

FUKIEN SECONDARY SCHOOL S6 MOCK EXAMINATION (2020-2021)

MATHEMATICS Compulsory Part PAPER 1 Question-Answer Book

Date : 8th January 2021 Time : 8:30 a.m. - 10:45 a.m. (2¹/4 hours)

This paper must be answered in English.

INSTRUCTIONS

- 1. Write your Name, Class and Class Number in the spaces provided on Page 1.
- 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. Graph paper and supplementary answer sheets will be supplied on request. Write your Name and mark the question number on each sheet.
- 5. Unless otherwise specified, all workings must be clearly shown.
- 6. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
- 7. The diagrams in this paper are not necessarily drawn to scale.

| Name | | |
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| Class | (| () |

| | Marker's Use Only | |
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| Question No. | Marks | |
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| 1. | Make <i>h</i> the subject of the formula $k = \frac{4-h}{5} + h$. | (3 marks) |
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| 2. | Simplify $\frac{1}{(m^3 n^{-1})^{-2}}$ and express your answer with positive indices. | (3 marks) |
| 2. | Simplify $\frac{1}{(m^3 n^{-1})^{-2}}$ and express your answer with positive indices. | (3 marks) |
| 2. | Simplify $\frac{1}{(m^3 n^{-1})^{-2}}$ and express your answer with positive indices. | (3 marks) |
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| 2. | Simplify $\frac{1}{(m^3n^{-1})^{-2}}$ and express your answer with positive indices. | (3 marks) |
| 2. | Simplify $\frac{1}{(m^3n^{-1})^{-2}}$ and express your answer with positive indices. | (3 marks) |
| 2. | Simplify $\frac{m}{(m^3n^{-1})^{-2}}$ and express your answer with positive indices. | (3 marks) |
| 2. | Simplify $\frac{m}{(m^3n^{-1})^{-2}}$ and express your answer with positive indices. | (3 marks) |
| 2. | Simplify $\frac{(m^3n^{-1})^{-2}}{(m^3n^{-1})^{-2}}$ and express your answer with positive indices. | (3 marks) |
| 2. | Simplify $\frac{(m^3n^{-1})^{-2}}{(m^3n^{-1})^{-2}}$ and express your answer with positive indices. | (3 marks) |

Answers written in the margins will not be marked.

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| Factorize | |
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| (a) $x^2 - 10xy + 25y^2$, | |
| (b) $x^2 - 10xy + 25y^2 - 2x^2y + 10xy^2$. | (3 marks) |
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| The marked price of a jacket is \$910. The jacket is sold at a discount of 40% on its mar | ked price. |
| (a) Find the selling price of the jacket. | |
| (b) After selling the jacket, the percentage loss is 30%. Find the cost of the jacket. | (4 marks) |
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| | Factorize (a) $x^2 - 10xy + 25y^2$, (b) $x^2 - 10xy + 25y^2 - 2x^2y + 10xy^2$. The marked price of a jacket is \$910. The jacket is sold at a discount of 40% on its mar (a) Find the selling price of the jacket. (b) After selling the jacket, the percentage loss is 30%. Find the cost of the jacket. |

