After School Revision Test 2022-23

MATHEMATICS Compulsory Part
PAPER 2

Time allowed: 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 first write 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 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 deduced for wrong answers.

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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. $\dfrac{(3^{2n})(16^{n})}{2^{2n}} =$

A. 6^{-n}.
B. 6^{n}.
C. 6^{2n}.
D. 6^{3n}.

2. If $2h(2-a) = a(a-2h)$, then $h =$

A. $4a$.
B. $2a^{2}$.
C. $\dfrac{a^{2}}{4}$.
D. $\dfrac{a^{2}}{4-4a}$.

3. $(2m-n)(2m+n)(1-m) =$

A. $-4m^{3}+4m^{2}+n^{2}m-n^{2}$.
B. $-4m^{3}+4m^{2}-n^{2}m-n^{2}$.
C. $4m^{3}+4m^{2}+n^{2}m-n^{2}$.
D. $4m^{3}+4m^{2}-n^{2}m-n^{2}$.

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4. $\frac{1}{x+2}-\frac{2}{x-3}=$

A. $\frac{x-1}{(x+2)(x-3)}$.

B. $\frac{x-1}{(x+2)(3-x)}$.

C. $\frac{x+7}{(x+2)(x-3)}$.

D. $\frac{x+7}{(x+2)(3-x)}$.

5. If $x = 1.90$ (correct to 3 significant figures), find the range of values of x.

A. $1.85 < x \leq 1.95$

B. $1.85 \leq x < 1.95$

C. $1.895 < x \leq 1.905$

D. $1.895 \leq x < 1.905$

6. If m and n are constants such that $(x-m)(x+3) \equiv x^2-4x+n$, then $n =$

A. –21.

B. 3.

C. 7.

D. 21.

7. Let a and b be constants. If $x = 1$ and $y = –2$ satisfy the equation $ax + by + 2 = bx – ay – 2 = 0$, find $a : b$.

A. 1 : 2

B. 1 : 3

C. 2 : 1

D. 3 : 1

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8. Let $p(x)$ be a polynomial. When $p(x)$ is divided by $2x - 1$, the remainder is -4. If $2x + 1$ is a factor of $p(x)$, find the remainder when $p(x)$ is divided by $4x^2 - 1$.

A. $4x + 2$
B. $4x - 2$
C. $-4x + 2$
D. $-4x - 2$

9. In a marathon race, 40% of the runners are above 25 years old. If 70% of the female runners and 30% of the male runners are above 25 years old, find the percentage of male runners in the race.

A. 25%
B. 50%
C. 60%
D. 75%

10. The solution of $-7(5+2x) \geq -5x+1$ and $\frac{3x+4}{5} < -4$ is

A. $x \leq -4$.
B. $x \geq -4$.
C. $x < -8$.
D. $x > -8$.

11. If $x : y = 2 : 3$ and $y : z = 1 : 4$, then $(x + y):(y + z) =$

A. 1 : 3.
B. 2 : 1.
C. 1 : 1.
D. 3 : 4.

12. It is given that p varies inversely as q and directly as the square root of r. Which of the following must be a constant?

A. $\dfrac{r}{pq}$

B. $\dfrac{r}{pq^2}$

C. $\dfrac{p^2r}{q^2}$

D. $\dfrac{p^2q^2}{r}$

13. In the figure, the 1st pattern consists of 1 dot. For any positive integer n, the $(n + 1)$th pattern is formed by adding $(2n + 1)$ dots to the nth pattern. Find the number of dots in the 9th pattern.

A. 64

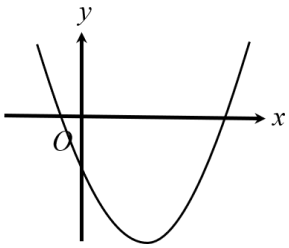
B. 81

C. 100

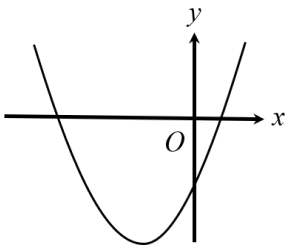
D. 121

14. Let h and k be constants. If $h > 0$ and $k < 0$, which of the following can be the graph of $y = h(k - x)^2 - 1$?

A.



