# Institute of Actuaries of India

## ACET November 2022

## Mathematics

1. The range of the function $f(x) = \frac{1}{1-2\cos x}, x \in R$ is

   A. $\left(-\infty, -\frac{1}{3}\right] \cup [1, \infty)$.
   B. $(-\infty, -1] \cup \left[\frac{1}{3}, \infty\right)$.
   C. $\left(-\infty, -\frac{1}{3}\right] \cup \left[\frac{1}{3}, 1, \infty\right)$.
   D. $(-\infty, -1] \cup [1, \infty)$.

   2 marks

2. Let $f$ be a real valued function such that

   $$f(x) = (4 - x^4)^{\frac{1}{4}}, \ |x| \le \sqrt{2}.$$

   Then $f \circ f(x)$ is

   A. $x^4$.
   B. $\sqrt[4]{x}$.
   C. $x$.
   D. $(1 - x^4)$.

   1 mark

3. The principal value of $\cos^{-1}\frac{\sqrt{3}}{2}$ is

   A. $\frac{\pi}{2}$.
   B. $\frac{\pi}{3}$.
   C. $\frac{\pi}{4}$.
   D. none of these.

   1 mark

4. The solution of $x = +\sqrt{x + 6}$ is

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

   1 mark

5. The value of $\sum_{n=4}^{\infty} \frac{8}{n^2 - 4n + 3}$ is

   A. 4.
   B. 5.
   C. 6.
   D. 2.

   2 marks

6. Let $S_n = \frac{1 + 2 + \cdots + n}{3n}$. If $\sum_{n=1}^{20} S_n^2 = \frac{1}{36} S$, then $S$ is equal to

   A. 3310.

B. 3311.

C. 2870.

D. 2879.

<div align="right">1 mark</div>

7. If $x$ and $y$ are angles in the first and the second quadrant, respectively, such that $\sin x = \frac{4}{5}$ and $\cos y = -\frac{12}{13}$, then $\sin(x + y)$ is

A. $-\frac{152}{195}$.

B. $\frac{152}{195}$.

C. $\frac{63}{65}$.

D. $-\frac{33}{65}$.

<div align="right">1 mark</div>

8. If $x^2 - 2x + c = 0$ has roots $\alpha$ and $\beta$ and $x^2 - 3x + c = 0$ has roots $\frac{\alpha}{2}$ and $2\beta$, then the value of $c$ is

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

B. $\frac{8}{9}$.

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

D. $\frac{2}{3}$.

<div align="right">1 mark</div>

9. The direction cosines of the vector $\vec{a} = 3\vec{\imath} - 4\vec{\jmath} + \vec{k}$ are

A. $\left(\frac{3}{\sqrt{26}}, \frac{-4}{\sqrt{26}}, \frac{1}{\sqrt{26}}\right)$.

B. $\left(\frac{3}{\sqrt{26}}, \frac{4}{\sqrt{26}}, \frac{1}{\sqrt{26}}\right)$.

C. $\left(\frac{3}{26}, \frac{-2}{13}, \frac{1}{26}\right)$.

D. $\left(\frac{3}{26}, \frac{2}{13}, \frac{1}{26}\right)$.

<div align="right">1 mark</div>

10. The two adjacent sides of a parallelogram are $\vec{a} = 3\vec{\imath} - 5\vec{\jmath} + 6\vec{k}$ and $\vec{b} = 2\vec{\imath} - 3\vec{\jmath} - 4\vec{k}$. A unit vector parallel to its diagonal that passes through the intersection of these two adjacent sides is

