17-18 F.4
2nd TERM EXAM
MATH CP
PAPER 1

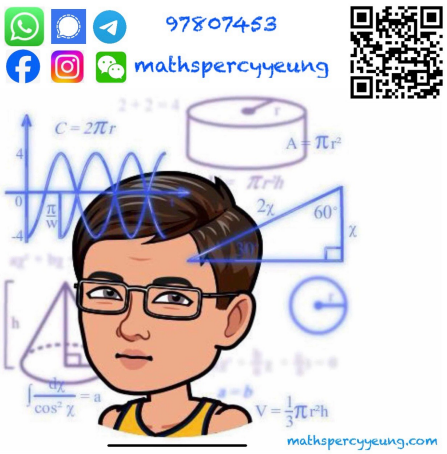
2017 – 2018
Form 4 Second Term Examination

MATHEMATICS Compulsory Part

PAPER 1

Question–Answer Book

5th June, 2018
8:15 am – 9:45 am (1 hour 30 minutes)
This paper must be answered in English



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. Make b the subject of the formula $\frac{a}{b} = 1 - \frac{2a}{c}$. (3 marks)

2. Simplify $\frac{(-2xy^{-1})^2}{10xy^3}$ and express your answer with positive indices. (3 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

3. Factorize

(a) $a^2 - 10ab + 25b^2$,

(b) $a^2 - 10ab + 25b^2 - a + 5b$. (3 marks)

4. A merchant bought an article for \$$x$. He put it in his shop for sale at a marked price 70% higher than its cost. The article was then sold to a customer at a discount of 5%.

(a) What was the percentage gain for the merchant by selling the article?

(b) If the customer paid \$2 907 for the article, find the value of x.

(5 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

Section A(2) (27 marks)

5. Figure 1 shows a photograph with dimensions 11 cm × 7 cm is fixed on a rectangular cardboard leaving a border of uniform width x cm.

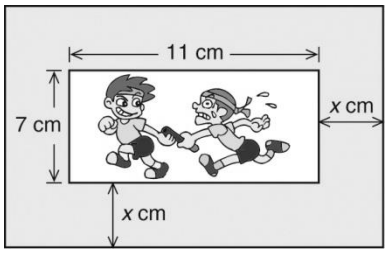


Figure 1

(a) Express the area of the border in terms of x.

(b) If the area of the border is 114 cm^2, find the value of x. (4 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

6. Let $f(x) = ax^3 - 3x^2 + bx + 4$. When $f(x)$ is divided by $x + 1$ and $x - 3$, the remainders are 6 and 10 respectively.

(a) Find the values of a and b.

(b) Find the remainder when $f(2x)$ is divided by $(2x-1)$. (6 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

7. In Figure 2, the vertices of an isosceles triangle OAB are O, A and $B(8, 6)$ respectively. A is a point on the x-axis, and P is a point on AB such that $OP \perp AB$.

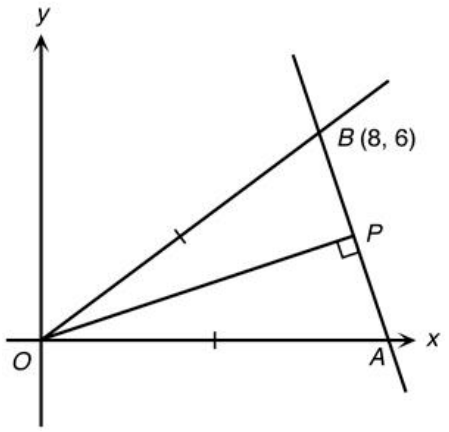


Figure 2

Find

(a) the coordinates of A and P,

(b) the equations of OP and AB. (6 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

8. In Figure 3, the graph of $y = x^2 - 4x - 12$ touches the straight line $y = k$ at only one point D.

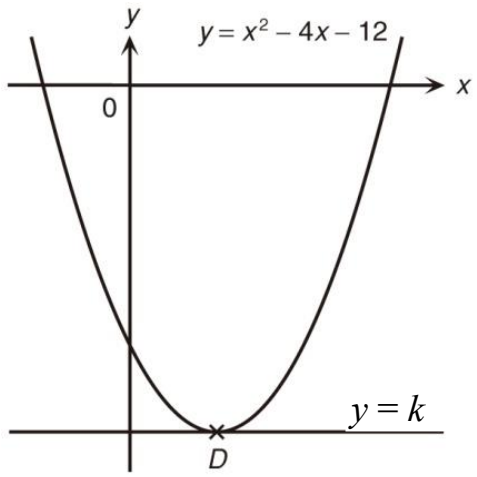


Figure 3

(a) (i) Find the coordinates of D.

(ii) Find the value of k.

(b) State the axis of symmetry and the y-intercept of the graph of $y = x^2 - 4x - 12$.

