MUNSANG COLLEGE

2020-2021 Mock Examination

F. 6 Mathematics (Compulsory Part)

Paper 2

Class : _____ Name : _____ Class Number : _____

Subject teacher: CYL / CHF / HYC / MKL / WFL (Please circle as appropriate)

Time allowed : 1 hour 15 minutes

Full mark : 45

This question book consists of 12 printed pages.

Instructions to candidates:

1. Write your name, class and class number in the space provided on this cover and circle the initial of your subject teacher.

2. This paper consists of 45 multiple-choice questions.
   There are 30 questions in Section A and 15 questions in Section B. All questions carry equal marks.

3. Answer ALL questions. Mark your answers on the MC Answer Sheet provided with an HB pencil.

4. Choose the best answer for each question.

5. Read carefully the instructions on the MC Answer Sheet and insert the information required in the spaces provided.

6. When told to check the question paper, you should check that all the questions are there. Look for the words 'END OF PAPER' after the last question.

7. You should mark only ONE answer for each question. If you mark more than one answer, you will receive NO MARKS for that question.

8. No marks will be deducted for wrong answers.

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

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

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. $\dfrac{(3x^3)^{-4}}{9x^{-2}} =$

   A. $\dfrac{1}{729x^{10}}$.

   B. $\dfrac{1}{729x^{6}}$.

   C. $\dfrac{9}{x^{6}}$.

   D. $9x^{6}$.

2. If $(b-a)(3-a) = a+2b$, then $b =$

   A. $\dfrac{a^2-a}{a-3}$.

   B. $\dfrac{a^2-a}{a+1}$.

   C. $\dfrac{a^2-4a}{a+1}$.

   D. $\dfrac{a^2-4a}{a-1}$.

3 $\dfrac{2}{3k-4} - \dfrac{3}{4+3k} =$

   A. $\dfrac{20-3k}{9k^2-16}$.

   B. $\dfrac{3k-20}{9k^2-16}$.

   C. $\dfrac{4+3k}{9k^2-16}$.

   D. $\dfrac{4-3k}{9k^2-16}$.

4. $m^2-6m-9n^2-18n =$

   A. $(m-3n)(m-3n+6)$.

   B. $(m-3n)(m+3n+6)$.

   C. $(m+3n)(m+3n-6)$.

   D. $(m+3n)(m-3n-6)$.

5. Let $f(x) = 3x^2 - 1$. If α is a constant, then $f(\alpha) - f(\alpha - 1) =$

A. 5.

B. $6\alpha - 3$.

C. $3 - 12\alpha$.

D. $12\alpha - 5$.

6. If p and q are constants such that $x^2 + px + q \equiv (x + 6)(x - p) - 2$, q =

A. 3.

B. –3 .

C. 20 .

D. –20 .

7. If α is a root of the equation $4x^2 - 8x - 7 = 0$, then $12 + 16\alpha - 8\alpha^2 =$

A. –4 .

B. –2 .

C. 0 .

D. 2 .

8. The least integer satisfying the compound inequality $x - \frac{x-2}{3} > 8$ or $-1 < x - 15$ is

A. 11.

B. 12.

C. 14.

D. 15.

9. Let $g(x) = x^{10} - ax^9 - b$, where a and b are constants. If $g(x)$ is divisible by $x - 1$, find the remainder when $g(x)$ is divided by $x + 1$.

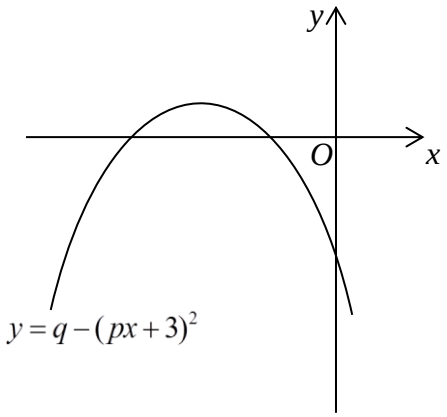
A. 0

B. $2b$

C. $2 - 2b$

D. $4 - 2b$

10. The figure shows the graph of $y = q - (px + 3)^2$, where p and q are constants. Which of the following is true?



A. $p > 0$ and $q > 0$

B. $p > 0$ and $q < 0$

C. $p < 0$ and $q > 0$

D. $p < 0$ and $q < 0$

11. The cost of a watch is y% higher than its selling price. After selling the watch, the percentage loss is 20%. Find y.