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Page total

| of the | There are certain numbers of boys and girls in a group. If 4 boys leave the group, then the rathenumber of boys to the number of girls is 2 : 1. If 1 boy and 1 girl join the group, then the of the number of boys to the number of girls is 3 : 1. Find the ratio of the original number of the test the original number of girls in the group. | |
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| to the | e original number of girls in the group. | (4 marks |
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| Cons | ider the compound inequality $5-x = x+9$ | |
| Cons | ider the compound inequality $\frac{5-x}{2} < \frac{x+9}{5} \text{or} 8-3x > 5 \dots \dots \dots (*).$ | |
| Cons (a) | ider the compound inequality $\frac{5-x}{2} < \frac{x+9}{5} \text{or} 8-3x > 5 \dots \dots \dots (*).$ Solve (*). | |
| Cons (a) (b) | ider the compound inequality $\frac{5-x}{2} < \frac{x+9}{5} \text{or} 8-3x > 5 \dots \dots \dots (*).$ Solve (*). Write down the smallest positive integer satisfying (*). | (4 marks |
| (a) (b) | ider the compound inequality $\frac{5-x}{2} < \frac{x+9}{5} \text{or} 8-3x > 5 \dots \dots (*).$ Solve (*). Write down the smallest positive integer satisfying (*). | (4 marks |
| (a) (b) | ider the compound inequality $\frac{5-x}{2} < \frac{x+9}{5} \text{or} 8-3x > 5 \dots \dots (*).$ Solve (*). Write down the smallest positive integer satisfying (*). | (4 marks |
| (a) (b) | ider the compound inequality $\frac{5-x}{2} < \frac{x+9}{5} \text{or} 8-3x > 5 \dots \dots (*).$ Solve (*). Write down the smallest positive integer satisfying (*). | (4 marks |
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| (a) (b) | ider the compound inequality $\frac{5-x}{2} < \frac{x+9}{5} \text{or} 8-3x > 5 \dots \dots (*).$ Solve (*). Write down the smallest positive integer satisfying (*). | (4 marks |
| Cons (a) (b) | ider the compound inequality $\frac{5-x}{2} < \frac{x+9}{5} \text{or} 8-3x > 5 \dots \dots (*).$ Solve (*). Write down the smallest positive integer satisfying (*). | (4 marks |

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| 7. | The abou | coordinates of the points P and Q are $(-4, -2)$ and $(1, 3)$ respectively. P is rotated anti- at the origin through 90° to P'. Q is translated rightwards by 8 units to the point Q'. | clockwise |
|----|-------------|---|-----------|
| | (a) (b) | Write down the coordinates of P' and Q' . Prove that PQ is parallel to $P'Q'$. | (4 marks) |
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| 8. A | pill | is termed standard if its weight is measured as 20.0 mg correct to the nearest 0.1 mg. | |
|------|------------|---|----------|
| (a | ı) | Find the least possible weight of a standard pill. | |
| (b |)) | Someone claims that the total weight of 14 <i>standard</i> pills can be measured as 280.7 correct to the nearest 0.1 mg. Do you agree? Explain your answer. | 7 mg |
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| In F | In Figure 1, <i>O</i> is the centre of the semi-circle <i>ABCD</i> . <i>AC</i> and <i>OB</i> intersect at <i>E</i> . Let $\angle ABC = \theta$. | |
|------|--|--|
| | Figure 1 | |
| (a) | Express $\angle CAD$ in terms of θ . | |
| (b) | If <i>OB</i> bisects <i>AC</i> , express $\angle BOD$ in terms of θ . (5 marks) | |
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SECTION A(2) (35 marks)

- 10. The cost of printing *n* copies of Christmas card is \$*C*. *C* is partly constant and partly varies as \sqrt{n} . When $n = 10\ 000$, $C = 212\ 000$ and when $n = 40\ 000$, $C = 224\ 000$.
 - (a) Initially, the printing company plans to print 62 500 copies of Christmas card. Find the cost of printing 62 500 copies of Christmas card.

(4 marks)

(b) Finally, the printing company decides to increase the number of copies of Christmas card from 62 500 to 250 000. The company claims that the extra cost of printing the Christmas cards is less than \$50 000. Do you agree? Explain your answer.

