FUKIEN SECONDARY SCHOOL S6 First Term Uniform Test (2020 - 2021) Mathematics (1 hour 15 minutes)

Date: 21st October 2020 Time: 8:30 a.m. – 9:45 a.m. Name:_____ Class: _____ No. :_____

INSTRUCTIONS

- 1. When told to open this book, you should check that all the questions are there. Look for the words **'END OF PAPER'** after the last question.
- 2. All questions carry equal marks.
- 3. **ANSWER ALL QUESTIONS**. You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber.
- 4. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARK** for that question.
- 5. No marks will be deducted for wrong answers.

There are 30 questions in Section A and 15 questions in Section B.

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

Choose the best answer for each question.

Section A

1. $2^{333} \cdot 4^{222} =$ A. 2^{444} . B. 2^{555} . C. 2^{666} . D. 2^{777} .

2. If
$$\frac{\alpha - 3\beta}{2\alpha} = \frac{\beta}{\alpha} - 1$$
, then $\alpha =$
A. $\frac{5\beta}{3}$.
B. 2β .
C. $\frac{3\beta}{5}$.
D. $\frac{\beta}{2}$.

3.
$$m^2 + 8m - 9n^2 - 24n =$$

- A. (m-3n)(m+3n-8).
- B. (m-3n)(m+3n+8).
- C. (m+3n)(m+3n-8).
- D. (m+3n)(m+3n+8).

- $4. \qquad \frac{\pi}{14^2} =$
 - A. 0.01 (correct to 2 decimal places).
 - B. 0.016 (correct to 3 significant figures).
 - C. 0.016 0 (correct to 4 decimal places).
 - D. 0.016 03 (correct to 5 significant figures).
- 5. The solution of 2-x < 2x-7 or 4-x > 2 is
 - A. x < 2. B. x < 3. C. 2 < x < 3. D. x < 2 or x > 3.
- 6. If $f(x) = 2x^2 3x + 1$, then f(3a 1) =
 - A. $18a^2 21a + 6$.
 - B. $6a^2 9a + 1$.
 - C. $18a^2 9a + 1$.
 - D. $2a^2 7a + 6$.
- 7. Let $p(x) = 2x^2 x + c$, where c is a constant. If p(x) is divisible by x + 2, find the remainder when p(x) is divided by 2x 1.
 - A. -10
 - B. -5
 - C. 5
 - D. 10

S6 Mathematics Compulsory Part

- 8. Which of the following statements about the graph of y = (2-x)(x+5)-6 is/are true?
 - I. The graph opens upwards.
 - II. The graph cuts the positive *y*-axis.
 - III. The *x*-intercepts of the graph are -1 and 4.
 - A. I only
 - B. II only
 - C. III only
 - D. II and III only
- 9. A sum of \$2 020 is deposited at an interest rate of 3% per annum for 2 years, compounded monthly. Find the interest correct to the nearest dollar.
 - A. \$10
 - B. \$123
 - C. \$125
 - D. \$2 086

10. Let a, b and c be non-zero numbers. If 2a = 3b and a: c = 4:3, then $\frac{a+2b}{5b-c} =$

A.
$$\frac{16}{27}$$
.
B. $\frac{28}{31}$.
C. $\frac{24}{37}$.
D. $\frac{7}{6}$.

- 11. If p and q are constants such that $(x+p)^2 q(x-2) \equiv x(x+1) + p(p+1)$, then q = 1
 - A. $\frac{1}{3}$. B. $\frac{2}{3}$. C. $\frac{3}{2}$. D. 3.
- 12. In the figure, the equations of the straight lines L_1 and L_2 are 3x ay = b and

cx - 3y = d respectively. L_1 and L_2 intersect at a point on the positive *x*-axis. Which of the following are true?



- 13. It is given that y is the sum of two parts, one part is a constant and the other part varies directly as x^2 . When x = 2, y = -29 and when x = -3, y = -69. If x = 7, then y =
 - A. -389.
 - B. -53.
 - C. 59.
 - D. 395.
- 14. There are 3 dots in the 1st pattern. For any positive integer *n*, the (n + 1)th pattern is formed by adding (n + 2) dots to the *n*th pattern. Find the number of dots in the 6th pattern.
 - A. 23
 - B. 28
 - C. 30
 - D. 36

15. In the figure, *D* is a point lying on *AC*. *AB* and *BD* are perpendicular to *BC* and *AC* respectively. If BD = 6, find $AD \times CD$.



16. In the figure, AB = BD and BA // CD. If $\angle ADC = 110^{\circ}$ and $\angle DCB = 125^{\circ}$, find $\angle DBC$.