A. 15

B. 20

C. 25

D. 80

12. The costs of wine of brand A and brand B are \$500 / L and \$2500 / L respectively. If x L of wine of brand A and y L of wine of brand B are mixed so that the cost of the mixture is \$1250 / L, then $x : y =$

A. 3 : 4 .

B. 4 : 3 .

C. 3 : 5 .

D. 5 : 3 .

13. The base radius of a right circular cone is 4 times the base radius of a right circular cylinder while the height of the circular cylinder is 3 times the height of the circular cone. If the volume of the circular cone is 32 cm^3, then the volume of the circular cylinder is

A. 18 cm^3.

B. 24 cm^3.

C. 32 cm^3.

D. 56 cm^3.

14. The angle of a sector is decreased by 40% but its radius is increased by k% . If the area of the sector remains unchanged, find the value of k correct to the nearest integer.

A. 29

B. 32

C. 35

D. 67

15. There is a bag of sand. The weight of sand in the bag is measured as 12 kg correct to the nearest kg. If the bag of sand is packed into n packets such that the weight of sand in each packet is measured as 27 g correct to the nearest g, find the greatest possible value of n.

A. 444

B. 445

C. 471

D. 472

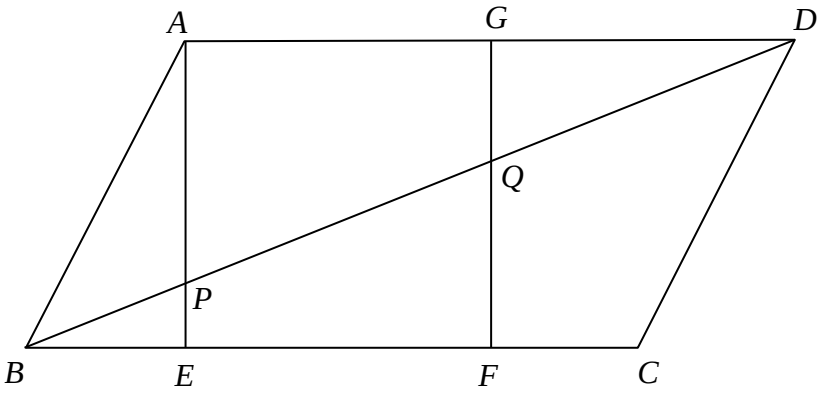
16. In the figure, $ADCB$ is a parallelogram. It is given that G is a point on AD such that $AG : GD = 7 : 6$. E and F are points on BC such that $BE : EF : FC = 3 : 7 : 3$. BD cuts AE and GF at P and Q respectively. If the area of ΔABP is 39 cm^2, the area of the quadrilateral $QDCF$ is

A. 91 cm^2.

B. 108 cm^2.

C. 169 cm^2.

D. 182 cm^2.



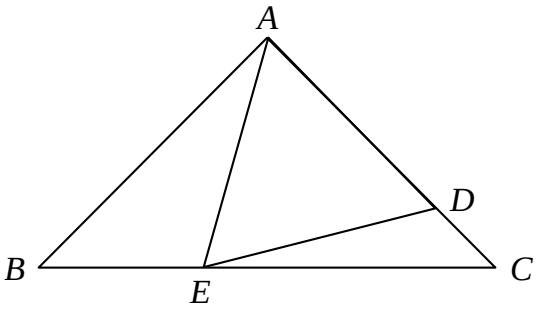
17. In the figure, ABC is an isosceles triangle with $AB = AC$. D and E are points lying on AC and BC respectively such that ΔADE is an equilateral triangle. If $\angle BAE = 36°$, then $\angle DEC =$

A. 16°.

B. 18°.

C. 20°.

D. 22°.



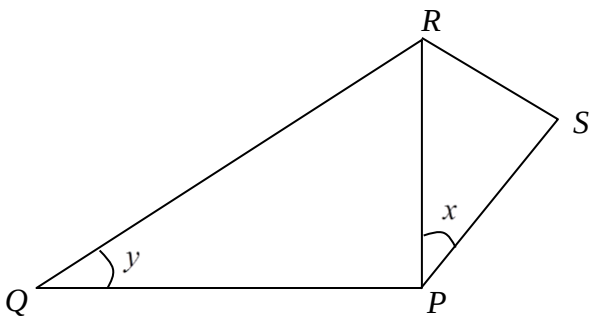
18. In the figure, $QP \perp RP$ and $RS \perp SP$. $\dfrac{PS}{PQ} =$

