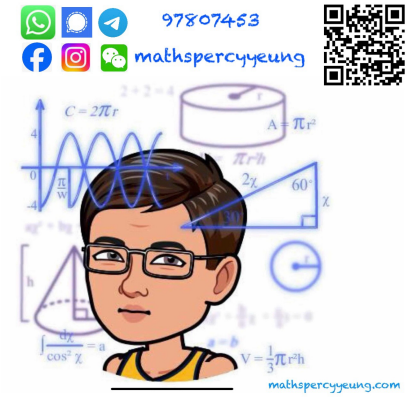
2021-2022 S6
MOCK EXAM
MATH CP
PAPER 2
MC



2021 – 2022
S6 Mock Examination

MATHEMATICS Compulsory Part

PAPER 2

10th January, 2022
11:00 am – 12:15 pm (1 hour 15 minutes)

INSTRUCTIONS

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should insert the information required in the spaces provided.

2. 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.

3. All questions carry equal marks.

4. **ANSWER ALL QUESTIONS**. You should use an HB pencil to mark all your answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.

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

6. 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. $\left(7a^9\right)^2 \cdot a^6 =$

A. $49a^{24}$.
B. $49a^{87}$.
C. $14a^{24}$.
D. $14a^{87}$.

2. If $\frac{m+5n}{3m} = 3 + \frac{n}{m}$, then $m =$

A. $\frac{n}{4}$.
B. $\frac{2n}{7}$.
C. $\frac{3n}{5}$.
D. $\frac{7n}{8}$.

3. $ad - ae - bd + be + cd - ce =$

A. $(a+b-c)(d+e)$.
B. $(a+b-c)(d-e)$.
C. $(a-b+c)(d+e)$.
D. $(a-b+c)(d-e)$.

4. Let a and b be constants. If $3x^2 + 36x + b \equiv a(x+6)^2 - 96$, then $b =$

A. −81.
B. −63.
C. 3.
D. 12.

5. If $a < b$, which of the following must be true?

I. $a^2 > b^2$
II. $\frac{1}{a^2} > \frac{1}{b^2}$
III. $-3a + 1 > -3b + 1$

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

6. $\frac{\pi^2}{360} =$

A. 0.027 (correct to 3 significant figures).
B. 0.02741 (correct to 4 significant figures).
C. 0.02742 (correct to 5 decimal places).
D. 0.027415 (correct to 6 decimal places).

7. In a piggy bank, there are only \$2 coins and \$5 coins. Every \$2 coin weighs 8.4g and every \$5 coins weighs 13.5g. If the total weight and the total value of the coins in the piggy bank are 372g and \$110 respectively, how many coins are there in the piggy bank?

A. 12
B. 13
C. 25
D. 37

8. Grace sells two phones for \$4 000 each. She sells the first one at a profit of 25%. After she has sold both phones, she has no gain and no loss. Grace sells the second phone at a loss of

A. 16.7%.
B. 20%.
C. 25%.
D. 33.3%.

9. If $f(x)$ is a polynomial divisible by $x+3$, which of the following must be a factor of $f(2x-6)$?

A. $2x$
B. $x+3$
C. $x-3$
D. $2x-3$

10. If the axis of symmetry and one of the x-intercepts of the quadratic graph of $y=x^2+ax+b$ are $x=-2$ and 1 respectively, where a and b are constant, then

A. $a=4, b=-5$.
B. $a=-3, b=-4$.
C. $a=-4, b=-3$.
D. $a=-5, b=4$.

11. The solution of $\frac{3}{2}-\frac{2x+1}{4}\geq\frac{4-3x}{8}$ or $-\frac{6-4x}{3}<2$ is

A. $x\leq 6$.
B. $x\leq 10$.
C. $x<3$
D. all real numbers.

12. If m and n are positive numbers such that $\frac{5m+6n}{9m-5n}=6$, then $\sqrt{m}:\sqrt{n}=$

A. 6 : 7.
B. 7 : 6.
C. 36 : 49.
D. 49 : 36.

13. Let a_n be the nth term of a sequence. If $a_1=1$ and $a_{n+1}=(2n+1)a_n$ for any positive integer n, then $a_7=$

A. 13.
B. 15.
C. 135 135.
D. 2 027 025.

14. It is given that a varies directly as the square root of b and inversely as the square of c. Which of the following is a/are constant(s)?