A. $\frac{1}{105}\left(\vec{\imath} - 2\vec{\jmath} + 2\vec{k}\right)$.

B. $\frac{1}{\sqrt{105}}\left(\vec{\imath} - 2\vec{\jmath} + 2\vec{k}\right)$.

C. $\frac{1}{\sqrt{93}}\left(5\vec{\imath} - 8\vec{\jmath} + 2\vec{k}\right)$.

D. $\frac{1}{93}\left(5\vec{\imath} - 8\vec{\jmath} + 2\vec{k}\right)$.

<div align="right">1 mark</div>

11. The value of $\lim_{x \to 0} \frac{(1-\cos 2x)(2+\cos x)}{x \tan 3x}$ is equal to

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

B. 1.

C. $\frac{4}{3}$.

D. 2.

2 marks

12. If $\log(x + y) = 3xy$, then $\frac{dy}{dx}$ at $x = 0$ is

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

1 mark

13. If $f(x) = xe^{x(1-x)}$, then $f(x)$ increases in

A. $\left(-\frac{1}{2}, 1\right)$.

B. $\left(-1, \frac{1}{2}\right)$.

C. $(1, 2)$.

D. $\left(-\frac{1}{2}, \frac{1}{2}\right)$.

3 marks

14. The value of $\int (\tan x + \cot x)^2 \, dx$ is equal to

A. $\tan x + \cot x + c$.
B. $\tan x - \cot x + c$.
C. $-\tan x + \cot x + c$.
D. $-(\tan x + \cot x) + c$.

1 mark

15. The value of the integral $\int_{-1}^{3} |x^3 - x| \, dx$ is

A. $\frac{63}{4}$.

B. $\frac{33}{4}$.

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

D. $\frac{33}{2}$.

2 marks

16. If
$$\begin{vmatrix} 3i & -4i & 1 \\ 2 & 4i & -1 \\ 10 & 4 & i \end{vmatrix} = x + iy,$$
where $i^2 = -1$, then the values of $(x, y)$ are

A. $(0,0)$.
B. $(1,1)$.
C. $(0,1)$.
D. $(1,0)$.

17. If

$$A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix},$$

then $A^2$ for $\theta = \frac{\pi}{2}$ is

A. $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$.

B. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$.

C. $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$.

D. $\begin{bmatrix} -1 & 1 \\ -1 & 0 \end{bmatrix}$.

18. Let

$$A = \begin{bmatrix} 0 & 3q & r \\ p & q & -r \\ p & -q & r \end{bmatrix}.$$

If $AA^T = I$, then $|p|$ is equal to

A. $\frac{1}{\sqrt{6}}$.

B. $\frac{1}{\sqrt{2}}$.

C. $\frac{1}{\sqrt{5}}$.

D. $\frac{1}{\sqrt{3}}$.

19. The closest root of the equation $e^x - 2x - 1 = 0$ using Newton-Raphson method with initial value $x_0 = 1$ and with two iterations, correct to 4 decimal places, (given that the value of $e = 2.7183$ and $e^{0.3922} = 1.4802$) is

A. 1.2740.
B. 1.9152.
C. 1.7273.
D. 1.5236.

20. The value of the integral $\int_0^1 \frac{1}{1+x} dx$ using Trapezoidal rule with $h = \frac{1}{2}$ is

A. $\frac{17}{24}$.

B. $\frac{11}{24}$.

C. $\frac{13}{24}$.

D. $\frac{13}{12}$.

# Statistics

21. If the letters of the word "ATTITUDE" are written down at random, then the probability that no two T's occur together is

    A. $\frac{1}{120}$.

    B. $\frac{5}{84}$.

    C. $\frac{5}{24}$.

    D. $\frac{5}{14}$.

    2 marks

22. If two events $E$ and $F$ are such that $P(F) = \frac{3}{5}$, $P(E|F) = \frac{1}{2}$ and $P(E \cup F) = \frac{4}{5}$, then $P(E)$ equals

    A. $\frac{3}{10}$.

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

    C. $\frac{1}{10}$.

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

    1 mark

23. Let $\bar{x}_n$ be the sample mean of $n$ observations. Now another observation $x$ becomes available. Let $\bar{x}_{n+1}$ be the mean for all $n + 1$ observations. Then

    A. $\bar{x}_{n+1} = \frac{\bar{x}_n + x}{2}$.

    B. $\bar{x}_{n+1} = \frac{n\bar{x}_n + x}{n}$.

    C. $\bar{x}_{n+1} = \frac{n\bar{x}_n + x}{n+1}$.

    D. $\bar{x}_{n+1} = \frac{\bar{x}_n + nx}{n+1}$.

    1 mark

24. The mean and range of four observations are 12 and 20, respectively. If the smallest observation is 5, the median of the observations is

    A. 9.
    B. 8.
    C. 7.
    D. 6.

    2 marks

25. A class has 12 students whose ages are 23, 24, 23, 25, 26, 25, 26, 24, 26, 24, 27, 24. One student is selected in such a manner that each has the same probability of being chosen and the age $X$ of the selected students is recorded. What is the probability that age of the selected student is more than 25?

