2022-MOCK
MATH CP

PAPER 2

MC

ST. JOSEPH'S COLLEGE

MOCK EXAMINATION 2021 – 2022

S.6 MATHEMATICS - Compulsory Part
PAPER 2

(1¼ hours)

Date : 15th Feb 2022

INSTRUCTIONS

1. Write your Name, Class and Class Number in the spaces provided on the multiple choice answer sheet.

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 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. 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. $(a-1)(a^2-a-1) =$

   A. a^3-1.

   B. a^3+1.

   C. a^3-2a^2+1.

   D. a^3-a+1.

2. $8^{5x+3}\left(\frac{1}{32^{3x+1}}\right) =$

   A. 4.

   B. 16.

   C. 4^{2x+1}.

   D. $\frac{1}{4^{2x+1}}$.

3. $\frac{2}{2-m}-\frac{m}{m-2} =$

   A. -1.

   B. 1.

   C. $\frac{m+2}{m-2}$

   D. $\frac{2+m}{2-m}$

4. $0.0986502 =$

   A. 0.098 (correct to 2 decimal places).

   B. 0.0986 (correct to 3 significant figures).

   C. 0.09865 (correct to 5 decimal places).

   D. 0.098650 (correct to 6 significant figures).

5. $\sqrt{7}-\sqrt{-9} =$

   A. 4.

   B. $\sqrt{7}-3i$.

   C. $\sqrt{7}+3i$.

   D. $\sqrt{7}+3$.

6. If A is 15% less than B and B is 6% less than C, then

   A. A is 20.1% less than C.

   B. A is 79.9% less than C.

   C. C is 20.1% greater than A.

   D. C is 79.9% greater than A.

7. Let k be a constant. If the coefficient of x^2 in the expansion of $(2x^2 - 5x + 1)(k - x)$ is -15, then $k =$

A. -10.

B. -5.

C. 5.

D. 10.

8. The scale of a map is 1 : 25000. If the actual area of a farm is 50000 m^2, then the area of the farm on map is

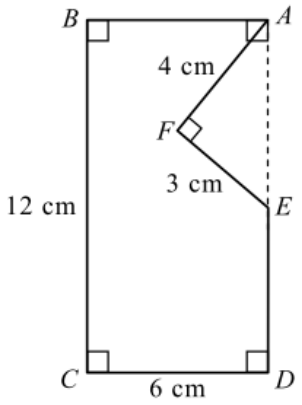
A. $8 \times 10^{-3}\ cm^2$.

B. $2 \times 10^{-2}\ cm^2$.

C. $8 \times 10^{-1}\ cm^2$.

D. $2 \times 10^{-1}\ cm^2$.

9. In the figure, $ABCDEF$ is a hexagon, where all the measurements are correct to the nearest cm. Let x cm^2 be the actual area of the hexagon. Find the range of values of x.



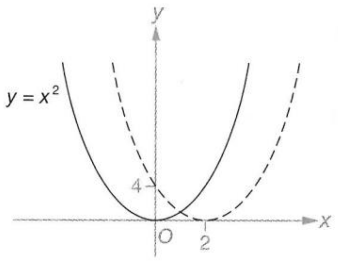
A. $55.375 \leq x < 73.375$

B. $55.375 \leq x < 76.875$

C. $58.875 \leq x < 73.375$

D. $58.875 \leq x < 76.875$

10. In the figure, the dotted curve has the same shape as the graph of $y = x^2$. Its equation is



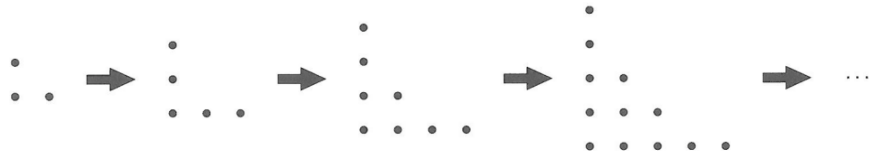
A. $y = x^2 + 2$.

