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2021 – 2022
S4 First Term Examination

MATHEMATICS Compulsory Part

PAPER 2

4th January, 2022
9:45 am – 10:30 am (45 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 18 questions in Section A and 9 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. Simplify $\dfrac{(3x^2y^0)^2}{9x^5y^2}$.

   A. $\dfrac{1}{xy^2}$

   B. $\dfrac{3}{xy^2}$

   C. $\dfrac{1}{3xy}$

   D. $\dfrac{1}{x}$

2. $ab - ac - bm + cm + bn - cn =$

   A. $(b-c)(a-m+n)$.

   B. $(b+c)(a+m-n)$.

   C. $(b+c)(a-m+n)$.

   D. $(b-c)(a+m-n)$.

3. If p and q are constants such that $x^2 + 4x + p \equiv (x-2)(x+q)+10$, then $p =$

   A. -6.

   B. -2.

   C. 6.

   D. 12.

4. Solve the equation $(x+1)x = 3(x+1)$.

   A. $x = -1$

   B. $x = -1$ or 3

   C. $x = 3$

   D. $x = 1$ or 3

5. If N is a positive integer, which of the following must be an even number?
   I. $4N + 2$
   II. $(N+1)^2 + 6$
   III. $6^N + 2$

   A. II only
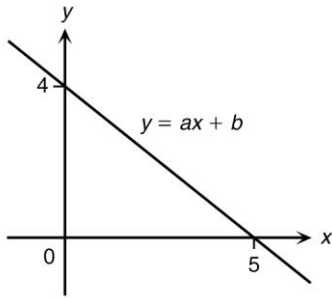
   B. III only

   C. I and II only

   D. I and III only

6. $0.1\dot{3}\dot{1} =$

   A. $\dfrac{13}{100}$.

   B. $\dfrac{130}{999}$.

   C. $\dfrac{131}{999}$.

   D. $\dfrac{13}{99}$.

7. Which of the following is the domain of the function $y = -\dfrac{1}{\sqrt{x}}$?

   A. All positive real numbers

   B. All real numbers except 0

   C. All negative real numbers

   D. All non-negative real numbers

8. The figure shows the graph of $y = ax + b$.

Find the values of a and b.

A. $a = 4$ and $b = 5$

B. $a = 5$ and $b = 4$

C. $a = -\dfrac{4}{5}$ and $b = 4$

D. $a = -4$ and $b = -\dfrac{4}{5}$
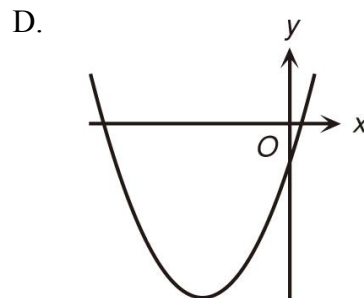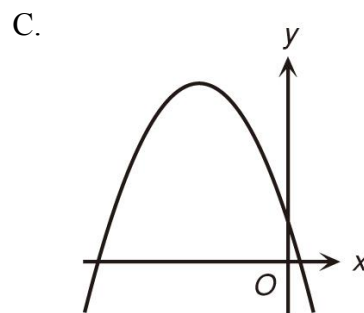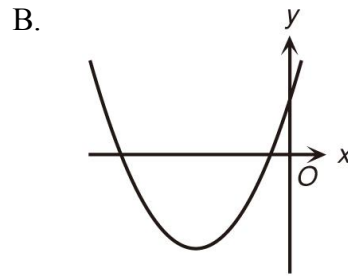
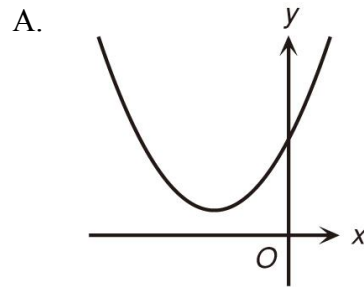9. If $f(x) = 6x^2 - 3x - 2$, then $f(a) - f(-a) =$