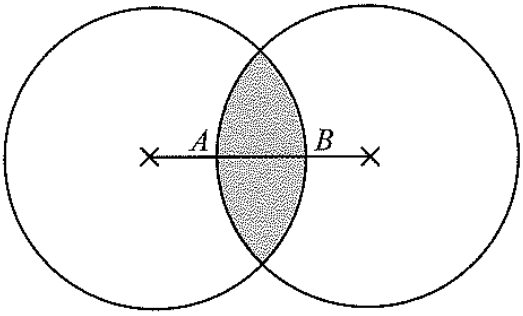
I. $\frac{ac^2}{\sqrt{b}}$
II. $\frac{ac^2}{b}$
III. $\frac{a^2c^4}{b}$

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

15. $\left[1+\sin\theta-\sin^2(270°-\theta)\right]\left[1+\sin(180°+\theta)\right]=$

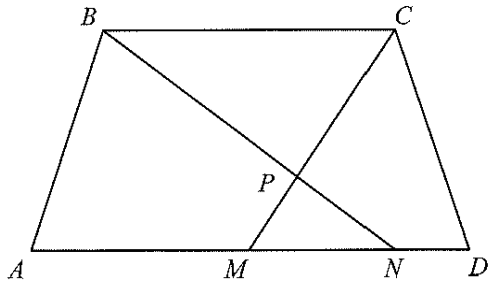
A. $\sin^3\theta$.
B. $\sin\theta\cos^2\theta$.
C. $1+\sin^3\theta$.
D. $1+\sin\theta\cos^2\theta$.

16. In the figure, the diameters of the two circles are both 6 cm. The line joining the two centres cuts the circles at A and B. If AB = 2 cm, find the area of the shaded region correct to 2 decimal places.



A. 2.57 cm^2
B. 3.10 cm^2
C. 5.14 cm^2
D. 6.19 cm^2

17. In the figure, $ABCD$ is a trapezium with AD // BC. Let M and N be points on AD such that $AM : MN : ND = 3 : 2 : 1$. BN and CM intersect at point P. If the area of the quadrilateral $ABPM$ and area of the quadrilateral $CDNP$ are 39 m^2 and 21 m^2 respectively, find the area of the trapezium $ABCD$.

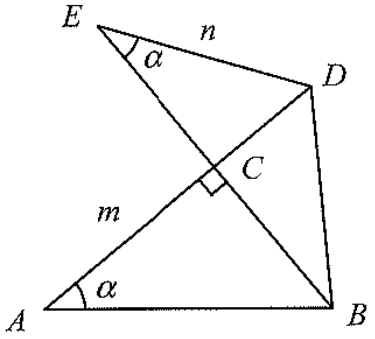


A. 79.5 m^2
B. 86.7 m^2
C. 90 m^2
D. 103.5 m^2

18. The length and the width of a piece of paper are measured as 25 cm and 19 cm respectively correct to the nearest cm. The paper is then cut into n pieces of square with side measured as 2 cm correct to the nearest 0.1 cm. Find the greatest possible value of n.

A. 108
B. 117
C. 118
D. 130

19. In the figure, ACD and BCE are straight lines and $\angle ACB = 90°$. If $AC = m$, $DE = n$ and $\angle BAC = \angle BED = \alpha$, express $\tan\angle CBD$ in terms of m, n and α.

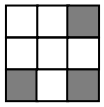


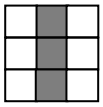
A. $\dfrac{m}{n\sin\alpha\tan\alpha}$
B. $\dfrac{n\sin\alpha\tan\alpha}{m}$
C. $\dfrac{m}{n\cos\alpha}$
D. $\dfrac{n\cos\alpha}{m}$

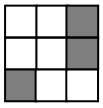
20. If P is a moving point in the rectangular coordinate plane such that the distance between P and the point (–5, –3) is equal to the distance between P and the line $x-3y+25=0$, then the locus of P is a

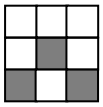
A. parabola.
B. circle.
C. pair of straight lines.
D. straight line.

21. Which of the following figures has both rotational and reflectional symmetry?

A. 

B. 