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

C. $y = (x - 2)^2$.

D. $y = (x + 4)^2$.

11. In the figure, the 1st pattern consists of 3 dots. For any positive integer n, the $(n + 1)^{th}$ pattern is formed by adding $(n + 1)$ dots to the n^{th} pattern. Find the number of dots in the 10th pattern.



A. 38

B. 47

C. 57

D. 68

12. The solution of $3(4-x) > -15$ or $2x+3 < 6x-9$ is

A. $x > -1$.

B. $x > 3$.

C. $x < 9$.

D. all real numbers.

13. If $f(x)$ is a polynomial and $f\left(-\frac{1}{2}\right) = 0$, then a factor of $f(x)$ is

A. $x-2$.

B. $x+2$.

C. $2x-1$.

D. $2x+1$.

14. A alone can complete a piece of work in x days, while B alone can complete the same work in y days. If A and B work together, how many days will they take to complete the work?

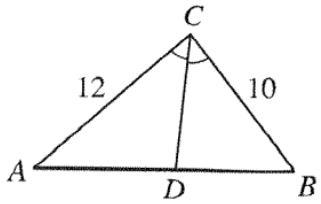
A. $x+y$

B. $\frac{x+y}{2}$

C. $\frac{1}{x}+\frac{1}{y}$

D. $\frac{xy}{x+y}$

15. In the figure, CD is the angle bisector of $\angle ACB$. $\frac{Area\ of\ \Delta ACD}{Area\ of\ \Delta BCD} =$



A. $6:5$

B. $36:35$

C. $5:6$

D. $25:36$

16. y is partly constant and party varies inversely as x. When $x=1,\ y=1$; when $x=2,\ y=2$. Find y when $x=3$.

A. 3

B. $\frac{3}{8}$

C. $\frac{7}{3}$

D. 2

17. $\sin(\alpha + 90°)\cos(\alpha - 180°) + \cos(\alpha + 90°)\sin(\alpha - 180°) =$

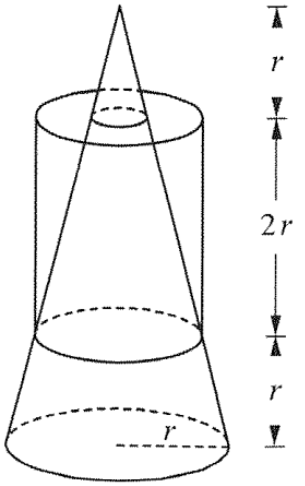
A. 0.

B. 1.

C. $-\cos^2\alpha + \sin^2\alpha$.

D. $\cos^2\alpha - \sin^2\alpha$.

18. The figure shows a right circular cone being embedded in a right circular cylinder. Find the overlapping volume in terms of r.



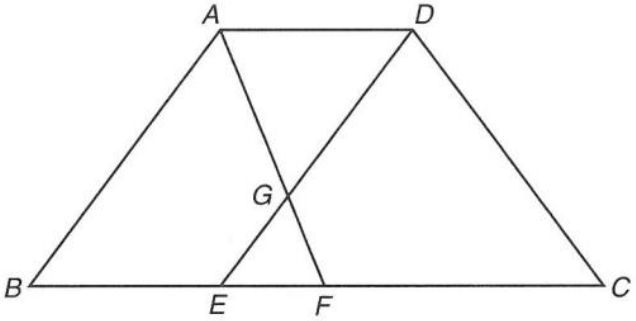
A. $\frac{\pi r^3}{6}$

B. $\frac{5\pi r^3}{12}$

C. $\frac{13\pi r^3}{24}$

D. $\frac{9\pi r^3}{8}$

19. In the figure, *ABCD* is a trapezium with *AD* // *BC* and *AD* : *BC* = 1 : 3. *E* is a point on *BC* such that *ABED* is a parallelogram and *F* is the mid-point of *BC*. *DE* and *AF* intersect at *G*. If the area of ΔEGF is 7 cm^2, then the area of trapezium *ABCD* is



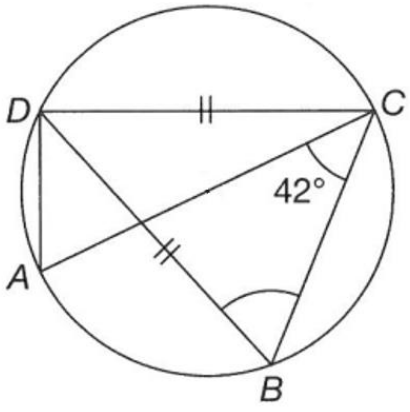
A. $135\ cm^2$.

