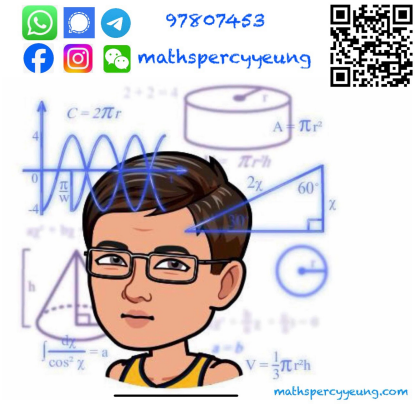
2021-2022 S5
2nd TERM EXAM
MATH CP
PAPER 2
MC



2021 – 2022
S5 Second Term Examination

MATHEMATICS Compulsory Part

PAPER 2

24th June, 2022
11:00 am – 12:15 pm (1 hour 15 minutes)
Total Marks: 45

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. $\left(\frac{8^{n+1}}{2^{2n}}\right)^2 =$

   A. 2^{2n+2}.

   B. 2^{2n+6}.

   C. 2^{10n+2}.

   D. 2^{10n+6}.

2. $(a-1)(a+1)(a+b) =$

   A. a^3+a^2b-a-b.

   B. a^3+a^2b+a-b.

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

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

3. $\frac{1}{3^3}+\frac{1}{2^7} =$

   A. 0.044 (corr. to 2 significant figures).

   B. 0.044 8 (corr. to 3 decimal places).

   C. 0.044 84 (corr. to 4 significant figures).

   D. 0.044 85 (corr. to 5 decimal places).

4. Let $f(x)=4x^3-10x^2-kx+5$, where k is a constant. If $f(-1)=-14$, then $k=$

   A. -13.

   B. -5.

   C. 13.

   D. 25.

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

   A. $\frac{a^2+3a}{a-3}$.

   B. $\frac{a^2+3a}{3-a}$.

   C. $\frac{a^2-3a}{a+3}$.

   D. $\frac{3a-a^2}{a+3}$.

6. $\frac{6}{k-6}-\frac{7}{k-7} =$

   A. $\frac{k}{(k-6)(7-k)}$.

   B. $\frac{k}{(k-6)(k-7)}$.

   C. $\frac{k+84}{(k-6)(7-k)}$.

   D. $\frac{k+84}{(k-6)(k-7)}$.

7. Let $f(x)=4x^3+kx+3$, where k is a constant. If $f(x)$ is divisible by $2x+1$, find the remainder when $f(x)$ is divided by $x+1$.

   A. -7

   B. -6

   C. 0

   D. 5

8. Find the range of values of k such that the quadratic equation $x^2-8x+1=k$ has two distinct real roots.

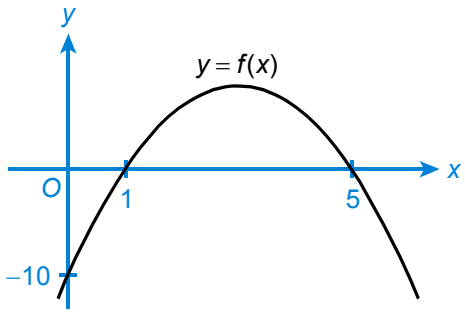
A. $k>-15$

B. $k<-15$

C. $k>17$

D. $k<17$

9. In the figure, $y=f(x)$ is the graph of a quadratic function. $f(x)=$



A. $(x-1)(x-5)$.

B. $-(x+1)(x+5)$.

C. $-2(x-1)(x-5)$.

D. $-2(x+1)(x+5)$.

10. Solve the compound inequality

$7-3x<1$ or $2x+1>9$.

A. No solutions

B. $x>2$

C. $x>4$

D. $2<x<4$

11. A sum of \$6 200 is deposited at an interest rate of 2% per annum for 3 years, compounded monthly. Find the interest correct to the nearest dollar.

