AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XI

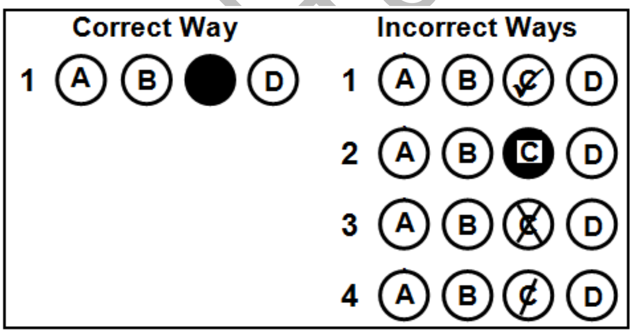
MODEL EXAMINATION PAPER 2018

Mathematics Paper I

Time: 1 hour   Marks: 40

INSTRUCTIONS

1. Read each question carefully.
2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.
3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 40 only.
4. In each question there are four choices A, B, C, D. Choose ONE. On the answer grid black out the circle for your choice with a pencil as shown below.



<u>Candidate's Signature</u>

5. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
6. DO NOT write anything in the answer grid. The computer only records what is in the circles.
7. You may use a scientific calculator if you wish.

1. If $Z = a - ib$ and $|Z| = 2$, then the relationship between a and b will be

   A. $a^2 + b^2 = 4$
   B. $a^2 - b^2 = 4$
   C. $a + b = 2$
   D. $a - b = 2$

2. On simplification of $(1+i)^2$, the real part we get is

   A. -2
   B. 0
   C. 1
   D. 2

3. $\overline{\left(\dfrac{6+i}{5-i}\right)}$ is equal to

   A. $\dfrac{-6+i}{-5-i}$
   B. $\dfrac{-6-i}{-5+i}$
   C. $\dfrac{6-i}{5-i}$
   D. $\dfrac{6-i}{5+i}$

4. $(2+2i)\times(2-2i)$ is equal to

   A. 4
   B. 8
   C. $4-4i$
   D. $8-8i$

5. The cofactor of element in the third row and the second column of the matrix $\begin{bmatrix} 2 & 2 & 3 \\ 1 & 2 & 3 \\ 1 & 5 & 7 \end{bmatrix}$ is

   A. 8
   B. 3
   C. -3
   D. -8

6. The determinant of the matrix $\begin{bmatrix} a & b & c \\ b & a & c \\ 2a & 2b & 2c \end{bmatrix}$ is

A. 0
B. 2
C. abc
D. $2abc$

7. For the matrix $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$, which of the following options is TRUE?

I. Square matrix
II. Scalar matrix
III. Null matrix

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

8. The matrix multiplication of $\begin{bmatrix} 2i & 3i \end{bmatrix}$ and $\begin{bmatrix} 2 & 3 \\ 0 & 1 \end{bmatrix}$ is

(**Note:** $i = \sqrt{-1}$)

A. $\begin{bmatrix} 4i \\ 9i \end{bmatrix}$
B. $\begin{bmatrix} 4i & 9i \\ 0 & 3i \end{bmatrix}$
C. $\begin{bmatrix} 4i & 9i \end{bmatrix}$
D. not possible.

9. If the determinant of $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$ is a^3, then the determinant of $3A$ is equal to

A. a^3
B. $3a^3$
C. $9a^3$
D. $27a^3$

PLEASE TURN OVER THE PAGE

10. If $Y=\begin{bmatrix}0 & x & 0\\ 1 & 0 & 1\\ 3 & 0 & 1\end{bmatrix}$ and $|Y|=-2$, then the value of x will be

A. 1
B. -1
C. $\frac{1}{2}$
D. $-\frac{1}{2}$

11. For a geometric progression, the sum of the first two terms is 9. If the first term is 3, then the third term is

A. 12
B. 8
C. 7
D. 6

12. The sum of the infinite geometric series $a, ab, ab^2, ab^3, \ldots$ is equal to

(**Note**: $|b|<1$)