A. $\cos x \tan y$.

B. $\sin x \tan y$.

C. $\dfrac{\cos x}{\tan y}$.

D. $\dfrac{\sin x}{\tan y}$.



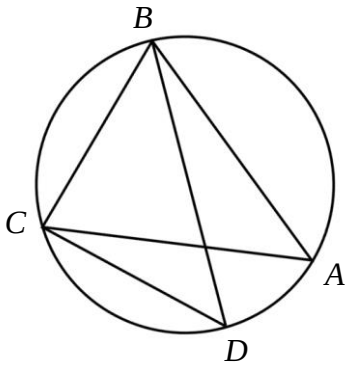
19. In the figure, $ABCD$ is a circle. If $AB = AC = 36$ cm, $\angle ABC = 70^o$ and $\angle ACD = 20^o$, find CD correct to the nearest cm.

A. 25 cm

B. 27 cm

C. 29 cm

D. 31 cm



20. In the figure, ABD is a circle with centre C. It is known that AD // BC and $AD = BC = 6$ cm.

Which of the following statements are true?

I. $\angle BAD = 120^o$

II. $ABCD$ is a rhombus.

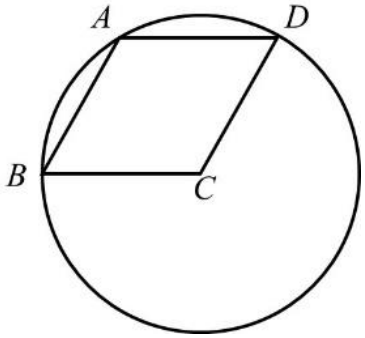
III. Area of $ABCD$ is $18\sqrt{3}$ cm^2.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III



21. The polar coordinates of the points P, Q and R are (32, 125^o), (24, 215^o) and (10, 305^o) respectively. Find the perimeter of ΔPQR.

A. 108

B. 156

C. 252

D. 260

22. If the sum of the interior angles of a regular n-sided polygon is 1800^o, which of the following is true?

A. The value of n is 10.

B. Each exterior angle of the polygon is 20^o.

C. The number of diagonals of the polygon is 54.

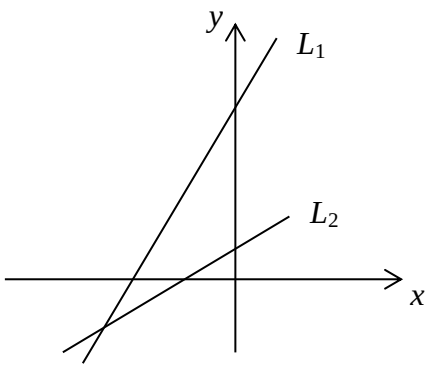
D. Each interior angle of the polygon is 120^o.

23. In the figure, the equations of the straight lines L_1 and L_2 are $6x + ay - b = 0$ and $cx + y - d = 0$ respectively. Which of the following is/are true?

I. $ac < 6$

II. $ad < b$

III. $bc < 6d$



A. I only

B. II only

C. I and III only

D. II and III only

24. The equations of the straight lines L_1 and L_2 are $x-3y+12=0$ and $2x-6y+15=0$ respectively. Let P be a moving point in the rectangular coordinate plane such that the perpendicular distance from P to L_1 is equal to the perpendicular distance from P to L_2. Find the equation of the locus of P.

A. $12x-4y-39=0$

B. $12x-4y+39=0$

C. $4x-12y+39=0$

D. $4x-12y-39=0$

25. The equations of the circles C_1 and C_2 are $x^2 + y^2 + 16x - 8y - 1 = 0$ and $2x^2 + 2y^2 + 24x - 8y - 1 = 0$ 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. The y-coordinates of G_1 and G_2 are equal.