A. \$372

B. \$378

C. \$379

D. \$383

12. The scale of a map is $1:400\ 000$. If the area of a national park on the map is $36\ \text{cm}^2$, then the actual area of the national park is

A. $144\ \text{km}^2$.

B. $576\ \text{km}^2$.

C. $1\ 440\ \text{km}^2$.

D. $57\ 600\ \text{km}^2$.

13. If an electric fan is sold at a discount of 12% on its marked price, then the discount is \$27 and the percentage loss is 10%. Find the cost of the electric fan.

A. \$220

B. \$226.8

C. \$250

D. \$280

14. It is given that r varies directly as the square of p and inversely as q. If r is increased by 80% and q is decreased by 20%, then p

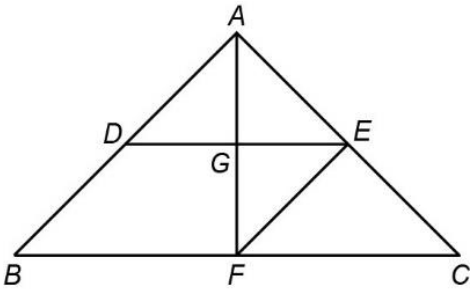
A. is increased by 20%.

B. is increased by 44%.

C. is decreased by 40%.

D. is decreased by 60%.

15. In the figure, D, E and F are points lying on AB, AC and BC respectively such that AF cuts DE perpendicularly at G.



If $\angle BAF = \angle CAF = \angle AED = \angle FED$, which of the following must be true?

I. $\Delta ADG \cong \Delta EFG$

II. ΔADG is an isosceles triangle.

III. $\angle BAC = 90°$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

16. Convert the polar coordinates $(10, 240°)$ into rectangular coordinates.

A. $(-5, -5\sqrt{3})$

B. $(5, 5\sqrt{3})$

C. $(-5\sqrt{3}, -5)$

D. $(5\sqrt{3}, 5)$

17. $\sin(\theta - 270°) + \dfrac{2\sin(180° + \theta)}{\tan(-\theta)} =$

A. $-\cos\theta$.

B. $3\cos\theta$.

C. $\sin\theta - 2\cos\theta$.

D. $2\cos\theta - \sin\theta$.

18. It is given that a moving point P is equidistant from $(1, 2)$ and $(7, 4)$, find the equation of the locus of P.

A. $3x + y + 15 = 0$

B. $x + 3y - 13 = 0$

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

D. $x - y + 6 = 0$

19. Which of the following statement(s) about a regular 10-sided polygon is / are true?

I. The number of axes of reflectional symmetry is 5.

II. Each exterior angle is 36°.

III. Each interior angle is 144°.

A. II only

B. I and III only

C. II and III only

D. I, II and III

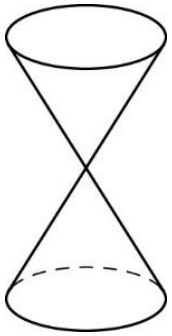
20. In the figure, the solid consists of two identical right circular cones. The height and the circumference of the base of one circular cone are 4 cm and 6π cm respectively. Find the total surface area of the solid.

A. 18π cm^2

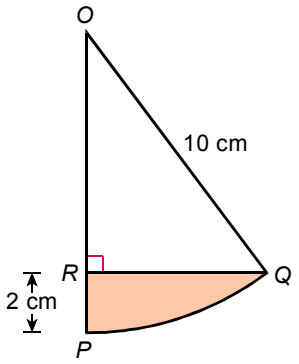
B. 24π cm^2

C. 30π cm^2

D. 48π cm^2



21. In the figure, OPQ is a sector of radius 10 cm. R is a point lying on OP such that QR is perpendicular to OP. If $PR = 2$ cm, find the area of the shaded region PQR correct to the nearest 0.1 cm^2.



