18-19 F.6
MOCK EXAM
MATH CP
PAPER 1

2018 – 2019
Form 6 Mock Examination

MATHEMATICS Compulsory Part

PAPER 1

Question-Answer Book

9th January, 2019.
8:15 a.m. – 10:30 a.m. (2 hours 15 minutes)
This paper must be answered in English.

INSTRUCTIONS

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

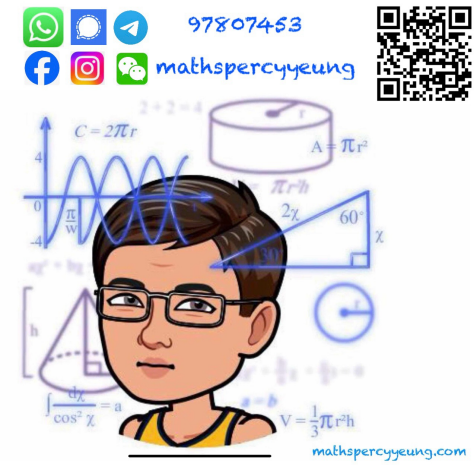
2. This paper consists of THREE sections, A(1), A(2) and B.

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	Marks
A (1)	
A (2)	
A Total	**/ 70**
B Total	**/ 35**
TOTAL	**/ 105**

Section A(1) (35 marks)

1. Simplify $\dfrac{(m^{-2})^3 n^2}{(m^5 n^{-1})^2}$ and express your answer in positive indices. (3 marks)

2. Make n the subject of the formula $\dfrac{1}{3m} - \dfrac{3}{n} = -4$. (3 marks)

3. **(a)** Round down 2714.2944 to 1 decimal places.
(b) Round up 2714.2944 to the nearest integer.
(c) Round off 2714.2944 to 3 significant figures.

(3 marks)

Answers written in the margins will not be marked.

4. A box contains n^2 white balls, $2n$ black balls and 4 red balls. If a ball is randomly drawn from the box, then the probability of drawing a white ball is $\frac{9}{13}$. Find the value of n.

(3 marks)

5. Factorize

(a) $4x^3 - 12x^2y$,

(b) $4x^3 - 12x^2y - xy^2 + 3y^3$.

(4 marks)

Answers written in the margins will not be marked.

6. **(a)** Find the range of values of x which satisfy both $\frac{5-2x}{-3} < 4x+5$ and $3x - 10 \leq 0$.

(b) Write down the number of integers satisfying both inequalities in (a).

(4 marks)

7. The marked price of a book is 40% above its cost. A profit of \$18 is made by selling the book at a discount of 20% on its marked price. Find the marked price of the book.

(5 marks)

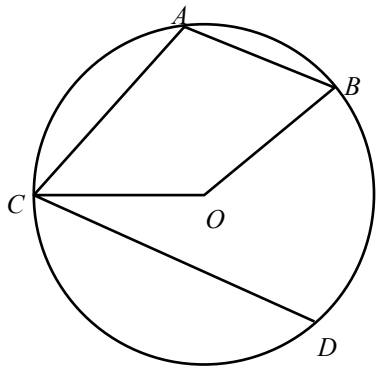
Answers written in the margins will not be marked.

8. In the figure, O is the centre of the circle $ABDC$. It is given that AB // CD, $\angle BOC = 160°$, $\angle OCD = 30°$ and the radius of the circle is 9 cm.

(a) Find $\angle ACO$.

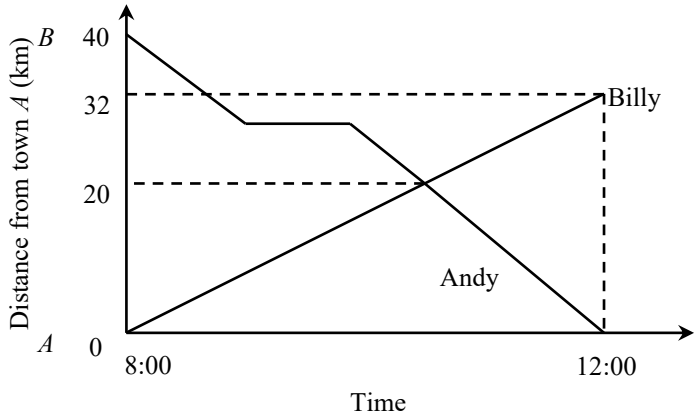
(b) Express the area of the sector AOC in terms of π.