II. O lies inside both C_1 and C_2.

III. Area of C_1 > Area of C_2.

A. I only

B. II only

C. I and III only

D. II and III only

26. The equation of the circle C is $x^2 + y^2 + 6x - 4y - 23 = 0$. A straight line L divides C into two equal halves. If the x-intercept of L is 6, the slope of L is

A. $-\frac{9}{2}$.

B. $-\frac{2}{9}$.

C. $-\frac{1}{9}$.

D. $\frac{2}{9}$.

27. Two numbers are randomly drawn at the same time from ten balls numbered 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9 , 10 and 11 respectively. Find the probability that the two numbers drawn are not consecutive integers.

A. $\frac{1}{2}$

B. $\frac{2}{3}$

C. $\frac{3}{4}$

D. $\frac{4}{5}$

28. Two fair dice are thrown in a game. If the sum of the two numbers got is at least 9, \$90 will be gained; otherwise, \$18 will be gained. Find the expected gain in the game.

A. \$32

B. \$36

C. \$38

D. \$42

29. The mean height of 24 boys and 16 girls is 159 cm. If the mean height of the boys is 157 cm , then the mean height of the girls is

A. 155 cm.

B. 161 cm.

C. 162 cm.

D. 163 cm.

30. Consider the following integers:

1 1 2 2 2 2 2 4 4 5 7 7 8 9 p

Let a, b and c be the mean, the median and the mode of the above integers respectively. If $1 < p < 5$, which of the following must be true?

I. $a > b$
II. $a > c$
III. $b > c$

A. I only
B. II only
C. I and III only
D. II and III only

Section B

31. $E00000000040_{16}$ =

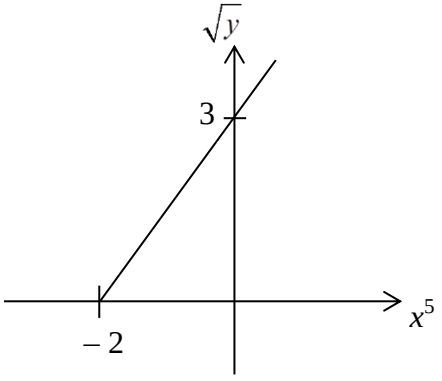
A. $14 \times 2^{44} + 64$.
B. $15 \times 2^{44} + 64$.
C. $14 \times 2^{48} + 1024$.
D. $15 \times 2^{48} + 1024$.

32. If the roots of the equation $(\log_7 x)^2 - 12\log_7 x + 36 = \log_7 x$ are α and β, then $\alpha\beta =$

A. 7^{13}.
B. 7^{36}.
C. $\log_7 13$.
D. $\log_7 36$.

33. The graph in the figure shows the linear relation between x^5 and $\sqrt{y}$. If $x = 2$, $y =$

A. 51.
B. 52.
C. 2601.
D. 2704.



34. If k and $\frac{17}{4-i}+(k+3)i$ are real numbers, then k =

A. –5.

B. –4.

C. –3.

D. –2.

35. Let a_n be the nth term of a geometric sequence. If $a_3 = 30$ and $a_7 = 750$, which of the following must be true?

I. The common ratio of the sequence is greater than 2.

II. Some of the terms of the sequence are irrational numbers.

III. The sum of the first 51 terms of the sequence is greater than 2×10^{18}.

A. I only

B. II only

C. I and III only

D. II and III only

36. Consider the following system of inequalities:

$$\begin{cases} y-18\le 0 \\ x-y-18\le 0 \\ y\ge 18-x \end{cases}$$

Let R be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in R, then the smallest value of $4y-3x+100$ is

A. 46.

B. 52.

C. 54.

D. 64.

37. Let k be a constant. The straight line $y=4kx+1$ and the parabola $y=x^2+2$ intersect at the points A and B. The y-coordinate of the mid-point of AB is

A. $2k$.

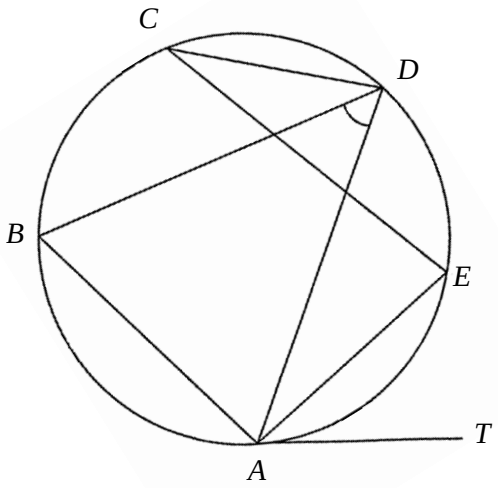
B. $k^2 + 1$.