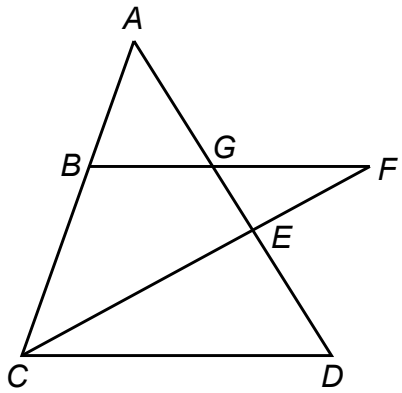
A. 8.2 cm^2

B. 15.8 cm^2

C. 22.3 cm^2

D. 32.2 cm^2

22. In the figure, B is a point lying on AC such that $AB : BC = 2 : 3$. G and E are points lying on AD. BG produced and CE produced meet at F such that $FE : CE = 1 : 2$. It is given that $BF \,//\, CD$. If the area of ΔCDE is 20 cm^2, then the area of the quadrilateral $BCEG$ is



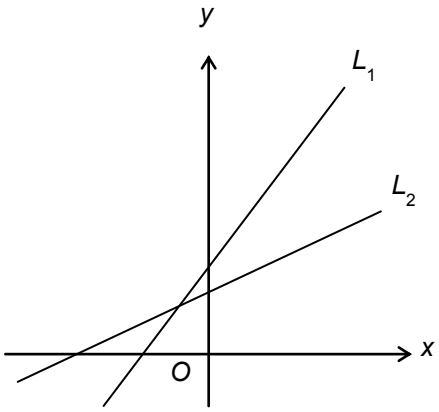
A. 20 cm^2 .

B. 22 cm^2 .

C. 27 cm^2 .

D. 38 cm^2 .

23. In the figure, the equations of the straight lines L_1 and L_2 are $ax + by = 1$ and $cx + 3y = 1$ respectively.



Which of the following are true?

I. $a < 0$

II. $0 < b < 3$

III. $c > 0$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

24. A circle C lies in the fourth quadrant. Which of the following can be the equation of C?

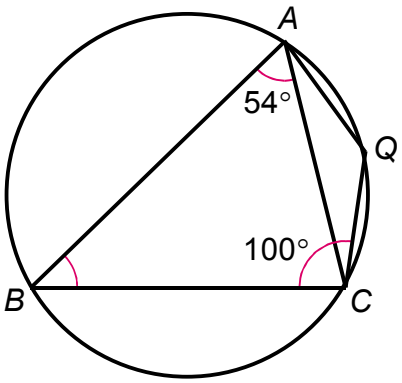
A. $x^2 + y^2 - 6x + 4y + 4 = 0$

B. $x^2 + y^2 - 4x + 8y + 11 = 0$

C. $x^2 + y^2 - 12x - 14y + 21 = 0$

D. $x^2 + y^2 - 10x + 10y + 34 = 0$

25. In the figure, A, B, C and Q are points lying on the circle. It is given that $\overset{\frown}{AQ} = \overset{\frown}{QC}$, $\angle BAC = 54°$ and $\angle BCQ = 100°$. Find $\angle ABC$.



