17-18 F.5
2nd TERM UT
MATH CP
PAPER 1

2017 – 2018
Form 5 Second Term Examination

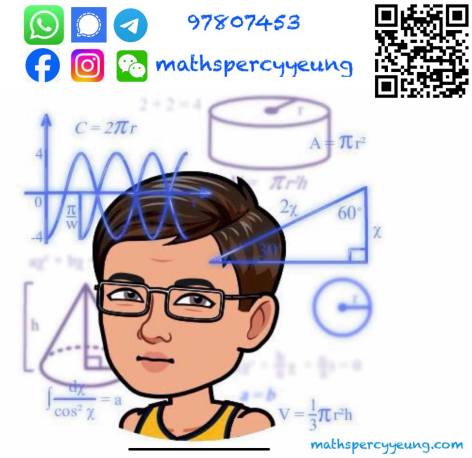
MATHEMATICS Compulsory Part

PAPER 1

Question-Answer Book

17th April, 2018.
8:15 am – 9:30 am (1 hour 15 minutes)

This paper must be answered in English.



Section	Marks
A (1 – 3)	
A (4 – 6)	
A Total	**/27**
B Total	**/33**
TOTAL	**/60**

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) (9 marks)

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

2. Make b the subject of the formula $\dfrac{1-3b+5a}{b}=4$. (3 marks)

3. Factorize

(a) $4p^2 - 9q^2$,

(b) $4p^2 - 9q^2 + 10p - 15q$. (3 marks)

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Section A(2) (18 marks)

4. An inverted right circular conical vessel contains some water. The vessel is held vertically. The depth of water in the vessel is 10 cm. Carl then pours 546π cm^3 of water into the vessel without overflowing. He now finds that the depth of water in the vessel is 12 cm.

(a) Express the final volume of water in the vessel in terms of π.

(2 marks)

(b) Carl claims that the final area of the wet curved surface of the vessel is at least 1250 cm^2. Do you agree? Explain your answer.

(3 marks)

Answers written in the margins will not be marked.

5. The coordinates of A and B are $(-2, 5)$ and $(6, -7)$ respectively. P is a moving point in the rectangular coordinate plane such that $PA = PB$.

(a) Describe the locus of P. (1 mark)

(b) M is a point lying on the locus of P which is the nearest point to A. Q is a moving point such that $QM = MA$.

(i) Find the coordinates of M.

(ii) Describe the locus of Q.

(iii) Find the equation of the locus of Q.

(5 marks)

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6. Let \$$C$ be the cost of painting a box of surface area A m^2. It is given that C is the sum of two parts, one part is a constant and the other part varies as A. When $A = 3$, $C = 15$; when $A = 4$, $C = 18$.

(a) Find the cost of painting a box of surface area 2 m^2.

(4 marks)

(b) There is a larger box which is similar to the box described in (a), and the volume of the larger box is 8 times that of the box described in (a). Paul claims that the cost of painting the larger box is 4 times that of painting the box described in (a). Do you agree? Explain your answer.

(3 marks)

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Section B (33 marks)

7. A string is formed using the letters of the word 'HKDSE'. If no letters can be repeated,

(a) how many 5-letter strings can be formed? (2 marks)

(b) how many 3-letter strings can be formed? (2 marks)

8. The probabilities that Tony will pass paper *A* and paper *B* are 0.7 and 0.4 respectively. Assume that his performances on the two papers are independent of each other. Find the probability that

(a) he passes paper *A* but fails paper *B*, (2 marks)

(b) he passes both papers, (2 marks)

(c) he fails at least one paper. (2 marks)

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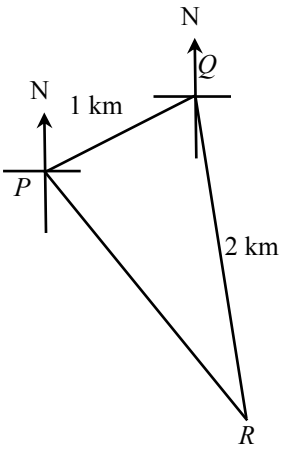
9. In the figure, PQ, QR and RP are straight roads on the same horizontal ground. The bearing of Q from P is 063°, and Q is 1 km from P. The bearing of R from Q is 171°, and R is 2 km from Q.



(a) Find the distance between P and R. (3 marks)

(b) Find the bearing of R from P. (2 marks)

(c) At 6 p.m., Steven walks at an average speed of 3 km/h from R along the road PR. When will he reach the nearest point to Q? (*Give the answer correct to the nearest minute.*) (3 marks)

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10. A circle C_1 passes through the origin O and its centre is $(-5, 4)$. The y-intercept and the slope of the straight line L are k and $-\frac{1}{4}$ respectively.

(a) Find the equations of C_1 and L. (3 marks)

(b) C_1 and L intersect at the points A and B. M is the mid-point of AB.

(i) Express the coordinates of M in terms of k.

(ii) C_2 is a circle with centre M, and the y-axis is a tangent to C_2. If M lies on the x-axis, find the equation of C_2.

(4 marks)

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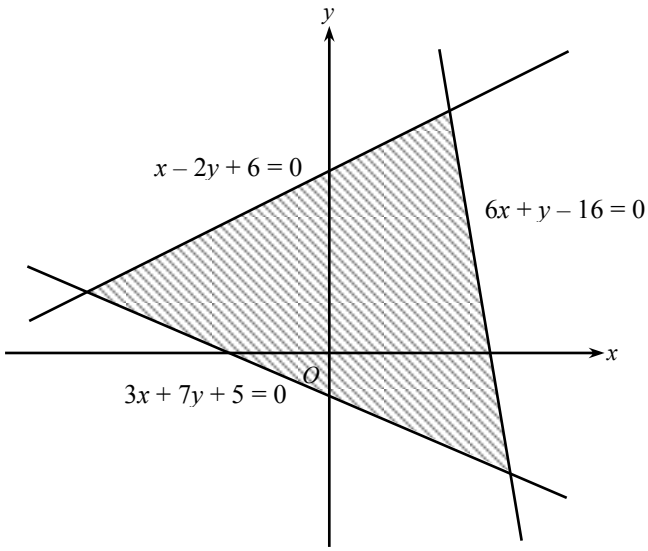
11. In the figure, the shaded region (including the boundary) is bounded by three straight lines.



(a) Write down the three inequalities that determine the shaded region. (3 marks)

(b) Find the coordinates of the vertices of the shaded region. (2 marks)

(c) Find the maximum and minimum values of the function $P = -3x + y$ subject to the constraints in (a).

(3 marks)

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