# YUEN LONG MERCHANTS ASSOCIATION SECONDARY SCHOOL

## Final Examination, 2021-2022

Secondary: 2 Mathematics (I) Date: 22-07-2022

Time Allowed: 1 hr 30 mins

Full Marks: 100

Question-Answer Book

Class: _____ Name: _____

Class Number: _____ Marks: _____

INSTRUCTIONS

1. This paper consists of THREE sections, A(1), A(2) and B.
2. Answer ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book.
3. Graph paper and supplementary answer sheets will be supplied on request. Write your name, class and class number on each sheet.
4. Unless otherwise specified, all working must be clearly shown.
5. Unless otherwise specified, numerical answers should be exact or correct to 3 significant figures.
6. The diagrams in this paper are not necessarily drawn to scale.
7. Maximum mark penalty for units: 2.

| SECTION A1 | SECTION A2 | SECTION B | TOTAL |
|---|---|---|---|
| /35 | /35 | /30 | /100 |

**Section A1 (35 marks)**

1. Factorize

   (a) $25x^2 - 9y^2$

   (b) $25x^2 - 9y^2 + 10x + 6y$

(4 marks)

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2. In the 84 games played by the Happy football team last year, the ratio of the number of games won, lost and drawn was 7: 10: 4. Find the number of games won.

(2 marks)

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3. It is given that $a$ is inversely proportional to $b$. $b = 12$ when $a = 6$.

   (a) Find the value of $b$ when $a = 8$.

   (b) Find the value of $a$ when $b = 30$.

(4 marks)

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4. Solve the simultaneous equations $\begin{cases} 5x+3y=27 \\ 5x+7y=23 \end{cases}$.

(4 marks)

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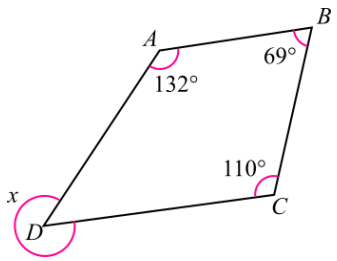
5. Find $x$ in the figure.




(3 marks)

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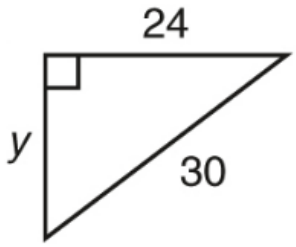
6. Find $y$ in the figure.




(3 marks)

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7. The stem-and-leaf diagram shows the ratings of a government officer given by a group of people.

**Ratings of a government officer given by a group of people**

| Stem (tens) | Leaf (units) |
|---|---|
| 4 | 5 9 |
| 5 | 0 2 5 9 |
| 6 | 0 0 0 5 5 9 |
| 7 | 0 0 5 5 5 |
| 8 | 0 0 0 0 5 |
| 9 | 0 5 9 |

(a) How many people have given the government officer a rating of 70?

(b) How many people have given ratings below 60?

(c) What percentage of these people have given ratings above 80?

(4 marks)

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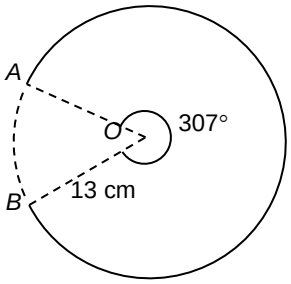
8. Find the length of $\overset{\frown}{AB}$ in the figure and area of sector OAB.




(3 marks)

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9. In each of the following, find $\theta$.