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

    B. $\frac{1}{3}$.

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

D. $\frac{5}{12}$.

26. The probability that a customer's order is not shipped on time is 0.10. Suppose a particular customer placed three orders independently. The probability that exactly one order is not shipped on time is

    A. 0.009.
    B. 0.027.
    C. 0.081.
    D. 0.243.

27. The sum of the deviations of 20 observations measured from 10 is 50. The mean of the of the observations is

    A. 3.
    B. 7.5.
    C. 10.
    D. 12.5.

28. The stem-and-leaf display shows populations of 50 states, in millions of people.

    0|111111111122223333334444
    0|555556666667789
    1|000233
    1|99
    2|5
    3|7

    (1|0 means 10).

    Which of the following is true for the data?

    A. Range of the observations is 36 millions.
    B. Median of the observation is 4 millions.
    C. The distribution is negatively skewed.
    D. Median must be larger than mean.

29. An insurance company has high-risk, medium-risk and low-risk clients, who have probabilities 0.02, 0.01 and 0.0025, respectively, of filing claims within a given year. The proportion of the number of clients in the three categories are 0.10, 0.30 and 0.60, respectively. If a claim is filed in a year, what is the probability that it is claimed by a high-risk client?

    A. 0.002.

    B. $\frac{4}{13}$.

    C. $\frac{5}{13}$.

    D. $\frac{2}{13}$.

30. A commuter must pass through five traffic lights on her way to work and will have to stop at each one that is red. Suppose the probability distribution for the number of red lights she hits is given below.

| $x$ | 0 | 1 | 2 | 3 | 4 | 5 |
|-----|-----|-----|-----|-----|-----|-----|
| $P(X = x)$ | 0.05 | 0.25 | 0.30 | 0.20 | 0.15 | 0.05 |

The expected number of red lights she hits each day is

A. 2.3.
B. 2.5.
C. 3.3.
D. 2.0.

1 mark

31. Suppose $X$ has a continuous uniform distribution over the interval $[-2, 2]$. The value $a$ such that $P(-a < X < a) = 0.95$ is

A. 0.95.
B. 1.45.
C. 1.90.
D. 1.95.

1 mark

32. The following table shows the cumulative distribution function of a discrete random variable $X$.

| $x$ | 0 | 1 | 2 | 3 | 4 | 5 |
|-----|-----|-----|-----|-----|-----|-----|
| $F(x)$ | 0 | 0.1 | 0.3 | 0.6 | 0.9 | 1.0 |

Then $P(X = 3 | X \geq 3)$ equals

A. $\frac{3}{10}$.
B. $\frac{3}{7}$.
C. $\frac{6}{7}$.
D. 1.

1 mark

33. Let $X$ be a random variable with probability density function

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}}, \quad -\infty < x < \infty.$$

Let $Y = 5 + 0.5X$. Then $E(Y - E(Y))^{25}$ is

A. 0.
B. 0.125.
C. 0.25.
D. 1.

1 mark

34. Let $X$ be a continuous random variable with probability density function

$$f(x) = \begin{cases} \dfrac{1}{b - a}, & a \leq x \leq b, \\ 0, & \text{otherwise.} \end{cases}$$

The mean and the 25$^{th}$ percentile of the distribution are 8 and 6 respectively. Then the 90$^{th}$ percentile of the distribution is

A. 10.5.
B. 11.2.
C. 11.5.
D. 12.5.

<div align="right">3 marks</div>

35. Suppose $X$ and $Y$ are independent discrete random variables and each assumes the values 0, 1 and 2 with probability $\frac{1}{3}$. Then $P(X = 2, Y \geq 1)$ equals

A. $\frac{1}{3}$.
B. $\frac{1}{9}$.
C. $\frac{2}{9}$.
D. 0.

<div align="right">1 mark</div>

36. The number of cracks in a section of highway that require repair is assumed to follow Poisson distribution with a mean of 3 cracks per kilometre. The probability that there are no cracks that require repair in 6 kilometres of highway is

A. $e^{-18}$.
B. $e^{-0.5}$.
C. $1 - e^{-0.5}$.
D. $e^{-2}$.

<div align="right">1 mark</div>

37. The probability density function of the time-to-failure of an electronic component in a copier (in hours) is

$$f(x) = \frac{1}{100} e^{-\frac{x}{100}}, \qquad x > 0.$$

The probability that the component lasts more than 200 hours before failure is

A. $e^{-0.5}$.
B. $e^{-1}$.
C. 0.5.
D. $e^{-2}$.

<div align="right">1 mark</div>

38. Two variables $x$ and $y$ have the least square regression lines $x + 4y + 3 = 0$ and $4x + 9y + 1 = 0$. Then means $\bar{x}$ and $\bar{y}$, and the correlation coefficient between $x$ and $y$ are

A. $\frac{23}{7}, -\frac{11}{7}$ and 0.75.
B. $\frac{23}{7}, -\frac{11}{7}$ and $-0.75$.
C. $-\frac{23}{7}, \frac{11}{7}$ and 0.75.