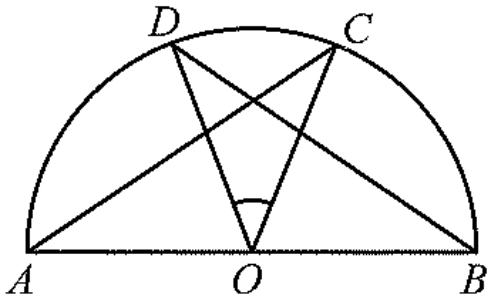
C. 

D. 

22. Let a, b, c and d, be the exterior angles of a quadrilateral $ABCD$ at the vertices A, B, C and D respectively. If $a:b:c:d=1:2:3:3$, find $\angle ABC$.

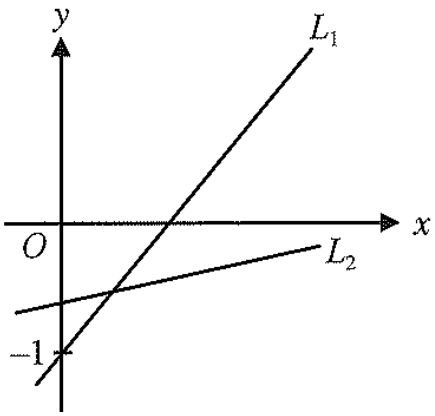
A. 80°
B. 100°
C. 120°
D. 150°

23. In the figure, O is the centre of the semi-circle $ABCD$. If $\angle CAO$ = 34° and $AC = BD$, then $\angle COD$ =



A. 33°.
B. 38°.
C. 44°.
D. 49°.

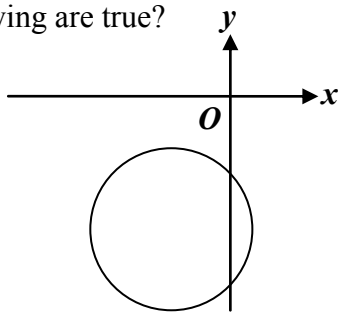
24. In the figure, the equations of the straight lines L_1 and L_2 are $x-ay-b=0$ and $x-my-n=0$ respectively. Which of the following must be true?



I. $a < m$
II. $b < n$
III. $a = b$

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

25. In the figure, the equation of the circle is $x^2+y^2-Ax+By+C=0$. Which of the following are true?



I. $A < 0$
II. $B > 0$
III. $C > \frac{A^2}{4}$

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

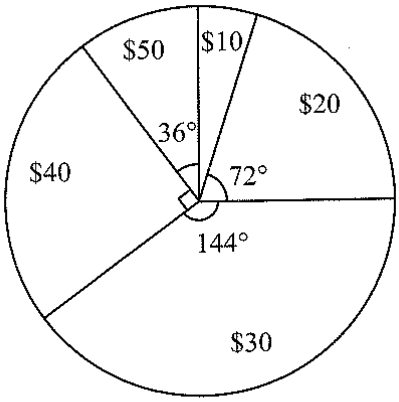
26. If the point $(-2, -7)$ is translated downwards by 3 units and then rotated anti-clockwise about the origin O through 270°, then the coordinates of its image are

A. $(-10, 2)$.
B. $(-7, 5)$.
C. $(7, -5)$.
D. $(10, -2)$.

27. A box contains 9 balls numbered 1, 2, 3, 4, 5, 6, 7, 8 and 9 respectively. Two balls are randomly drawn at the same time. Find the probability that the two numbers drawn are consecutive odd numbers.

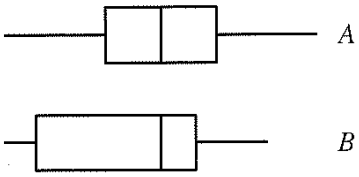
A. $\frac{1}{3}$
B. $\frac{2}{9}$
C. $\frac{1}{9}$
D. $\frac{1}{18}$

28. The pie chart below shows the distribution of the amounts of money donated by the students in class 1A in a fund raising event. Find the inter-quartile range of the amounts of the money donated.



A. $10
B. $15
C. $20
D. $25

29. The box-and-whisker diagrams below show the distributions of two data sets A and B. Which of the following must be true?