(2 marks)

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| A so two heigh | lid metal right circular cylinder of base radius 8 cm and height 7 cm is melted and similar solid right circular cones. The ratio of the height of the smaller circular at of the larger circular cone is 1 : 3. | l recast in cone to |
|----------------------|--|----------------------|
| (a) | Find the volume of the larger circular cone in terms of π . | (3 mark |
| (b) | If the base radius of the larger circular cone is 12 cm, find the total surface area of circular cone in terms of π . | the small (4 mark |
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| <pre>d k, p and q. v many rational roots does the equation f(x) = 0 have? Explain your answer. </pre> | (4 marks) (3 marks) |
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| v many rational roots does the equation $f(x) = 0$ have? Explain your answer. | (3 marks) |
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| | Age | 7 | 8 | 9 | 10 | 11 | 1 |
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| | Number of members | 7 | 9 | x | 10 | у | 8 |
| The | mode and the media | an of the ages | of the mem | bers are 9 and | 1 9.5 respecti | vely. | |
| (a) | Find <i>x</i> and <i>y</i> . | | | | | | (3 m |
| (b) | Find the least pos | sible standard | d deviation o | f the distribu | tion. | | (2 m |
| (c) | Four members no Find the greatest j | w leave the g possible mear | roup. It is gi n of the ages | ven that the r of the remain | ange of their ning member | ages is 2. s in the group | o. (2 m |
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14. In Figure 2, ABCD is a parallelogram and AEFG is a rectangle. J is the mid-point of CD. AEB, AHG, AJI, BCI, CJHD, ECF and FIG are straight lines. E B Ć Η \bar{D} G Figure 2 (a) Prove that $\Delta ADJ \cong \Delta ICJ$, (i) $\Delta CBE \sim \Delta CIF$. (4 marks) (ii) Suppose that AE = 12 cm, BE = 5 cm, BC = 13 cm. (b) Find the area of $\triangle ABI$. (i) Is there a point P lying on AI such that the distance between B and P(ii) (4 marks) is 16 cm? Explain your answer.

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SECTION B (35 marks)

15. There are 14 boys and 16 girls in a room. If 4 children are selected from the room to form a team consisting of at most 2 boys, how many different teams can be formed? (3 marks)

Answers written in the margins will not be marked.

| 16. | The sum of the first 2 terms of a geometric sequence is 1 and the sum of the first 4 terms of the sequence is 5. It is known that all the terms of the sequence are positive. | | | | | | | |
|-----|---|--|-----------|--|--|--|--|--|
| | (a) | Find the first term of the sequence. | (2 marks) | | | | | |
| | (b) | Find the least value of n such that the sum of the first n terms of the sequence is gr | eater | | | | | |
| | | than 5^{30} . | (3 marks) | | | | | |
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- 17. Let $f(x) = x^2 4ax + 3a^2 1$, where *a* is a positive constant. *P* and *Q* are the vertices of the graphs of y = f(x-1) 1 and y = 1 f(x-1) respectively.
 - (a) Using the method of completing the square, express the coordinates of the vertex of the graph of y = f(x) in terms of *a*.

(2 marks)

- (b) It is given that PQ = 12 and the coordinates of R are (-4, 0). Let S be the orthocentre of $\triangle PQR$.
 - (i) Find the coordinates of *S*.

Answers written in the margins will not be marked.

(ii) The circle C passes through P. S is the centre of C. The straight line L is the tangent to C at P. If L cuts the x-axis at the point T, is PQ the angle bisector of $\angle RPT$? Explain your answer.

(5 marks)

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- 19. The coordinates of the centre G of the circle C with the radius of 10 is (-6, 4). Let L_1 be the straight line 4x ky 14 = 0, where k is an integer. It is given that L_1 is a tangent to C.
 - (a) Find k.

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- (4 marks)
- (b) Denote the point of contact of C and L_1 by T. Another straight line L_2 , which is parallel to L_1 , cuts C at A and B such that $\angle ATB = 120^\circ$. Denote the centre of the inscribed circle of $\triangle ABT$ by I.
 - (i) Find the coordinates of *T*.
 - (ii) Describe the geometric relationship between G, T and I. Explain your answer.
 - (iii) Given that $\tan 15^\circ = 2 \sqrt{3}$, find the coordinates of *I*. (Leave your answer in surd form.)

(7 marks)

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