ST. PAUL'S COLLEGE

FORM 6 INTERNAL EXAMINATION 2021 - 2022

MATHEMATICS Compulsory Part

PAPER 1

Section A1

Question-Answer Book

2¼ hours

This paper must be answered in English.

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.

A1

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

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

SECTION A(1) (35 marks)

1. Simplify $\dfrac{p^3q^4}{(p^{-1}q^3)^2}$ and express your answer with positive indices.

(3 marks)

$\dfrac{p^3q^4}{(p^{-1}q^3)^2} = \dfrac{p^3q^4}{p^{-2}q^6}$ 1M for $(a^h)^k = a^{hk}$ or $(ab)^l = a^l b^l$

$= \dfrac{p^{3+2}}{q^{6-4}}$ 1M for $\dfrac{c^p}{c^q} = c^{p-q}$ or $d^{-r} = \dfrac{1}{d^r}$

$= \dfrac{p^5}{q^2}$ 1A

2. Make k the subject of the formula $\dfrac{h+3k}{k-3} = -2$.

(3 marks)

$\dfrac{h+3k}{k-3} = -2$

$h+3k = -2k+6$ 1M

$5k = -h+6$ 1M for putting k on one side

$k = \dfrac{-h+6}{5}$ 1A or equivalent

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3. Factorize

(a) $3a^2 - 7ab - 6b^2$,

(b) $3a^2 - 7ab - 6b^2 - 15a - 10b$.

(3 marks)

(a) $3a^2 - 7ab - 6b^2 = (a - 3b)(3a + 2b)$ 1A or equivalent

(b) $3a^2 - 7ab - 6b^2 - 15a - 10b$

$= (a - 3b)(3a + 2b) - 15a - 10b$

$= (a - 3b)(3a + 2b) - 5(3a + 2b)$ 1M for using the result of (a) and (b)

$= (a - 3b - 5)(3a + 2b)$ 1A or equivalent

4. (a) Round down 254.62241 to 3 significant figures.

(b) Round up 254.62241 to 3 decimal places.

(c) Round off 254.62241 to the nearest integer.

(3 marks)

(a) 254 1A

(b) 254.623 1A

(c) 255 1A

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5. (a) Find the range of values of x which satisfy both $\frac{4x-3}{2} \geq 3(7-x)$ and $2x+5>0$.

(b) Write down the least integer which satisfies both inequalities in (a).

(4 marks)

(a)

$$\frac{4x-3}{2} \geq 3(7-x)$$
$$4x-3 \geq 6(7-x)$$
$$4x-3 \geq 42-6x$$
$$10x \geq 45$$
$$x \geq \frac{9}{2} \qquad \text{1A}$$

$$2x+5>0$$
$$x > -\frac{5}{2} \qquad \text{1A}$$

Thus, the required range is $x \geq \frac{9}{2}$ 1M

(b) 5

6. The marked price of a computer is \$4500. The computer is now sold at a discount of 20% on its marked price.

(a) Find the selling price of the computer.

(b) If the percentage profit is 20%, find the cost of the computer.

(4 marks)

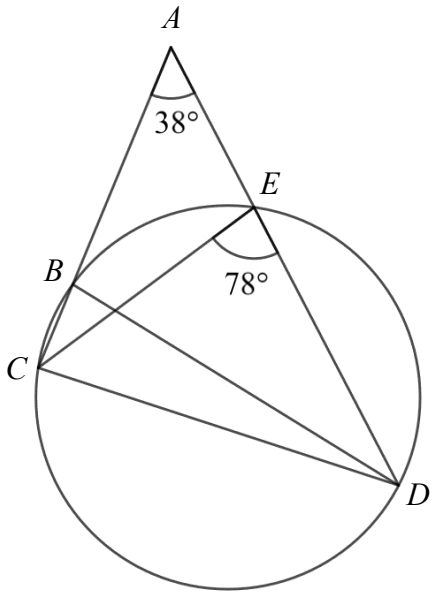
(a) The selling price of the computer $= 4500 \times (1-20\%)$ 1M
$= \$3600$ 1A

(b) Let $\$x$ be the cost of the computer.

$x(1+20\%) = 3600$ 1M
$x = 3000$ 1A

Thus, the cost of the computer is \$3000.

7. In the figure, $BCDE$ is a circle. DE produced and CB produced meet at A. It is given that $\angle CAD = 38°$, $\angle CED = 78°$ and $CE = DE$. Find $\angle ABD$ and $\angle CDB$.



(5 marks)

$\angle CBD = \angle CED = 78°$ 1M

$\angle ABD = 180° - \angle CBD$

$= 180° - 78°$

$= 102°$ 1A

$\because$ $CE = DE$

$\therefore$ $\angle EDC = \angle ECD$

$= \dfrac{180° - \angle CED}{2}$ 1M

$= \dfrac{180° - 78°}{2}$

$= 51°$

$\angle EDB = 180° - \angle BAD - \angle ABD$ 1M

$= 180° - 38° - 102°$

$= 40°$

$\therefore$ $\angle BDC = \angle EDC - \angle EDB$

$= 51° - 40°$

$= 11°$ 1A

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8. A car travels from point A to point B at an average speed of 80 km/h and then the car travels from point B to point C at an average speed of 120 km/h. It is given that the car travels 125 km in 75 minutes for the whole journey. How long does the car take to travel from point B to point C?

(5 marks)

Let t minutes be the time required for the car travelling from point B to point C. Then, the time required for the car travelling from point A to point B is $(75-t)$ minutes. 1A

$$80\left(\frac{75-t}{60}\right)+120\left(\frac{t}{60}\right)=125$$ 1M for changing unit + 1M for getting a linear eq in one unknwon + 1A

$$40t=1500$$

$$t=37.5$$ 1A

Thus, the car takes 37.5 minutes to travel from point B to point C.

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9. In a polar coordinate system, O is the pole. The polar coordinates of the points P and Q are $(r, 127°)$ and $(r-21, 217°)$ respectively. The distance between P and Q is 39.

(a) Find $\angle POQ$.

(b) Find the value of r and the perimeter of ΔOPQ.

(5 marks)

(a) $\angle POQ = 217° - 127° = 90°$ 1A

(b) $r^2 + (r-21)^2 = 39^2$ 1M

$r^2 + r^2 - 42r + 411 = 1521$

$r^2 - 21r - 540 = 0$ 1M for $ar^2 + br + c = 0$

$(r-36)(r+15) = 0$

$r = 36$ or $r = -15$ (rej.) 1A

Thus, we have $r = 36$.

The perimeter of $\Delta OPQ = 36 + (36-21) + 39$

$= 90$ 1A

End of Section A1

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