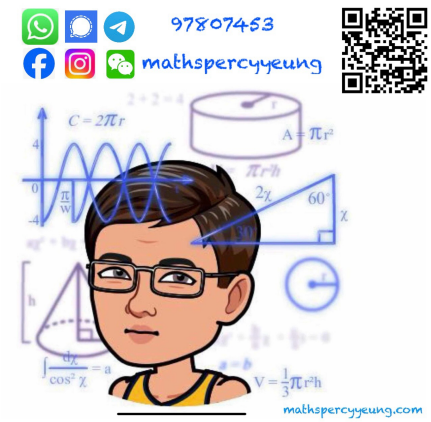
2021-2022 S5
1st TERM EXAM
MATH CP
PAPER 2

MC



2021 – 2022
S5 First Term Examination

MATHEMATICS Compulsory Part

PAPER 2

6th January, 2022
10:30 am – 11:30 am (1 hour)

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 24 questions in Section A and 12 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. $\dfrac{(9k^{-2})^2}{3k^2} =$

   A. $\dfrac{6}{k^2}$.

   B. $\dfrac{27}{k^2}$.

   C. $\dfrac{6}{k^6}$.

   D. $\dfrac{27}{k^6}$.

2. Which of the following is false?

   A. All non-terminating decimal numbers are irrational.

   B. All prime numbers are rational numbers.

   C. All surds are real numbers.

   D. Zero is neither positive nor negative.

3. If $\dfrac{1}{x} = \dfrac{y-2z}{y+2z}$, then $z =$

   A. $\dfrac{y}{2}$.

   B. $\dfrac{y(x-1)}{4}$.

   C. $\dfrac{y(x+1)}{2(x-1)}$.

   D. $\dfrac{y(x-1)}{2(x+1)}$.

4. $(a+b)(a^2-ab-b^2) =$

   A. $(a+b)^3$.

   B. a^3+b^3.

   C. $a^3-2ab^2-b^3$.

   D. $a^3+2a^2b-2ab^2-b^3$.

5. $\left(\dfrac{\pi}{5}\right)^3 =$

   A. 0.24 (correct to 2 significant figures).

   B. 0.2480 (correct to 3 decimal places).

   C. 0.2481 (correct to 4 significant figures).

   D. 0.24810 (correct to 5 decimal places).

6. A sum of \$2000 is deposited at an interest rate of 12% per annum for 2 years, compounded half yearly. Find the interest correct to the nearest dollar.

   A. \$480

   B. \$509

   C. \$525

   D. \$539

7. If α is a root of the equation $2x^2-5x-1=0$, then $7+15\alpha-6\alpha^2 =$

   A. -10.

   B. -7.

   C. 4.

   D. 10.

8. Let k be a constant. Find the range of values of k such that the quadratic equation $x^2-10x+k=-9$ has two distinct real roots.

A. $k<16$

B. $k>16$

C. $k<25$

D. $k>25$

9. Let $f(x)=(x-1)^3-6(x-1)+4$. Which of the following is a factor of $f(x)$?

A. $x+1$

B. $x-2$

C. $x+2$

D. $x-3$

10. The solution of $2x-13<7$ or $18-11x>-4$ is

A. $x<2$.

B. $x<10$.

C. $2<x<10$.

D. $x<2$ or $x>10$.

11. Let $f(x)=x^3+3x^2-8x-7$. When $f(x)$ is divided by $x+3$, the remainder is

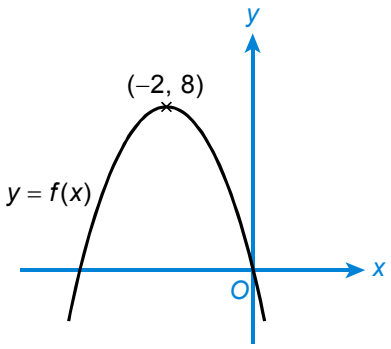
A. –37.