I. Mean of A = Mean of B
II. Range of A > Range of B
III. Inter-quartile range of A < Inter-quartile range of B

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

30. The stem-and leaf diagram below shows the distribution of the scores of a group of students in a Mathematics test.

Stem (tens)	Leaf (units)
1	2 3 5 7
2	4 8
3	a 4 9 9
4	1 b

The mode of the scores is 39 marks. Let m, q and r be the median, the inter-quartile range and the range of the distribution respectively. Which of the following statements about m, q and r are true?

I. $q = 23$
II. $29 < m < 31$
III. $r > 29$

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

Section B

31. The H.C.F and the L.C.M. of the two expressions $(x+1)^4(x-2)^4(x-3)$ and $f(x)$ are $(x+1)^3(x-2)^4$ and $g(x)$, where $f(x)$ and $g(x)$ are polynomials of x. Which of the following is true?

A. $f(x)=(x-2)g(x)$
B. $f(x)=(x^2-2x-3)g(x)$
C. $g(x)=(x-2)f(x)$
D. $g(x)=(x^2-2x-3)f(x)$

32. $\text{B04E0012}_{16}=$
A. $11\times16^7+4\times16^5+14\times16^4+18$.
B. $11\times16^8+4\times16^6+14\times16^5+288$.
C. $12\times16^7+4\times16^5+15\times16^4+18$.
D. $12\times16^8+4\times16^6+15\times16^5+288$.

33. If $\log_a b=\log_b a$, then
A. $a=b$.
B. $a=b$ or $a=-b$.
C. $a=b$ or $a=\dfrac{1}{b}$.
D. $a=b$ or $a=-\dfrac{1}{b}$.

34. For $0°<\theta<180°$, solve $3(1+\sin\theta\cos\theta)=10\sin^2\theta$ correct to 3 significant figures.
A. 42.1°
B. 155°
C. –25.4° or 42.1°
D. 42.1° or 155°

35. If $2^{4x}-4^{x+3}+63=0$, find x correct to 3 significant figures.
A. 0 or 0.335
B. 0 or 2.99
C. 1 or 63
D. 63

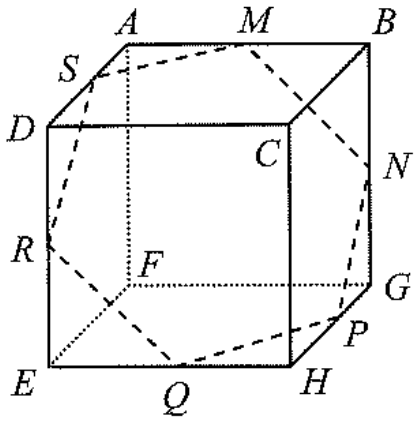
36. If α is a real number, then the real part of $\dfrac{2i-\alpha}{3i-1}$ is
A. $\dfrac{6+\alpha}{10}$.
B. $\dfrac{6-\alpha}{8}$.
C. $\dfrac{\alpha}{10}$.
D. α.

37. Consider the following system of inequalities:

$$\begin{cases} y\ge1 \\ 2x+y\ge5 \\ 4x+y\le41 \\ 2y-x\le10 \end{cases}$$

Let G be the region which represents the solution of the above system of inequalities. If (x, y) is a point lying in G, find the maximum value of $75-4x-3y$.
A. 64
B. 60
C. 54
D. 16

38. In the figure, *ABCDEFGH* is a cube. *M*, *N*, *P*, *Q*, *R* and *S* are mid-points of *AB*, *BG*, *GH*, *HE*, *ED* and *DA* respectively. If θ is the angle between plane *MNPQRS* and the plane *ABGF*, find $\cos\theta$.



A. $\frac{\sqrt{30}}{10}$

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

C. $\frac{\sqrt{10}}{5}$

D. $\frac{\sqrt{6}}{3}$

39. *a*, *b*, 9, *c* form an arithmetic sequence and *a*, *b*, *c* form a geometric sequence where *a*, *b* and *c* are all distinct real numbers. Find the value of $a+b+c$.

A. 15

B. 18

C. 21

D. 30

40. If a regular tetrahedron of side *a* cm, a cube of side *b* cm and a sphere of radius *c* cm have the same volume, find $a^3 : b^3 : c^3$.