(5 marks)



Answers written in the margins will not be marked.

9. The figure shows the graphs for Andy and Billy running on the same straight road between town A and town B during the period 8:00 to 12:00 in a morning. Billy runs at a constant speed during the period. It is given that town A and town B are 40 km apart.



(a) When do Andy and Billy meet during the period?

(b) Find the average speed for Andy running from town B to town A.

(c) Use the average speed during the period to determine who runs faster. Explain your answer.

(5 marks)

Answers written in the margins will not be marked.

Section A(2) (35 marks)

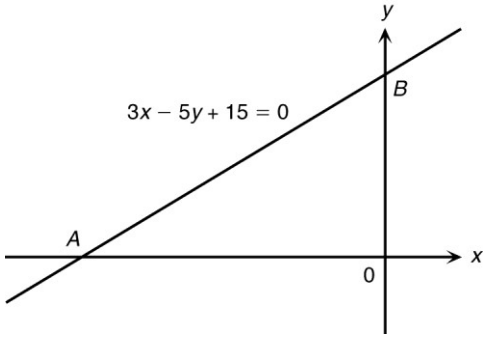
10. Let $f(x) = x(x-4)^2 + ax + b$, where a and b are constants. It is given that $x - 3$ is a factor of $f(x)$. When $f(x)$ is divided by $x - 1$, the remainder is 2.

(a) Find a and b. (3 marks)

(b) Someone claims that the equation $f(x) = 0$ has at least one irrational root. Do you agree? Explain your answer. (3 marks)

Answers written in the margins will not be marked.

11. In the figure, the straight line $3x - 5y + 15 = 0$ cuts the x-axis and the y-axis at A and B respectively.



(a) Find the coordinates of A and B. (2 marks)

(b) P is a moving point on the coordinate plane such that $AP \perp BP$. Denote the locus of P by C.

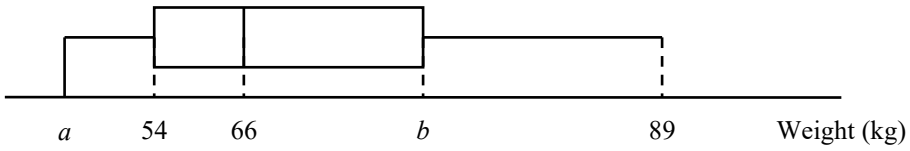
(i) Describe the geometric relation between the line segment AB and C.

(ii) Find the equation of C.

(4 marks)

Answers written in the margins will not be marked.

12. The box-and-whisker diagram below shows the distribution of the initial weights (in kg) of 29 members joining a fitness course. It is given that the mean, the inter-quartile range and the range of the distribution are 69 kg, 25 kg and 40 kg respectively.



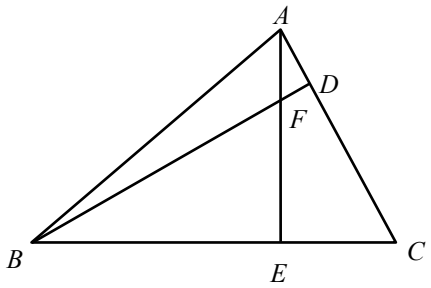
(a) Find a and b. (2 marks)

(b) If four members with initial weights 52 kg, 60 kg, 68 kg and 71 kg quitted the fitness course, find the mean and the median of the weights of the remaining members. (3 marks)

(c) One year later, it is found that the weight of the heaviest member after the training is 11 kg less than that before joining the fitness course. The trainer claims that at least 25% of the members can reduce their weights. Do you agree? Explain your answer. (2 marks)

Answers written in the margins will not be marked.

13. In the figure, D and E are points on AC and BC respectively such that $\angle CAE = \angle CBD$. AE and BD intersect at F.



(a) Prove that $\triangle ACE \sim \triangle BCD$. (2 marks)

(b) Suppose that $AC = 26$ cm, $CD = 15$ cm, $CE = 10$ cm and $BD \perp AC$.

(i) Find the length of BE.