B.



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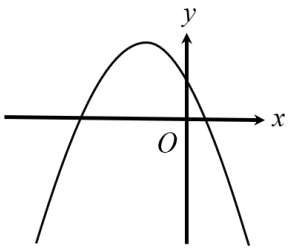
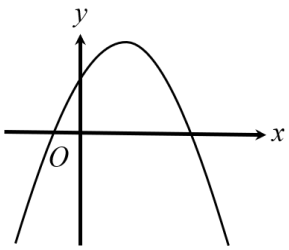


D.



15. The base of a solid right pyramid is an equilateral triangle. If the perimeter of the base is 30 cm and the length of each slant edge of the pyramid is 13 cm, find the total surface area of the pyramid.

A. $(60 + 50\sqrt{3})$ cm^2

B. $(65 + 50\sqrt{3})$ cm^2

C. $(180 + 25\sqrt{3})$ cm^2

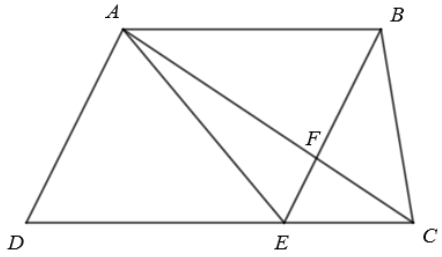
D. $(195 + 25\sqrt{3})$ cm^2

16. A container is full of water. 3 spherical metal balls are put into the container. When the metal balls are completely immersed into water, 252 cm^3 of water overflows. It is known that the ratio of the surface areas of the 3 metal balls are 1 : 4 : 9. Find the volume of the largest metal ball.

A. 126 cm^3
B. 162 cm^3
C. 189 cm^3
D. 210 cm^3

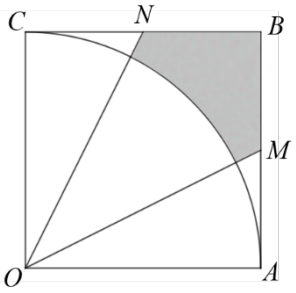
17. In the figure, $ABCD$ is a trapezium. E is a point lying on DC such that $ABED$ is a parallelogram and $AB : EC = 2 : 1$. BE and AC intersect at F. The ratio of the area of $\triangle FEC$ to the area of $\triangle ADE$ is

A. 1 : 3.
B. 1 : 4.
C. 1 : 6.
D. 1 : 8.



18. In the figure, $OABC$ is a square of side 10 cm. O is the centre of the sector OAC. M and N are the mid-points of AB and BC respectively. Find the area of the shaded region, correct to 3 significant figures.

A. 17.8 cm^2
B. 18.5 cm^2
C. 20.4 cm^2
D. 22.1 cm^2



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19. In the figure, $AB = AC$, $AD = AE$ and $\angle BAC = \angle DAE$. BD and CE intersect at F. Which of the following must be true?

I. $\triangle ABC \cong \triangle ADE$

II. $\triangle ABD \cong \triangle ACE$

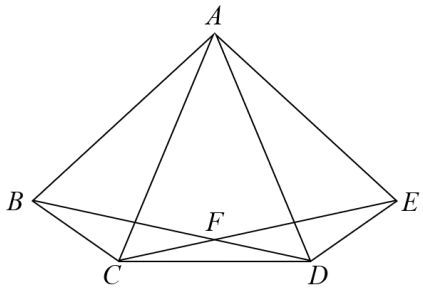
III. $\triangle BFC \cong \triangle EFD$