(5 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

9. In Figure 4, O is the centre of circle $ABCD$. $\angle COB = 100°$ and $\overset{\frown}{AB} = \overset{\frown}{BC}$.

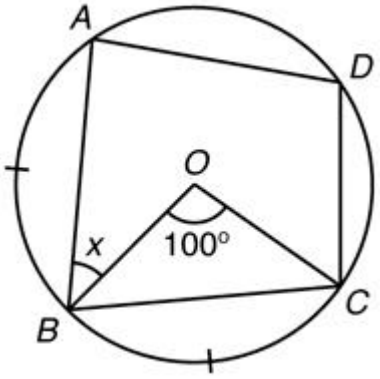


Figure 4

(a) Find x.

(b) Let E be a point on BC, find $\angle BEC$. (6 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

Section B (29 marks)

10. Solve $2^{2x} - 14(2^x) - 32 = 0$. (3 marks)

11. It is given that α and β are the roots of the quadratic equation $x^2 + (7 - 2k)x + (k - 1) = 0$. Given that $\alpha + \beta = 3\alpha\beta$.

(a) Find the value of k,

(b) (i) Find the value of $\alpha^3 + \beta^3$.

(ii) Hence, write down the quadratic equation in y with roots α^3 and β^3. (6 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

12. Solve $\log_8 x - \log_{16} x = \frac{1}{4}$ where $x > 0$. (4 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

13. (a) If (2, 3) satisfies the equation $x^2 + kx + 9 - y = 0$, find the value of k.

(b) Hence, solve the simultaneous equations $\begin{cases} x^2 + kx + 9 - y = 0 \\ 8x + y = 7 \end{cases}$. (4 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

14. In Figure 5, two circles touch each other internally at B. PQ is the common tangent to these circles at B. AC is the tangent to the smaller circle at R. AB and BC cut the smaller circle at S and T respectively.

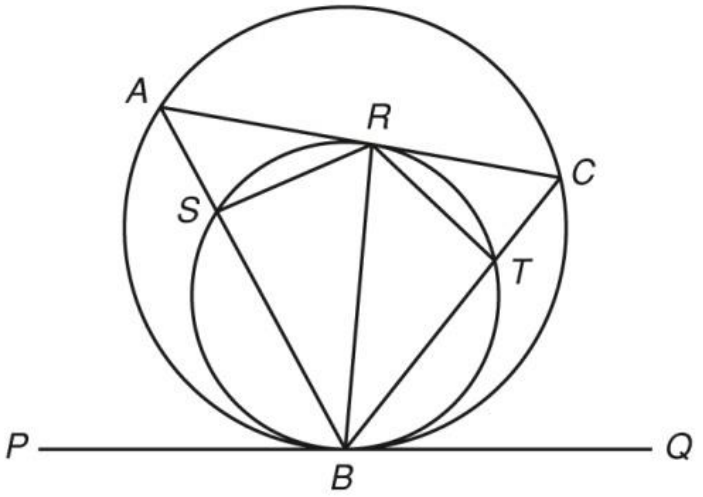


Figure 5

(a) (i) Show that $\Delta ASR \sim \Delta RTB$.

(ii) Hence, show that BR is the angle bisector of $\angle ABC$.

(5 marks)

(b) If ΔABC is an equilateral triangle,

(i) prove that BR is a diameter of the smaller circle,

(ii) write down two triangles other than ΔRTB which are similar to ΔASR.

(4 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

14 continued

Answers written in the margins will not be marked

Answers written in the margins will not be marked

14 continued

Answers written in the margins will not be marked

Answers written in the margins will not be marked

15. In Figure 6, the straight line L shows the relation between $\log_4 x$ and $\log_4 y$. It is given that L passes through the points (1, 2) and (9, 6). If $y = kx^a$, find the values of k and a.

(3 marks)

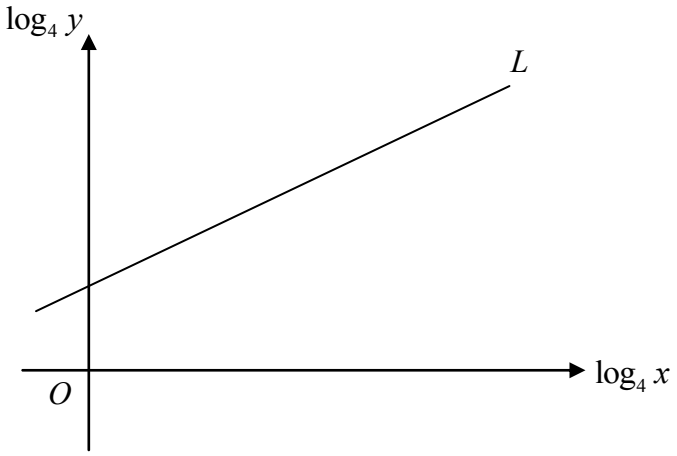


Figure 6

Answers written in the margins will not be marked

Answers written in the margins will not be marked

End of Paper