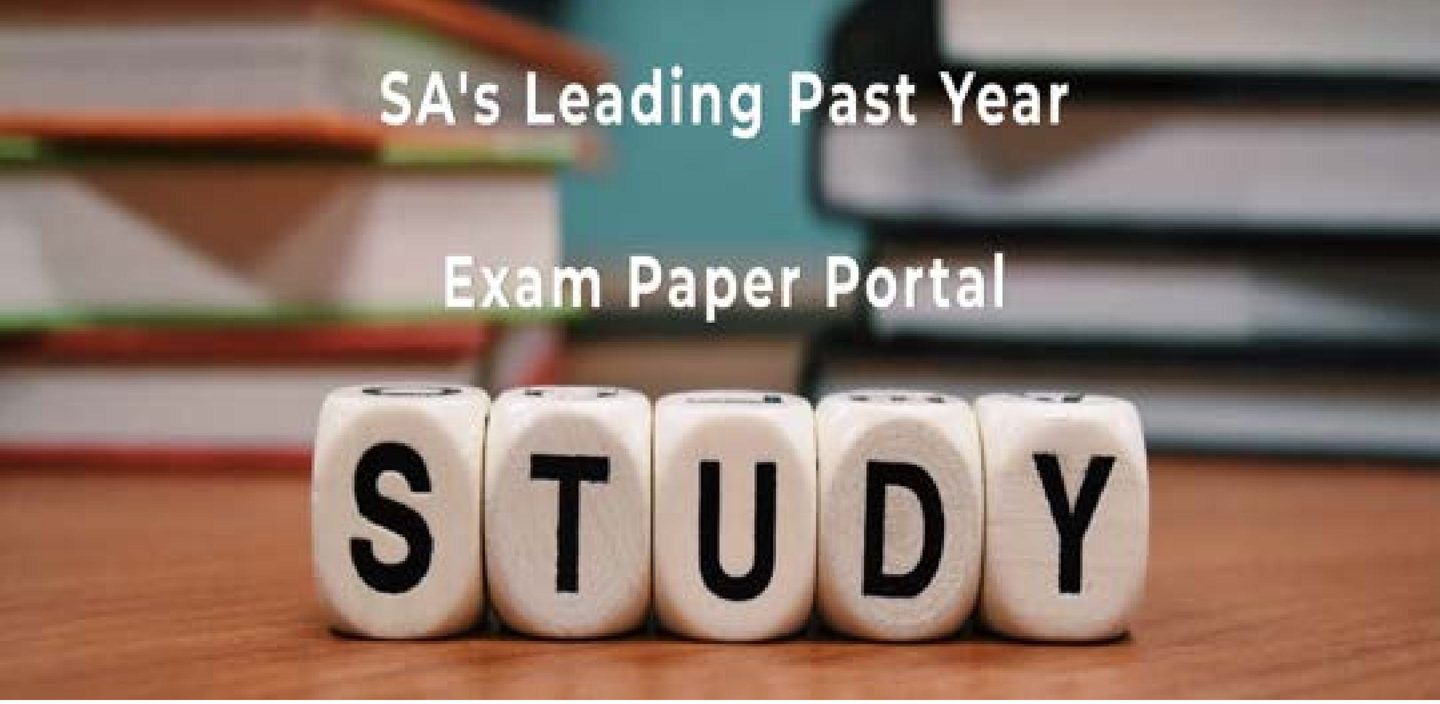
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PREPARATORY EXAMINATION

GRADE 12

MATHEMATICS P2

SEPTEMBER 2022

MATHEMATICS P2

10612E

MARKS: 150

TIME: 3 HOURS

X10

This question paper consists of 14 pages, 1 information sheet and an answer book of 22 pages.

A

QUESTION 1

The table below shows the distances (in cm) of the best attempts of 11 long jump athletes during an athletics event.