(ii) Find the area of $\triangle ABD$.

(iii) Is there a point P lying on AB such that the distance between D and P is less than 10 cm? Explain your answer.

(6 marks)

Answers written in the margins will not be marked.

14. An inverted right circular conical vessel of base radius 96 cm and height 180 cm is held vertically and it contains some water with volume 8640π cm^3.

(a) Find the depth of water in the vessel. (3 marks)

(b) It is known that 195 hemispherical containers of radius 12 cm are fully filled with water. The water in the containers is now poured into the vessel without overflowing. Someone claims that the increase in the wet curved surface of the vessel is at least 30 000 cm^2. Do you agree? Explain your answer. (5 marks)

Answers written in the margins will not be marked.

Section B (35 marks)

15. There are 3 different Chinese books, 3 different English books and 6 different Mathematics books.

(a) If all the books are arranged on a bookshelf and the English books are next to each other, how many arrangements can be formed? (2 marks)

(b) If 3 Mathematics books and 3 non-Mathematics books are selected and arranged on a bookshelf, and no Mathematics books are next to each other, how many arrangements can be formed? (2 marks)

Answers written in the margins will not be marked.

16. The sum of the first 3 terms and the sum of the first 6 terms of a geometric sequence are 15 616 and 46 116 respectively.

(a) Find the first term of the sequence. (3 marks)

(b) Find the greatest value of n such that the sum of the nth term and the $(2n)$th term is less than 786 432.

(3 marks)

Answers written in the margins will not be marked.

17. It is given that $f(x)$ partly varies as x^2 and partly varies as $(2x - 7)$. Suppose that $f(4) = 10$ and $f(7) = 7$.

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

(b) Let Q be the vertex of the graph of $y = f(x)$ and R be the vertex of the graph of $y = 6 - f(x + 8)$.

(i) Using the method of the completing the square, find the coordinates of Q.

(ii) Write down the coordinates of R.

(iii) The coordinates of the point S are $(-1, 7)$. Let P be the orthocentre of $\triangle QRS$. Describe the geometric relationship between P, Q and R. Explain your answer.

(5 marks)

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18. Figure (1) shows a triangular cardboard ABC. E and F are points on AB such that $AE = 2.5$ cm and $CF \perp AB$. D is a point on AC such that $DE \perp AB$. It is known that $BC = 6$ cm, $\angle ABC = 60°$ and $\angle ACB = 80°$.

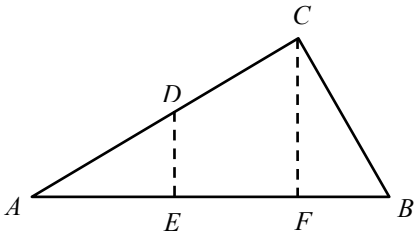

Figure (1)

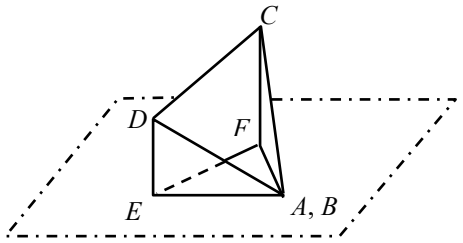

Figure (2)

(a) Find the lengths of BF and EF. (3 marks)

(b) The cardboard is then folded along CF and DE such that A and B meet each other. AE, EF and BF lie on the horizontal ground as shown in Figure (2). The angle between the planes BCF and $CDEF$ is denoted by α.

(i) Find α.

(ii) The angle between CE and plane BCF is denoted by β. Someone claims that $\alpha > 2\beta$. Do you agree? Explain your answer.

(5 marks)

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19. The centre of the circle C is the origin. Denote the radius of C by r. Let L be the straight line $y = mx + c$, where m and c are constants. It is given that L is a tangent to C.

(a) **(i)** Express c^2 in terms of r and m.

(ii) If L passes through a point (h, k), show that $(k - mh)^2 = r^2(m^2 + 1)$.

(3 marks)

(b) The coordinates of P and R are $(-11, -2)$ and $(13, -9)$ respectively. C is inscribed in a triangle PQR.

(i) Find r .

(ii) Find the equation of PQ.

(iii) Find the coordinates of Q.

(6 marks)

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