Surname	Forename(s)	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

PURE MATHEMATICS 4027/1

PAPER 1

SPECIMEN PAPER 2 hours 30 minutes

Candidates answer on the question paper.
Additional materials: Formulae booklet
Mathematical tables/ electronic calculator

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 of this page and your Centre number and Candidate number on the top right corner of every page of this paper.

Answer **all** questions.
Check that all the pages are in the booklet and ask the invigilator for a replacement if there are duplicate or missing pages.
Write your answers in the spaces provided on the question paper using **black** or **blue** pens.
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 correct to three significant figures unless stated otherwise. Answers in degrees should be given correct to one decimal place.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.
Electronic calculators or Mathematical tables may be used to evaluate explicit numerical expressions.

This specimen paper consists of 13 printed pages and 3 blank page.

Copyright: Zimbabwe School Examinations Council, Specimen.

2

Answer **all** questions

1 Solve the simultaneous equations:

$y = x^2 + 5x - 3$

$2y = 3x - 2$

Answer _____

_____ [5]

2 **(i)** Find the gradient of the curve $y = x^2 + \frac{24}{x}$ $x \neq 0$, at a point **P** (2; 16).

Answer **(i)** _____ [2]

(ii) The tangent to the curve in **(i)** at **P** meets the x - axis at **A** and the y - axis at **B**.

Calculate the area of the triangle **AOB** where **O** is the origin.

Answer **(ii)** _____ [3]

3 **(a)** A circular cylinder has radius r cm, height $4r$ cm and volume $V\text{cm}^3$.
Express V in terms of r and hence find $\frac{dv}{dr}$.

Answer _____ [2]

(b) The coefficient of x^3 in the expansion of $(2+ax)(1-3x)^6$ is 405.
Find the value of a.

Answer _____ [3]

4 The points **A, B** and **C** have coordinates $(-2; 1)$, $(3; 11)$ and $(-1; 8)$ respectively. The line from **C** is perpendicular to **AB** and meets **AB** at the point **N**.

(a) Find the equations of **AB** and **CN.**

Answer _____ [4]

(b) Calculate the coordinates of **N.**

Answer _____ [3]

5 **(a)** Solve the inequality $x^2 + 4x - 5 < 5x - 3$.

Answer _____ [4]

(b) The expressions $x^3 - ax + a^2$ and $ax^3 + x^2 - 17$ have the same remainder when divided by $x - 2$. Find the possible values of a.

Answer _____ [4]

6 A function f is defined by $f : x \to 5 - \frac{6}{x}$, $x \neq 0$.

(a) Find $f^{-1}(x)$.

Answer _____ [3]

6 **(b)** Find the value of x for which $f^{-1}(x)$ is undefined.

Answer _____ [3]

(c) Find the values of x for which $f(x) = f^{-1}(x)$.

Answer _____ [4]

7 The position vectors of points A and B relative to an origin O, are

$\mathbf{OA} = 10\mathbf{i} + 9\mathbf{j}$ and $\mathbf{OB} = 14\mathbf{i} + 2\mathbf{j}$

(a) Find angle AOB.

Answer _____ [4]

7 **(b)** A third point P has position vector $\overrightarrow{OP} = q\mathbf{i}+13\mathbf{j}$.

Find the

(i) vector $\overrightarrow{AP}$ in terms of q,

Answer _____ [1]

(ii) vector $\overrightarrow{BP}$ in terms of q,

Answer _____ [1]

(ii) values of q for which $\overrightarrow{AP}$ and $\overrightarrow{BP}$ are perpendicular,

Answer _____ [3]

(iii) value of q for which $\overrightarrow{AP}$ and $\overrightarrow{BP}$ are equal in length.

Answer _____ [3]

8 The following table shows the experimental values of two variables x and y.

x	7	8	9	10	11	12
y	40	46	53	60	69	78

The variables x and y are related by the equation $y = ax^2 + b$.

(a) Draw a suitable straight line graph on page 7.