287	328	374	486	492	501	522	583	601	619	685

1.1 Calculate the:

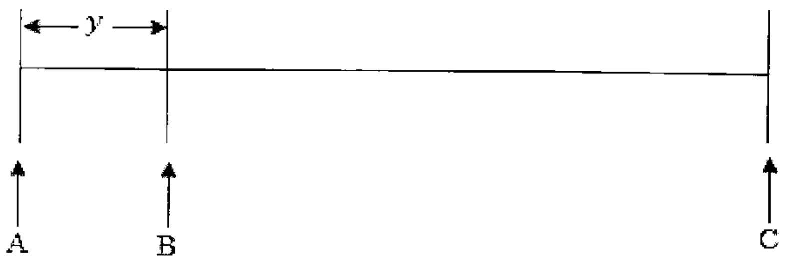
1.1.1 Range of the data. (1)

1.1.2 Mean distance of the athletes' best attempts. (2)

1.1.3 Standard deviation of the above data. (1)

1.2 Determine how many distances lie outside one standard deviation from the mean best attempt. Show ALL your calculations. (3)

1.3 Unfortunately, the official incorrectly measured the distances of the long jump athletes; he measured y cm short from the correct measuring mark. Hence, all distances measured were y cm shorter than what it was supposed to be. This scenario is shown in the diagram below



A= The correct mark from where the distance should have been measured.
B= The incorrect mark from where the distances were measured.
C= The mark up to where the distances were measured.

When the correction is made to the distances, the sum of the athletes' best jumps is now 5555 cm, i.e.:

$$\sum_{n=1}^{11} k_n = 5555$$

After the corrections were made, write down the:

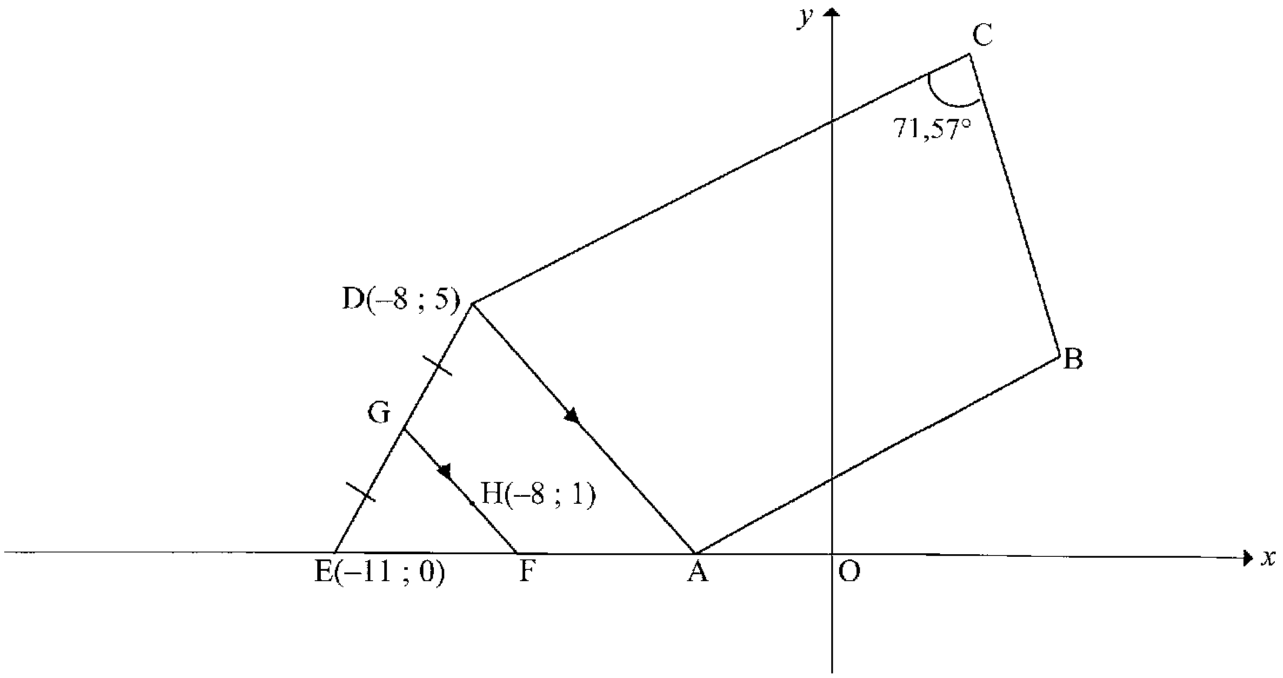
1.3.1 Standard deviation of the new data. (1)

1.3.2 Median of the new data. (3)

[11]

QUESTION 3

In the diagram, A, B, C and D $(-8\,;5)$ are vertices of a cyclic quadrilateral. ED is drawn with E $(-11\,;\,0)$. G and F are points on ED and EA respectively such that GF || DA. H $(-8\,;1)$ is a point on GF. EG GD and $D\hat{C}B = 71{,}57°$.