B. $147\ cm^2$.

C. $168\ cm^2$.

D. $288\ cm^2$.

20. In the figure, $ABCD$ is a circle and AC is a diameter of the circle. If $BD = CD$ and $\angle ACB = 42°$, then $\angle CBD =$



A. 48°.

B. 62°.

C. 66°.

D. 69°.

21. In a polar plane, the distance between the points $(1,30°)$ and $(3,120°)$ is

A. 2.

B. $\sqrt{10}$.

C. 4.

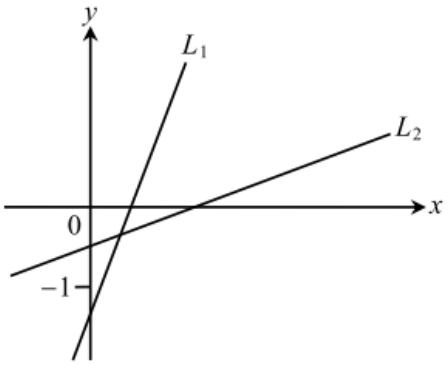
D. $\sqrt{20}$

22. In the figure, the equations of the straight line L_1 and L_2 are $5x + py = q$ and $rx + 2y = s$ respectively. Which of the following is/are true?

I. $pr < 10$

II. $5s > qr$

III. $p + q > 0$



A. I only

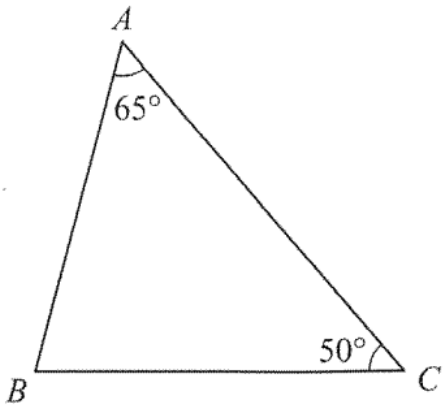
B. II only

C. I and III only

D. II and III only

23. Which of the following is/are true about ΔABC in the figure?

I. It has 1 axis of symmetry.
II. It has 2 axes of symmetry.
III. It has no rotational symmetry.
IV. It has 2-fold rotational symmetry.



