18-19 F.4
2nd TERM EXAM
MATH CP
PAPER 1

2018 – 2019
Form 4 Second Term Examination

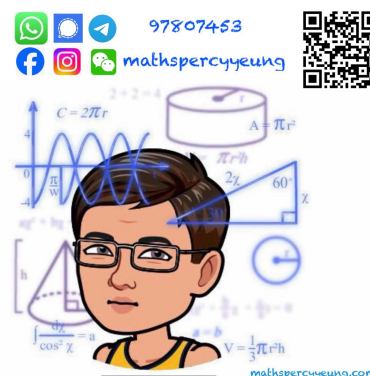## MATHEMATICS Compulsory Part

PAPER 1

Question–Answer Book

5th June, 2019
8:15 am – 9:45 am (1 hour 30 minutes)
This paper must be answered in English

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Sections	Marks
A (1 – 4)	/14
A (5 – 10)	/27
A Total	**/41**
B Total	**/29**
TOTAL	**/70**

INSTRUCTIONS

1. Write your name, class and class number in the spaces provided on this cover.

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. Unless otherwise specified, all working must be clearly shown.

5. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.

6. The diagrams in this paper are not necessarily drawn to scale.

Section A(1) (14 marks)

1. Simplify $\dfrac{(3a^{-2}b^3)^2}{a^{-2}b^{-1}}$ and express your answer with positive indices. (3 marks)

2. Factorize
    (a) $2xy - 2y$,
    (b) $x^2 - 4x + 3$,
    (c) $x^2 - 4x + 3 - 2xy + 2y$. (4 marks)

3. Make a the subject of the formula $\dfrac{6a-2b+3}{4a}=7$. (3 marks)

4. The cost of a toy car is $40. It is sold at a profit percentage of 20%.
  (a) Find the selling price of the toy car.
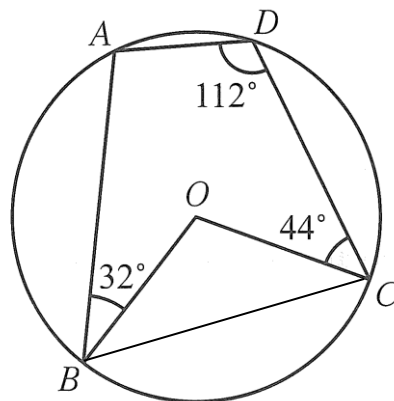 (b) If the marked price of the toy car is $80, find the discount percentage.

(4 marks)

Section A(2) (27 marks)

5. In the figure, O is the centre of the circle $ABCD$. It is given that $\angle ABO = 32°$, $\angle ADC = 112°$ and $\angle DCO = 44°$. Find $\angle OBC$ and $\angle BAD$. (4 marks)

6. Consider the points $A(0, 2)$, $B(2, 1)$ and $C(-4, 4)$.

    (a) Show that A, B and C are collinear.   (2 marks)

    (b) Find the equation of the perpendicular bisector of AC.   (3 marks)

7. Given that the polynomial $x^3 + mx^2 + nx + 15$ is divisible by $x+3$, where m and n are constants. When it is divided by $x-2$, the remainder is -15.

   (a) Find the values of m and n. (3 marks)

   (b) Sam claims that the equation $x^3 + mx^2 + nx + 15 = 0$ has 3 distinct real roots. Do you agree? Explain your answer. (3 marks)

8. The figure shows the graph of $y = -2(x+2)^2 + 18$. The graph cuts the y-axis at B and cuts the x-axis at C and D.
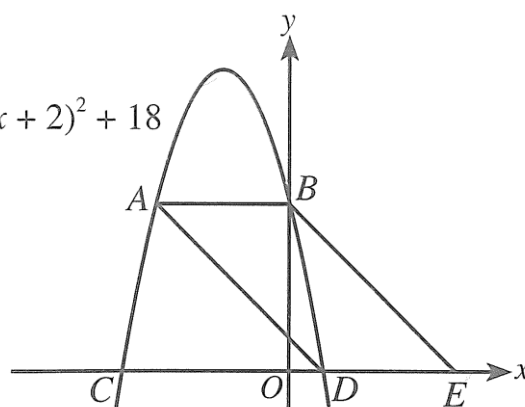
(a) If AB is a horizontal line, find the coordinates of A. (3 marks)