A. 0.

B. $-6a$.

C. $12a^3$.

D. $12a^3 - 6a$.

10. Which of the following have the same minimum value of y?

I. $y = 4x^2 + 4x + 11$

II. $y = x^2 + 4x - 6$

III. $y = (3-x)^2 - 10$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

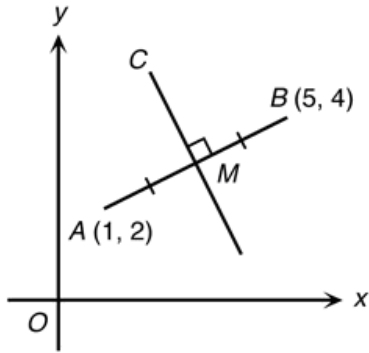11. Which of the following may represent the graph of $y = 2x^2 + 7x + 3$?

A.

B.

C.

D.

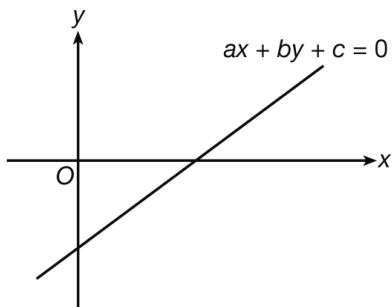12. Which of the following does NOT represent that y is a function of x?

A. $y = 5 - x$

B. $y = x^2 + 9x - 12$

C. $y = x^3 + \dfrac{1}{x}$

D. $y^2 = 4x$

13. In the figure, *CM* is the perpendicular bisector of *AB*. Find the equation of *CM*.

   A. $x + 2y + 6 = 0$

   B. $x + 2y - 18 = 0$

   C. $2x + y + 3 = 0$

   D. $2x + y - 9 = 0$

14. The graph shown represents the straight line $ax + by + c = 0$. If *c* is a negative real number, which of the following is true?

   A. $a > 0$ and $b > 0$

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

   C. $a < 0$ and $b > 0$

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

15. When $x^{2468} + 1$ is divided by $x + 1$, the remainder is

   A. -1.

   B. 0.

   C. 1.

   D. 2.

16. Which of the following is/are factor(s) of $(x+1)(4x^2 - 6x) + 2 + 2x$?

   I. 2

   II. $x + 1$

   III. $2x - 1$

   IV. $2x + 1$

   A. I and II only

   B. II and III only

   C. I, II and III only

   D. II, III and IV only

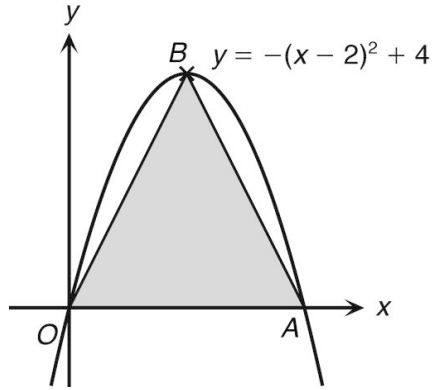17. Let $f(x) = 2x^3 + kx^2 - 22x - 15$. If $f(-1) = 0$, then $f(x) =$

   A. $(x + 1)(x + 5)(2x + 3)$.

   B. $(x + 1)(x + 5)(2x - 3)$.

   C. $(x + 1)(x - 5)(2x + 3)$.

   D. $(x - 1)(x - 5)(2x - 3)$.

18. The graph of $y = x^2 - 6x + (k - 2)$ has no intersections with the *x*-axis. Find the range of values of *k*.
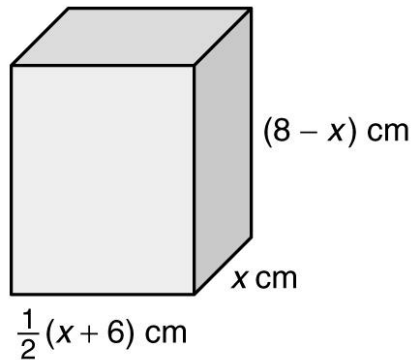
   A. $k > 9$

