Name: ________________________( ) Class: ________

WOODLANDS SECONDARY SCHOOL
WEIGHTED ASSESSMENT 2 2020

Level:	Sec 4Exp	Marks:	80
Subject:	Additional Mathematics	Day:	Tuesday
Paper:	4047/01	Date:	30th June 2020
Duration:	2 hours	Time:	1445 – 1645

READ THESE INSTRUCTIONS FIRST

Answer on the Question Paper.

Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **ALL** the questions.

Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of an approved scientific calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is **80**.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.
This document consists of **17** printed pages and **1** blank page.

Mathematical Formulae

1. ALGEBRA

Quadratic Equation

For the equation $ax^2 + bx + c = 0$,

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

Binomial expansion

$$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \ldots + \binom{n}{r}a^{n-r}b^r + \ldots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{r!(n-r)!} = \frac{n(n-1)\ldots(n-r+1)}{r!}$.

2. TRIGONOMETRY

Identities

$$\sin^2 A + \cos^2 A = 1$$
$$\sec^2 A = 1 + \tan^2 A$$
$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$
$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$
$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$
$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$
$$\sin 2A = 2\sin A \cos A$$
$$\cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A$$
$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

Formulae for ΔABC

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

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

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

1 Find the values of x and y which satisfy the equations

$$\frac{2^x}{32} = \frac{16}{4^y}$$

$$\log_x (y + 3) = 1 + \log_x 4.$$ [5]

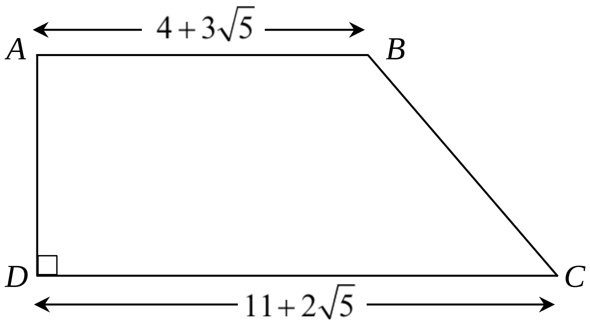
2 **(a)** Find the range of values of p for which the quadratic equation $x^2 - px + 2p + 5 = 0$ has

(i) real roots, [3]

(ii) one positive and one negative root. [2]

(b) Consider the function f such that its derivative $f'(x) = 2x^2 + 5kx + (3k^2 + 2)$, where x and k are real numbers. Given that f is an increasing function, find the range of values of k. [4]

3



The diagram shows a trapezium *ABCD* such that *AD* is perpendicular to *DC* and *AB* is parallel to *DC*. It is given that $AB = \left(4+3\sqrt{5}\right)$ cm, $DC = \left(11+2\sqrt{5}\right)$ cm and the area of the trapezium is $\left(65+25\sqrt{5}\right)$ cm^2.

Find the

(i) length of *AD* in the form $\left(a+b\sqrt{5}\right)$ cm, [3]

(ii) length of BC, giving your answer in the simplest surd form. [3]

4 **(a)** Given that $\log_a x = p$ and $\log_a y = q$, find, in terms of p and q,

(i) $\log_a ax^2y$, [2]

(ii) $\log_x a - \log_y x$. [2]

