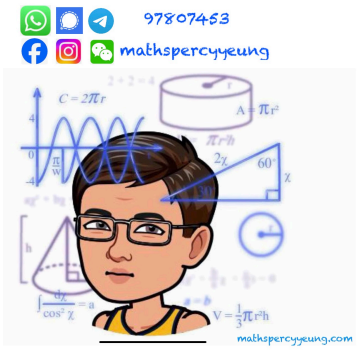
MSC F2 2021-22 Final P1



Class : _____ Name : _____ Class Number : _____

Time allowed : 1 hour 15 minutes

Full mark : 80

This question-answer book consists of 15 printed pages.

Instructions to candidates:

1. This paper must be answered in English with a blue / black ball pen, unless otherwise specified.

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

3. This paper consists of TWO sections, A and B.
   Section A carries 40 marks and Section B carries 40 marks.

4. Answer 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.

5. All diagrams / graphs / charts as part of the answers must be clearly drawn with an HB pencil.

6. Graph paper and supplementary answer sheets will be supplied on request. Write your name, class and class number on each sheet, and fasten them INSIDE this book.

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

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

9. Unless otherwise specified, numerical answers must be exact or correct to 3 significant figures.

10. Calculator pad printed with the "HKEA Approved" / "HKEAA Approved" label is allowed.
    Remove the calculator cover / jacket.

Section A (40 marks)

1. Simplify $\dfrac{(-\frac{7}{2}x^0y^{-1})^{-2}}{2y^7}$ and express your answer with positive indices. (3 marks)

2. (a) Factorize $36a^2 - b^2 + 6a - b$. (3 marks)

   (b) Hence, or otherwise, factorize $36y^2 - (x-1)^2 + 6y - (x-1)$. (2 marks)

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3. Make x the subject of the formula $b = 2x + (1 - x)a$. (3 marks)

4. If $(2x - 3)^2 + Ax \equiv x(Ax - B) - 12 - C$, where A, B and C are constants, find the values of A, B and C. (5 marks)

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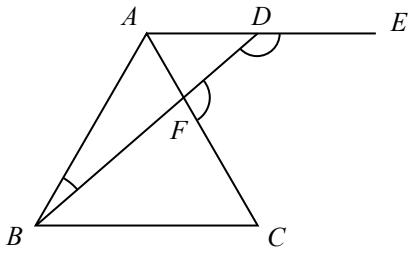
5. In the figure, ADE, AFC and BFD are straight lines. AE // BC, AB = BC, $\angle ABD = 18°$ and $\angle BDE = 138°$. Find $\angle CFD$.



(6 marks)

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6. A cylindrical container of base radius 4 cm and height 12 cm. It contains some water to a depth of 7 cm. Peter puts some cubes with side 2 cm into the container. Suppose all the cubes are totally submerged in water, at least how many cubes have to be put into the container to make the water overflow?

(7 marks)

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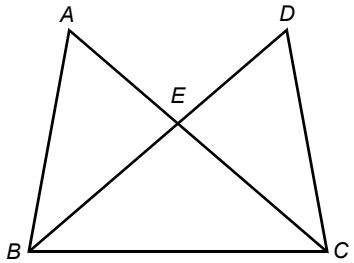
7. In the figure, AEC and DEB are straight lines, $AB = CD$ and $\angle ABC = \angle DCB$.



(a) Prove that $\Delta ABC \cong \Delta DCB$. (3 marks)

(b) Prove that ΔEBC is an isosceles triangle. (2 marks)

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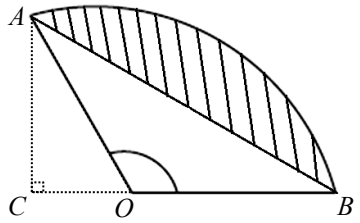
8. The figure shows a sector with $AC = 5$ cm and $\angle AOB = 120°$.



(a) Find the radius of the sector. (3 marks)

(b) Find the area of the shaded region. (3 marks)

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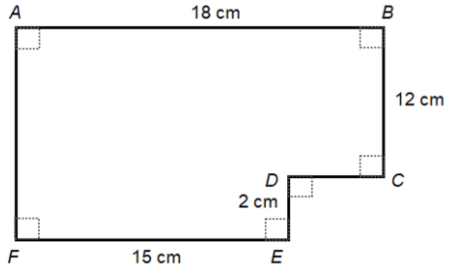
Section B (40 marks)

9. In the figure, *ABCDEF* is a thin six-sided polygonal metal sheet, where all the measurements are correct to the nearest cm.



(a) Write down the maximum absolute error of the measurements. (1 mark)

(b) Find the least possible area of the metal sheet. (3 marks)

(c) The actual area of the metal sheet is x cm^2. Find the range of values of x. (4 marks)

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10. The composition of alloy A and alloy B are as follows.

