ST. PAUL'S COLLEGE
FORM 6 INTERNAL EXAMINATION 2023 - 2024
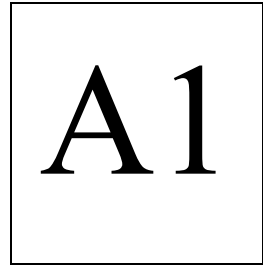
MATHEMATICS Compulsory Part

PAPER 1

Section A1

Question-Answer Book

2¼ hours

This paper must be answered in English.

Name	**Marking Scheme**
Class	( )
Group	G1 LMW G2 PSK G3 TMF G4 WHP G5 TMF G6 LMW G7 PSK

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 $\dfrac{(-2m^3n)^2}{(3m^4)^{-1}}$ and express your answer with positive indices. (3 marks)

$\dfrac{(-2m^3n)^2}{(3m^4)^{-1}}$ $= \dfrac{4m^6n^2}{\dfrac{1}{3}m^{-4}}$ $= 12m^{10}n^2$	1M $(ab)^m = a^m b^m$ 1M $x^{-r} = \dfrac{1}{x^r}$ or $\dfrac{x^p}{x^q} = x^{p-q}$ 1A

2. Make k the subject of the formula $\dfrac{1}{h} + 2 = \dfrac{3}{4-k}$. (3 marks)

$\dfrac{1}{h} + 2 = \dfrac{3}{4-k}$ $\dfrac{1+2h}{h} = \dfrac{3}{4-k}$ $(1+2h)(4-k) = 3h$ $4 + 8h - k - 2hk = 3h$ $4 + 5h = k + 2hk$ $\quad\quad = k(1+2h)$ $k = \dfrac{4+5h}{1+2h}$	1M no more fraction 1M grouping terms with k 1A

3. Factorize
   (a) $5x^2 - 3xy - 2y^2$,
   (b) $x^3 - xy^2 - 5x^2 + 3xy + 2y^2$.

   (3 marks)

(a)	$5x^2 - 3xy - 2y^2 = (5x+2y)(x-y)$	1A
(b)	$x^3 - xy^2 - 5x^2 + 3xy + 2y^2$ $= x(x+y)(x-y) - (5x+2y)(x-y)$ $= (x-y)(x^2+xy-5x-2y)$	1M having $(x-y)$ in both terms 1A

4. Let a, b and c be non-zero numbers such that $2a = 3c$ and $4b - 3a = 2c$. Find

(a) $a:b:c$,

(b) $\dfrac{3a-4c}{2b}$.

(4 marks)

(a)	$a:c=3:2$ $\quad\quad 4b-3a=2c$ $4b-3\left(\dfrac{3c}{2}\right)=2c$ $\quad\quad 4b=\dfrac{13}{2}c$ $\quad\quad 8b=13c$ $b:c=13:8$ $a:b:c=12:13:8$	1M express a i.t.o c or c i.t.o a 1A
(b)	Let $a=12k$, $b=13k$ and $c=8k$ $\dfrac{3a-4c}{2b}=\dfrac{3(12k)-4(8k)}{2(13k)}$ $\quad\quad =\dfrac{2}{13}$	1M k-method 1A

5. Consider the compound inequality

$$x-3\le\frac{2-3x}{4}\quad\text{and}\quad 1-3x>10\quad\cdots\cdots\cdots\cdots(*)$$

(a) Solve (*).

(b) Write down largest integer satisfying (*).

(4 marks)

(a)	$\quad\quad x-3\le\dfrac{2-3x}{4}$ $4x-12\le 2-3x$ $\quad\quad 7x\le 14$ $\quad\quad\quad x\le 2$ $\quad\quad 1-3x>10$ and $\quad\quad 3x<-9$ $\quad\quad\quad\quad x<-3$ $\therefore\ x<-3$	1M grouping x terms 1A 1A
(b)	-4	1

6. The marked price of a chair is 30% above its cost. A loss of 25% is made by selling the chair at

a discount of $297. Find the marked price of the chair. (4 marks)

Let $x and $y be the cost and the marked price of the chair respectively. $\begin{cases} y = (1+30\%)x \\ y - 297 = (1-25\%)x \end{cases}$ $1.3x - 297 = 0.75x$ $\quad 0.55x = 297$ $\qquad x = 540$ $\qquad y = 1.3 \times 540$ $\qquad\quad = 702$ $\therefore$ The marked price of the chair is $702.	1A + 1A 1M linear equation in one unknown 1A