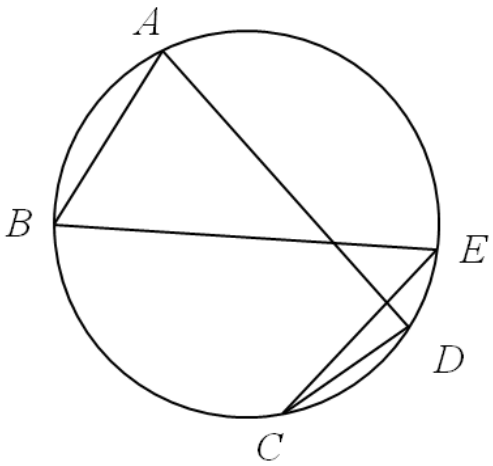
A. 50°

B. 52°

C. 54°

D. 56°

26. In the figure, BE is a diameter of the circle $ABCDE$. If $\angle BAD = 75°$, then $\angle ECD =$



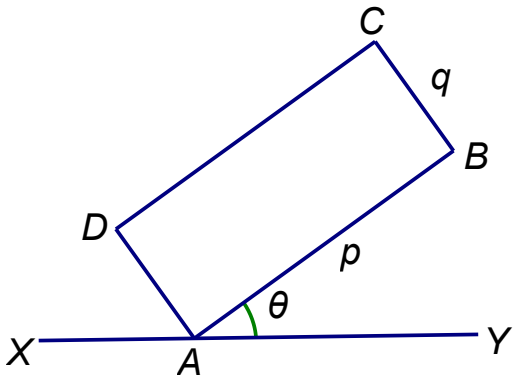
A. 5°.

B. 10°.

C. 15°.

D. 25°.

27. In the figure, $ABCD$ is a rectangle. $AB = p$, $BC = q$ and $\angle BAY = \theta$. Find the distance of C from the straight line XAY.



A. $p \sin\theta + q \cos\theta$

B. $p \cos\theta + q \sin\theta$

C. $\sqrt{p^2 + q^2} \sin\theta$

D. $(p + q) \sin\theta$

28. Two cards are randomly drawn one by one with replacement from seven cards numbered 1, 2, 3, 4, 5, 6 and 7 respectively. Find the probability that the product of the two numbers on the cards drawn is an even number.

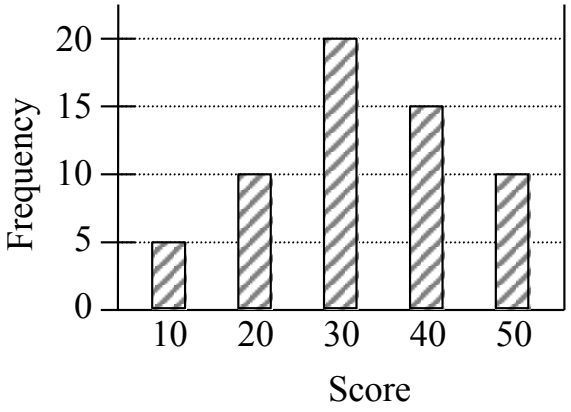
A. $\frac{1}{7}$

B. $\frac{9}{49}$

C. $\frac{33}{49}$

D. $\frac{5}{7}$

29. The bar chart shows the distribution of the scores obtained by a group of students in a test.



Which of the following is true?

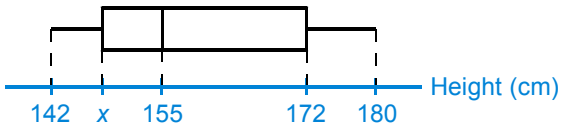
A. The mode of the distribution is 20.

B. The median of the distribution is 32.5.

C. The lower quartile of the distribution is 20.

D. The upper quartile of the distribution is 40.

30. The box-and-whisker diagram below shows the distribution of the heights (in cm) of students in a class.



If the inter-quartile range of the heights of the students is 24 cm, find x.

A. 146

B. 148

C. 150

D. 152

Section B

31. The L.C.M. of $3a^4b^2c, 4ab^5c$ and $6a^2b^3$ is

A. ab^2.

B. ab^2c.

C. $12a^4b^5c$.

D. $12a^7b^9c$.

32. 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.

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

A. $\frac{k}{10}$.

B. $\frac{k^2}{100}$.

C. $\frac{3k^2}{50}$.

D. $\frac{2k^2}{25}$.

34. $11\times16^{11}+12\times16^{7}+515=$

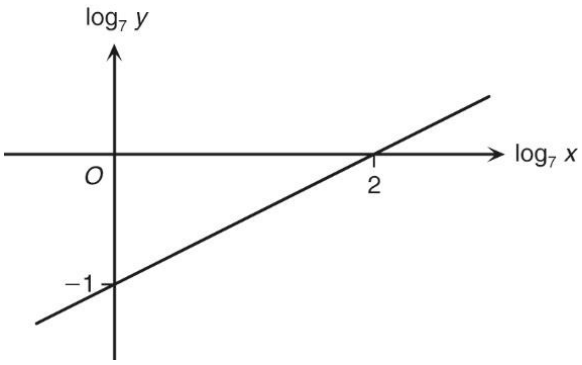
A. A000B000020_{16} .