A. ∞
B. $\frac{a}{1-b}$
C. $\frac{a}{b-1}$
D. $\frac{b}{1-a}$

13. The harmonic mean between two numbers $\frac{a}{2}$ and $\frac{b}{2}$ is

A. $\frac{ab}{a+b}$
B. $\frac{a+b}{ab}$
C. $\frac{2ab}{a+b}$
D. $\frac{a+b}{2ab}$

14. The sum of the arithmetic sequence $a, a+2b, a+4b, a+6b, a+8b, \ldots$ to the 10th term is

A. $2a+18b$
B. $5a+90b$
C. $10a+18b$
D. $10a+90b$

15. The two geometric means between $\frac{1}{2}$ and 4 are

A. 1 and 2
B. $2\sqrt{2}$ and 1
C. $\sqrt{2}$ and 2
D. 2 and $2\sqrt{2}$

16. If $\frac{1}{18}, \frac{1}{14}, \frac{1}{10}, \frac{1}{6}, \frac{1}{2}, \ldots$ are in harmonic progression, then the common difference of the associated arithmetic progression will be

A. -4
B. 4
C. $-\frac{1}{4}$
D. $\frac{1}{4}$

17. The possible number of arrangements of the letters of the word **SYSTEMATIC**, taken all at a time, is equal to

A. $\frac{10!}{2!\,2!}$
B. $\frac{2!}{10!}$
C. $10!$
D. $2!\,10!$

18. ${}^{n}C_{n-1}$ or $\binom{n}{n-1}$ is equal to

A. 1
B. n
C. $\frac{n}{n-1}$
D. $\frac{1}{n-1}$

19. A bag contains 6 red, 5 yellow, 8 white, 6 black and 10 blue identical balls. Two balls are drawn at random with replacement from the bag. What is the probability that the first ball is red and the second ball is white?

A. $\frac{6}{35}\times\frac{8}{34}$
B. $\frac{6}{35}\times\frac{8}{35}$
C. $\frac{6}{14}\times\frac{8}{14}$
D. $\frac{6}{14}\times\frac{8}{13}$

20. The number of ways, a teacher can randomly select 6 students from a class of 30 students, to create a mathematics' club is

A. 180
B. 593,775
C. 427,518,000
D. 729,000,000

21. The third term in the expansion of $(a-2b)^6$ is

A. $60a^4b^2$
B. $60a^3b^3$
C. $-60a^3b^3$
D. $-60a^4b^2$

22. The general term in the binomial expansion of $(3x+7y)^{10}$ is

A. $\binom{10}{r}(3x)^{r-10}(7y)^r$
B. $\binom{10}{r}(3x)^r(7y)^{r-10}$
C. $\binom{10}{r}(3x)^r(7y)^{10-r}$
D. $\binom{10}{r}(3x)^{10-r}(7y)^r$

23. By using principle of mathematical induction, what should be added to both sides of $1+3+5+...+(2n-1)=n^2$ to prove that the statement is true for $n=k+1$?

A. $2k$
B. $2k+1$
C. $2k-1$
D. $(k+1)^2$

24. A quadratic equation has rational coefficients. If one of its root is $1+\sqrt{2}$, then the sum of its roots will be

A. 2
B. -2
C. $2+2\sqrt{2}$
D. $2-2\sqrt{2}$

25. The solution set of the quadratic equation $2x^2+\frac{1}{2}=0$ is

A. $\{-i, i\}$
B. $\left\{0, \frac{i}{2}\right\}$
C. $\left\{\frac{i}{4}, -\frac{i}{4}\right\}$
D. $\left\{\frac{i}{2}, -\frac{i}{2}\right\}$

26. The nature of roots of the equation $x^2-2bx+b^2=0$, where $b \in Z$, is

A. real and equal.
B. real and unequal.
C. complex and equal.
D. complex and unequal.

27. If 1, ω, and ω^2 are the cube roots of unity, then $\omega^2 \times \omega^3 + 1$ is equal to

A. ω
B. $-\omega$
C. ω^2
D. $-\omega^2$

28. For the quadratic equation $ax^2 + bx + c = 0$, if the sum of roots is equal to the product of roots, then

A. $b + c = 0$
B. $b - c = 0$
C. $b - c = a^2$
D. $b + c = a^2$

29. ω^{303} is equal to

(**Note:** ω and ω^2 are the complex cube roots of unity.)