D. $-\frac{23}{7}, \frac{11}{7}$ and $-0.75$.

39. Suppose $X$ and $Y$ have the joint probability described in the table below.

| $x$ | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|
| $y$ | 0 | 1 | 2 | 3 | 0 | 1 | 2 | 3 |
| $P(X = x, Y = y)$ | $\frac{1}{8}$ | $\frac{2}{8}$ | $\frac{1}{8}$ | 0 | 0 | $\frac{1}{8}$ | $\frac{2}{8}$ | $\frac{1}{8}$ |

Then $P(Y = 3 \mid X = 1)$ equals

A. $\frac{1}{8}$.

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

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

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

40. Suppose $X_1$ and $X_2$ are two independent random variables with means $\mu_1$ and $\mu_2$, and variances $\sigma_1^2$ and $\sigma_2^2$. Then the correlation between $Y_1 = a_{11}X_1 + a_{12}X_2$ and $Y_2 = a_{21}X_1 + a_{22}X_2$ is

A. $\dfrac{a_{11}a_{21}\sigma_1^2 + a_{12}a_{22}\sigma_2^2}{\sqrt{a_{11}^2\sigma_1 + a_{12}^2\sigma_2}\sqrt{a_{21}^2\sigma_1 + a_{22}^2\sigma_2}}$.

B. $\dfrac{a_{11}a_{21}\sigma_1^2 + a_{12}a_{22}\sigma_2^2}{\sqrt{a_{11}\sigma_1^2 + a_{12}\sigma_2^2}\sqrt{a_{21}\sigma_1^2 + a_{22}\sigma_2^2}}$.

C. $\dfrac{a_{11}a_{21}\sigma_1^2 + a_{12}a_{22}\sigma_2^2}{\sqrt{a_{11}^2\sigma_1^2 + a_{12}^2\sigma_2^2}\sqrt{a_{21}^2\sigma_1^2 + a_{22}^2\sigma_2^2}}$.

D. 0.

# Data Interpretation

The following table shows the number of licensed drivers (in thousand) by age and sex.

| Age | Male Drivers (in thousand) | Female Drivers (in thousand) |
|---|---|---|
| 18-19 | 51 | 9 |
| 20-24 | 87 | 38 |
| 25-29 | 92 | 43 |
| 30-34 | 95 | 45 |
| 35-39 | 97 | 63 |
| 40-44 | 99 | 61 |
| 45-49 | 106 | 54 |
| 50-54 | 111 | 49 |
| 55-59 | 87 | 33 |
| 60-64 | 72 | 28 |
| 65-69 | 53 | 7 |
| 70-75 | 18 | 2 |
| Total | 968 | 432 |

Answer the questions 41-43 based on your interpretation of the table.

41. The percentage of total drivers under 20 is approximately

    A.  3.6.
    B.  4.3.
    C.  9.9.
    D.  13.2.

1 mark

42. The numbers of male and female drivers in the age group 25-44 are
    A.  383 and 189, respectively.
    B.  383 and 212, respectively.
    C.  371 and 212, respectively.
    D.  371 and 189, respectively.

2 marks

43. The percentage of total drivers in the age group 30-59 is approximately

    A.  42.5.
    B.  64.3.
    C.  68.2.
    D.  72.

2 marks

44. Twenty-six countries won gold medals in Commonwealth Games 2022. The following table lists them with the number of gold medals each won.

| Country | Number of gold medals | Country | Number of gold medals |
|---|---|---|---|
| Australia | 67 | Singapore | 4 |
| England | 57 | Trinidad and Tobago | 3 |
| Canada | 26 | Uganda | 3 |
| India | 22 | Cyprus | 2 |
| New Zealand | 20 | Pakistan | 2 |
| Scotland | 13 | Samoa | 1 |
| Nigeria | 12 | Barbados | 1 |
| Wales | 8 | Cameroon | 1 |
| South Africa | 7 | Zambia | 1 |
| Malaysia | 7 | Grenada | 1 |
| Northern Ireland | 7 | The Bahamas | 1 |
| Jamaica | 6 | Bermuda | 1 |
| Kenya | 6 | British Virgin Islands | 1 |

Which of the following statements is true?

