Candidate Name	Centre Number	Candidate Number

For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

ADDITIONAL MATHEMATICS 4026/1

PAPER 1

SPECIMEN PAPER 2 hours 30 minutes

Additional materials:
Graph paper
Mathematical tables
Data Booklet

Allow candidates 5 minutes to count pages before the examination.

This booklet should not be punched or stapled and pages should not be removed.

TIME 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top.

Write your centre and candidate number in the boxes on the top right corner of every page of this paper.

Check if the booklet has all the pages and ask the invigilator for a replacement if there are duplicate or missing pages.

Answer **all** questions in section A and any **four** in Section B.

Write your answers in the spaces provided on the question paper.
If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks. Decimal answers which are not exact should be given to three significant figures unless stated otherwise.
Electronic calculators may be used.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question. If the degree of accuracy is not specified in the question and if the answer is not exact, the answer should be given to three significant figures. Answers in degrees should be given to one decimal place.

This question paper consists of 14 printed pages and 2 blank pages.

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SECTION A [52 Marks]

Answer **all** questions in this section.

1 Given that the polynomial $2x^3 + x^2 + px - 4$ has a factor $x - 2$.

(a) Find the value of p.

Answer _____ [2]

(b) Show that $2x + 1$ is another factor of the polynomial.

[1]

(c) Find the third factor.

Answer _____ [3]

2 The line $y = x + 2$ meets the curve $y^2 = 4\,(2x + 1)$ at A and B.
Find the coordinates of the midpoint of line AB.

Answer _____ [5]

3 Find the range of values of x which satisfy the inequality

$$\frac{3x-1}{2+x} > 1$$

Answer_____ [4]

4 Given that$(a + b\sqrt{3}) = (\frac{6}{3+\sqrt{3}})^2$,where a and b are integers. Find the value of a and the value of b.

Answer_____ [5]

5 **(a)** Solve the following pair of simultaneous equations:

$3x^2 - y^2 = 3$

$2x - y = 1$

Answer x = _____

y = _____ [4]

(b) Given that

$Ax^3 + Bx^2 + x - 2C = (3x - 2)(x + 1)(x + 2) + (x - 4)$.

Find the values of A, B and C.

Answer A = _____

B = _____

C = _____ [4]

6 Show that

$\frac{1}{1+\sin\theta}+\frac{1}{1-\sin\theta} \equiv 2Sec^2\theta.$

[3]

7 Given that $f: x \to \frac{x+p}{x-3}; x \neq 3$ and $f(4) = 9$,

Find,

(a) the value of P,

Answer P = _____ [2]

(b) $f^{-1}(-3)$,

Answer_____ [3]

(c) $f^2(x)$.

Answer_____ [3]

8 **(a)** A geometric series has a first term 1 and a common ratio r. Given that the sum to infinity of the series is 5, find the value of r.

Answer r = _____ [3]

(b) Find the least value of n for which the sum of the first n terms of the series exceeds 4,9.

Answer n = _____ [3]

9 **(a)** Express

$\log p + 2\log q - 3\log r$ as a single logarithm.

Answer_____ [3]

(b) Solve the equation

$2^x + 2^{1-x} = 3$.

Answer x = _____ [4]

SECTION B [48 Marks]

Answer any **four** questions in this section

10 **(a)** A curve has an equation $y = x^4 - 4x^3 + 27$.

Find,

(i) $\frac{dy}{dx}$,

Answer _____ [1]

(ii) the coordinates of the stationary points on the curve.

Answer _____ [3]

(iii) the nature of stationary points

Answer _____ [5]

10 **(b)** Find the equation of a curve which passes through the point (3;8) and has a gradient function