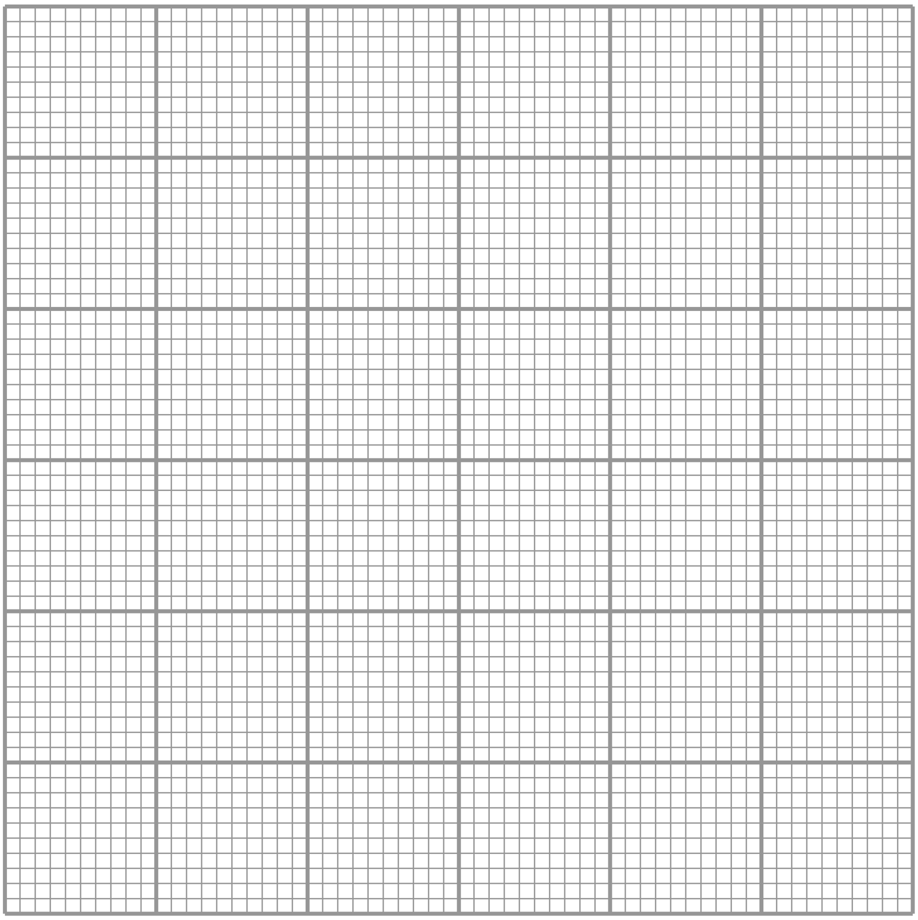
(b) Solve the equation $\lg 5z + \lg(3+2z) = 1$. [3]

5

x	1	1.5	2	2.5	3
y	6	14.3	48	228	1536

The table shows values of the variables x and y such that $y = Ab^{x^2}$, where A and b are constants.

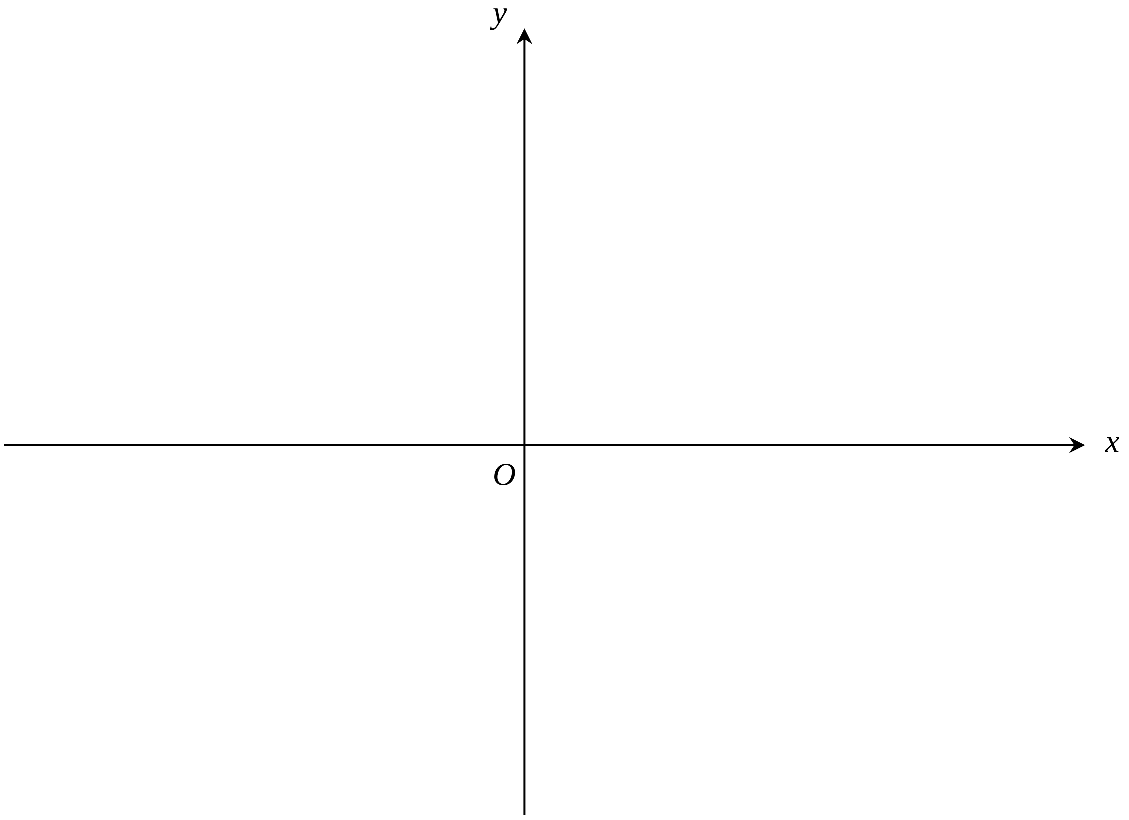
(i) Draw the graph of $\ln y$ plotted against x^2, using a scale of 1 cm for 1 unit on the x^2-axis and a scale of 1 cm for 1 unit on the $\ln y$-axis. [3]



