ST. PAUL'S COLLEGE

FORM 6 INTERNAL EXAMINATION 2022 - 2023

MATHEMATICS Compulsory Part

PAPER 1

Section A1

Question-Answer Book

2¼ hours

This paper must be answered in English.

A1

Name	
Class	( )
Group	G1 LTN G2 PSK G3 LMW G4 HL G5 YKC G6 LTN G7 HL

INSTRUCTIONS

1. Write your Name, Class and Class number in the spaces provided on the right. Circle your Group Number.
2. This paper consists of THREE sections, A(1), A(2) and B.
3. Attempt **ALL** questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
4. Graph paper and supplementary answer sheets will be supplied on request. Write your Name, Class and Class number in the spaces provided, mark the question number box, and fasten them with string INSIDE this book.
5. Unless otherwise specified, all working must be clearly shown.
6. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
7. The diagrams in this paper are not necessarily drawn to scale.

Question No.	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

SECTION A(1) (35 marks)

1. Simplify $\dfrac{(x^{-2}y^3)^4}{(y^{-5})^2}$ and express your answer with positive indices. (3 marks)

$$\frac{(x^{-2}y^3)^4}{(y^{-5})^2}$$
$$= \frac{x^{-8}y^{12}}{y^{-10}}$$
$$= \frac{y^{12+10}}{x^8}$$
$$= \frac{y^{22}}{x^8}$$

2. Let a, b and c be non-zero numbers such that $4a = 3b$ and $\dfrac{b}{c} = \dfrac{6}{5}$.

Find $\dfrac{a+2b}{b+3c}$. (3 marks)

$$a:b$$
$$= 3:4$$
$$= 9:12$$

$$b:c$$
$$= 6:5$$
$$= 12:10$$

$$a:b:c$$
$$= 9:12:10$$

Let $a = 9k$, $b = 12k$, $c = 10k$, where k is a non-zero constant.

$$\frac{a+2b}{b+3c}$$
$$= \frac{9k+2(12k)}{12k+3(10k)}$$
$$= \frac{11}{14}$$

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3. A bag contains n white balls, 5 black balls and 9 pink balls. If a ball is randomly drawn from the bag, the probability of drawing a pink ball is $\frac{3}{8}$. Find the value of n. (3 marks)

The probability of drawing a pink ball $= \frac{9}{n+5+9}$

$$\frac{9}{n+5+9} = \frac{3}{8}$$
$$3n+15+27 = 72$$
$$n = 10$$

4. Factorize

(a) $m^3 - m^2n + 6m^2$.

(b) $4m - 4n + 24 - m^3 + m^2n - 6m^2$. (4 marks)

(a) $m^3 - m^2n + 6m^2$
$= m^2(m - n + 6)$

(b) $4m - 4n + 24 - m^3 + m^2n - 6m^2$
$= 4(m - n + 6) - m^2(m - n + 6)$
$= (m - n + 6)(4 - m^2)$
$= (m - n + 6)(2 - m)(2 + m)$

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5. A box of tokens are shared by Steve and Paul, where Steve got $\frac{1}{3}$ of them. Steve used 8 tokens and then gave 18 tokens to Paul. The number of tokens with Steve is now $\frac{1}{7}$ of the number of tokens with Paul. Find the number of tokens in the box. (4 marks)

Let x be the number of tokens in the box.

Then, the number of tokens owned by Steve is $\frac{x}{3}$ and

the number of tokens owned by Paul is $\frac{2x}{3}$.

$$\frac{x}{3}-8-18=\frac{1}{7}\left(\frac{2x}{3}+18\right)$$

$$7\left(x-78\right)=2x+54$$

$$7x-546=2x+54$$
$$5x=600$$
$$x=120$$

$\therefore$ The number of tokens in the box is 120.

6. Consider the compound inequality

$$\frac{7x-17}{3}<5(x+1) \quad \text{or} \quad 5-x<6 \quad \text{……..(*).}$$

(a) Solve (*).

(b) Write down the least integer satisfying (*). (4 marks)

(a) $\frac{7x-17}{3}<5(x+1)$

$$7x-17<15x+15$$
$$-8x<32$$
$$x>-4$$

OR

$$5-x<6$$
$$x>-1$$

$\therefore$ The required range is $x>-4$

(b) -3

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7. In a polar coordinate system, O is the pole. The polar coordinates of the points A and B are $(8, 35°)$ and $(8, 155°)$ respectively. Let L be the axis of reflectional symmetry of ΔOAB.

(a) Describe the geometric relationship between L and $\angle AOB$.

(b) Find the polar coordinates of the point of the intersection of L and AB. (4 marks)

(a) L is the angle bisector of $\angle AOB$.

(b) Let $S(r, \theta)$ be the point of intersection of L and AB.

$$r = 8\cos 60°$$
$$= 4$$

$$\theta = 35° + 60°$$
$$= 95°$$

$\therefore$ The polar coordinates are $(4, 95°)$.

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8. A pack of brown sugar is termed regular if its weight is measured 100 g correct to the nearest g.

(a) Find the least possible weight of a regular pack of brown sugar.

(b) A student claims that the total weight of 48 regular packs of brown sugar can be measured as 4.7 kg correct to the nearest 0.1 kg. Do you agree? Explain your answer.

(5 marks)

(a) The maximum absolute error

$= 0.5\,\text{g}$

The least possible weight

$= 100 - 0.5$

$= 99.5\,\text{g}$

(b) The least possible total weight of 48 regular packs of brown sugar

$= (99.5)(48)$

$= 4776\,\text{g}$

$= 4.776$

$> 4.75\,\text{kg}$

$\therefore$ It is impossible.

The claim is disagreed.

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9. The marked price of a hard disk is 20% above its cost. A loss of \$64 is made by selling the hard disk at a discount of 30% on its marked price. Find the marked price of the hard disk.

(5 marks)

Let \$$x$ be the marked price of the hard disk.

The cost of the hard disk

$$= \frac{x}{1+20\%}$$

$$= \$\left(\frac{5x}{6}\right)$$

The selling price of the hard disk

$$= (1-30\%)x$$

$$= \$\left(\frac{7x}{10}\right)$$

$$\frac{5x}{6} - \frac{7x}{10} = 64$$

$$\frac{2x}{15} = 64$$

$$x = 480$$

$\therefore$ The marked price of the hard disk is \$480.

End of Section A1

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