B. –31.

C. 17.

D. 23.

12. The figure shows the graph of the quadratic function $y=f(x)$. If the coordinates of the vertex of the graph are (–2, 8), then $f(x)=$



A. $-2(x+2)^2+8$.

B. $-2(x-2)^2+8$.

C. $-(x+2)^2+8$.

D. $-(x+2)^2-8$.

13. Let $f(x)=kx+(k-5)$, where k is a constant. If $f(5)=-3k+4$, then $k=$

A. –5.

B. 1.

C. 2.

D. 3.

14. If a varies directly as the square of b and inversely as the cube of c, which of the following must be constant?

A. $\frac{a}{b^2c^3}$

B. $\frac{a^2}{bc^2}$

C. $\frac{b}{a^2c^6}$

D. $\frac{b^2}{ac^3}$

15. It is given that z varies directly as the square of x and directly as $\sqrt{y}$. If x is increased by 30% and y is decreased by 75%, then z is

A. increased by 84.5%.

B. decreased by 84.5%.

C. increased by 15.5%.

D. decreased by 15.5%.

16. It is given that y partly varies directly as x and partly varies directly as x^2. $y=3$ when $x=1$ and $y=8$ when $x=2$. Find the relation between x and y.

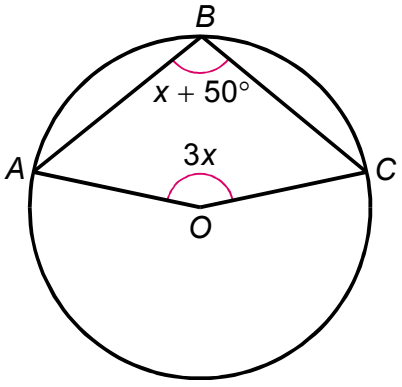
A. $y=x+2x^2$

B. $y=2(x+x^2)$

C. $y=x+4x^2$

D. $y=2x+x^2$

17. In the figure, O is the centre of the circle ABC. Find x.



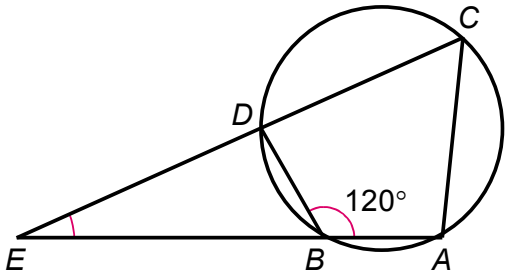
A. 32.5°

B. 52°

C. 62°

D. 100°

18. In the figure, chord AB and chord CD are produced to meet at E. If $\overset{\frown}{BA}:\overset{\frown}{AC}:\overset{\frown}{CD}=3:4:6$, find $\angle AEC$.



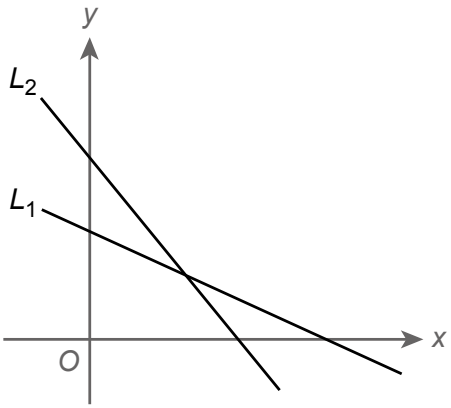
A. 12°

B. 18°

C. 24°

D. 36°

19. In the figure, the equations of the straight lines L_1 and L_2 are $ax+y=b$ and $cx+y=d$ respectively.



Which of the following are true?

I. $a>c$

II. $d>b$

III. $ad<bc$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

20. Which of the following straight lines is perpendicular to the straight line $\frac{x}{3}-\frac{y}{5}=1$?

A. $3x+y-12=0$

B. $3x-y-15=0$

C. $3x-5y+15=0$

D. $3x+5y-12=0$

21. If the graph of $y=x^2+kx+k$ has two x-intercepts, find the range of possible values of k.

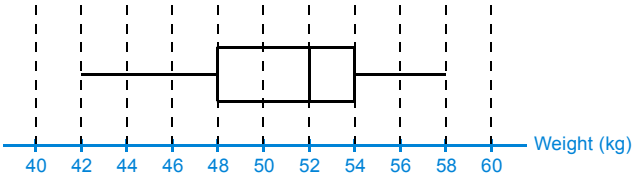
A. $k<0$ or $k>4$

B. $0<k<4$

C. $k>0$

D. $k>4$

22. The box-and-whisker diagram below shows the distribution of the weights (in kg) of a group of students.



Which of the following is/are true?