B. B000C000023_{16} .

C. A000B0000201_{16} .

D. B000C0000203_{16} .

35. The graph in the figure shows the linear relation between $\log_7 x$ and $\log_7 y$. If $y=a\,x^{b}$, then



A. $a=\frac{1}{7}$ and $b=-\frac{1}{2}$.

B. $a=-\frac{1}{7}$ and $b=-\frac{1}{2}$.

C. $a=\frac{1}{7}$ and $b=\frac{1}{2}$.

D. $a=7$ and $b=2$.

36. For $0°\le x<360°$, how many roots does the equation $6\cos^2 x-13\cos x=-6$ have?

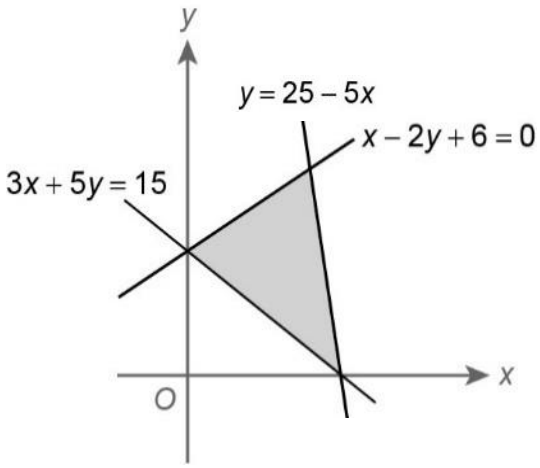
A. 0

B. 1

C. 2

D. 4

37. The figure shows a shaded region (including the boundary).



If (p, q) is a point lying in the shaded region, which of the following are true?

I. $0\le q\le 5$

II. $q\le 25-5p$

III. $q\le\frac{p}{2}+3$

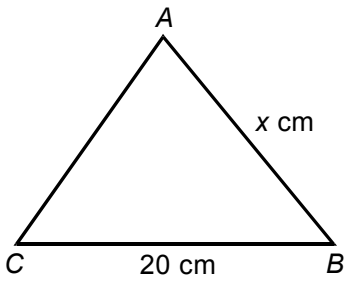
A. I and II only

B. I and III only

C. II and III only

D. I, II and III

38. In the figure, the perimeter of ΔABC is 50 cm. The area of $\Delta ABC=$



A. $\frac{1}{2}\sqrt{125(25-x)(x-5)}$ cm^2 .

B. $\sqrt{125(25-x)(x-5)}$ cm^2 .

C. $\sqrt{1\ 125(x+25)(55-x)}$ cm^2 .

D. $\sqrt{1\ 500(50-x)(x+20)}$ cm^2 .

39. It is given that k is a non-zero constant. The straight line $6x-3y=k$ cuts the x-axis and the y-axis at the points A and B respectively. Let C be a point lying on the x-axis such that the centroid of ΔABC lies on the y-axis. Find the x-coordinate of C in terms of k.

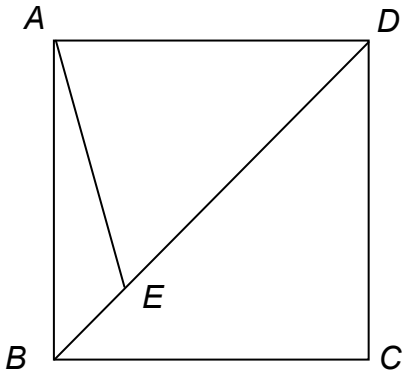
A. $-\frac{k}{3}$

B. $-\frac{k}{6}$

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

D. $-\frac{k}{12}$

40. In the figure, $ABCD$ is a square with diagonal $BD=5\sqrt{2}\,\text{cm}$. If E is a point lying on BD such that $\angle AED = 60°$, then $AE =$