(a) $2\tan\theta = \sqrt{5}$

(b) $\tan\theta = \dfrac{11}{5}$

(2 marks)

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10. The weight of a duck is measured as 500 g, correct to the nearest 10 g. Find the

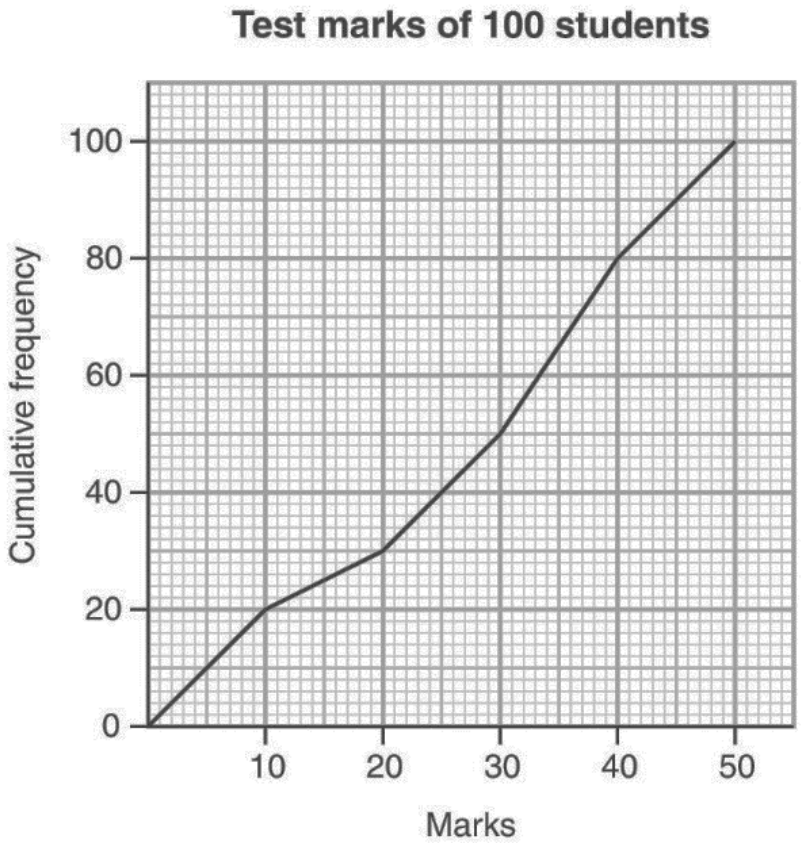
(a) maximum absolute error of the measured weight.

(b) relative error of the measured weight.

(c) percentage error of the measured weight.

(3 marks)

11. The cumulative frequency polygon below shows the test marks of 100 students.




(a) Find the 20th percentile.
(b) Find the 80th percentile.
(c) Find the median.

(3 marks)

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**Section A2 (35 marks)**

12. If $(3x - 1)^2 \equiv (3x + 1)(3x - 1) + Ax + B$, where $A$, $B$ are constants, find the values of $A$, $B$.

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13. Simplify $\frac{5}{3k+2} - \frac{4}{2k+7}$.

(4 marks)

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14. Make $y$ the subject of the formula $\frac{1}{x} + \frac{1}{y} = 5$.

(4 marks)

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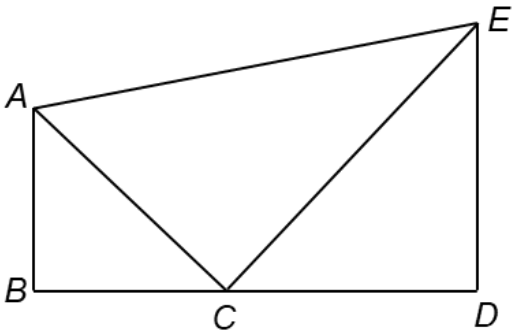
15. On a straight road, the distance between a car and a bicycle is 36 km. If they move towards each other, they will meet after 45 minutes. If they travel in the same direction, the car will catch up the bicycle after $1\frac{1}{2}$ hours. Find the speed of each of them.

(4 marks)

16. The figure shows a trapezium $ABDE$ with $\angle ABD = 90°$ and $AB$ // $ED$. $C$ is a point on $BD$ such that $\angle ACE = 90°$.




(a) Prove that $\triangle ABC \sim \triangle CDE$.