I. The median is 52 kg.

II. The range is 20 kg.

III. The inter-quartile range is 6 kg.

A. I only

B. I and III only

C. II and III only

D. I, II and III

23. It is given that the median and the mode of the seven numbers 7, 3, 2, 3, 7, x and y are 6 and 7 respectively. Find the mean of the five numbers 2, 3, 3, x and y.

A. 4.2

B. 4.8

C. 5

D. 6

24. The stem-and-leaf diagram below shows the distribution of the scores obtained by 16 students in a quiz.

Stem (10 marks)	Leaf (1 mark)
0	0 1 4
1	m m
2	0 1 2 7 8 9
3	n n 8
4	3 5

If the inter-quartile range of the above distribution is more than 24 marks, which of the following is/are true?

I. $0 \le m < 4$

II. n must be greater than 5

III. $n-m>4$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Section B

25. The L.C.M. of x^2+2x+1, $3x^2+2x-1$ and x^3+1 is

A. $x+1$.

B. $(x+1)(3x-1)(x^2-x+1)$.

C. $(x+1)^2(3x-1)(x^2+x+1)$.

D. $(x+1)^2(3x-1)(x^2-x+1)$.

26. If $\alpha \neq \beta$ and $\alpha^2+\alpha=\beta^2+\beta=3$, then $3^\alpha \times 3^\beta =$

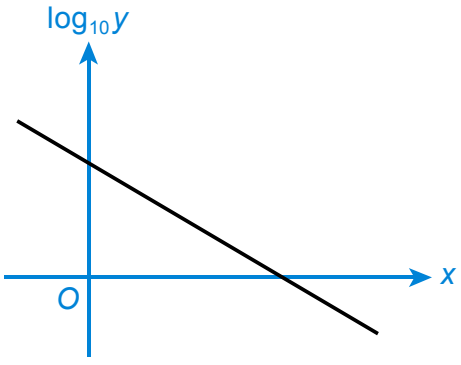
A. $\frac{1}{27}$.

B. $\frac{1}{3}$.

C. 3.

D. 27.

27. Let a and b be positive constants. The graph in the figure shows the linear relation between x and $\log_{10} y$. If $y=ab^x$, then



A. $0<a<1$ and $0<b<1$.

B. $0<a<1$ and $b>1$.

C. $a>1$ and $b>1$.

D. $a>1$ and $0<b<1$.

28. $\frac{2\log x^2}{\log(3x)+\log x-\log 3} =$

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

B. 2.

C. $\frac{\log x}{\log\left(\frac{x}{3}\right)}$.

D. $\frac{\log x}{\log(3x)}$.

29. If the roots of the equation $(\log_\pi x)^2-10\log_\pi x+24=\log_\pi x$ are α and β, then $\alpha\beta=$

A. π^{24}.

B. π^{11}.

C. 10.

D. 24.

30. If k is a real number, then the imaginary part of $\frac{i^{2020}}{k+i^{2019}}$ is

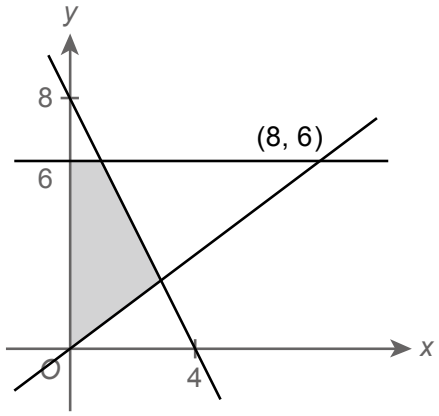
A. $\frac{1}{k^2+1}$.