   B. $k < 9$

   C. $k > 11$

   D. $k < 11$

Section B

19. In the figure, the quadratic graph $y = -(x-2)^2 + 4$ with vertex B cuts the x-axis at point A and the origin O. The area of $\triangle OAB$ is

   A. 4 sq. units.
   B. 8 sq. units.
   C. 12 sq. units.
   D. 16 sq. units.

20. In the figure, the total surface area of the cuboid is 102 cm². Find the volume of the cuboid.

(8 − x) cm

x cm

$\frac{1}{2}(x+6)$ cm

   A. 67.5 cm³
   B. 80 cm³
   C. 92.5 cm³
   D. 102 cm³

21. $\dfrac{1}{3-\sqrt{5}} - \dfrac{1}{3+\sqrt{5}} =$

   A. $-\dfrac{\sqrt{5}}{4}$.
   B. $-\dfrac{4}{5}$.
   C. $\dfrac{3}{5}$.
   D. $\dfrac{\sqrt{5}}{2}$.

22. Form a quadratic equation in x whose roots are $2+\sqrt{5}$ and $2-\sqrt{5}$.

   A. $x^2 - 4x - 1 = 0$
   B. $x^2 + 4x - 1 = 0$
   C. $x^2 - 4x + 1 = 0$
   D. $x^2 + 4x + 1 = 0$

23. If $\alpha \neq \beta$ and $\begin{cases} \alpha^2 = 2\alpha + 5 \\ \beta^2 = 2\beta + 5 \end{cases}$, then $\dfrac{1}{\alpha} + \dfrac{1}{\beta} =$

   A. $\dfrac{2}{5}$.
   B. $\dfrac{5}{2}$.
   C. $-\dfrac{5}{2}$.
   D. $-\dfrac{2}{5}$.

24. $\dfrac{2}{x^2+2x}-\dfrac{1}{x^2+x}=$

A. $\dfrac{1}{x(x-1)}$.

B. $\dfrac{2}{x(x+1)}$.

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

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

25. It is given that $f(x)=4x^2-4x+13$. Which of the following must be true?
   I. The minimum value of $f(x)$ is 12.
   II. The coordinates of the vertex of the graph of $y=f(x)$ are $\left(\dfrac{1}{2},12\right)$.
   III. The axis of symmetry of the graph of $y=f(x)$ is $x=-\dfrac{1}{2}$.
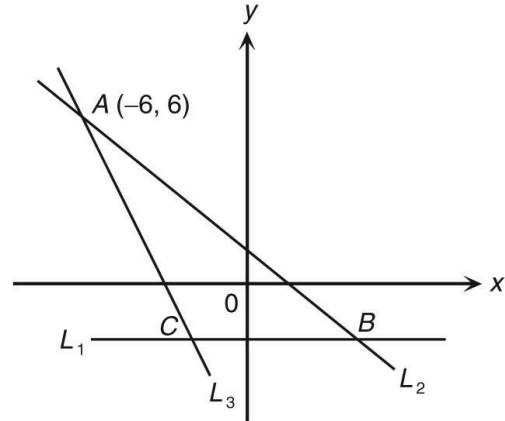
   A. I and II only
   B. I and III only
   C. II and III only
   D. I, II and III

26. Find the H.C.F. and L.C.M. of $8y^3z$, $16x^3yz^2$ and $32xyz^4$.

	H.C.F.	L.C.M.
A.	$2yz$	$32x^3y^3z^4$
B.	$2xyz$	$64xy^3z$
C.	$8yz$	$32x^3y^3z^4$
D.	$8xyz$	$64xy^3z^2$

27. In the figure, the equations of the straight lines L_1 and L_3 are $y=-2$ and $2x+y+6=0$ respectively. L_1 intersects L_2 and L_3 at B and C respectively. If the area of $\triangle ABC$ is 24 square units, find the equation of L_2.

A. $4x+5y-6=0$
B. $4x+5y+6=0$
C. $5x-4y-6=0$
D. $5x-4y+6=0$

END OF PAPER