(b) It is given that $AB = 6$ cm, $BC = 7$ cm and $CD = 9$ cm. Find the area of trapezium $ABDE$.

(c) Is there a point F lying on AE such that the distance between C and F is less than 20 cm? Explain you answer.

(8 marks)

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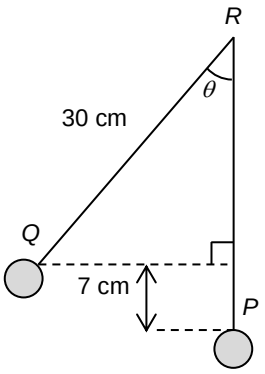
17. In the figure, one end of a taut string is fixed at point $R$. A ball is attached to the other end of the string. It is given that the string is 30 cm long. When the ball moves to a position $Q$ which is 7 cm above its lowest position $P$, find the angle $\theta$ that the string makes with the vertical.

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18. The following are the data collected from 30 cars showing their distances travelled (in km) using one litre of petrol.

| | | | | | |
|---|---|---|---|---|---|
| 8.8 | 10.1 | 9.1 | 10.8 | 11.2 | 10.7 |
| 11.4 | 10.5 | 10.8 | 9.3 | 10.5 | 8.6 |
| 9.6 | 10.2 | 10.0 | 9.1 | 9.2 | 11.1 |
| 8.7 | 9.7 | 10.5 | 10.6 | 9.7 | 9.8 |
| 10.8 | 10.2 | 9.6 | 9.0 | 10.2 | 10.1 |

(a) Complete the following table.

| **Distance travelled per litre of petrol (km)** | **Tally** | **Frequency** |
|---|---|---|
| 8.5 – 8.9 | | |
| 9.0 – 9.4 | | |
| | | |
| | | |
| | | |
| | | |

(b) Referring to the table in (a), answer the following questions.

(i) What are the class limits of the last class interval?
(ii) What are the class boundaries of the second class interval?
(iii) How many cars can travel more than or equal to 10 km using one litre of petrol?

(6 marks)

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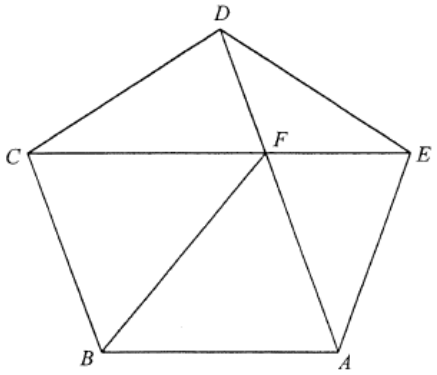
**Section B (30 marks)**

19. In the figure, ABCDE is a regular pentagon. AD and CE intersect at the point F.

Prove that $\angle AFB + \angle EAF = 90°$.

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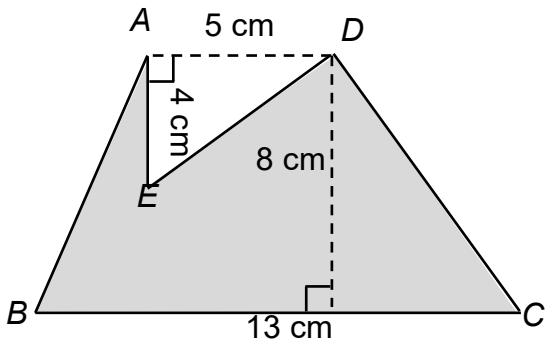
20. In the figure, pentagon *ABCDE* is obtained by removing right-angled triangle *ADE* from trapezium *ABCD*. Ben measured the lengths of *AD*, *AE*, *BC* and the height of trapezium *ABCD* as 5 cm, 4 cm, 13 cm and 8 cm respectively, correct to the nearest cm.




