20-21 F.5
1st TERM EXAM
MATH CP
PAPER 1

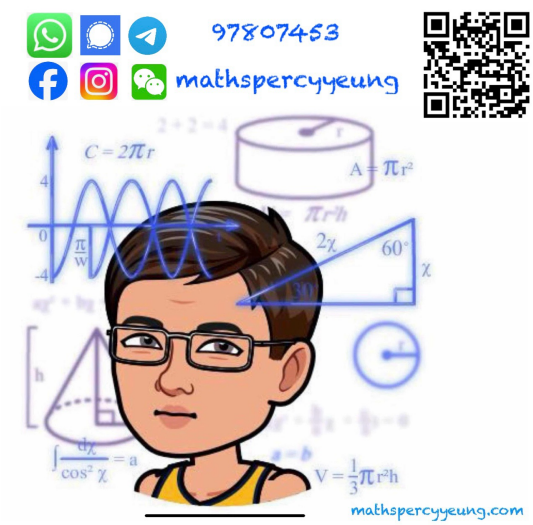
2020 – 2021
Form 5 First Term Examination

MATHEMATICS Compulsory Part

PAPER 1

Question–Answer Book

5th January, 2021
8:15 am – 10:00 am (1 hour 45 minutes)
This paper must be answered in English



Sections	Marks
A (1 – 4)	
A (5 – 11)	
A Total	**/56**
B Total	**/28**
TOTAL	**/84**

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) (28 marks)

1. Simplify $\dfrac{(2x^{-2}y^3)^3}{4x^5y^8}$ and express your answer with positive indices. (3 marks)

2. Factorize

(a) $x^3 - 8$,

(b) $3x^2 - 4x - 4$,

(c) $x^3 + 3x^2 - 4x - 12$.

(4 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

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

4. Figure 1 shows a quarter circle OPQ with area 36π cm^2.

(a) Find the radius.

(b) A solid is formed by rotating the quarter circle OPQ about OP. Find the volume of the solid formed in terms of π.

(4 marks)

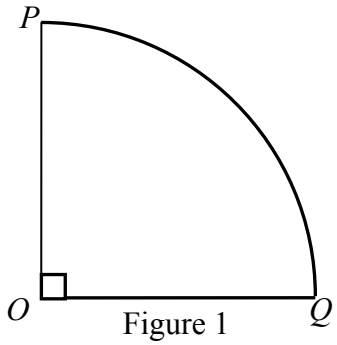


Figure 1

Answers written in the margins will not be marked

5. **(a)** Solve the compound inequalities $2(a+4)+a>-1$ or $\frac{4-3a}{2}\leq a+1$.

(b) Write down the least integer satisfying $2(a+4)+a>-1$ or $\frac{4-3a}{2}\leq a+1$.

(4 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

6. **(a)** Figure 2 shows the graphs of $y = -7x^2 - 8x + 12$ and $y = 6x + 12$.

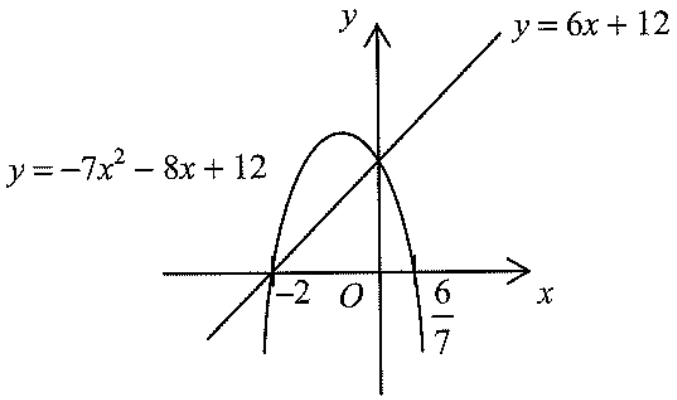


Figure 2

Write down the range of values of x which satisfy the inequality

(i) $-7x^2 - 8x + 12 \geq 0$,

(ii) $6x + 12 \geq -7x^2 - 8x + 12$.

(b) Find the range of values of x which satisfy the inequality $-12 \leq -7x^2 - 8x \leq 6x$. Hence, find all integer(s) satisfying the inequality $-12 \leq -7x^2 - 8x \leq 6x$.

(5 marks)

Answers written in the margins will not be marked

7. In Figure 3, $AB = BC$ and $\angle ABC = 54°$.

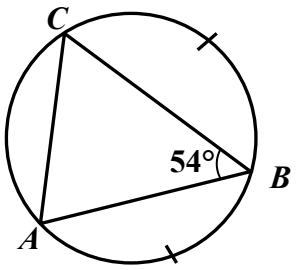


Figure 3

(a) Find $BC : CA$.

(b) Let D be a point on AC such that BD bisects $\angle ABC$. Is BD a diameter of the circle? Explain your answer.

(5 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

Section A(2) (28 marks)

8. It is given that $f(x)$ is partly constant and partly varies as x^2. Suppose $f(1)=-6$ and $f(-2)=-66$.

(a) Find $f(x)$. (3 marks)

(b) Consider the graph of $y=f(x)-27x$. Find the axis of symmetry of the graph. (2 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

9. Henry conducts a survey about the amount (in $) spent by his classmates on snack on a certain day. The stem-and-leaf diagram shows the result.