3.1 Calculate the:

3.1.1 Coordinates of G. (2)

3.1.2 Gradient of GF (2)

3.2 Determine the equation of AD in the form $y = mx + c$. (3)

3.3 Calculate the:

3.3.1 Length of AE. (2)

3.3.2 Area of trapezium ADGF (4)

3.3.3 Gradient of AB. (6)

[19]

QUESTION 5

5.1 Simplify the following expression to a single trigonometric ratio:

$$\frac{\cos(x-180°).\tan(-x).\sin^2(90°-x)}{\sin(180°-x)}-4\cos^2 x$$ (7)

5.2 Consider: $\cos(A-B)-\cos(A+B)=2\sin A\sin B$

5.2.1 Prove the identity. (2)

5.2.2 Hence or otherwise calculate, **without using a calculator**, the value of $\cos 15° - \cos 75°$. (4)

5.3 **Without using a calculator**, determine the value of:

$$\frac{\cos 36°}{\cos 12°}-\frac{\sin 36°}{\sin 12°}$$ (4)

5.4 Consider: $\dfrac{2\sin^2 x+\sin 2x}{\cos 2x}=\dfrac{2\sin x}{\cos x-\sin x}$

5.4.1 Prove the identity. (4)

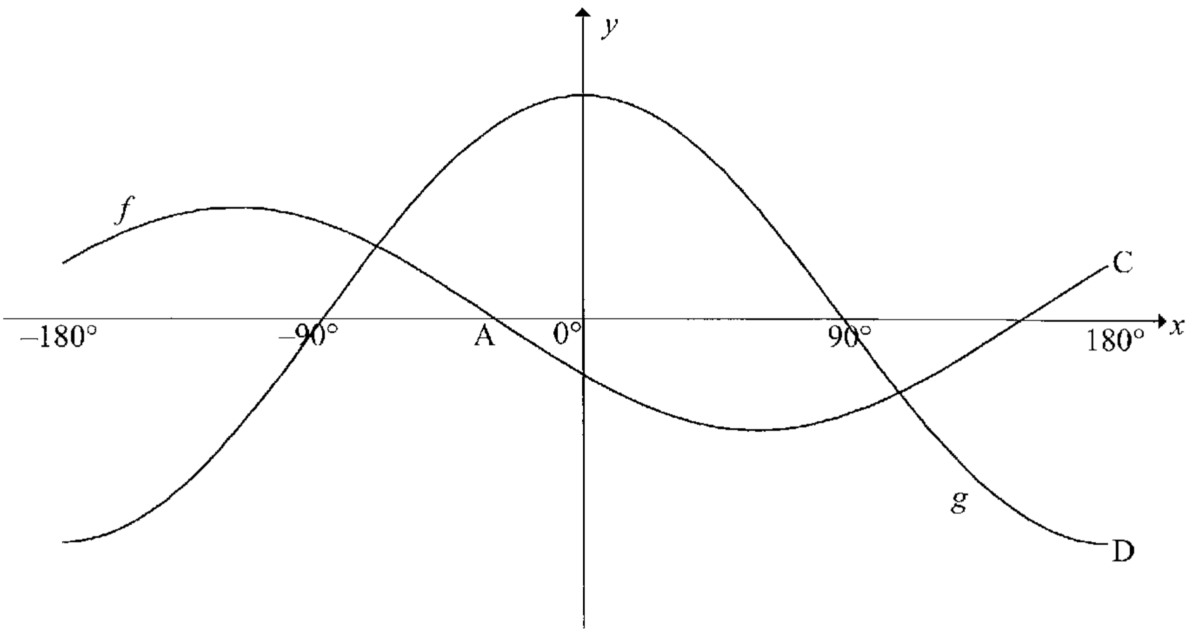
5.4.2 For which value(s) of x in the interval $x\in[-90°;180°]$ will the identity not be valid? (2)

5.5 A line is drawn from A $(\cos\theta;\sin\theta)$ to B $(6;7)$. If $AB=\sqrt{86}$, determine the value of $\tan\theta$. (5)

[28]

QUESTION 7

In the diagram below, the functions $f(x) = -\sin(x + 30°)$ and $g(x) = 2\cos x$ are drawn in the interval $x \in [-180° ; 180°]$. A is an x-intercept of f and C and D are the endpoints of the graphs of f and g at 180°.