A. Australia and England won about 40% of the gold medals.
B. Number of countries which won at least 6 gold medals is 11.
C. Number of countries which won less than 4 gold medals is 8.
D. Australia, England, Canada and India together won more than 60% of gold medals.

2 marks

45. The following line chart shows yearly number of bicycle fatalities in a city from 1994 to 2012.
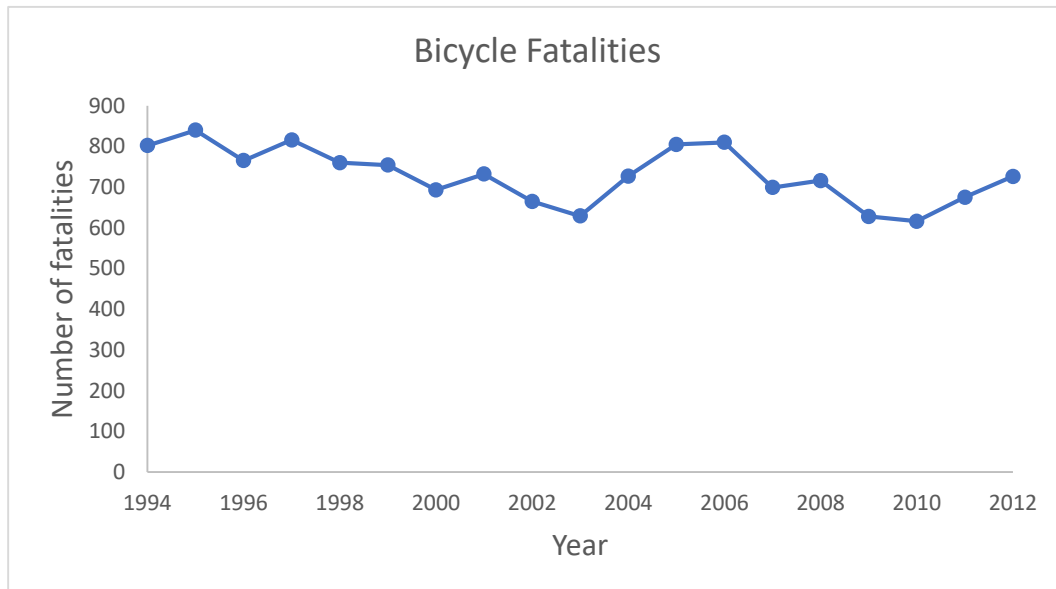


Which years have the maximum and the minimum numbers of bicycle fatalities?

A. 1995 and 2010, respectively.
B. 1995 and 2003, respectively.
C. 2006 and 2003, respectively.
D. 2006 and 2010, respectively.

2 marks

Answer questions 46-47 based on scatter plots shown in figures (a) –(f). The calculated correlation coefficients are $-0.522, -0.987, 0.022, -0.889, 0.333$ and $0.974$.
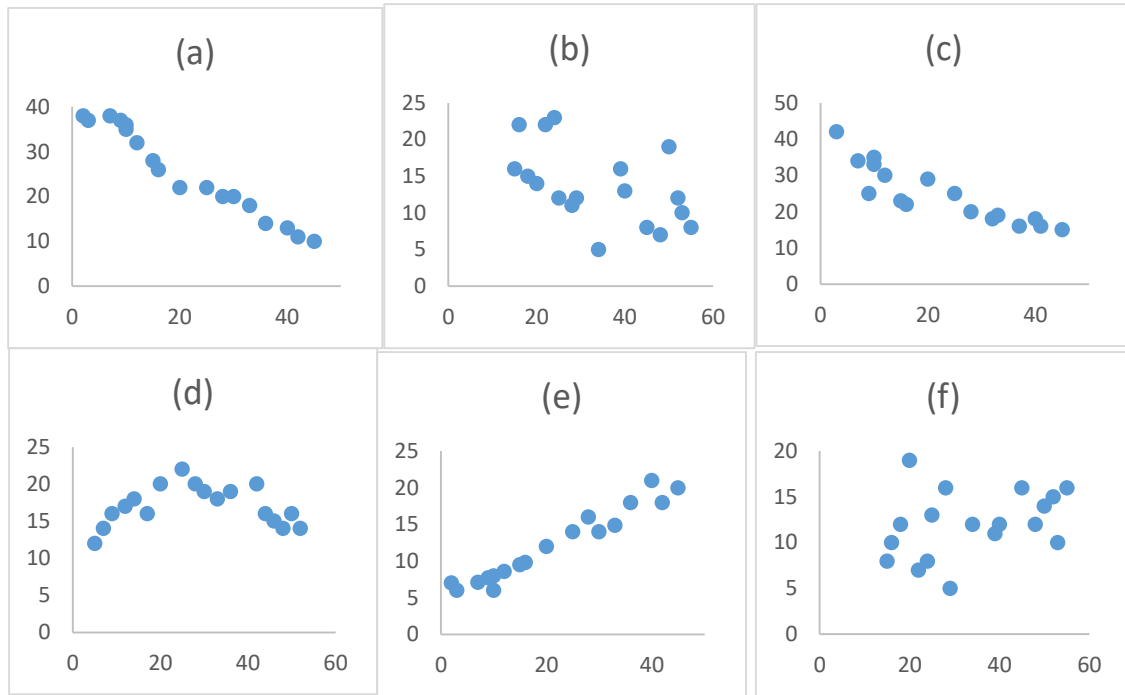