A. I only

B. II only

C. I and III only

D. II and III only



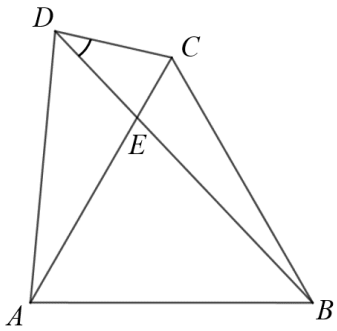
20. In the figure, ABC is an equilateral triangle and ABD is an isosceles triangle with $AB = AD$. AC and BD intersect at E. If $\angle DAC = 20°$, find $\angle CDB$.

A. 30°

B. 35°

C. 40°

D. 45°



21. In an n-sided regular polygon, the sum of the exterior angles equals the sum of the interior angles. Which of the following is true?

I. The polygon must be a square.

II. The diagonals of the polygon bisect each other.

III. The diagonals of the polygon have equal lengths.

A. I and II only

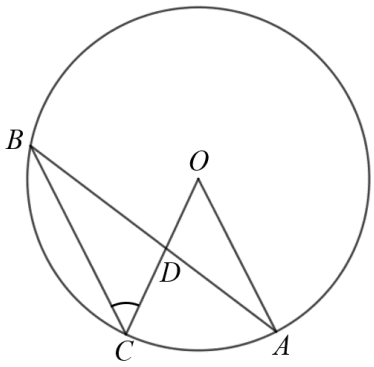
B. I and III only

C. II and III only

D. I, II and III

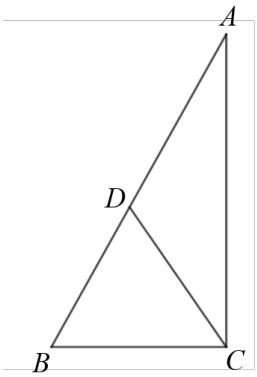
22. In the figure, ABC is a circle. O is the centre of the circle. OC and AB intersect at D. If OA // BC and $\angle BDC = 102°$, find $\angle BCO$.

A. 45°
B. 48°
C. 50°
D. 52°



23. In the figure, $\triangle ABC$ is a right-angled triangle with $\angle ACB = 90°$. D is a point on AB such that $BD = BC$. If $\angle ADC = \alpha$, then $\dfrac{BC}{BA} =$

A. $\sin \alpha$.
B. $-\cos \alpha$.
C. $-\cos 2\alpha$.
D. $-\sin 2\alpha$.



24. A baseball is 150 m due north of a lighthouse. If the baseball rolls in the direction 165°, find the shortest distance between the baseball and the lighthouse correct to 1 decimal place.

A. 38.8 m
B. 40.2 m
C. 75.0 m
D. 144.9 m

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25. The point A is translated downwards by 2 units to point B. When B is rotated clockwise about the origin through 90°, the coordinates of its image are (–5, –3). Find the polar coordinates of A.

A. (3, 135°)
B. (3, 315°)
C. $(3\sqrt{2}, 135°)$
D. $(3\sqrt{2}, 315°)$

26. The coordinates of the points A and B are (3, –6) and (–5, 2) respectively. Let P be a moving point in the rectangular coordinate plane such that $AP \perp AB$. Find the equation of the locus of P.

A. $x + y + 3 = 0$
B. $x - y - 9 = 0$
C. $x^2 + y^2 + 2x + 4y - 27 = 0$
D. $x^2 + y^2 - 2x + 8y + 9 = 0$

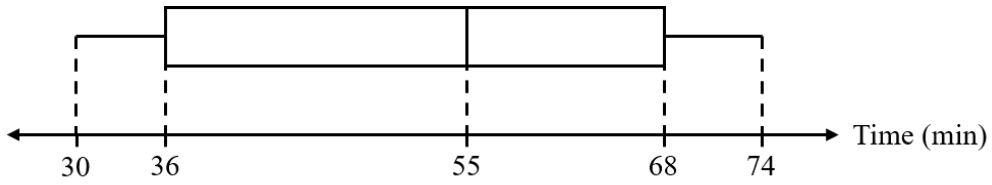
27. It is given that the straight line L and the circle $x^2 + y^2 - 10x + 8y + 5 = 0$ intersect at two points P and Q. If the coordinates of the mid-point of PQ are (4, –8), find the y-intercept of L.