Answer on graph [7]

(b) Use the graph to estimate the

(i) values of a and b,

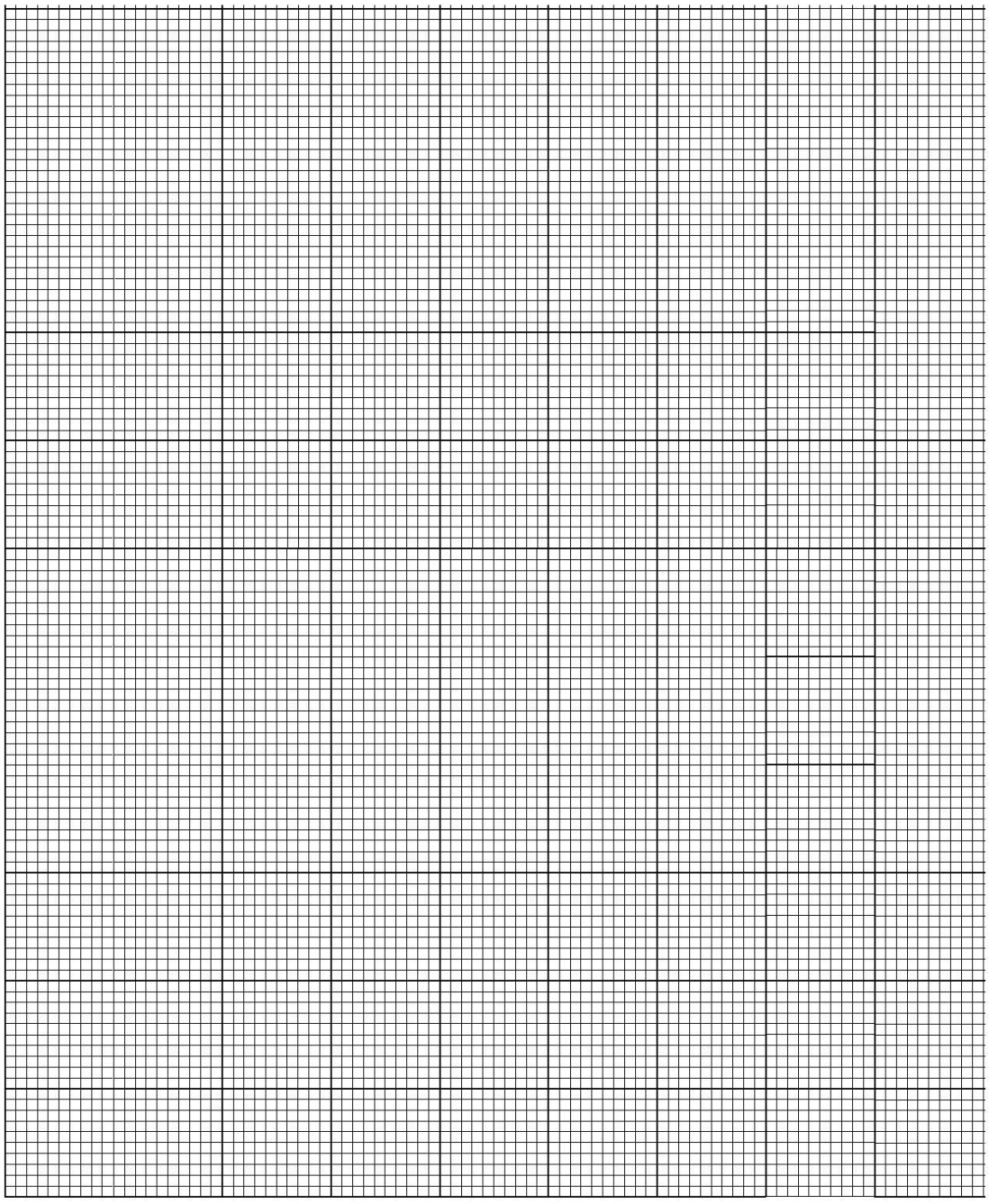
Answer a = _____

b = _____ [3]

(iii) value of y when x = 8,4.