	Silver	Copper	Others
Alloy A	25%	a %	b %
Alloy B	37.5%	62.5%	-

Suppose x kg of alloy A is mixed with y kg of alloy B to form a new alloy. If a craftsman has to prepare 10 kg of a new alloy with 30% silver and 64% copper, find

(a) the amount of alloy A and alloy B required respectively. (5 marks)

(b) the amount of copper in alloy A. (3 marks)

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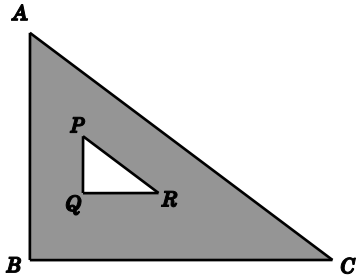
11. In the figure, $\angle BAC = \angle RPQ$, AB = 12 m, BC = 16 m, AC = 20 m, PQ = 3 m and PR = 5 m.



(a) Prove that $\triangle ABC$ is a right-angled triangle and state the right angle. (2 marks)

(b) Prove that $\triangle ABC \sim \triangle PQR$. (3 marks)

(c) It is given that $\triangle PQR$ is a right-angled triangle, find the area of the shaded region. (3 marks)

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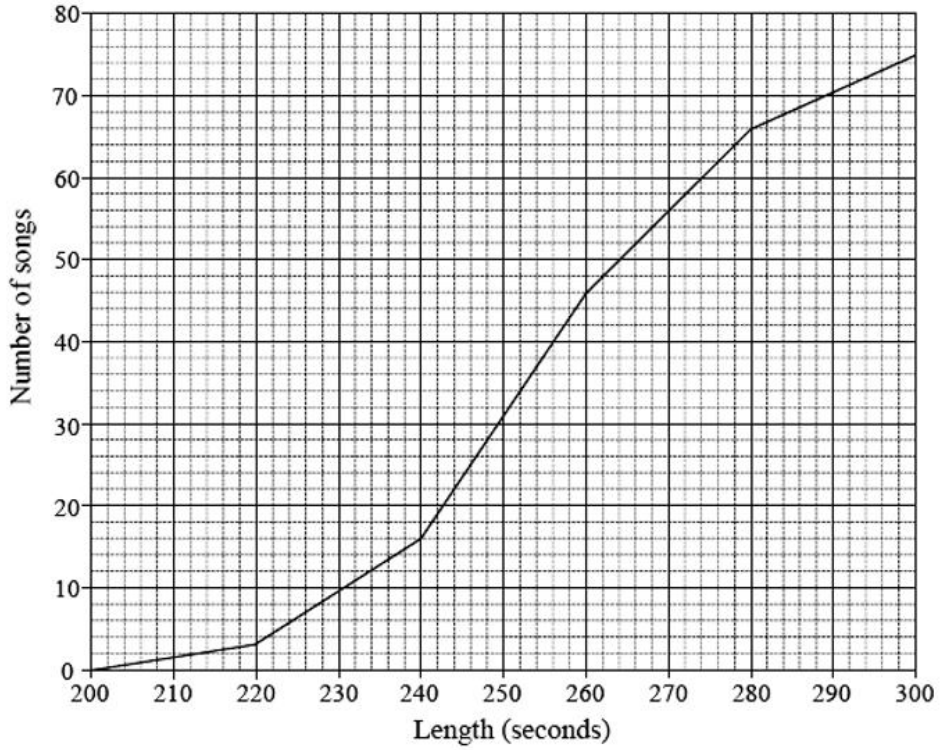
12. The figure shows the cumulative frequency polygon of the distribution of the lengths of a number of songs.

Cumulative frequency polygon of the distribution of lengths of songs



(a) Complete the tables below.

Length (t seconds)	Cumulative frequency
$t \leq 220$	3
$t \leq 240$	
$t \leq 260$	46
$t \leq 280$	
$t \leq 300$	

Length (t seconds)	Frequency
$200 < t \leq 220$	3
$220 < t \leq 240$	
$240 < t \leq 260$	
$260 < t \leq 280$	
$280 < t \leq 300$	9

(4 marks)

(b) From the cumulative frequency polygon, find the median and upper quartile of the distribution.

(3 marks)

(c) What percentage of these songs have lengths greater than 220 seconds but not greater than 260 seconds? (3 marks)

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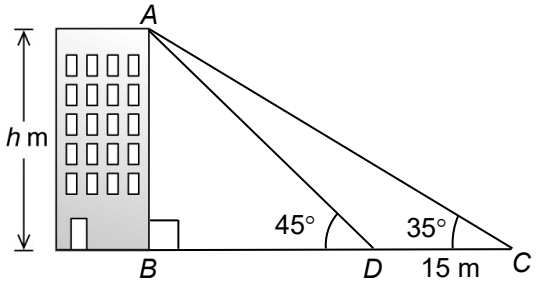
13. The figure shows a vertical building AB of height h m.



C and D are two points on the horizontal ground. AC and AD are two taut ropes. It is given that the angles made by AC and AD with the ground are 35° and 45° respectively and the distance between C and D is 15 m.

(a) Express, in terms of h,

(i) the distance between B and D.

(ii) the distance between B and C.

(3 marks)

(b) Find the height of the building. (3 marks)

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End of Paper

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