(b) Find the coordinates of C and D. (2 marks)

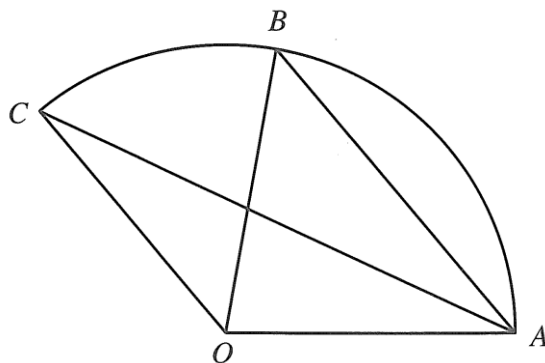(c) If $ABDE$ is a parallelogram, find the coordinates of E. (2 marks)

$$y = -2(x+2)^2 + 18$$

9. In the figure, *OABC* is a sector with centre *O*. *AC* is the angle bisector of ∠*OAB*.

(a) Are *AB* and *OC* parallel? Explain your answer. (2 marks)

(b) If ∠*AOB* = 80°, find $\overset{\frown}{AB} : \overset{\frown}{BC}$. (3 marks)

Section B (29 marks)

10. Solve $7 \cdot 3^{2x-1} = 11$. Give your answer correct to 3 significant figures if necessary. (3 marks)

11. Consider the equation $2x^2 - 4x + k = 0$.

    (a) Find the range of values of k if the equation has imaginary roots. (2 marks)

    (b) Using the smallest integral value of k in **(a)**, solve the equation. (2 marks)

12. The loudness of sound L (in dB) is given by $L = 10 \log \dfrac{I}{I_0}$, where I is the intensity of the sound (in W/m^2) and I_0 is the minimum audible sound intensity for a normal person. It is given that $I_0 = 10^{-12}$ W/m^2.

(a) If the loudness of a sound is 35 dB, find the intensity of the sound. (2 marks)

(b) Amy claims that if the intensity of the sound in **(a)** is reduced to $\dfrac{1}{10\,000}$ of the original, a normal person still can hear the new sound. Do you agree? Explain your answer. (2 marks)

13. The graph of $y = x^2 + kx + 3$ intersects the straight line $y = 4x + k$ at exactly one point.

(a) Find the value of k.   (3 marks)
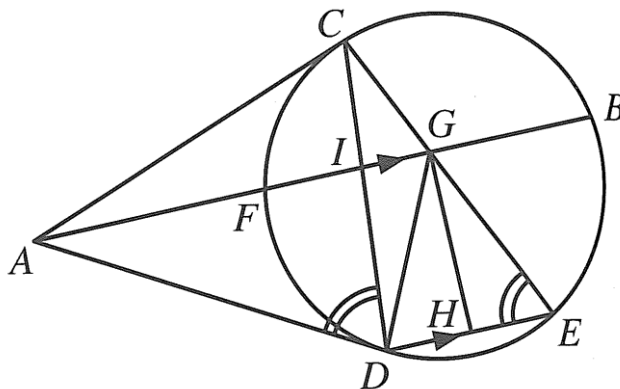
(b) Find the point of intersection.   (2 marks)

14. In the figure, *AC* is the tangent to the circle at *C*. *AFIGB*, *CID* and *CGE* are straight lines. *AB* // *DE* and ∠*CED* = ∠*CDA*.

Prove that

(a) (i) *AD* is the tangent to the circle at *D*.

　　(ii) *A*, *C*, *G* and *D* are concyclic.

　　(iii) Δ*DEG* is an isosceles triangle. (6 marks)

(b) If *GH* is the angle bisector of ∠*DGE*, prove that the centre of the circle must lie on the line passing through *G* and *H*. (3 marks)

14 continued

15. Let a and b be constants. Denote the graph of $y = 2\log_a x + b$ as G. It is given that G passes through $(8, 2)$ and the x-intercept of G is 2. Express x in terms of y. (4 marks)