- 17. In the figure, *PQRS* is a rectangle where diagonals *PR* and *QS* intersect at *D*. $\triangle DFP$ is an equilateral triangle. *DF* and *PS* intersect at *E*, and *RF* and *QS* intersect at *G*. If *PF* = *RS*, which of the following must be true?
 - I. DR = DF
 - II. *RF* is the angle bisector of $\angle DRS$.
 - III. $\triangle PQR \cong \triangle PFR$
 - A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III



18. In the figure, *OAB* is a sector with centre *O*. *M* is the mid-point of *OA* and $\angle AOB = \angle AMN = 90^{\circ}$. If the radius of the sector is 12 cm, find the area of the shaded region.



- 19. The base radius of a right circular cylinder is 3 times the base radius of a right circular cone while the volume of the circular cone is 2 times the volume of the circular cylinder. Find the ratio of the height of the circular cylinder to the height of the circular cone.
 - A. 1:6
 B. 1:54
 C. 6:1
 D. 54:1
- 20. In the figure, *ABCD* is a parallelogram. *M* is a point lying on *CD* such that CM : MD = 1 : 4 and *BM* and *AC* intersect at *N*. If the area of $\triangle CMN$ is 10 cm², then the area of the quadrilateral *ANMD* is
 - A. 160 cm^2 .
 - B. 250 cm^2 .
 - C. 290 cm².
 - D. 300 cm^2 .



- 21. In the figure, ABCD is a square. E is a point on BC and F is a point on CD. Find $\frac{AF}{EF}$.
 - A. $\frac{\sin \beta}{\sin \alpha \cos \alpha}$ B. $\frac{\sin \alpha}{\cos \alpha + \sin \beta}$ C. $\frac{\cos \beta}{\sin \alpha - \cos \alpha}$

D.
$$\frac{-\cos\beta}{\sin\alpha}$$



S6 Mathematics Compulsory Part

В

Α

22. In the figure, AC is a diameter of the circle ABCD. AC and BD intersect at E.

If $\overrightarrow{BC} = 24$ cm, $\overrightarrow{CD} = 16$ cm and $\angle BAC = 63^{\circ}$, then $\angle AED =$ A. 96°. B. 105°. C. 111°. D. 126°.

- 23. The figure below is made up of twelve identical equilateral triangles. The number of axes of reflectional symmetry of the figure is
 - A. 2.B. 3.
 - C. 6.
 - D. 12.



D

- 24. In the figure, the equation of the straight line *L* is ax + 5y = b. Which of the following are true?
 - I. a > 0II. b < -5
 - III. b + 2a > 0
 - A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III



- 25. The equation of the straight line *L* is 3x 5y + 24 = 0. *A* and *B* are two fixed points on *L*. If *P* is a moving point in the rectangular coordinate plane such that the area of $\triangle PAB$
 - is 3, then the locus of P is
 - A. a circle.
 - B. a straight line.
 - C. a parabola.
 - D. a pair of straight lines.
- 26. The equation of the straight line L is 3x + 2y + 4 = 0. The equation of the straight line passing through (5, 1) and perpendicular to L is
 - A. 2x 3y 7 = 0.
 - B. 2x 3y + 7 = 0.
 - C. 2x + 3y 13 = 0.
 - D. 2x + 3y + 13 = 0.
- 27. The equations of the circles C_1 and C_2 are $x^2 + y^2 8x 6y + 20 = 0$ and $2x^2 + 2y^2 + 12x 16y + 33 = 0$ respectively. Let G_1 and G_2 be the centres of C_1 and C_2 respectively. Denote the origin by *O*. Which of the following is/are true?
 - I. G_1O is perpendicular to G_2O .
 - II. The area of C_1 is greater than the area of C_2 .
 - III. *O* is equidistant from G_1 and G_2 .
 - A. I only
 - B. II only
 - C. I and III only
 - D. II and III only
- 28. Two numbers are randomly selected at the same time from the eight numbers 4, 5, 6, 7, 8, 9, 10 and 11 respectively. Find the probability that the sum of the two numbers selected is not greater than 11.

A.
$$\frac{1}{7}$$

B. $\frac{1}{14}$
C. $\frac{3}{32}$
D. $\frac{5}{32}$





The cumulative frequency curve above shows the distribution of the scores of a group of students in a test. Which of the following box-and-whisker diagrams may represent the distribution?



30. Consider the following set of data:

a b c d 90 90 19 60 76 90 78 81

If the mean and the mode of the above set of data are 70 and 60 respectively, then the median of the above set of data is

- A. 68.
- B. 76.
- C. 77.
- D. 85.