A. I only

B. I and III only

C. II and III only

D. I and IV only

24. The salaries of 50 factory workers are shown in the following table. Which of the following is/are true?

Monthly salary ($)	2 800	2 000	1 500	1 000	900	800	700
Frequency	1	1	2	3	11	30	2

I. The mode salary is $800.

II. The mean salary is $922.

III. The median salary is $1000.

A. I only

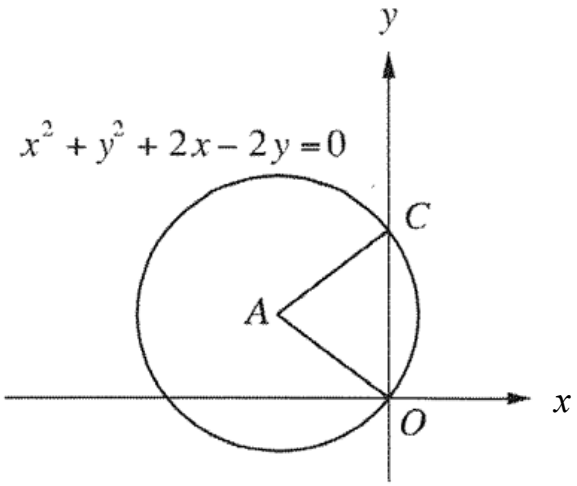
B. II only

C. I and II only

D. I, II and III

25. In the figure, A is the centre of the circle $x^2 + y^2 + 2x - 2y = 0$. Find the area of the minor sector OAC.

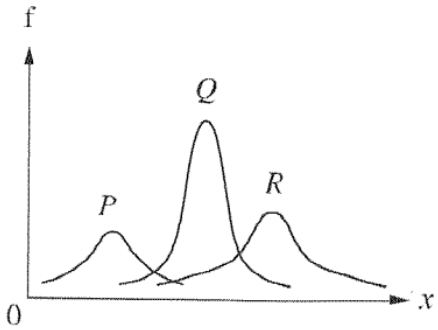
A. $\frac{\pi}{4}$
B. $\frac{\pi}{2}$
C. π
D. $\sqrt{2}\pi$



26. The graph shows the frequency curves of three normal distribution P, Q and R. Which of the following is/are true?

I. Mean of P < Mean of Q < Mean of R
II. Mode of Q > Mode of P > Mode of R
III. Mean of P > Median of Q > Mode of R

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



27. The Education Department of a city consisting of 10 districts wants to investigate the times spent on the Internet by the secondary 4 students. Questionnaires are distributed to all the secondary schools in 5 of the districts. 3 students, randomly selected from each class of average size of 30, are required to complete and return the questionnaire. Which of the following is/are disadvantage(s) of this sampling method?

I. The sample size is small.
II. Not all secondary 4 students in the city are selected.
III. The response rate is low.

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

28. A ball is drawn at random from a bag containing 6 red, n white and 5 blue balls. If the probability of getting a white ball is $\frac{4}{15}$, find n.

A. 3
B. 4
C. 7
D. 11

29. The equation of a circle is $3x^2 + 3y^2 - 24x + 18y + 26 = 0$. Which of the following are true?

I. The coordinates of the centre of the circle are $(4, -3)$.

II. The area of the circle is greater than 16π.

III. The origin lies outside the circle.

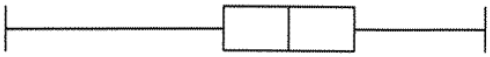
A. I and II only

B. I and III only

C. II and III only

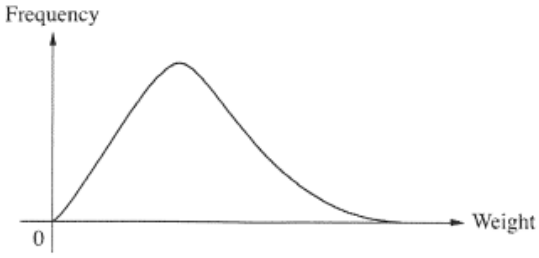
D. I, II and III

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



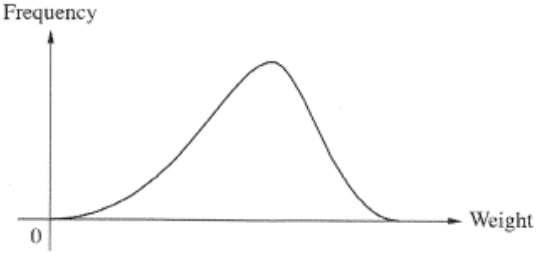
Which of the following frequency curves may represent the distribution of their weights?

A.

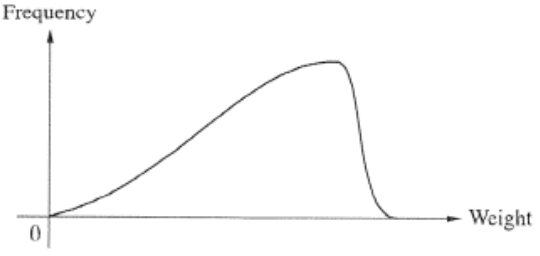


B.

C.



D.