B. $-\frac{1}{k^2+1}$.

C. $\frac{k}{k^2+1}$.

D. $\frac{1}{k^2-1}$.

31. Which of the following systems of inequalities has its solution represented by the shaded region in the figure?



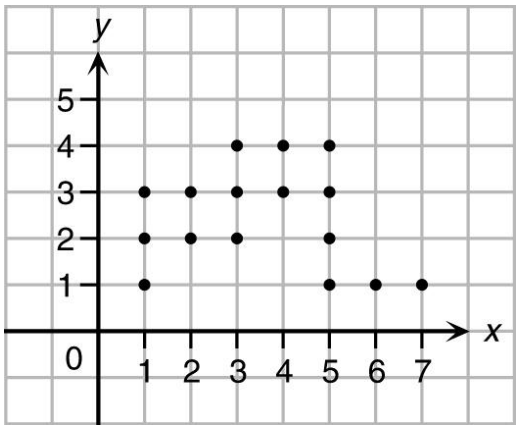
A. $\begin{cases} x \geq 0 \\ y \leq 6 \\ 2x + y - 8 \geq 0 \\ 3x \geq 4y \end{cases}$

B. $\begin{cases} x \geq 0 \\ y \leq 6 \\ 2x + y - 8 \leq 0 \\ 3x \leq 4y \end{cases}$

C. $\begin{cases} x \leq 6 \\ y \geq 0 \\ 2x + y - 8 \geq 0 \\ 3x \geq 4y \end{cases}$

D. $\begin{cases} x \leq 6 \\ y \geq 0 \\ 2x + y - 8 \leq 0 \\ 3x \leq 4y \end{cases}$

32. Among the points in the figure, at which point does $P = 3x + y$ attain its maximum value?



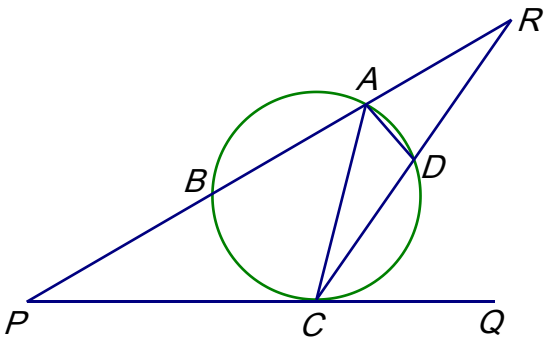
A. (7, 1)

B. (5, 4)

C. (3, 4)

D. (1, 3)

33. The figure shows a circle $ABCD$. PQ is a tangent to the circle at C. It is known that $PBAR$ and CDR are straight lines. If $\angle APC = 26°$, $\angle ADC = 102°$ and AD is the angle bisector of $\angle RAC$, find $\angle ARD$.



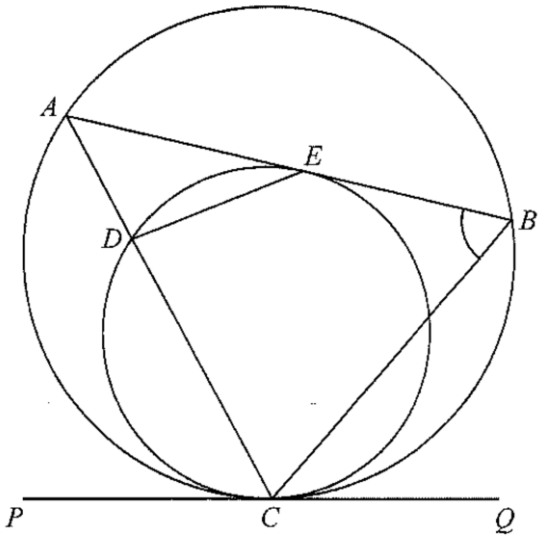
A. 52°

B. 48°

C. 38°

D. 24°

34. In the figure, ABC and CDE are circles such that ADC is a straight line. PQ is the common tangent to the two circles at C. AB is the tangent to the circle CDE at E. If $\angle ADE = 100°$ and $\angle BCQ = 35°$, then $\angle ABC =$



A. 55°.
B. 65°.
C. 70°.
D. 80°.

35. The scores of Jackson and Alex in a English test are 56 marks and 73.5 marks respectively, while their standard scores are −2 and 0.5 respectively. Find the standard deviation of the scores in the test.

A. 7 marks
B. 11.7 marks (corr. to 3 sig. fig.)
C. 49 marks
D. 70 marks

36. The variance of a set of numbers is 10. If 10 is added to each number and then each result is increased by 200%, then the variance of the new set of numbers is

A. 30.
B. 40.
C. 90.
D. 180.

END OF PAPER