Answer y = _____ [2]

8 (a)



[7]

9 **(a)** Evaluate $\int_0^{p/2} (3\sin x - 4\cos 2x)\,dx$

Answer _____ [4]

(b) Given that, Sin $b = p$ where b is an acute angle measured in degrees, obtain an expression, in terms of p, for

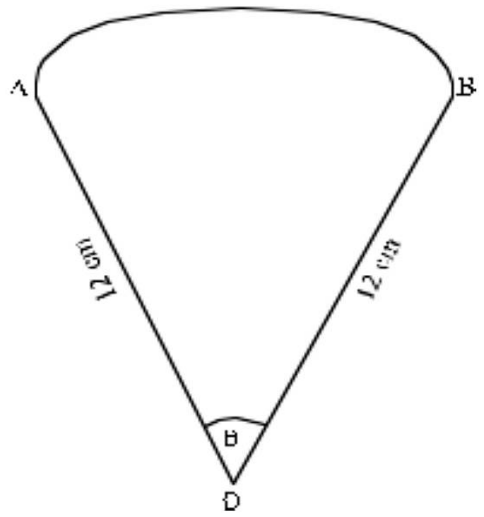
(i) tan b,

Answer _____ [2]

(iii) Sin (180 + b).

Answer _____ [2]

(c)



The diagram shows a sector OAB of a circle centre O and radius 12cm. $A\hat{O}B = q$ radians. The area of the sector is 150 cm^2.

Calculate the

(i) size of angle AOB,

Answer _____ [2]

(ii) length of arc AB.

Answer _____ [2]

10 A curve is represented parametrically by

$x = t^2 + 3t$; $y = t^2 - 2t$.

Find

(a) an expression for $\frac{dy}{dx}$ in terms of t,

Answer _____ [4]

(b) the coordinates of the stationary point of the curve.

Answer _____ [4]

(c) the values of t at the points of intersection of the curve with the line $4y + x = 10$,

Answer _____ [4]

11 **(a)** Find

(i) $\int \frac{4x^2+3}{x^2}\,dx,$

Answer _____ [3]

(ii) $\int (2x-1)^7\,dx.$

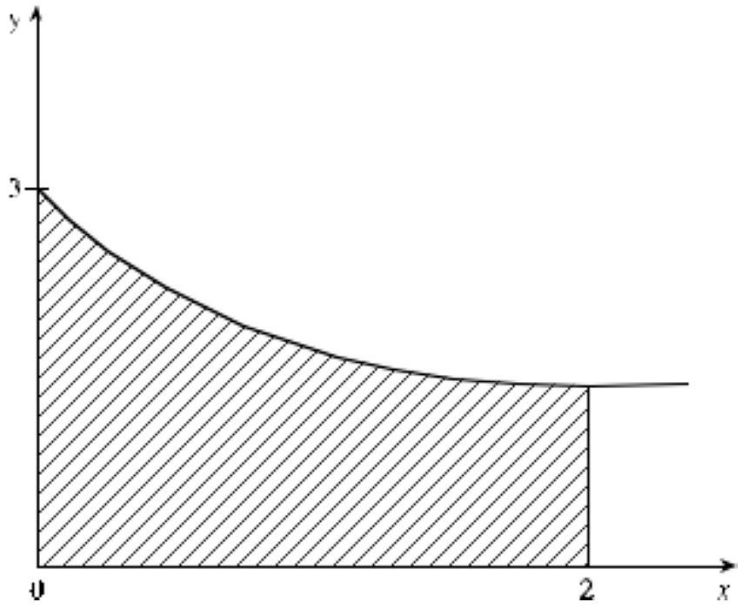
Answer _____ [2]

(b) Find the range of values of p for which the roots of the equation

$3x^2 - 3px + (p^2 - p - 3) = 0$ are real.

Answer _____ [4]

(c) The diagram shows part of the curve $y = 2 + \frac{1}{x+1}$, $x \neq -1$.



Find the volume generated when the shaded area is rotated through 360° about the x-axis.

Answer _____ [3]

BLANK PAGE

15

BLANK PAGE

BLANK PAGE