7.1 Calculate the:

7.1.1 Coordinates of A. (1)

7.1.2 Distance CD. (2)

7.2 Write down the period of g. (1)

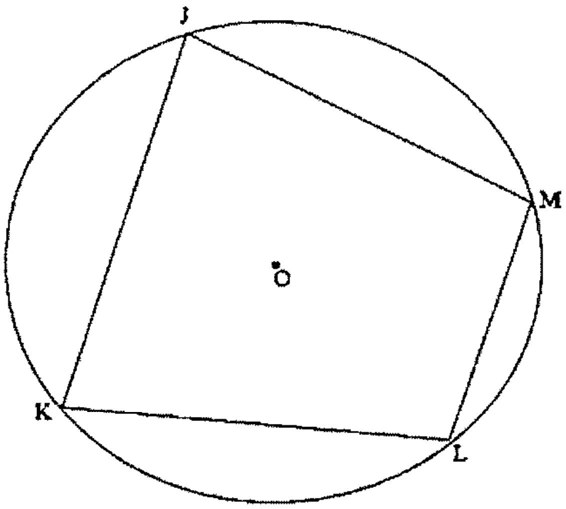
7.3 Determine the general solution of the equation $2\cos x + \sin(x + 30°) = 0$. (6)

7.4 For which values of x in the interval $x \in [-180° ; 180°]$ will $2\cos(x + 20°) + \sin(x + 50°) > 0$? (3)

[13]

QUESTION 9

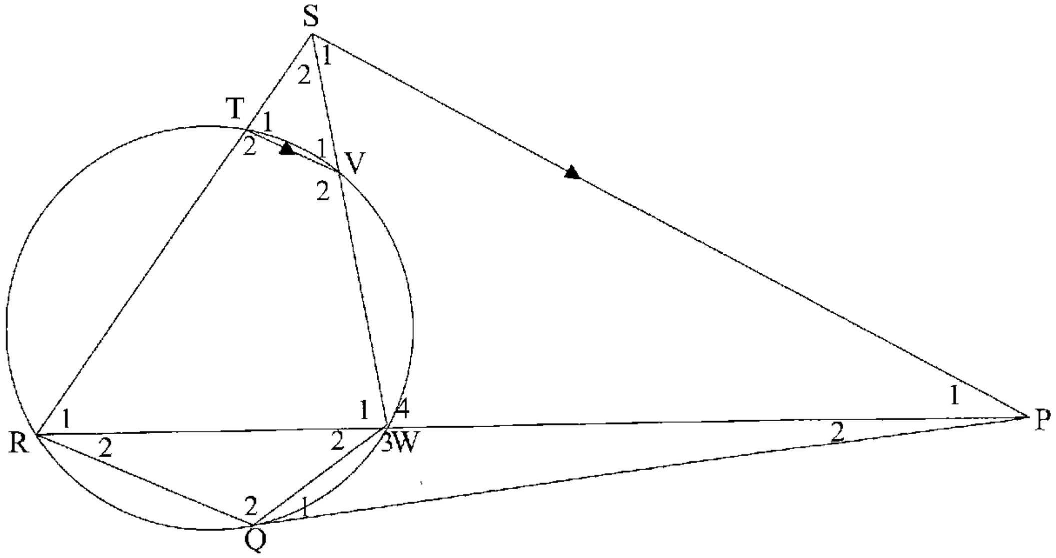
9.1 In the diagram, JKLM is a cyclic quadrilateral in the circle centred O. Prove the theorem that states that the opposite angles of a cyclic quadrilateral are supplementary i.e. $\hat{J}+\hat{L}\ \ 180°$.



(5)

QUESTION 10

In the diagram, V, W, Q, R and T are points on a circle. PQ is a tangent to circle at Q. Chord RW is produced to meet the tangent at P. S is a point outside the circle such that PS || VT Chords RT and WV are produced to meet at S. RQ and QW are drawn.



10.1 Prove, giving reasons, that:

10.1.1 $\hat{S}_1 = \hat{R}_1$ (3)

10.1.2 PQ^2 PW.PR (4)

10.2 Write down a triangle similar to $\triangle$PSR. (1)

10.3 Hence, prove that PQ PS. (3)

[11]

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$\sin 2\alpha = 2\sin\alpha.\cos\alpha$

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

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

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