Section B

31. Let f(x) be a quadratic function. The figure below may represent the graph of y = f(x) and



- A. the graph of y = -4f(x).
- B. the graph of y = f(-4x).
- C. the graph of y = -f(x+4).
- D. the graph of y = f(-x+4).
- 32. In the figure, the straight line *L* shows the relation between $\log_9 x$ and $\log_9 y$. It is given that *L* passes through the points (2, 1) and (6, 2). If $y = kx^a$, then k =



33. $4^3 + 4^{13} =$

- A. 100001₁₆.
- B. 400004₁₆.
- C. 1000010₁₆.
- D. 4000040₁₆.

34. In the figure, *PQ* and *SR* are parallel to the *x*-axis. If (x, y) is a point lying in the shaded region *PQRS* (including the boundary), at which point does 6y - 4x + 3 attain its greatest value?



- 35. If the sum of the first *n* terms of a sequence is $4n^2 + n$, which of the following is/are true?
 - I. 39 is a term of the sequence.
 - II. The first term of the sequence is 5.
 - III. The sequence is a geometric sequence.
 - A. I only
 - B. II only
 - C. I and III only
 - D. II and III only

36. If
$$a \neq b$$
 and $\begin{cases} 2a - a^2 = 5\\ 2b - b^2 = 5 \end{cases}$, then $a^2 + b^2 =$
A. -6.
B. 2.
C. 4.
D. 25.

37. Let *k* be a real number. The imaginary part of $\left(\frac{k}{3-i}\right)^2$ is

A.
$$\frac{k}{10}$$
.
B. $\frac{3k^2}{50}$.
C. $\frac{k^2}{100}$.
D. $\frac{2k^2}{25}$.

- 38. For $0^{\circ} < x \le 360^{\circ}$, how many roots does the equation $\sin^2 x = \sin x \cos x$ have?
 - A. 2
 B. 3
 C. 4
 D. 5
- 39. In the figure, *BCE* is a semi-circle with centre *O*. *AB* and *AE* are tangents to the semi-circle at *B* and *E* respectively. *BC* produced and *AE* produced meet at *D*. If

 $\angle EBD = 38^\circ$, then $\angle BAE =$ A. 38° .

- B. 52°.
- C. 60°.
- D. 76°.



- 40. In the figure, *ABCDHEFG* is a cuboid with a square base. Given that X is the mid-point of *AD* and CG = 2AB, which of the following angles is the greatest?
 - A. $\angle BXF$
 - B. Angle between *BH* and *HF*
 - C. Angle between *HX* and *FX*
 - D. Angle between plane *XGH* and plane *EFGH*



- 41. Let *O* be the origin. The coordinates of the points *A* and *B* are (-10, 0) and (0, b) respectively, where b > 0. The in-centre *G* of $\triangle OAB$ lies on the straight line 4y + x = 3kb, where $k \neq 1$. Which of the following are true?
 - I. The *x*-coordinate and the *y*-coordinate of *G* are not equal.
 - II. The distance from *G* to *AB* is $\frac{5(1-2k)}{1-k}$.
 - III. When $k = \frac{1}{6}$, the straight line 3x + y = 5 is a tangent to the inscribed circle of $\triangle OAB$.
 - A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

- 42. Alan, Ben, Chris and 9 other people queue in a row and wait for a bus. If any two of Alan, Ben and Chris do not stand next to each other, how many different possible queues are there?
 - A. 1 088 640
 - B. 182 891 520
 - C. 261 273 600
 - D. 457 228 800
- 43. There are three boxes *A*, *B* and *C*. Each box contains 8 balls. 2 of the balls in box *A*, 3 of the balls in box *B* and 4 of the balls in box *C* are yellow balls. Simon randomly draws one ball from each box. Find the probability that Simon draws at least 1 yellow ball from these boxes.
 - A. $\frac{3}{64}$ B. $\frac{15}{64}$ C. $\frac{49}{64}$ D. $\frac{61}{64}$
- 44. In a test, the mean of the test scores is 64. The test score of Mandy is 76 and her standard score is 1.5. If the test score of Anson in the test is 54, then his standard score is
 - A. -1.
 B. -1.25.
 C. -1.5.
 D. -1.75.
- 45. Consider a set of numbers. 3 is added to each number of the set, and then each resulting number is divided by 4. The new set of numbers formed has the mean *m* and the variance *v*. Which of the following must be true?

	Mean of the original set of numbers	Variance of the original set of numbers
A.	4(m-3)	4v
B.	4(m-3)	16v
C.	4m - 3	4v
D.	4m - 3	16v

END OF PAPER