A. –2
B. –7
C. –11
D. –24

28. A bag contains five cards A, B, C, D and E. Two cards are drawn at random from the bag one by one without replacement. Find the probability that card C is not drawn.

A. $\frac{1}{5}$
B. $\frac{2}{5}$
C. $\frac{3}{5}$
D. $\frac{4}{5}$

29. The box-and-whisker diagram below shows the distribution of the time (in minutes) spent on revision by students in Class 6A on a certain day.



Which of the following must be true?

I. The range of the distribution is 44 minutes.

II. At least half of the students in Class 6A spend more than 55 minutes on revision on that day.

III. If a student is randomly chosen from Class 6A, the probability that he/she spends 68 minutes or above on revision on that day is 0.25.

A. I only

B. III only

C. I and II only

D. II and III only

30. The table below shows the distribution of the number of handbags owned by 40 ladies.

Number of handbags	1	2	3	4	n
Frequency	2	10	14	m	2

Let x, y and z be the mode, the mean and the median of the above distribution respectively. If the range of the above distribution is 5, which of the following are true?

I. $x = 3$

II. $y = 3$

III. $z = 3$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

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Section B

31. The H.C.F. of three expressions P, Q and R is $18ab^2c^3$. The H.C.F. of two other expressions X and Y is $24a^5b^2c^2$. What is the H.C.F. of P, Q, R, X and Y?

A. $6abc$

B. $6ab^2c^2$

C. $24a^6b^4c^5$

D. $72a^5b^2c^3$

32. If the roots of the equation $(\log_9 x)^2 + \log_9 x^2 - 12 = \log_9 x$ are α and β, then $\log_3 \alpha + \log_3 \beta =$

A. –2.

B. –3.

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

D. $\frac{1}{9}$.

33. Let a and b be positive constants, where $b > 1$. On the same rectangular coordinate system, the graph of $y = \log_a ax$ cuts the x-axis at P, while the graph of $y = \log_b (x + b)$ cuts the x-axis and y-axis at Q and R respectively. Find the area of $\triangle PQR$.

A. $\frac{1}{2a} + \frac{b}{2}$

B. $\frac{a}{2} + \frac{b}{2}$

C. $\frac{a}{2} - \frac{b}{2} + \frac{1}{2}$

D. $\frac{1}{2a} + \frac{b}{2} - \frac{1}{2}$

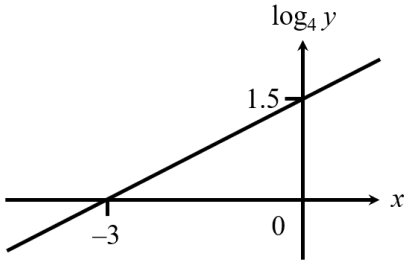
34. The figure shows the linear relation between $\log_4 y$ and x. Which of the following statement must be true?

A. y varies directly as x.

B. y varies directly as 2^x.

C. y varies directly as 4^x.

D. y varies directly as 8^x.



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35. Consider the following system of inequalities:

$$\begin{cases} 3x+4y-32 \le 0 \\ 2x+5y-26 \le 0 \\ x \ge 0 \\ y \ge 0 \end{cases}$$

Let R be the region which represents the solution of the above system of inequalities. Find the constant k such that the greatest value of $7x+12y+k$ is 55, where (x, y) is a point lying in R.