(ii) Use your graph to find the value of A and of b. [4]

(iii) Estimate the value of x when $y = 200$. [2]

6 **(i)** On the axes below, sketch the graph of $y = \left| x^2 - 4x - 12 \right|$, showing the coordinates of the points where the graph meets the axes. [5]



(ii) State the set of values of p for which the line $y = p$ intersects the curve $y = \left| x^2 - 4x - 12 \right|$ at four distinct points. [1]

(iii) Find the x-coordinate(s) of the points of intersection between the curve $y = \left|x^2 - 4x - 12\right|$ and a line with equation $y = 3x$. [3]

7 Given that $y = 2\sin 3x + \cos 3x$, show that $\frac{\mathrm{d}^2 y}{\mathrm{d}x^2} + \frac{\mathrm{d}y}{\mathrm{d}x} + 3y = k\sin 3x$, where k is a constant to be determined. [5]

8 **(a)** **(i)** Find, in ascending powers of x, the first three terms in the expansion of $(3+2x)^6$. [3]

(ii) Hence find the coefficient of x^2 in the expansion of $(1-4x)(3+2x)^6$. [2]

(b) Consider $\left(x^2-\dfrac{1}{2x^6}\right)^{16}$.

(i) Write down the general term. [1]

(ii) Find the term independent of x in the expansion of $\left(x^2-\dfrac{1}{2x^6}\right)^{16}$. [3]

9 **(i)** Find the x-coordinates of the two stationary points on the curve

$y = 12\ln x + x^2 - 10x$. [4]

(ii) Determine the nature of each stationary point. [3]

10 It is given that $y=(x+5)\sqrt{2x-5}$.

(i) Find an expression $\frac{\mathrm{d}y}{\mathrm{d}x}$ and show that it can be written in the form $\frac{kx}{\sqrt{2x-5}}$.

[3]

(ii) Hence evaluate $\int_3^7 \frac{x}{\sqrt{2x-5}}\,\mathrm{d}x$. [4]

11 **(i)** Show that $\dfrac{\tan x}{1+\sec x}+\dfrac{1+\sec x}{\tan x}=\dfrac{2}{\sin x}$. [3]

(ii) Hence solve the equation $\frac{\tan x}{1+\sec x}+\frac{1+\sec x}{\tan x}=1+6\sin x$ for $0° \le x \le 360°$. [4]

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