Stem ($10)	Leaf ($1)
0	0 0 5 5 6 6 9
1	2 4 8 8 8
2	1 2 6

(a) Find the mean, the mode and the median of the amount spent by the 15 students on snack on that day. (3 marks)

(b) Henry asked five more classmates and the mean of the amount spent by them on snack on that day is $14.

(i) Find the mean of the amount spent by the 20 students on snack on that day.

(ii) After that, Henry found that the mode and the median of the amount spent by the 20 students on snack on that day are $14 and $16 respectively. Mary claimed that there are something wrong in Henry's calculation. Is she correct? Explain your answer. (4 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

(Cont' 9)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

10. A container in the shape of an inverted right pyramid with a square base is held vertically and there is some water of depth 12 cm inside the container. May then pours 152 cm^3 of water into the container without overflowing. The depth of the water becomes 18 cm.

(a) What is the total volume of water inside the container? (3 marks)

(b) May claims that the final area of wet surface of the container is at least 220 cm^2. Do you agree? Explain your answer. (4 marks)

Answers written in the margins will not be marked

(Cont' 10)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

11. A circle C passes through the points $P(2, 1)$ and $Q(-2, -3)$. The centre of C lies on the straight line $x-7y+25=0$.

(a) **(i)** Find the coordinates of the centre of C.

(ii) Hence, find the equation of C.

(4 marks)

(b) A straight line L_1: $x-2y-10=0$ intersects with a straight line L_2 which is the perpendicular to L_1 and passes through the centre of C. Denote the point of intersection of L_1 and L_2 by R.

(i) Find the coordinates of R.

(ii) Tracy claims that the shortest distance between C and R is less than 3. Do you agree? Explain your answer.

(5 marks)

Answers written in the margins will not be marked

(Cont' 11)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

Section B (28 marks)

12. The following are the marks that 15 students got in the first term Mathematics examination. (The full mark is 100.)

59 59 60 62 63 63 63 65
70 71 72 73 73 75 77

(a) Sandy got 73 marks in the examination. Find the standard score of Sandy. (3 marks)

(b) Sandy performs better in the second term examination according to the standard scores. If the mean and the standard deviation of the second term examination are 52 and 11 respectively, find the range of marks that Sandy gets. (3 marks)

Answers written in the margins will not be marked

13. According to a survey conducted in a university, the mean of the scores of Physical Education of the university students is 46. Suppose the scores are normally distributed.
If Susan's score is 88 and only 0.15% of the students scored better than her, find the standard deviation of the data. (3 marks)

14. 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)

Answers written in the margins will not be marked

15. In Figure 4, the equations L_1 and L_2 are $4x-5y+6=0$ and $9x-y-32=0$ respectively. R is the region (including the boundary) bounded by L_1, L_2 and L_3.

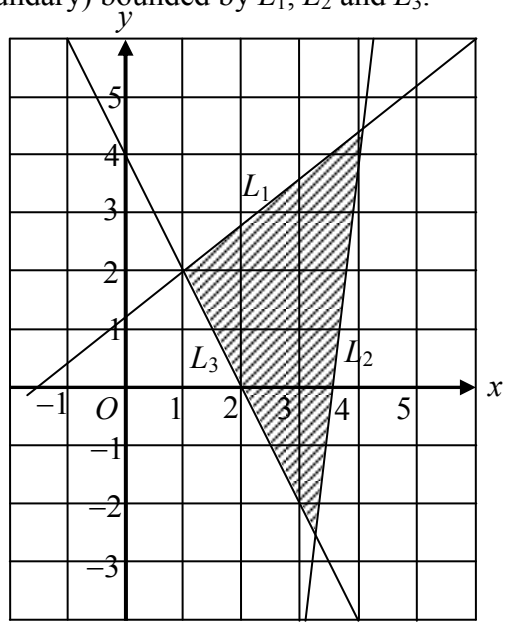


Figure 4

(a) **(i)** Find the equation of L_3.

(ii) If R represents the solutions of a system of inequalities, find the system of inequalities.

(4 marks)

(b) Let x and y be integers such that (x, y) lies in R. Find the maximum value of the function $F=2x-y+2$. (3 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

(Cont' 15)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

16. In Figure 5, TAB is a semi-circle with diameter AB. AB is produced to C such that TC is the tangent to the semi-circle at T.

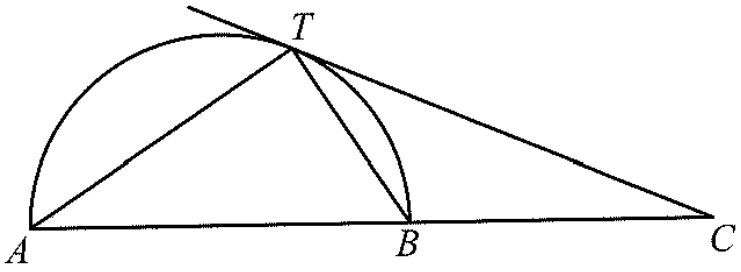


Figure 5

(a) Prove that $\Delta TBC \sim \Delta ATC$. (2 marks)

(b) Suppose that $TC = 36$ cm and $BC = 24$ cm.

(i) Find the diameter of the semi-circle.

(ii) Someone claims that the shortest distance from T to AB is less than 13 cm. Do you agree? Explain your answer.

(6 marks)

Answers written in the margins will not be marked

(Cont' 16)

End of Paper

Answers written in the margins will not be marked

Answers written in the margins will not be marked