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

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

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

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

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

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

*In $\Delta ABC$:*

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

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

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

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

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

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

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