A. 0
B. 1
C. ω
D. ω^2

30. $\dfrac{1-\sin^2\theta}{1+\tan^2\theta}$ is equal to

A. 1
B. $\cot^2\theta$
C. $\sec^4\theta$
D. $\cos^4\theta$

31. The terminal ray of angle 2360° lies in the

A. I quadrant.
B. II quadrant.
C. III quadrant.
D. IV quadrant.

32. $\sin\alpha + \sin\beta$ is equal to

A. $\sin\dfrac{\alpha+\beta}{2}\cos\dfrac{\alpha-\beta}{2}$
B. $2\sin\dfrac{\alpha+\beta}{2}\cos\dfrac{\alpha-\beta}{2}$
C. $\cos\dfrac{\alpha+\beta}{2}\sin\dfrac{\alpha-\beta}{2}$
D. $2\cos\dfrac{\alpha+\beta}{2}\sin\dfrac{\alpha-\beta}{2}$

33. If $\sin\alpha = a$ and $\cos\alpha = b,$ then the value of $\sin 2\alpha$ will be equal to

A. ab

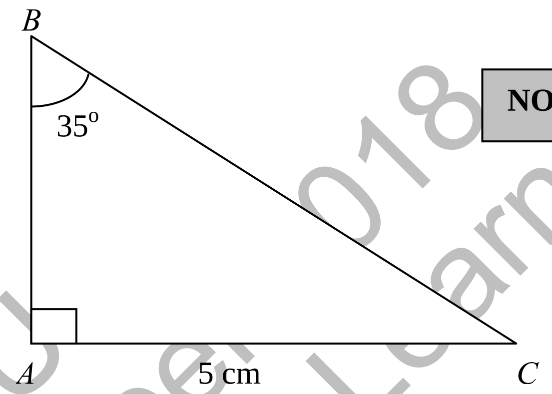
B. $\dfrac{a}{b}$

C. $\dfrac{2a}{b}$

D. $2ab$

34. In the given right angled triangle *ABC*, the length of *AB* is equal to

A. 7.14 cm
B. 4.10 cm
C. 3.50 cm
D. 2.87 cm



NOT TO SCALE

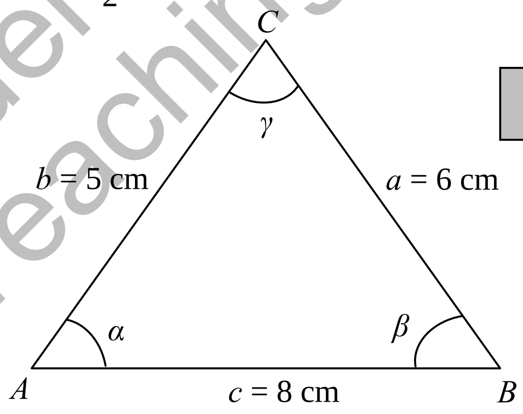
35. In the given triangle *ABC*, $\dfrac{\tan\dfrac{\alpha-\beta}{2}}{\tan\dfrac{\alpha+\beta}{2}}$ is equal to

A. $\dfrac{1}{11}$

B. $\dfrac{1}{7}$

C. 11

D. 7



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36. The sides of a triangle ABC are 6 cm, 5 cm, 7 cm and its area is $6\sqrt{6}$ cm^2. The circum-radius of the circle associated to the triangle ABC is

A. $\frac{210}{6\sqrt{6}}$ cm
B. $\frac{840}{6\sqrt{6}}$ cm
C. $\frac{210}{24\sqrt{6}}$ cm
D. $\frac{6\sqrt{6}}{210}$ cm

37. The domain of the trigonometric function $\cot\theta$ is

A. $-1 < x < 1$
B. $-\infty < x < \infty$
C. $-\infty < x < \infty$ where $x \neq n\pi$ and $n \in Z$
D. $-\infty < x < \infty$ where $x \neq \frac{(2n+1)}{2}\pi$ and $n \in Z$

38. The period of $5\cos 5x$ is

A. 10π
B. 2π
C. $\frac{2\pi}{5}$
D. $\frac{\pi}{5}$

39. If $\tan x = -1$, where $x \in [0, \pi]$, then x will be

A. 0
B. $\frac{\pi}{4}$
C. $\frac{\pi}{2}$
D. $\frac{3\pi}{4}$

40. Which of the following functions is an odd function?

A. $(\sin 4x)^3$
B. $(\sin 4x)^2$
C. $(\cos 3x)^3$
D. $(\cos 3x)^4$

END OF PAPER

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