7. Seven years ago, the ages of Jane and Paul were in the ratio of $2:3$. The ratio now becomes $3:4$. Find the present age of Paul. (4 marks)

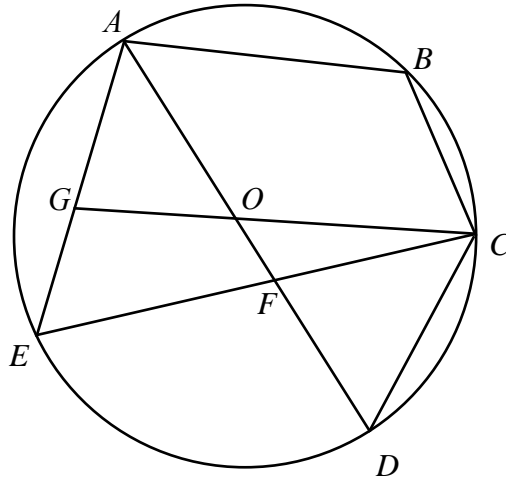|	
Let P and J be the present age of Paul and Jane respectively. $\begin{cases} \dfrac{J-7}{P-7} = \dfrac{2}{3} \\ \dfrac{J}{P} = \dfrac{3}{4} \end{cases}$ $\begin{cases} 3J - 2P = 7 \\ 4J = 43P \end{cases}$ Solving, $J = 21, P = 28$ $\therefore$ Paul's present age is 28.	1M for either ratio equation 1M for having $J-7$ and $P-7$ 1M solving simultaneous eq 1A

Page total

8. In the figure, *ABCDE* is a circle with center *O*. *AD* and *EC* intersect at *F*. *AD* and *GC* intersect at *O*. *G* is a point on *AE*. It is given that $\angle ABC = 120°$ and $\angle CFD = 80°$.

(a) Find $\angle FDC$ and $\angle COD$.

(b) Prove that $\triangle OCF \sim \triangle ECG$.

(5 marks)

(a)	$\angle FDC = 180° - 120°$ (opp. $\angle$s, cyclic quad.)	
	$\qquad = 60°$	1A
	$OC = OD$ (radii)	
	$\angle OCD = \angle ODC$ (base $\angle$s isos. $\triangle$)	1M using the fact that OCD
	$\angle COD = 180° - 60° - 60°$ ($\angle$ sum of $\triangle$)	is isos. or equilateral
	$\qquad = 60°$	1A
(b)	$\angle GEC = 180° - 120°$ (opp. $\angle$s, cyclic quad.)	
	$\qquad = 60°$	
	$\angle COF = \angle GEC$ (proven)	
	$\angle OCF = \angle ECG$ (common)	
	$\angle OFC = 180° - \angle COF - \angle OCF$ ($\angle$ sum of $\triangle$)	
	$\angle EGC = 180° - \angle GEC - \angle ECG$ ($\angle$ sum of $\triangle$)	1 all correct without reasons
	$\therefore \triangle OCF \sim \triangle ECG$ (AAA)	2 all correct

Answers written in the margins will not be marked.

Page total

9. A school conducted a survey on the favourite sports of all F1 students. The result is shown in the figure below.

The favourite sports of F1 students
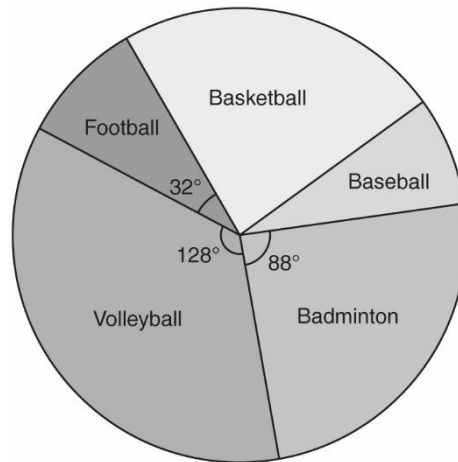
It is known that the number of students choosing badminton as their favourite sport is 21 more than that of football.

(a) Find the number of students who chose volleyball as their favourite sport.

(3 marks)

(b) A student is randomly chosen from all F1 students, find the probability that the student's favourite sport is neither volleyball nor badminton.

(2 mark)

(a)	Let x the be number of students who chose volleyball $$\frac{88-32}{128} = \frac{21}{x}$$ $$x = 48$$	1M $(88-32):21$ +1A 1A
(b)	Probability $$= \frac{360-128-88}{360}$$ $$= 40\%$$	1M "All $-$ x $-$ y" 1A

End of Section A1