46. The calculated correlation 0.333 relates to the scatter plot

    A. (b).
    B. (d).
    C. (e).
    D. (f).

<div style="text-align: right">1 mark</div>

47. The calculated correlation $-0.522$ relates to the scatter plot

    A. (a).
    B. (b).
    C. (c).
    D. (f).

<div style="text-align: right">1 mark</div>

A commercial bank is having 18 circles of operation C1-C18. There are four types of properties – residential, commercial, industrial and vacant sites – in each circle which have availed loan from the bank. The bank listed the properties to auction in view of their failure to repay the loan. The following chart shows the percentage of four categories of properties in each circle which will go for auction.

Category-wise Properties listed for auction
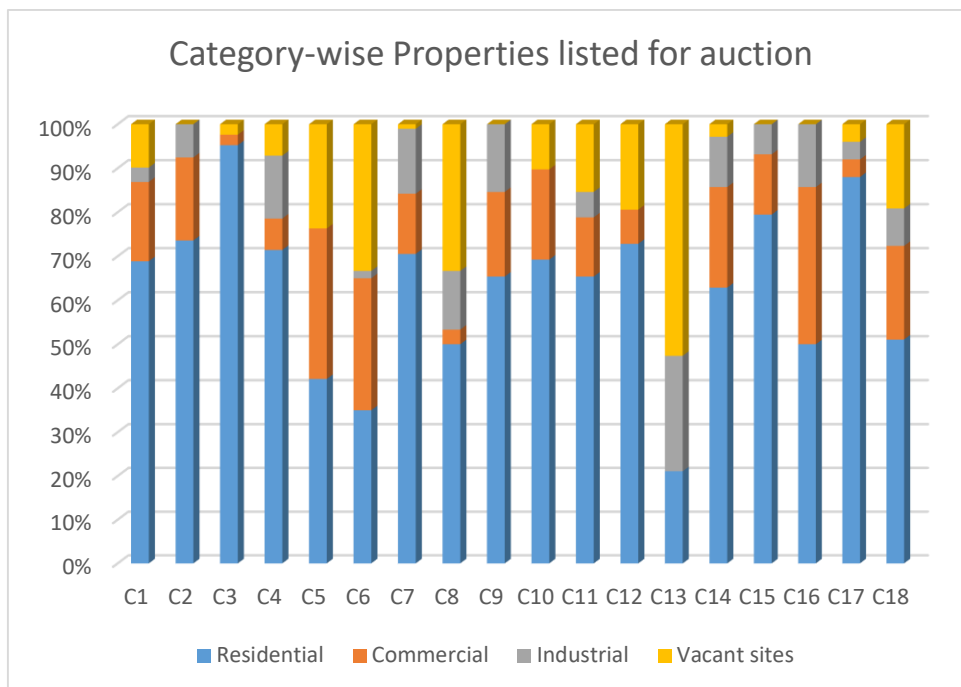
Answer the questions 48-51 based on your interpretation of the chart.

