2021 Advanced Mathematics 1 Paper 1

1. The following is a set of data in ascending order:

$3,\ 3,\ 4,\ 7,\ x,\ 12,\ 14,\ 18$

If the median and mean of the data are equal, find the value of x. Ans. A [30. Statistics]

A 11 B 10 C 9 D 8

2. A company accepted a renovation job of a hotel. If the job is completed before the deadline, the company will earn a profit of RM 50,000. If the job is delayed, there will be a penalty. The delayed period, corresponding probabilities and penalties are given in Table 1.

Delayed period	< 30 days	31—60 days	61—90 days
Probability	0.15	0.08	0.05
Penalty (RM)	5,000	12,000	20,000

Table 1

Knowing that the job would not be delayed beyond 90 days, find the expected profit of this job after penalty. Ans. A [11. Probabilities]

A Rm 47,290 B RM 37,290 C RM 33,290 D RM 11,290

3. A hospital selects 7 people from 7 doctors and 7 housemen to form a team in an outbreak. If the team can only have at most 4 housemen, how many ways are there to form the team? Ans. D [9. Permutation and Combination]

A $1,225$ B $1,716$ C $2,940$ D $2,941$

4. Find the value x, if the inverse of the matrix $A = (x + 1\ 2\ -\ 6\ 4\ )$ does not exist. Ans A [7. Matrices and determinants]

A $-\ 4$ B $-\ 2$ C 0 D 2

5. A quadratic equation $2x^2 - 4x + m - 2 = 0$ has two distinct non-zero real roots, find the range of m. aAns. A [1. Quadratic equation]

A $(-\infty, 2) \cup (2, 4)$ B $(-\infty, 4)$ C $(4, \infty)$ D $(2, 4)$

6. Given that $f: x \to x + 2,\ g \circ f: x \to x^2 + 4x + 8$. Find $g(x)$ Ans. B [12. Functions]

A $x - 2$ B $x^2 + 4$ C $2x + 8$ D $x^2 + 8x + 20$

7. In the expansion of $(2x + 1)^{10}$ in descending powers, determine the coefficient of the eighth term. Ans. C [10. Binomial theorem]

A 120 B 180 C 960 D 3360

8. In an arithmetic progression, the sum of the first four terms is $\frac{17}{3}$ and the tenth is $\frac{31}{6}$. Find the common difference. Ans. D [5. Sequence and series]

A $\frac{7}{6}$ B $\frac{5}{3}$ C $\frac{2}{3}$ D $\frac{1}{2}$

9. Given that $\underline{u} = \underline{b} - \underline{a}$ and $\underline{v} = \underline{c} - \underline{b}$, with $\underline{a} = (2\ 1)$, $\underline{b} = (5\ -\ 3)$ and $\underline{c} = (m\ -\ 6)$. If $\underline{u}$ is parallel to $\underline{v}$, find the value of m. Ans. D [14. Vector]

A 9 B 1 C $\frac{11}{4}$ D $\frac{29}{4}$

10. Find $\sum_{k=10}^{100} k(k-2)$. Ans. C [5. Sequence and series]

A 24,050,925 B 337,965 C 328,055 D 327,975

11. Find the largest value of $2\left(sin\theta cos^3\theta - sin^3\theta cos\theta\right)$.
Ans. B [17.Trigonometric functions of any angle]

A $\frac{\sqrt{2}}{2}$ B $\frac{1}{2}$ C 1 D $\sqrt{3}$

12. A triangle has three sides lengths of 5 cm, 6 cm and 7 cm. Suppose that the largest angle of this triangle is θ, find $cos\theta$. Ans A [18. Solution of triangles.]

A $\frac{1}{5}$ B $-\frac{1}{5}$ C $\frac{2}{5}\sqrt{6}$ D $-\frac{2}{5}\sqrt{6}$

13. Given that $sinx + cosx = \sqrt{3}sin\left(\frac{5\pi}{2} - x\right)$, find $tanx$.

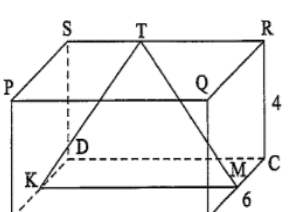
Ans. A 1[17. Trigonometric functions of any angle]

A $\sqrt{3} - 1$ B $\sqrt{3} + 1$ C $\frac{\sqrt{3}-1}{2}$ D $\frac{\sqrt{3}+1}{2}$

14. Fig.1 shows a cuboid. Given that $AB = 10,\ BC = 6,\ and\ RC = 4.\ K,\ M$ are the midpoints of $AD,\ BC$ respectively and T is a point on SR such that $ST : TR = 2 : 3$. Find the angle between the plane TKM and the base $ABCD$.
Ans. D [20. Problems in three dimensions]

A $30.81°$ B $38.66°$

C $51.34°$ D $53.13°$



15. Given that two points $P(1,-2)$ and $Q(b,c)$. P lies on a line l with gradient $\frac{1}{2}$. If l is perpendicular to PQ, find the relation between b and c. Ans. C [23. The straight line]

A $c = 2b + 4$ B $c = b$ C $c = -2b$ D $c = 2b - 4$

16. Given that k is a constant, find the radius of the circle

$x^2 + y^2 - (2k + 2)x + (2 - 2k)y + 2k^2 = 0$. Ans. D [24. The circle]

A 3 B 2 C $\sqrt{3}$ D $\sqrt{2}$

17. Find $\left(\sqrt{4x^2 + 2x + 1} - 2x - 1\right)$. Ans. B[25.Limit and Continuity]

A $-\frac{1}{4}$ B $-\frac{1}{2}$

C 0 D Limit does not exist

18. Given that $y = sin^2 x$. Find the value of $\frac{dy}{dx}$ when $x = \frac{2\pi}{3}$. Ans. A [26. Differentiation]

A $-\frac{\sqrt{3}}{2}$ B $\frac{\sqrt{3}}{2}$ C $\frac{1}{2}$ D $-\frac{1}{2}$

19. Find the absolute maximum value and absolute minimum value of

$f(x) = x^3 - 3x^2 - 9x + 5$ on the close interval $[-2, 2]$

Ans B [27. Applications of differentiation]

A Absolute maximum value=3 , absolute minimum value=−17

B Absolute maximum value=10 , absolute minimum value=−17

C Absolute maximum value=10 , absolute minimum value=−22

D Absolute maximum value=3 , absolute minimum value=−22

20. Given that the gradient of tangent to the curve $y = f(x)$ at the point (x, y) is

$x^3 + \frac{2}{x^2} - 2$. If the curve passes through the point $(2, 1)$, find the equation of the curve.

Ans. C [28. Indefinite integrals]

A $y = \frac{1}{4}x^4 - \frac{2}{x} - 2x$ B $y = 3x^2 - \frac{2}{x} - 2x - 6$

C $y = \frac{1}{4}x^4 - \frac{2}{x} - 2x + 2$ D $y = \frac{1}{4}x^4 + \frac{2}{x} - 2x$