Section B

31. Solve $\log \sqrt[4]{x} = 2 - \frac{1}{4}\log x^3$.

A. 2

B. $\frac{1}{4}$

C. 100

D. $\frac{1}{10000}$

32. The first term of a geometric sequence is x^6a^6 and the fifth term is $x^{-2}a^{-2}$, its seventh term is

A. x^3.

B. a^{-4}.

C. $x^4\,a^{-4}$.

D. $x^{-6}a^{-6}$.

33. Let k be a real number. The imaginary part of $\frac{ki^{10}+2ki^{11}+4ki^{12}}{1+i}$ is

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

B. $\frac{5k}{2}$.

C. $-\frac{k}{2}$.

D. $-\frac{5k}{2}$.

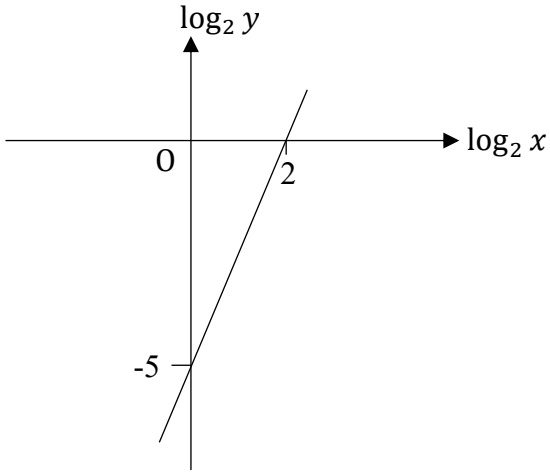
34. The graph in the figure shows the linear relation between $\log_2 y$ and $\log_2 x$. Which of the following must be true?

A. $y^2 = \frac{x^5}{2^{10}}$

B. $y^5 = \frac{x^2}{2^{10}}$

C. $x^5y^2 = \frac{1}{2^{10}}$

D. $x^2y^5 = \frac{1}{2^{10}}$



35. $20B00CE00000_{16} =$

A. $523 \times 16^9 + 206 \times 16^5$.

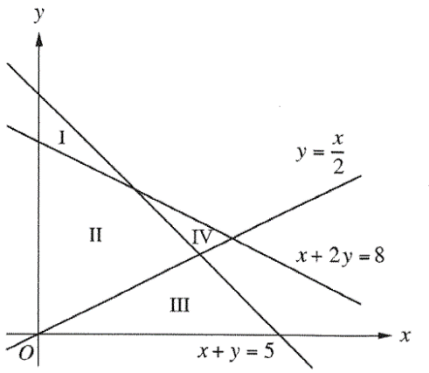
B. $524 \times 16^9 + 223 \times 16^5$.

C. $523 \times 16^{10} + 206 \times 16^6$.

D. $524 \times 16^{10} + 223 \times 16^6$.

36. Which of the following regions represents the solution of the system of inequalities

$$\begin{cases} x \geq 0, y \geq 0 \\ x + y \leq 5 \\ x + 2y \leq 8 \\ x - 2y \geq 0 \end{cases} ?$$



A. I

B. II

C. III

D. IV

37. Translating of the graph of $y = \log x$ obtains the graph of $\log \frac{x+3}{10}$, which of the following is the correct description?

A. Translate 3 units to the left, and then translate 1 unit upward.

B. Translate 3 units to the right, and then translate 1 unit upward.

C. Translate 3 units to the left, and then translate 1 unit downward.

D. Translate 3 units to the right, and then translate 1 unit downward.

38. Find the range of the possible value of k such that the circle $x^2 + y^2 + 4x + 2y + k = 0$ and the straight line $x + y + 3 = 0$ does not intersect.

A. $k > 1$

B. $k > 5$

C. $k < 5$

D. $1 < k < 5$

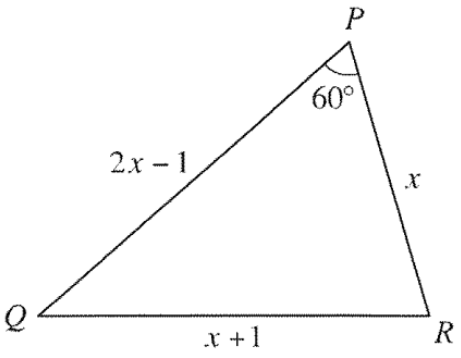
39. In $\angle QPR = 60°$. What is the value of x?