48. The circles having no industrial property which failed to repay the loan are

   A. C3, C4, C6, C10.
   B. C6, C17.
   C. C3, C5, C10, C12.
   D. C3, C12, C17.

<div align="right">1 mark</div>

49. Which circles have no vacant sites listed for auction?

   A. C2, C9, C15, C16.
   B. C2, C3, C7, C14.
   C. C3, C9, C15, C16.
   D. C9, C14, C15, C16.

<div align="right">1 mark</div>

50. The circle with second highest percentage of residential property failing to repay loan is

   A. C2.
   B. C3.
   C. C15.
   D. C17.

<div align="right">1 mark</div>

51. The circle with largest percentage of vacant sites failing to repay loan is

   A. C5.
   B. C6.
   C. C8.
   D. C13.

<div align="right">1 mark</div>

# English

52. Choose the pair of words that most appropriately completes the following sentence.

"I have _____ a response from the Government, and they say your enterprise is _____."

   A.  elicited, illicit.
   B.  elucidated, elicited.
   C.  elicit, illicit.
   D.  illicit, elucidate.

<div align="right">1 mark</div>

53. Which of the following sentences is incorrect?

   A.  He said me the tickets had arrived.
   B.  What are you here for?
   C.  I don't believe you, but I'm listening.
   D.  You're willfully misunderstanding me.

<div align="right">1 mark</div>

54. Which of these sequences is incorrect?

   A.  Small, medium, big, large.
   B.  Venial, venal, excusable, forgivable.
   C.  Graceful, deft, uncoordinated, clumsy.
   D.  Tropical, topical, optical, clear.

<div align="right">1 mark</div>

55. Select the word that is closest in meaning to the word 'Belligerent'.

   A.  Restless.
   B.  Noisy.
   C.  Aggressive.
   D.  Pretty.

<div align="right">1 mark</div>

56. Select the description that is most appropriate for the word 'Fusillade'.

   A.  Official files.
   B.  Fussy footballers.
   C.  A discharge of firearms.
   D.  Barricade.

<div align="right">1 mark</div>

57. Select the word that is closest in meaning to the word 'Mendacious'.

   A.  Lying.
   B.  Torn.
   C.  Beautiful.
   D.  Corrective.

<div align="right">1 mark</div>

58. Which of the following sentences is correct?

   A.  I have visited Juhu Chaupati last week.
   B.  Although it was raining, but we played Cricket.
   C.  When I will arrive, I will call you.
   D.  Please explain to me how to improve my Mathematics.

59. Choose the combination of words that most appropriately completes the following sentence:

"You tried to _____ a ride from me, and now that I've refused, you _____ and _____ me."

A. cadge, laugh, help.
B. hedge, spank, push.
C. cadge, upbraid, reproach.
D. cage, braid, approach.

1 mark

60. The following sentences are jumbled up. Choose the correct sequence from the options below.

I. We should not ignore the moral implications of the old "land and expand" business aphorism.
II. This is increasingly untenable: the speed with which more narrowly-cast solutions can supplant incumbents means that subpar services will be replaced.
III. More often than not, venture capitalists promote a "winner-take-all" mindset, pushing expansion at the cost of impact on initial customer targets.
IV. The market will punish premature growth, to say nothing of the ethical issues inherent in hooking customers into half-baked solutions in healthcare, financial services, or other critical industries.

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

2 marks

61. "Nineteenth-century Europe saw rapid industrialization and the movement of vast numbers of people into the cities. This led to congestion, crime and rampant abuses, but it also gave the working poor an opportunity to communicate with each other. Governments reacted by stepping up surveillance. A cost-effective tactic was to pay certain members of the poor community to inform their friends."

Which of the following statements does not follow from the above passage?

A. The laboring poor betrayed each other cheaply.
B. Governments wanted to control urban congestion.
C. Nineteenth-century cities were difficult to police.
D. The nineteenth-century saw a depopulation of the European countryside.

2 marks

Read the passage below and answer Question No. 62.

The Global Financial Recession of 2008 is widely regarded as the worst financial disaster. It started in 2007 with the subprime mortgage crisis in the United States. The collapse of the major investment bank Lehman Brothers in September 2008, developed into a full-fledged international banking crisis. The collapse of the US housing bubble, which peaked in FY 2006-2007, was the primary and immediate cause of the financial crisis. But it all began after the terrorist attacks of September 11, 2001. As a result of the US economy entering a recession, the Federal Reserve System (Fed) reduced its interest rate to 1%. Since 1% is such a low-interest rate, fixed-income investors who used to buy US Treasury bills became dissatisfied with the rates they were receiving and began searching for other investment options. Investment banks in