C. $2k^2 + 1$.

D. $8k^2 + 1$.

38. In the figure, *TA* is the tangent to the circle *ABCDE* at the point *A*. If $\angle DAB = 62^\circ$, $\angle TAE = 34^\circ$ and $\angle DCE = 22^\circ$, then $\angle BDA =$

A. 58°.
B. 60°.
C. 62°.
D. 64°.



39. The equations of the three sides of a triangle are $5x - 12y = 60$, $5x + 12y = 60$ and $x = m$, where m is a constant. If the x-coordinate of the in-centre of the triangle is 142, then $m =$

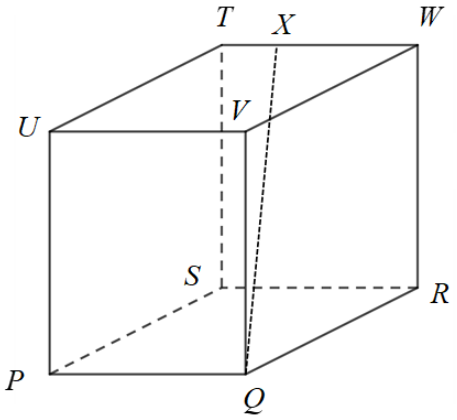
A. 50.
B. 62.
C. 182.
D. 192.

40. For $0^\circ \le x < 360^\circ$, how many roots does the equation $6\sin^2 x + \cos x = 1$ have?

A. 2
B. 3
C. 4
D. 5

41. In the figure, *PQRSTUVW* is a cuboid. *QR* = 60 cm and *WR* = 36 cm. *X* is a point on *TW* such that *TX* = 15 cm and *XW* = 27 cm. Find the angle between *XQ* and the plane *TWRS* correct to the nearest degree.

A. 37°.
B. 47°.
C. 50°.
D. 53°.



42. A queue is formed by 2 teachers, 4 boys and 3 girls. If no boys are next to each other, how many different queues can be formed?

A. 2880
B. 43200
C. 86400
D. 362880

43. In a game, Amy and Bosco take turns throwing a dart. The first one who hits the target wins the game immediately. The probabilities that Amy and Bosco hit the target are 0.3 and 0.4 respectively. If Amy throws the dart first, find the probability that Amy wins the game.

A. $\frac{3}{10}$
B. $\frac{14}{29}$
C. $\frac{15}{29}$
D. $\frac{16}{29}$

44. In a test, the standard deviation of the test scores obtained by a class of students including Ann and Billy is 12 marks. The test score of Ann is 48 marks and her standard score is –0.75 . If the standard score of Billy in the test is –2.5, then his test score is

A. 27.
B. 33.
C. 39.
D. 57.

45. Let m_1 , r_1 , v_1 be the median, the inter-quartile range and the variance of a set of numbers $\{x_1, x_2, x_3, x_4, x_5, x_6\}$ respectively while m_2 , r_2 , v_2 be the median, the inter-quartile range and the variance of the set of numbers $\{3x_1 - 2, 3x_2 - 2, 3x_3 - 2, 3x_4 - 2, 3x_5 - 2, 3x_6 - 2\}$ respectively. Which of the following must be true?

I. $m_2 = 3m_1$
II. $r_2 = 3r_1$
III. $v_2 = 9v_1$

A. I only
B. II only
C. I and III only
D. II and III only

END OF PAPER

Solution to 2020-2021 F.6 Mock

1 A 2 D 3 A 4 D 5 B	31 A 32 A 33 C 34 B 35 B
6 D 7 B 8 B 9 C 10 A	36 A 37 D 38 C 39 D 40 B
11 C 12 D 13 A 14 A 15 C	41 D 42 B 43 C 44 A 45 D
16 B 17 B 18 A 19 C 20 D	
21 A 22 C 23 A 24 C 25 D	
26 B 27 D 28 C 29 C 30 B	