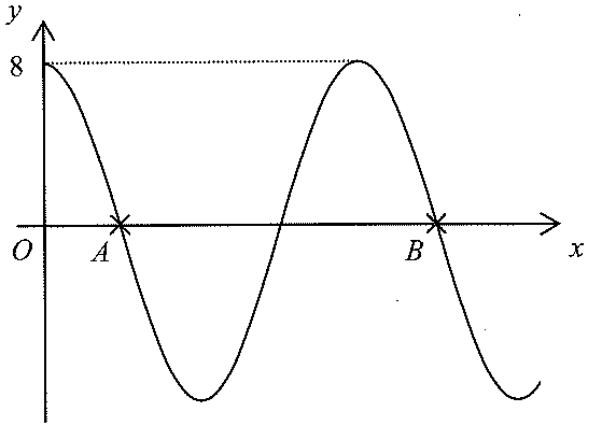
A. $24\sqrt{2}\pi : 4\pi : 3$

B. $8\sqrt{2}\pi : 4\pi : 3$

C. $6\sqrt{2}\pi : \pi : 6$

D. $2\sqrt{2}\pi : \pi : 6$

41. The figure shows the graph of $y = m\cos(75x°) - 1$, where *m* is a constant. *A* and *B* are the points of intersection of the graph with the *x*-axis. Let *P* be a point on the graph. Find the maximum area of $\triangle ABP$.



A. 19.2

B. 24

C. 38.4

D. 48

42. The equation of the circle C_1 is $x^2 + y^2 + 2x - 4\sqrt{3}y + 9 = 0$. C_2 is a circle with centre $\left(4, -3\sqrt{3}\right)$. If C_1 and C_2 touches each other at *A*, which of the following is a possible coordinates of *A*?

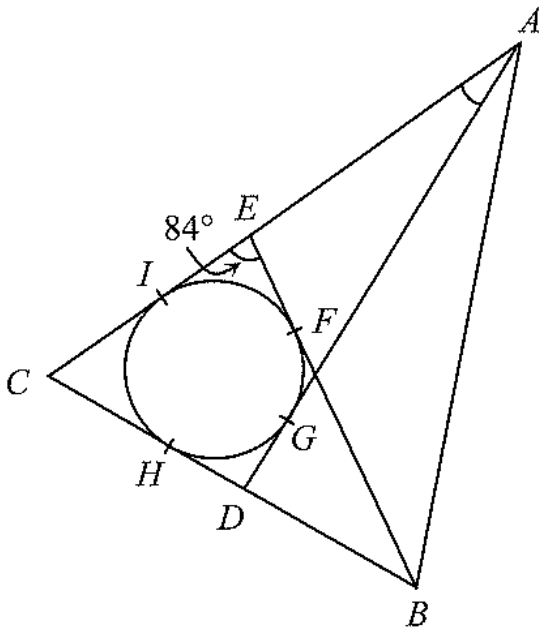
A. $\left(0, \sqrt{3}\right)$

B. $\left(3, 2\sqrt{3}\right)$

C. $\left(0, \sqrt{3}\right)$ or $\left(-2, 3\sqrt{3}\right)$

D. $\left(3, 2\sqrt{3}\right)$ or $\left(-26, 27\sqrt{3}\right)$

43. In the figure, BE, AD, BC and AC are the tangents to the circle at F, G, H and I respectively. It is given that BE is the angle bisector of $\angle ABC$ and $AE = BE$. If $\angle BEC = 84°$ and $FG : GH = 1 : 2$, find $\angle CAD$.



A. 15°
B. 21°
C. 36°
D. 38°

44. In a study, 12 subjects are used to compare 3 different diets such that each diet is followed by 4 subjects. In how many ways can the diets be assigned to the subjects?

A. 64
B. 1 728
C. 34 650
D. 121 287 375

45. A and B are two sets of numbers. The mean and the variance A are -16 and 12 respectively. B is formed by adding x to each number of A and then multiplying each resulting number by y, where $y \neq 0$. The mean and the variance of B are $10x$ and $-6xy$ respectively. Find the values of x and y.

A. $x = -4$ and $y = -2$
B. $x = -4$ and $y = 2$
C. $x = 4$ and $y = -2$
D. $x = 4$ and $y = 2$

END OF PAPER