A. $\frac{5}{3}$

B. $\frac{7}{4}$

C. 2

D. $\frac{5}{2}$



40. There are 3 bags each containing one ball and 5 bags that are empty. One ball will be put into one of the 8 bags at random and then one bag is randomly selected. Find the probability that the bag chosen is not empty.

A. $\frac{7}{8}$

B. $\frac{7}{16}$

C. $\frac{29}{32}$

D. $\frac{29}{64}$

41. To qualify as a contestant in 100-metre race, a runner has to be in the top 2.5% of all entrants. The running time are normally distributed, with a mean of 12.78 seconds and a standard deviation of 0.395 seconds. It is given that 95% of the running times lie within two standard deviations from the mean. What is the qualifying time for the race?

A. 11.200 seconds
B. 11.595 seconds
C. 11.990 seconds
D. 12.385 seconds

42. 4 men and 4 women table-tennis players are equally divided into 2 groups to engage in men and women mixed double (a pair of man and woman vs another pair of man and woman) demonstrated competitions. How many different demonstration matches are there?

A. 6
B. 18
C. 36
D. 72

43. The variance of three numbers $a-3d, a+d, a+5d$ is

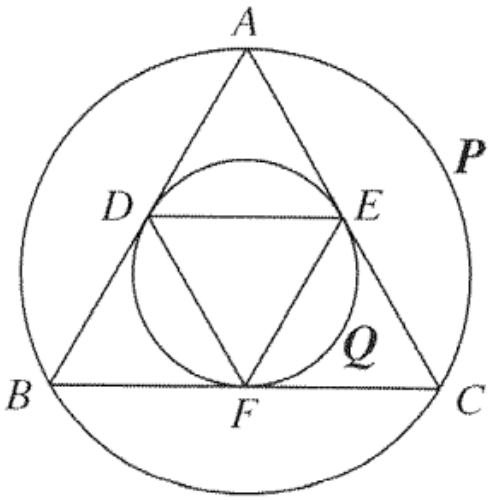
A. 0.

B. $\frac{32}{3}d^2$.

C. $\frac{16}{3}d^2$.

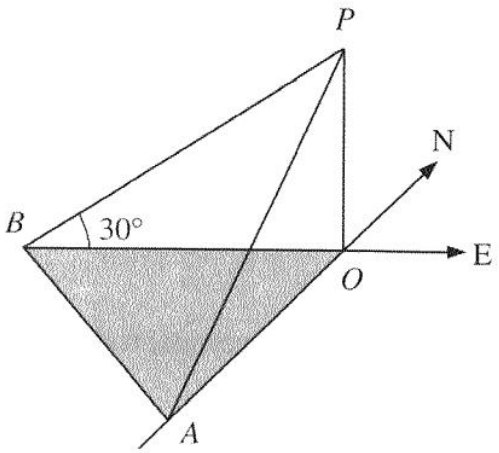
D. $32d^2$.

44. P and Q are the circumscribed circles of the equilateral triangles ABC and DEF respectively. Find the ratio of area of circle P : area of circle Q.



A. $2:1$
B. $2:\sqrt{3}$
C. $4:1$
D. $4:3$

45. In the figure, a speed boat sailing from a point A is due south of a vertical control tower OP. It sails on a bearing of $324°$ at a speed of 90 km/h for three hours to another point B which is due west of the tower. From the top P of the tower, B is observed to have an angle of depression of 30°. Find the angle of elevation of P from A.



A. 22.8°
B. 26.9°
C. 36°
D. 51°

END OF PAPER

1	2	3	4	5	6	7	8	9	10
C	B	D	C	B	A	A	C	B	C

11	12	13	14	15	16	17	18	19	20
C	D	D	D	A	C	C	C	C	C

21	22	23	24	25	26	27	28	29	30
B	C	B	C	B	A	A	B	D	C

31	32	33	34	35	36	37	38	39	40
C	D	D	A	A	C	C	B	D	D

41	42	43	44	45					
C	D	B	C	A					