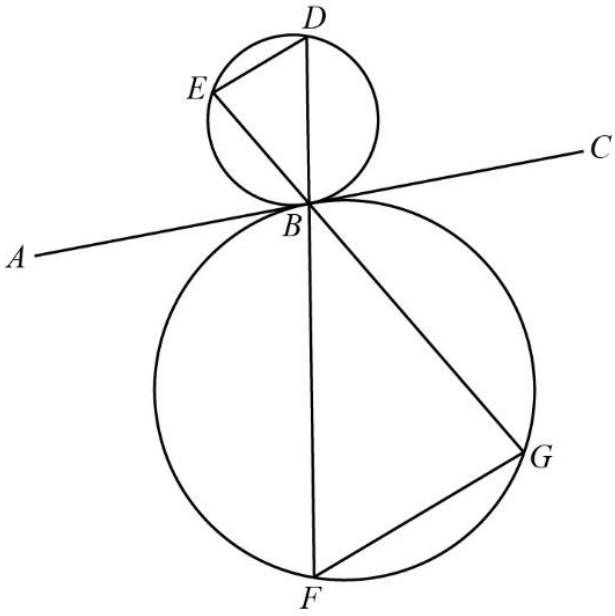
A. $\frac{2\sqrt{3}}{5}$ cm.

B. $\frac{5\sqrt{3}}{2}$ cm.

C. $\frac{3\sqrt{6}}{5}$ cm.

D. $\frac{5\sqrt{6}}{3}$ cm.

41. In the figure, ABC is the common tangent to the circles BDE and BFG at B. DBF and EBG are straight lines. Which of the following must be true?



I. $\angle ABE = \angle BFG$

II. $DE \,//\, GF$

III. D, E, F and G are concyclic.

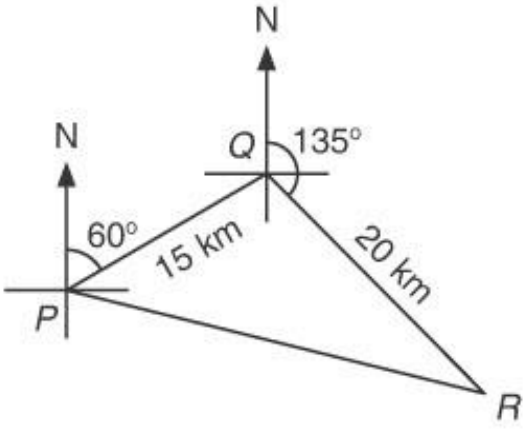
A. I and II only

B. I and III only

C. II and III only

D. I, II and III

42. In the figure, the true bearing of Q from P is 060° and that of R from Q is 135°. If PQ = 15 km and QR = 20 km, find the distance between P and R correct to nearest km.



A. 7 km
B. 25 km
C. 28 km
D. 32 km

43. Peter, John and 8 other students are arranged to stand in a row. Find the number of possible arrangements such that Peter does not stand at the front and he stands together with John.

A. 40 320
B. 362 880
C. 685 440
D. 725 760

44. Bag A contains 4 black balls and 2 white balls while bag B contains 3 black balls and 1 white ball. A ball is randomly drawn from bag A and put into bag B. If a ball is now randomly drawn from bag B, find the probability that the ball drawn is black.

A. $\frac{1}{2}$
B. $\frac{7}{10}$
C. $\frac{17}{24}$
D. $\frac{11}{15}$

45. The median, the inter-quartile range and the variance of a group of distinct numbers $\{x_1, x_2, x_3, \ldots, x_{40}\}$ are 15, 10 and 40 respectively. Find the median, the inter-quartile range and the variance of $\{2x_1+3, 2x_2+3, 2x_3+3, \ldots, 2x_{40}+3\}$.

	Median	Inter-quartile Range	Variance
A.	30	23	160
B.	33	20	80
C.	33	20	160
D.	33	23	83

END OF PAPER