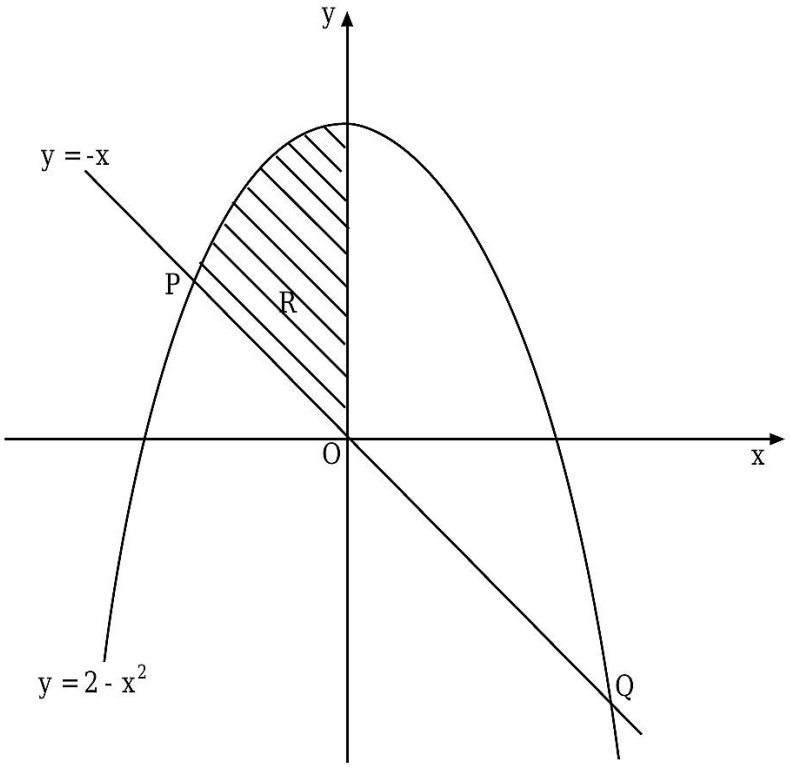
$\frac{dy}{dx} = 2x^2 - 5.$

Answer _____ [3]

11 **(a)** Evaluate $\int_0^4 \sqrt{2x+1} \ \ dx.$

Answer _____ [3]

11 **(b)** The diagram shows the graph of $y = 2 - x^2$ and the line $y = -x$.



Find,

(i) the coordinates of P and Q,

Answer P = _____

Q = _____ [4]

(ii) the shaded area, R.

Answer _____ [5]

12 The straight line L has an equation $2y - x + 7 = 0$. The straight line M passes through the point P (-1; 6) and is perpendicular to line L.

(a) Find the,

(i) equation of line M, giving your answer in the form $ax + by + c = 0$,

Answer _____ [3]

(ii) coordinates of the point of intersection of line L and line M.

Answer _____ [3]

(b) Find the perpendicular distance from P to line L.

Answer _____ [3]

(c) Given that the points Q(-7;-7) and R(9 ; 1) lie on line L, find the exact area of the triangle PQR.

Answer _____ [3]

13 **(a)** **(i)** Express $3\cos\theta + 5\sin\theta$ in the form

$R\cos(\theta - \alpha)$,

where $R > O$ and $0^0 < \alpha < 90°$.

State the exact value of R and give the value of α correct to 1 decimal place

Answer _____ [3]

(ii) Hence, solve the equation

$3\cos\theta + 5\sin\theta = 1$

giving all solutions in the interval $0° < \theta < 360°$

Answer _____ [3]

13 **(b)** The equation of a curve is $x^3 + y^3 = 6xy$.

(i) Show that

$$\frac{dy}{dx} = \frac{2y - x^2}{y^2 - 2x}$$

Answer _____ [4]

(ii) Find the equation of the tangent to the curve at the point (2; 4), giving your answer in the form $ax + by = c$

Answer _____ [2]

14 **(a)** Evaluate the first 4 terms of each sequence whose r^{th} term is given and determine the nature of the sequences, starting with $r = 1$

(i) $Ur = \frac{1}{r^2}$

terms _____

nature _____ [2]

14 **(a)** **(ii)** $Ur = 2^r$

terms _____

nature _____ [2]

(iii) $Ur = (-1)^{r+1}r$

terms _____

nature _____ [2]

(b) Evaluate $\sum_{n=0}^{n-3} 2^n + n^2$

Answer _____ [2]

(c) The first 3 terms of an arithmetic series are -2; 1; 4.

Find the number of terms for which the sum of the arithmetic series is 208.

Answer _____ [4]

15 **(a)** A particle P moves in a straight line such that t seconds after passing through a fixed point O, its velocity Vms^{-1} is given by $V = 4 - t^2$.

Find the

(i) acceleration of P after 4 seconds,

Answer _____ [3]

(ii) distance of P from O after 6 seconds,

Answer _____ [3]

(iii) displacement of P from O when P is instantaneously at rest.

Answer _____ [3]

(b) The parametric equations of a curve are

$x = 3t^2$ and $y = t^4 - 3t^2$ for $0 \leq t \leq 3$

Find $\frac{dy}{dx}$.

Answer _____ [3]

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