the United States became aware of the situation and began to apply some of their financial wizardry to mortgages. Mortgages were first securitized into Mortgage-Backed Securities (MBS), a form of asset-backed securities, by investment banks in the United States. An MBS is a series of various mortgages geographically scattered to increase diversification and thereby lower risk. Investment banks use MBS to keep future returns from such investments as high as possible while lowering risk. Almost no nation in the world, developing or developed, has been spared the effects of the US financial crisis. In August 2007, it became clear that the stock system alone could not overcome the US subprime crisis, and the problems had spread beyond the country's borders. The inter-banking market fully shut down, owing to widespread fear of the unknown among banks worldwide. Due to a liquidity shortage, Northern Rock, a British bank, had to approach the Bank of England for emergency funding. At that time, central banks and Governments all over the world had begun to band together to avert a global financial crisis. At the end of 2008, all of the world's major economies were either in or fighting to stay out of recession. The World Bank predicts a 0.9 percent rise in global economic activity in 2009, the slowest growth rate since records began in 1970.

I. The cause of the Global Financial Recession of 2008 was
   i. the collapse of the US housing bubble.
   ii. terrorist attacks of September 11, 2001.
   iii. both (i) and (ii).

II. During the 2008 recession, the inter-banking market fully shut down
   i. because of widespread fear of the unknown among banks worldwide.
   ii. because of liquidity shortage.
   iii. because central banks and Governments all over the world had begun to band together.

III. Mortgage-Backed Security is
   i. a form of asset-backed security.
   ii. used to keep future returns as high as possible while lowering risk.
   iii. both (i) and (ii).

62. The correct answers to I, II and III are

   A. iii, i, iii, respectively.
   B. ii, i, i, respectively.
   C. ii, ii, iii, respectively.
   D. i, ii, iii, respectively.

3 marks

# Logical Reasoning

63. A man said to a woman, ―Your brother's only sister is my mother. What is the relation of the woman with the maternal grandmother of that man?

    A. Mother.
    B. Sister.
    C. Niece.
    D. Daughter.

    1 mark

64. The maximum gap between two successive leap years is

    A. 4 years.
    B. 8 years.
    C. 2 years.
    D. none of the above.

    1 mark

65. A clock shows 6:00 in the morning. By how much angle will the hour's hand rotate when the clock shows 1:00 in the afternoon?

    A. 160 degrees.
    B. 120 degrees.
    C. 210 degrees.
    D. 135 degrees.

    1 mark

66. A $5 \times 5 \times 5$ cube is formed by using $1 \times 1 \times 1$ cubes. Suppose we add another layer of such $1 \times 1 \times 1$ cubes to all six sides to form a larger cube. What will be the number of $1 \times 1 \times 1$ cubes in the newly formed cubes?

    A. 216.
    B. 343.
    C. 294.
    D. 264.

    1 mark

67. Three closed boxes are placed in a corridor. A message is printed on each box. Out of the three messages only one message is True and the other two messages are False. There is a gift inside one of the three boxes and the other two boxes are empty. The first box has the message: Gift is not in the Box. The second box has the message: No gift in the Box. The third box has the message: Gift is in the second box. Which box has the Gift?

    A. First.
    B. Second.
    C. Third.
    D. Cannot be determined.

    2 marks

68. In the question below some statements are given followed by some conclusions. You have to take the given statements to be true even if they seem to be in variance with commonly known facts. Read all the conclusions and then decide which of the given conclusions logically follows from the given statements disregarding commonly known facts.

    Statements:
    I.      Some ocean is water.
    II.     Some river is sea.

III. No sea is ocean.
IV. Only ocean is lake.

Conclusions:
I. Some lake being water is a possibility.
II. No lake is sea.
III. Some water being river is a possibility.

A. Only conclusion II follows.
B. Both conclusion I and II follow.
C. Only conclusion III follows.
D. Both conclusion II and III follow.

2 marks

69. In a group, 80 persons like reading, 92 persons like playing sports, and 113 persons like listening to music. Among them, 21 persons like both reading and playing sports but not listening to music, 43 persons like both playing sports and listening to music but not reading, 29 persons like listening to music and reading but not playing sports, and 18 persons like all 3 types of activities.

What is the number of persons who like only listening to music?

A. 19.
B. 25.
C. 23.
D. 41.

1 mark

70. A person walks towards South for 10 meters, turns right and walks again for 5 meters, then to his left for another 7 meters, and again to his left for 5 meters. The general direction of his final position in relation to his initial position is

A. South-West.
B. South.
C. South-East.
D. West.

1 mark

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