A. –25
B. –4
C. 15
D. 27

36. If a is a real number, then the real part of $i^3 \cdot \dfrac{a-3i}{a+i}$ is

A. $-\dfrac{4a}{a^2+1}$.
B. $\dfrac{4a}{a^2+1}$.
C. $\dfrac{a^2-3}{a^2+1}$.
D. $\dfrac{3-a^2}{a^2+1}$.

37. For $0° < x \le 360°$, how many roots does the equation $7\cos x + 4\sin^2 x = 7$ have?

A. 1
B. 2
C. 3
D. 4

38. Let $f(x) = -x^2 + 2kx - 4$, where k is a constant. Find the greatest integral value of k such that the graph of $y = f(x)$ lies below the x-axis.

A. –2
B. –1
C. 1
D. 2

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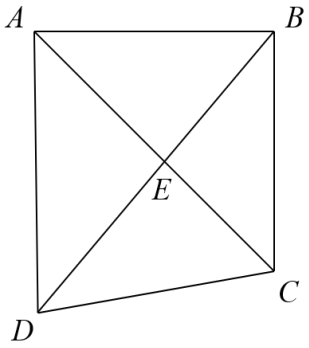
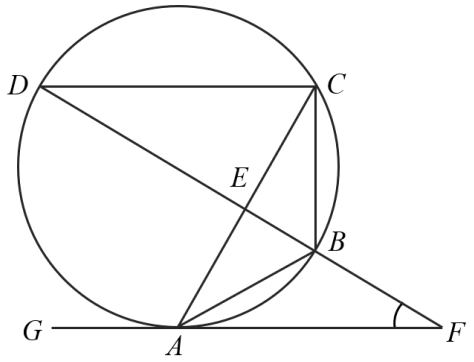
39. The figure shows a quadrilateral $ABCD$. AC and BD intersect at E. $AB \perp BC$, $\angle ACB = 45°$, $\angle ACD = 65°$ and $\angle BDC = 35°$. If $BC = 5$ cm, find the length of AD, correct to the nearest cm.



A. 5 cm
B. 6 cm
C. 7 cm
D. 8 cm

40. In the figure, $ABCD$ is a circle. DB is a diameter of the circle. FAG is the tangent to the circle at A. AC meets DB at E. DB produced meets FG at F. $\angle BAF = 25°$. Find $\angle BFA$.



A. 25°
B. 30°
C. 35°
D. 40°

41. The coordinates of two vertices of a triangle are (–2, 4) and (8, 6). If the circumcentre of the triangle lies on the x-axis, then the x-coordinate of the circumcentre is

A. 3.
B. 4.
C. 5.
D. 10.

42. A group contains 8 students and 7 teachers. 5 people are selected from the group to form a queue. If the queue must consist of a particular teacher and at least 3 students, how many different queues can be formed?

A. 406
B. 3696
C. 48 720
D. 443 520

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43. There are 3 lorries, 6 vans and 7 motorbikes in a car park. If 4 vehicles are randomly chosen from the car park at the same time, find the probability that at most 2 vans are chosen.

A. $\frac{4}{65}$

B. $\frac{27}{28}$

C. $\frac{81}{91}$

D. $\frac{321}{364}$

44. In a test, the test score of Lily is 45 marks and her standard score is –1.5. The test score of Henry is 70 marks and his standard score is 1. Find the standard deviation of the test scores.

A. 5 marks

B. 10 marks

C. 15 marks

D. 60 marks

45. It is given that $T(n)$ is the nth term of a geometric sequence. Let x_1, y_1 and z_1 be the median, the range and the variance of the group of numbers $\{T(1), T(2), T(3), \ldots, T(39)\}$ respectively while x_2, y_2 and z_2 be the median, the range and the variance of the group of numbers $\{T(41), T(42), T(43), \ldots, T(79)\}$ respectively. If $0 < T(2) < T(1)$, which of the following must be true?

I. $x_1 > x_2$

II. $y_1 > y_2$

III. $z_1 < z_2$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

END OF PAPER