(a) Find the lower limit and upper limit of the actual area of right-angled triangle *ADE*.
(b) Find the lower limit and upper limit of the actual area of trapezium *ABCD*.
(c) Find the range of the actual area of pentagon *ABCDE*.
(d) Ben claims that the actual area of pentagon *ABCDE* can be 55 $cm^2$. Do you agree? Explain your answer.

(9 marks)

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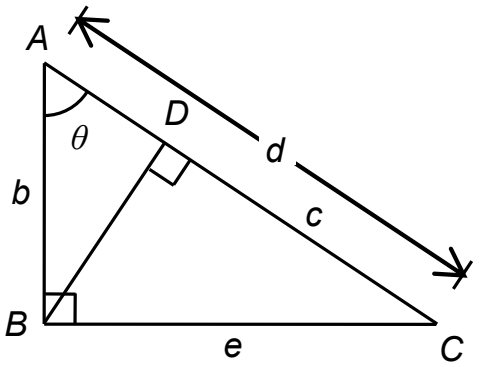
21. In the figure, $ADC$ is a straight line.




(a)

(i) By considering $\triangle ABC$, express cos $\theta$ in terms of $b$ and $d$.

(ii) By considering $\triangle ABD$, express cos $\theta$ in terms of $b$, $c$ and $d$.

(b) Using the results in (a), prove that

(i) $b^2 = d^2 - cd$,

(ii) $e^2 = cd$.

(iii) $sin^2\theta + cos^2\theta = 1$

(9 marks)

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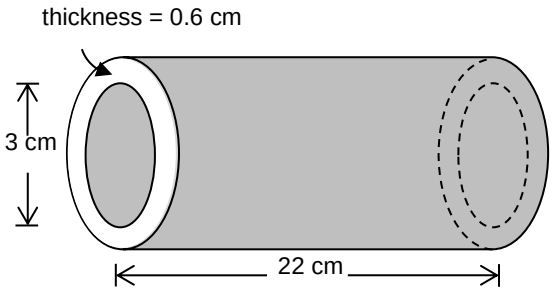
22. The solid in the figure is a right circular cylindrical metal tube of length 22 cm. The inner diameter and the uniform thickness of the metal tube are 3 cm and 0.6 cm respectively.




(a) Find the volume of metal needed to make the tube.
(b) Find the total surface area of the tube.

(7 marks)

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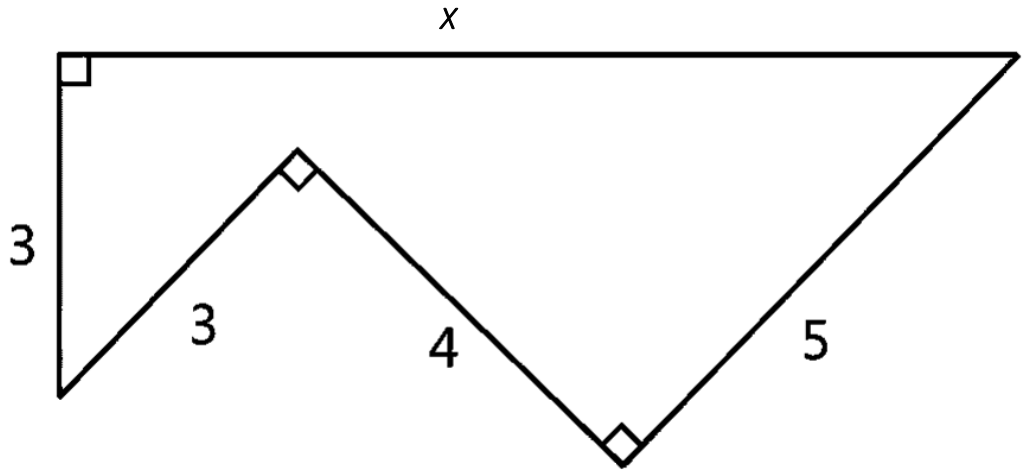
**Bonus:**

Find the value of $x$.

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**END OF PAPER**